A. U. B.

APOTHECARY

VOL. 8

1953

The Apothecary

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1953

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The Apothecary is published as a yearbook
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School of Pharmacy of the
American University of Beirut, Beirut
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JUNE 1953

The sketch of College Hall tower which appears on the front cover has been done by Mr. Samih Afifi B. Sc. (Pharm.).

IMP. ACHKAR FRÈRES

This Number
of the Apothecary
is respectfully dedicated
to the
three Vice-Presidents
of the University

Vice-President Costi K. Jurayk

COSTI K. ZURAYK

Born in Damascus, Syria, April 18, 1905.

B. A. 1928; M. A. 1929, University of Chicago; Ph. D. 1930, Princeton University.

Married Najla Cortas in 1940.

Children : Ilham, Huda, Afaf, Hanan.

Assistant Professor of History, A. U. B., 1930-1937.

Associate Professor of History, A. U. B., 1937-1945.

First Counsellor, Syrian Legation, Washington D. C., 1945-1946.

Minister of Syria, Washington D. C., 1946-1947.

Vice-President and Professor of History, A. U. B., 1947-1949.

Rector, Syrian University, Damascus, 1949-1952 (on leave from A. U. B.).

Edited : *Ibn al-Furat's History*, vols. VII, VIII, & IX (first two in cooperation with Dr. Najla Izzeddin).

Author : *al-Wa'y al-Qawmi*, *Ma'na al-Nakbah*, and many articles in reviews & magazines.

Awarded : "Medal of Education", 1947, conferred by Government of Lebanon; Syrian Medal.

Present Position : Vice-President 1952 —
Acting President 1952-1953.

Vice-President Archie S. Crawford

ARCHIE S. CRAWFORD

Born in Nebk, Syria, April 24, 1899.

Family moved to Beirut, September 1903.

Student in A. U. B. (SPC) 1916-1917.

Beloit College, Beloit, Wisconsin, 1917-1921, B. A.

M. A., A. U. B., Ancient History and Old Testament History, 1924.

Columbia University, graduate studies in Business and College Administration, Jan. 1927 — June 1928.

Harvard Business School, Sept. 1934 — Jan. 1935.

University of Chicago, summer 1927.

Married in 1928.

Children : One son, 24, in U. S. Army service; Daughter, married, 23; Daughter in school in U. S., 17.

Teacher in Prep., A. U. B., 1921-1924.

Assistant to President Dodge, 1924-1926.

Assistant Treasurer, 1926-1936.

Principal of International College, 1936-1947.

In U. S. Government service in Cairo, June 1943 - Dec. 1944.

Acting President, 1947-1948.

Present Position : Vice-President and Treasurer, 1948 —

Vice-President Fuad Sarruf

FUAD SARRUF

Born in Hadath-Beirut, Lebanon, December 20, 1900.

B.A. 1918.

Married; Children : Valerie.

Teacher at A.U.B., Prep. School, 1918-1919.

Headmaster, Lebanon Boys School, Souk-el-Gharb, 1919-1922.

Assistant Editor, *Al-Muktataf*, 1922-1927.

Editor, *Al-Muktataf*, 1927-1943.

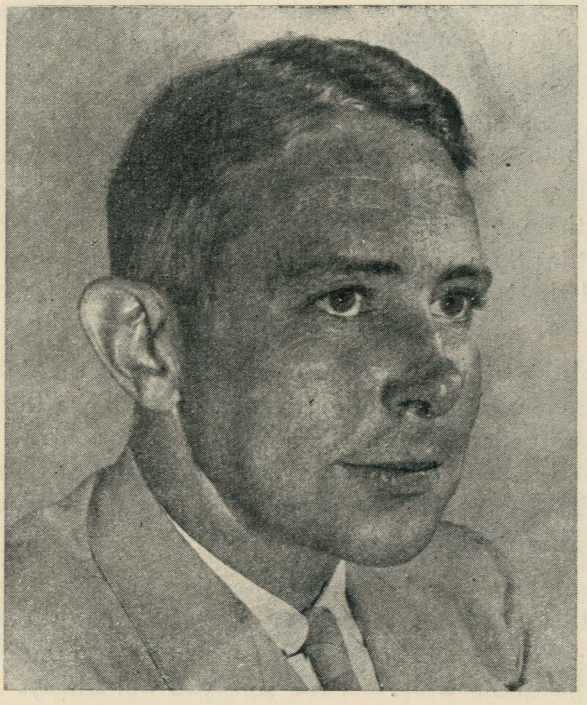
Editor, *Al-Mukhtar*, Arabic Version of the Reader's Digest, 1943-1947.

Lecturer at American University of Cairo, 1935-1944.

Author : *Psychology* 1924, *Views on the New World* 1925, *Conquest of Modern Science* 1934, *Pillars of Modern Science* 1935, *Horizons of Modern Science* 1939, *Roosevelt, Biography* 1943, *Altar of Mars* 1943, *The Conquest Continues* 1945, *Eternal Fire* 1947, *A Date with History* 1951.

Awarded : "Gold Medal of Merit" by Lebanese Republic.

Present Position : Vice-President in charge of Relations, Beirut, Lebanon, 1952 —



Stephen B. L. Penrose, Ph. D., L L. D.

President of the University

FOREWORD

It is a great pleasure for me to greet, through the 1953 issue of the "Apothecary", the Faculty and Students of the School of Pharmacy, to congratulate them on the fine work which they are doing and the notable team spirit which prevails in their School. This yearly publication is a symbol of these and other high qualities of teaching and practice for which the School stands.

I wish particularly to express my best wishes to this year's graduates of the School. I want to tell them, as they prepare to leave the University to enter the greater school of life, that we are confident in them, and in the kind of service which they will render to their countries through their profession. We are sure they will carry forward the banner of constructive professional work and of good citizenship, which has distinguished the sons of the A. U. B.

One of the tragic symptoms of modern life is the dehumanization of our actions and institutions. Much of what we think and do, individually and collectively, is shorn of its human content. A profession has often become a means for making money or getting social distinction, rather than an expression of the essential intellectual and moral qualities of man.

The profession of Pharmacy brings one in contact with human suffering. Human suffering is universal, and its real alleviation calls for the best that is in us. Your profession gives you the opportunity to share in this noble work. I am sure you will always remember that, behind every prescription that you fill, is an individual, a man or a woman, a sacred personality with which you are partly entrusted, and which requires your devotion and zeal.

The pharmaceutical education which you have received has, I hope, not only imparted to you a body of information, but developed in you those qualities of citizenship and humaneness which fit you to live up to the highest standards of the ethics of your profession.

As you go out to your countries, and confront the suffering around you, I am sure you will appreciate the privilege and the satisfaction of sharing in its alleviation, and of thus fulfilling your duty as pharmacists, citizens, and educated persons.

In this confidence, I am happy to convey to you the University's warmest greetings and best wishes.

C. K. Zurayk
Acting President

Our Society

Just as man has evolved over the centuries physically, so he has evolved socially. Just as physical man still has his weaknesses, man's society has imperfection. As physical man has mutations, society still has its throwbacks.

To the same extent that we can characterize the ideal physical man, we can describe the ideal society. It is a commonly accepted fact that only society based upon truth and justice, law and order can have the fruits of freedom of religion, freedom of speech, freedom from fear and freedom from want. Yet these freedoms are still in large part only dreams in this world, the existence of which is desired by everyone, yet prevented from materializing by man's greatest enemy, man himself.

Man alone has the privilege of knowing intellectually that he acquires rights only as he accepts responsibilities. Man knows that no freedom exists where there is special privilege. Yet man's vision is still so short that he seems incapable of giving up the immediate apparent or personal advantage for the greater long-term good, forgetting that he himself becomes, in time, a product of his own actions, and a slave of his own past.

Only when man dedicates himself to truth, only then will he become free from the bonds of ignorance, prejudice and suspicion, with the accompanying fear, poverty and suffering.

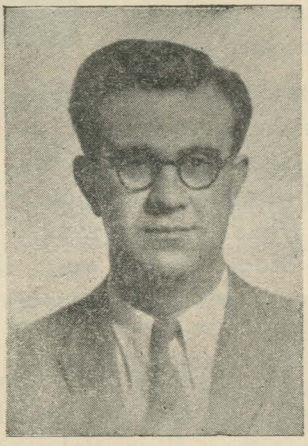
Two thousand years ago a great Teacher said, "Know the truth and the truth shall make you free". Our schools, our universities provide the hope of the world for they are based upon the search for the truth.

Norman B. Nelson, M. D.
Dean of the Medical Faculty

To the Graduating Class

It gives me pleasure to address to you this short message whereby I extend to you my sincere congratulations on your graduation after four years of honest study and hard work and welcome you into our profession, an honourable profession which you have chosen to be your life career.

A detailed report about the School of Pharmacy is given on later pages of *The Apothecary*. In this report the objectives of your School and the aims of the course of study you have just completed are clearly stated. May I urge you to read these objectives and aims. They will give you an appreciation of the value of the education you acquired at this University and of the importance of the responsibilities you are assuming as you complete your formal program of study and join a great profession of all time. The faculty of the School of Pharmacy and of the other Schools of the University have earnestly endeavoured to present to you a well balanced program of education which they consider necessary for a true professional pharmacist and a good citizen. We hope, however, that the completion of the program of study at your Alma Mater will not be a «stop» sign in your education. You should ardently endeavour to continue your education and development after graduation, regardless of what type of work will engage your time and effort.



I should like you to remember that your school training is only the prelude and that your success later in life rests upon your ability: to put into practice the ideals and principles you formed during your university days, to develop your professional capacities for which you were trained in the school, to practice the virtues and traits of pharmacy as described by the codes of ethics of your profession, to mix and mingle with other people and in particular to understand your fellowmen, to serve your community unselfishly, cheerfully and intelligently, to contribute to the intellectual, social and spiritual life of your society, to keep your chief interest and occupation in your prescription laboratory and finally and most essentially to keep abreast with the scientific advances in your profession and in the other health professions.

We know that each one of you possesses the potentialities, the courage, the ability and the qualification necessary for great future achievements. May your future accomplishments bring honour to you, to your profession and to your School. We send you forth from our midst with affectionate good wishes from us all. May fortune and happiness smile on you always.

Amin F. HADDAD
Director, School of Pharmacy

Graduating Class

Bachelors of Science in Pharmacy, B. Sc. (Pharm.).

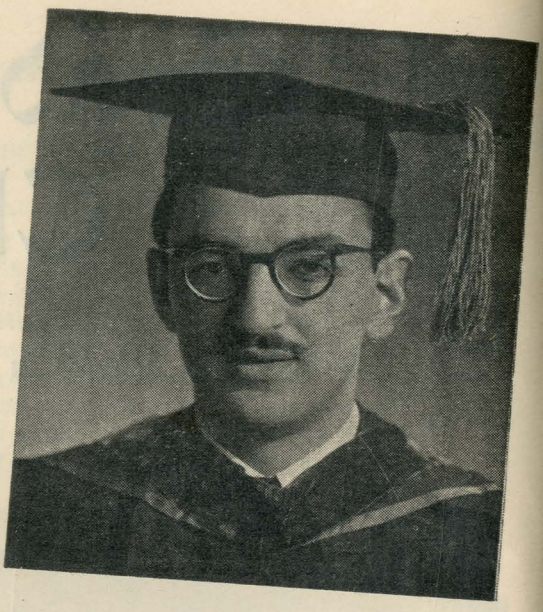
SAMI FARAH HALABY
Amman, Jordan

Art Club, President 1951-52; Debating Soc., Acting President 1951-52, Chairman 1952-53; Pharmaceut. Soc., Secretary 1951-52, President 1952-53; Usher. Comm., Inside Doorman 1952-53.

NICHOLAS MICHEL TROCHALAKIS
Jerusalem, Jordan

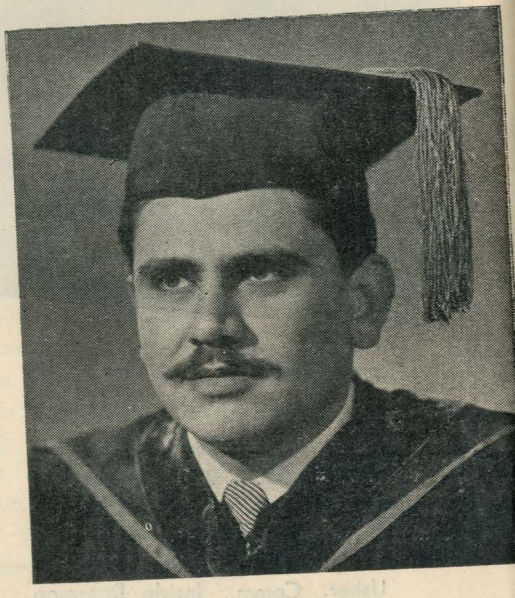
Student Council Representative 1950 - 51; Outlook, Editorial Board Member 1951-52; Pharmaceut. Soc., Secretary 1951-52.

NUHA FARID BADDURAH B. A.
Beirut, Lebanon



ELIAS LABIB FARAH
Beirut, Lebanon

HUSAM SAID NIMR
Jenin, Jordan



WASFI HANNA EL-KHAZEN
Beirut, Lebanon

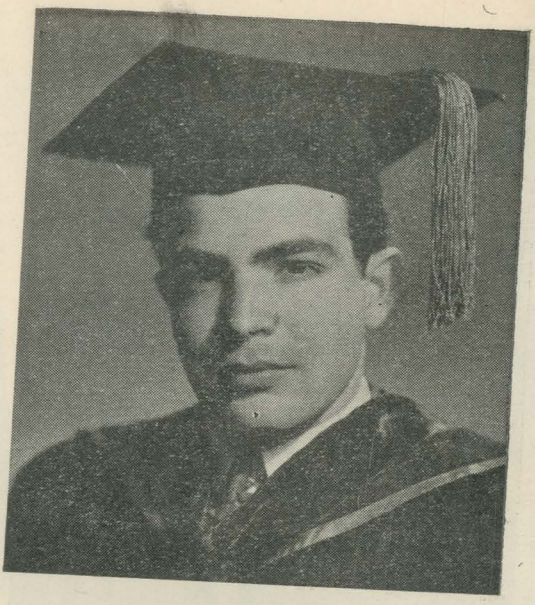
ANIS WAHBAH WAHBAH B. A.
Shoueifat, Lebanon

BERIN DJAMIL TUTUNJI
Amman, Jordan
Pharmaceut. Soc., Treasurer 1950-51

ANIS MANSOUR MOUASHER
Salt, Jordan

EDWARD NAIF BORDCOSH
Kirkuk, Iraq
Lieut. Usher 1952-53.

EUGENIE ELIAS ABOUCHDID B.A.
Beirut, Lebanon

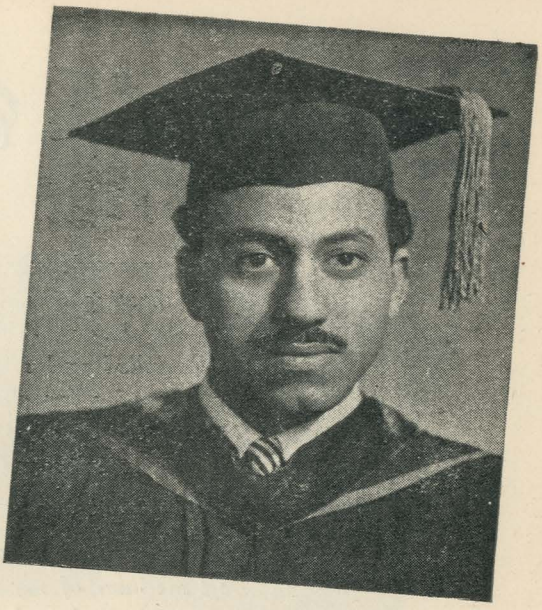


ANWAR HASHEM YUNIS HUSSEINI
Jerusalem, Jordan
Pharm. Football Team, Capt. 1952-53.

ARA D. ISRABIAN
Beirut, Lebanon
Pharm. Volley-ball Team, Capt.1952-53.

JOSEPH G. ANDONIAN B. A.
Beirut, Lebanon

AMAL RASHED ABU GHAZALEH
Nablus, Jordan



WILLIAM LOGA HABASHI
Heliopolis, Cairo

SAMI ELIAS NA'MAN B. A.
Beirut, Lebanon

Pharmaceut. Soc., First Vice-President 1952-53; «The Apothecary» Art Editor 1951-52, Assistant Editor 1952-53.

GEORGE YUSIF DAYIAN
Aleppo, Syria

Apothecary's Prayer

O God, great Master
Of the healing arts,
Bless my slow unwieldy hands;
Make skilled and sensitive
My fingertips for all demands,
As counter for disaster.
Fill my mental starts
With keenness; let me live

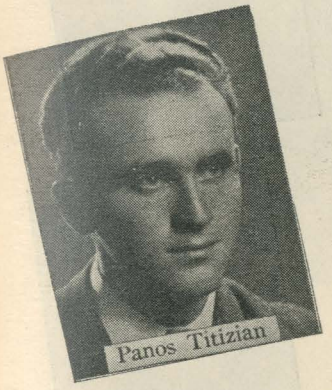
That other lives may through
Deft medium of my science,
Pursuance find in health.
Let each capsule that I count
Yield strength rewarding wealth;
Each liquid that I mix anew,
Each ointment for appliance,
In all and each amount

Be healing prayer.
Let me ne'er forget
Thy generous Providence
Held within my trembling hands.
Help me justly execute, dispense
And be cautious of my ware —
And while Life's hour-glass yet
Runs, with the doctor guide its sands.

Place within my heart
Alert and wholesome fear,
Lest I misweigh a single grain,
And Death comes stalking from my shelves.
Make impotent limbs to walk; pain
And sorrow's counterpart
With my potions disappear;
And God, Give Hope unto themselves.

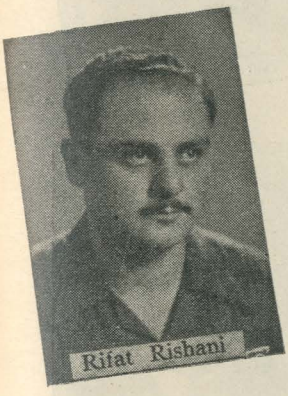
— Sister Mary Junilla, O.S.F., Ph. G.

Third Year


Panos Titizian


Naim Bandali Farraj


Faris Kuzma Musallam


Rifat Rishani


Umayyah Subra


Jerry Zerounian


Vartkes Apelian


Charles Nassar


Nazir Azmi


Samih Darwazah

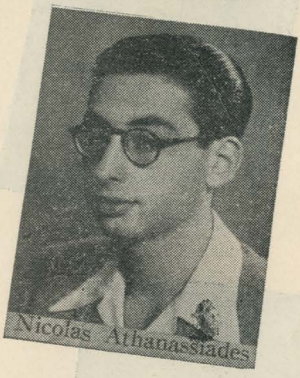

Khalil Samir Bishuti


Ibrahim Durr


Ilyas Sartan


Fadlu Shaban


Arthur Yuhanna


Nicolas Athanassiades


Sulayman Abu-Khadra


Hamid Jabr


Ilyas Bikhazi

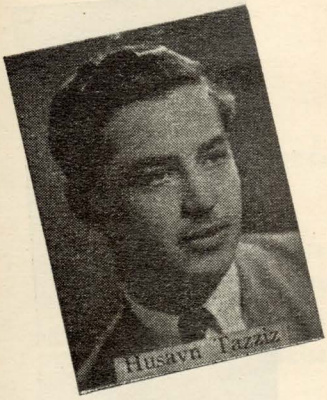

George Slim


Bashir ar-Rashid

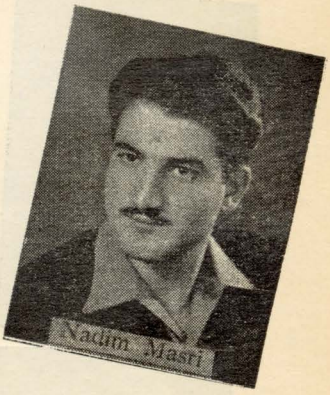

Agop Marcarian


Nizar Daghir

Second Year

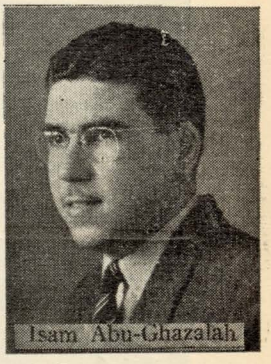

Husayn Tazziz


Zalfa Hamadah


Nadim Masri

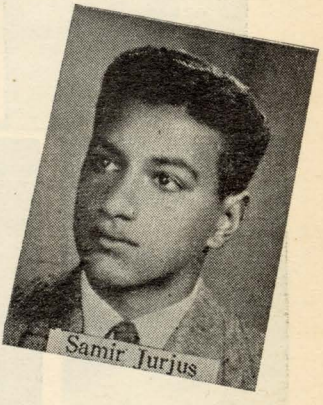

Iskandar Farkuh

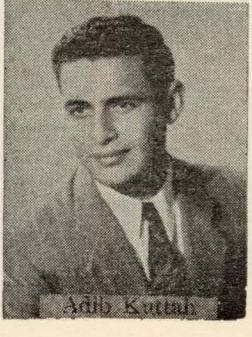

Sami Khayyat


Isam Abu-Ghazalah


Varoujan Etyemezian


Nimat Huri


Samir Jurjus


Adib Kuttah

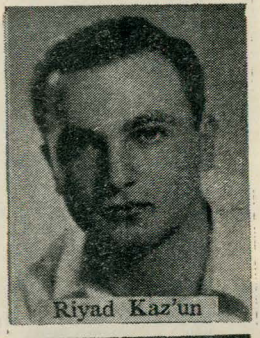
First Year


Badi' Nuwayhid


Faysal Kanj


Ghassan al-Mahasini


Sami Malak


Riyad Kaz'un


Khalid Sulayman


Nikula Sasin


Raymond Habr


Edward Tahmazian


Diran Palanjian


George Hishmah


Shibli Bayyuk


Haig Gourdikian

Editorial

This is the eighth volume of The Apothecary bringing to you information on a wide variety of subjects of interest to pharmacists.

A special feature of this year's issue is a Report on the School, prepared by the Director, Professor Amin Haddad, to mark the eightieth anniversary of the founding of the School.

It is hoped that the Apothecary continues to accomplish its purpose of keeping alive and strengthening the ties between the Alumni and their School, and between this School and other pharmacy schools, here and abroad.

May students and graduates find enjoyment in it and may it become for them a treasured souvenir of their school days at A. U. B.

Charles Abou-Chaar

The fleeting hour invites us
To noble studies and to fame;
The Grail summons us to climb
The holy mountain;
We shall not climb it at a later call.
Hasten thy well-guided
Steps to conquer the slope, and to gain
The summit alone, and to plunge
Thy pure hands into the fountain,
Where thine ardent desire shall be quenched.

(from an ode by Luis de Léon, dated 1578, translated by W. O. Goulden)

Review Articles

ANALGESIC, ANTIMALARIAL and AMEBECIDAL DRUGS

by Prof. Amin F. Haddad

ANALGESICS

The N. N. R. defines analgesics as «drugs which relieve pain without producing loss of consciousness». Presumably these agents act by blocking central pain appreciation, but the precise mode of action is still unknown. The analgesics can be classified into: (1) addicting analgesics which include the more potent members of this class of drugs, namely, morphine, its derivatives and the newer synthetic agents, such as meperidine and its analogues, and methadone and its analogues and, (2) nonaddicting but less potent analgesics. This group includes the antipyretic analgesics; among these are the salicylates, cinchophen and its derivatives, p-aminophenol derivatives (acetanilide and acetophenetidine), and pyrazolon derivatives (antipyrine and aminopyrine). With the exception of acetylsalicylic acid and acetophenetidine, all other analgesics should not be supplied by pharmacists without a prescription. It must be remembered that analgesics should not be used indiscriminately. The relief of pain is a fine thing, but the use of drugs for this purpose is dangerous if it makes diagnosis more difficult, or if it is allowed to take the place of more fundamental treatment. Antipyretics for example may be detrimental if used against a fever without knowledge of its cause. With the advent of sulfa drugs, antibiotics and other effective drugs for the treatment of specific infections, the use of antipyretics as such has become less important.

THE ADDICTING ANALGESICS

One natural plant product which for centuries has played a paramount role in the relief of pain is opium. The first reference to the medicinal use of opium was made by Theophrastus in the third century B.C. Until the nineteenth century, only crude opium preparations were known.

In 1806, the German pharmacist Sertürner isolated and described the principal alkaloid of opium which he later called «morphine» a name derived from Morpheus, the god of dreams of Greek mythology. With this important advance in chemistry, Sertürner opened the way to the use of pure active ingredients rather than of crude natural products. Within the next few decades other opium alkaloids were isolated by other investigators: codeine in 1832, thebaine in 1835, and papaverine in 1848. In 1925 Gulland and Robinson (Mem. Proc. Manchester Lit. Phil. Soc., 69: 79, 1925, through Research Today — Eli Lilly and Co., 9: No. 1, 1953) proposed the first generally accepted chemical structure of morphine. This structure has recently been proved conclusively to be correct by the synthesis of morphine in 1952 by Gates and Tschudi (J. Amer. Chem. Soc., 74: 1109, 1952). Morphine is still considered to be one of the most important and most widely used analgesic. Its medical importance, however, is marred by its propensity to cause addiction. Such liability, with its social

and economic implications, has spurred the search for substitutes that are free from these undesirable features. The first series of compounds produced were the antipyretic analgesics of which Phenacetin was introduced in 1887, Pyramidon in 1896, Acetylsalicylic Acid in 1899. These substances have gained popularity for the relief of mild pain but none of them is of value in severe pain.

Morphine itself has been modified chemically in many ways with the hope of reducing its addiction properties and its depressant effect on the respiratory center. With the exception of Codeine, none of the morphine derivatives thus far produced has fulfilled this hope. As a result of this work many derivatives were prepared of which the following can be mentioned.

Morphine Derivatives

6-ACETYL MORPHINE is 4 times as active as morphine but it has a greater activity in the unwanted side effects.

DIACETYLMORPHINE (Diamorphine, Heroin) possesses a higher analgesic activity than morphine but it is more toxic and possesses a greater liability to addiction. Its use and manufacture have been prohibited in many countries.

DIHYDROMORPHINONE (Dilaudid) is said to possess strong analgesic activity, less emetic action and less habit forming than morphine.

METHYLDIHYDROMORPHINONE (Metopon) was studied clinically in 1948 in America. It differs from dihydromorphinone hydrochloride (Dilaudid) in having a methyl group replacing a hydrogen atom in the CH2 group adjacent to the ketone radical. It is effective orally and appears to possess more undesirable side action than the parent compound morphine. Tolerance and dependence develop less rapidly and disappear more quickly than with morphine, but the drug must be used with the usual care to avoid narcotic addiction. It is recommended only for the control of severe persistent pain such as that of cancer. It should not be used as a preanesthetic medication because it may cause unpredictable and severe respiratory depression when used in conjunction with an inhalation anesthetic. Three mg. is approximately equivalent to 10 mg. of morphine. This dose should be repeated only on the recurrence of pain. As with morphine, it is desirable to keep the dose at the lowest level compatible with adequate relief of pain.

DIHYDRODESOXYMORPHINE — D (Desomorphine) is ten times as active as morphine as an analgesic, and possesses three times its toxicity. This compound, however, has only a short duration of action.

6 - METHYLDIHYDROMORPHINE is another morphine derivative obtained by the action of methyl lithium upon dihydromorphine. A remarkable feature of this compound is the duration of its analgesic action, which is almost twice that of morphine.

CODEINE AND PHENOLIC ETHERS OF MORPHINE. The substitution in the phenolic hydroxyl group of morphine produced a reduction in analgesic activity and toxicity. Codeine, ethylmorphine (dionine) and benzylmorphine (peronine) have been used in medicine for a long time. Codeine is different from morphine in having a less depressant action on the respiratory center, and because it has also little action on the intestines and is not such a powerful drug of addiction as morphine, it is of value as a mild analgesic and cough sedative. Dionine and Peronine are more active than Codeine but also more toxic.

DIHYDROCODEINONE (Dicodid) has been used in Germany and America principally for cough relief, although apparently there is more danger of addiction than with codeine.

DIHYDRO-HYDROXYCODEINONE (Eucodal) is less toxic than dicodid but has a higher addiction liability.

ANTIDOTE FOR MORPHINE DERIVATIVES AND MORPHINE SYNTHETIC SUBSTITUTES. Extremely interesting changes in properties occur when the methyl group attached to the nitrogen in morphine is replaced by an allyl group,

resulting in N-allylnormorphine. This derivative of morphine has little or no analgesic action. Moreover, it antagonizes most of the effects of morphine, including analgesic, respiratory, intestinal, sedative, and exciting actions. It also antagonizes the action of the morphine synthetic substitutes. Because of this antagonistic action, this compound has found use as a specific antidote to the poisoning that may occur with morphine derivatives, pethidine, and methadone. It is of value in obstetrics, since maternal and fetal respirations which have been depressed by morphine return to normal upon administration of this drug.

The Morphinans

Investigations on the total synthesis of morphine have yielded compounds with analgesic activity. N-methylmorphinan was the first synthetic compound of a morphine-like structure prepared by Grewe in 1946. This compound, although lacking the oxygen bridge of morphine, showed pronounced analgesic activity. Its analogue, 3-hydroxy-N-methylmorphinane has an intense and long-lasting analgesic effect on oral as well as parenteral administration. Later pharmacological reports on its hydrobromide called Dromoran (see Apothecary 1952, p. 44) demonstrated that it was about 4 times as potent an analgesic as morphine with a greater duration of effect, and less frequent or severe side reactions. Dromoran has been recently accepted by the A.M.A. council on Pharmacy and Chemistry and has been admitted to the N.N.R. under the name Methorphinan Hydrobromide.

PETHIDINE AND RELATED COMPOUNDS

In 1939, Eisleb and Schaumann of the I.G. Farben Industrie in Germany initiated a new era in the field of analgesics. They found that a relatively simple phenyl piperidine ester originally intended to be an antispasmodic agent, possessed sufficiently high analgesic activity to be of therapeutic value. This new compound, ethyl 1-methyl-4-phenyl-piperidine-4-carboxylate was introduced under the name «Pethidine» and was later called «Meperidine» in the U.S.A. This product was admitted to the B. P. 1948 and to the U.S.P. XIV in 1950. It is widely used for the control of pain and is similar in action to morphine. Although not as potent, it does not possess the undesirable side effects to as high a degree. Pethidine, already a well known product will not be discussed.

Research in the I.G. Farben Industrie at Hoechst-am-Main was continued during World War II and many additional analogues of pethidine were prepared, of which two will be discussed later, namely Ketobemidone and Prisilidine. This work led to a newer series of compounds, some of which rivaled morphine in analgesic activity. The most promising among them was called «Hoechst 10820» or «Amidon» by the German workers. After World War II this drug was brought out of Germany to the United States of America by United States investigators. Its chemical structure was investigated and it was later produced on a large scale by authorized American pharmaceutical firms. Structural modifications of dl-methadone (Amidon) have been explored extensively. Although most of the analogues have less analgesic activity, a few have been reported to be more potent. Two methadone analogues l-isomethadone and phenadoxone have been put recently into medical use.

METHADONE HYDROCHLORIDE N.N.R. 1952, is also known as Amidon Hydrocloride, Methadon, Dolophine Hidrochloride, Adanon Hydrochloride, Physeptone Hydrochloride, Hoechst 10820, Polamidon Hydrochloride, Miadone, Butalgin. The term methadone refers to a mixture of the d and l isomers. Its chemical name is dl-6-dimethylamino-4, 4-diphenyl-3-heptanone hydrochloride. The analgesic activity of l-methadone is approximately thirly times as that of d-methadone. Unfortunately, the undesirable side effects are also found in the l-isomer. This substance occurs as a white crystalline substance of bitter taste, melting between 232° and 238°, soluble in water and in

absolute alcohol, but practically insoluble in ether. Solutions may be sterilized by heating in an autoclave, or by filtration. Chlorocresol should not be used as a bacteriostatic. Methadone hydrochloride resembles morphine in many of its properties but has a less marked sedative action. The duration of its action is longer than that of morphine and it is better absorbed when given orally. It is a useful analgesic in moderate and severe pain and is especially valuable for oral administration to alleviate the pain of cancer. It should not be employed in obstetrics since, although it relieves the pains similarly to pethidine, it has a much more depressant effect on the baby. The fact that it gives less sedation makes it inferior to morphine for pre-anaesthesia medication.

Methadone hydrochloride also has a depressant action on the cough center and is given orally in the form of a syrup or elixir to control useless coughing. For this purpose codeine is to be preferred to depress cough since it is safer and is less liable to cause addiction.

Minor toxic effects include nausea, vomiting, light headaches, dizziness, faintness, dryness of the mouth and constriction of the pupil. Great care should be taken to avoid overdosage in children since they tolerate only very small doses. It is liable to produce addition. Withdrawal symptoms are less severe, however, than those following withdrawal of morphine, and it may be used as a substitute during withdrawal treatment of morphine addiction.

The adult dose is 5 to 15 mg. depending on the intensity and etiology of the pain. The usual dose is 7.5 mg. orally every three to four hours. When necessary, it may be administered parenterally either intramuscularly or subcutaneously, but because of its slight local irritant effects it should not be administered by either route in doses larger than 2.5 to 10 mg. It should not be given intravenously.

L-ISOMETHADONE or l-Isoamidone is 1-6-dimethylamino - 4,4 - diphenyl-5-methyl-3-hexanone. The free base is an oily liquid and the hydrochloride (monohydrated) is in the form of crystals which melt at 173-174° (when anhydrous it melts at 231-233°). It is soluble in water and alcohol. The pH of 1% aqueous solutions is 5 to 6.5. Solutions and tablets are stable.

It is an analgesic with the same activity ratio as morphine but with a respiratory depressant ratio only 0.5 to 0.7 that of morphine, and free from the side effects caused by amidone, such as nausea, vomiting and dizziness.

PHENADOXONE (Heptalgin; C. B. 11, Hoechst 10600, Hepatazone hydrochloride, Morphodone Hydrochloride) was synthesized in 1948 and is known chemically as 6-(N-morpholino)-4,4-diphenyl-3-heptanone. The hydrochloride occurs in the form of crystals melting at 224-5° (with some decomposition). It is soluble in water and in alcohol. The pH of a 1% aqueous solution is 4.1, of 5% aqueous solution 3.7.

Phenadoxone is a potent analgesic with only slight hypnotic effect and little or no accompanying cortical depression. It also has a marked spasmolytic action but does not appear to cause constipation in normal dosage. Clinical trials have shown it to be of value for the relief of pain in fibrositis, pleurisy, and coronary thrombosis; also in colic of the gall-bladder and ureter; and in senusitis, toothache and gastric ulcer. Given orally, it acts within 15 to 30 minutes and usually lasts for 3 to 4 hours. The effect is prompter when the drug is given by intramuscular or subcutaneous injection but lasts only for 1 to 2 hours. It does not appear to give rise to addiction, and euphoria is not pronounced, but the possibility of habit formation should not be overlooked until more extensive evidence has proved its absence. Tolerance has not been noticed.

For oral use phenadoxone is usually given in tablets of 10 mg., one tablet is effective for moderate pain and up to 3 tablets may be given for severe pain. These doses may be repeated in 3 to 4 hours if necessary. By injection, a dose of 10 mg.

may be given intramuscularly or subcutaneously when a prompt effect is desired, as in cases of very severe pain. It should never be given intravenously.

KETOBEMIDONE (Hoechst 10720, Win 1539) is the most active analogue of meperidine (pethidine) which results from the introduction of a 3-hydroxyl group into the phenyl ring and substitution of propionyloxy for the carbethoxyl group. Chemically it is 4-propionyl-4-m-hydroxyphenyl-l-methylpiperidine, first prepared by Eisleb in 1942 at the I.G. Farben Industrie. It is used as the hydrochloride which is soluble in water, and slightly soluble in alcohol. Aqueous solutions may be sterilized by boiling for short periods. This compound has an analgesic activity thirty times that of the parent compound and also greater than that of morphine. Unfortunately, repeated administration leads to the rapid development of addiction.

NISENTIL HYDROCHLORIDE is another compound arising from the research on meperidine (pethidine) analogues. It is also known as Prisilidine Hydrochloride and Alphaprodine Hydrochloride. Chemically it is the alpha-dl-l,3-dimethyl-4-phenyl-4-propionoxy-piperidine hydrochloride. It is more active than meperidine and is used in obstetrical analgesia. It is a narcotic.

This substance occurs in the form of crystals, very soluble in water and soluble in 95% alcohol. It is supplied by Hoffmann-La Roche in the form of 1 cc. ampuls containing 40 mg. per cc. It is administered subcutaneously in doses of 40 mg. at least 2 hours apart. The last dose should be given 2 hours or more prior to delivery. Not more than 4 consecutive 40 mg. doses should be administered. In this way there is no likelihood of depressing the fibers.

THE ANTIPYRETIC ANALGESICS

The antipyretic analgesics can be classified into three groups, namely, the antipyrine — aminopyrine group (Pyrazolone derivatives), the acetanilid — phenacetin group (p-aminophenol derivatives), and the acetylsalicylic acid group. The nature of the limited analgesic action of the antipyretic compounds is not understood. Recent work, however, has shown that the activity of many substances depends upon the metabolic changes they undergo in the body. It has been shown for example that the analgesic action of acetanilid and phenacetin is due to a metabolic product p-acetaminophenol. Animal experiments have shown that p-acetaminophenol is less toxic than the mother substance acetanilid. Therefore the possibility of using p-acetaminophenol as an analgesic was studied. Clinical results were favorable and the product is now used as an antipyretic analgesic in place of acetanilid. This compound is marketed by Squibb in the form of Trigesic Tablets, a combination of p-acetaminophenol, acetylsalicylic acid and caffeine. Trigesic with Codeine Tablets are also available. These products are indicated in neuralgia, musculoskeletal pain, and for severe pain originating in the central nervous system as well as for pain from traumatic conditions.

The metabolism of Pyramidon (amidopyrine) which is one of the more potent pyrazolone analgesics, was also studied. Results show that this compound is demethylated in the body to form 4-amino antipyrine, an active analgesic. This in turn is acetylated to 4-acetylaminoantipyrine, which is inactive. 4-Aminoantipyrine has been considered a possible substitute for amidopyrine.

ALCOHOL 5% v/v and dextrose 5% w/v in isotonic sodium chloride solution is used as an analgesic agent for intravenous infusion after major surgical operations. The amount injected slowly is 500 to 2000 cc. as required. Extravasation during intravenous injection may cause slight tissue irritation due to the alcohol. The patient should be observed for alcoholic excitation. It is not to be given to nursing mothers (i.e. after Cesarean section). Alcohol is also supplied in 5% v/v solu-

tion with 5% dextrose w/v combined with four vitamin B factors in balanced proportions, in water for injection, for intravenous use.

SODIUM GENTISATE (see Apothecary 1951, p. 31).

IRGAPYRINE, a new antipyretic-analgesic, is a combination of 3,5-dioxo-1,2-diphenyl-4-n-butyl-pyrazolidine sodium and dimethyl-amino-phenyldimethylpyrazolone. This product is used as an analgesic, antipyretic and antirheumatic. It is administered in the form of injection, given intragluteally, slowly and deeply. Particular care should be taken in the case of fat patients that the injection be made deep enough in the muscle and not into adipose tissue. Suppositories and tablets are also available to be used during the interval between injections. These two forms are also indicated for the treatment of light rheumatic affections and of relapses.

ANTI-MALARIALS

Malaria is said to be the most prevalent of all human infectious diseases. No disease is comparable to malaria in its geographic distribution, its toll of human life, and the check which it maintains on the economic progress of a people. While accurate statistics are not available, it is generally agreed that at least 300 million people are affected with the disease. Further, it is estimated that over three million individuals die from malaria each year. It is believed that in India alone the yearly death rate from malaria exceeds one million people.

Four types of malarial parasites, each with a different biologic pattern may affect man. These are *P. vivax P .falciparum*, *P. malariae* and *P. ovale*. Infection takes place through the bite of an infected anopheles mosquito or by the transfusion of blood from an infected donor. The life cycle of the malaria parasite begins when the female anopheles mosquito, feeding on a patient infected with malaria, ingests blood containing gametocytes. These are taken into the intestine of the mosquito, where they penetrate into the intestinal wall and undergo a series of developments, to emerge as sporozoites and migrate to the mosquito salivary glands. The parasite now is ready to complete its life cycle in man. After the mosquito delivers the sporozoites into the skin of a susceptible subject, the asexual phase of the parasite's cycle begins. In the case of *P. vivax* and *P. falciparum* the sporozoites undergo a series of developments in the liver, before invading the red cells and initiating the clinical aspects of the disease. Duration of the parasite development in the liver phase is exceedingly variable. This ability of the plasmodium to «hibernate» and to elaborate erythrocytic forms from time to time is responsible for the persistence of the disease and the tendency to relapses which may occur at extremely variable intervals. These stages are very important from the point of view of chemotherapy.

Drugs used in the treatment, prevention and cure of malaria fall into one or more of the following categories: (1) Prophylactic, a drug possessing activity against the mosquito-introduced sporozoites or the parasites of the primary-fixed tissue phase of the disease. (2) Suppressive, a drug possessing activity against the asexual erythrocytic forms of the parasite. (3) Curative activity, a drug possessing activity against the persisting tissue parasites so characteristic of *P. vivax* and *P. falciparum*. (4) Gametocidal activity, a drug possessing activity against the gametocytes or sexual forms of the parasites.

Up till 1926 quinine was the only antimalarial drug available. At this period the German workers Schülmann, Schonfer, and Wingler began their studies on the modification of the nucleus of methylene blue, which was shown to have antimalarial activity by Ehrlich as far

back as 1891, and eventually succeeded in preparing Plasmochin in 1926. However, clinical investigations showed that plasmochin, though a much more powerful destructive agent against the gametocytes than quinine, was less effective against the trophozoites. An extension of these studies led to the development of Atabrine in 1930. Twelve thousand compounds were tested before Atabrine with its optimum properties was decided upon.

With the establishment of a research group in 1941 under the auspices of the Committee on Medical Research of the Office of Scientific Research and Development, U.S.A., a systematic approach to the synthesis of antimalarials took form in the United States. Since 1941 more than 14,000 compounds have been screened for antimalarial activity by British and American investigators. In 1944 Woodward and Doëring made of a dream a reality by synthesizing quinine. The process although not economically feasible, may contribute to the effort to achieve an inexpensive antimalarial by synthesis.

The search for suppressive drugs superior to Atabrine led to the development of a series of 4-amino quinolines in the United States and a series of diguanides in Great Britain. Towards the close of the World War II it became evident that suppressive drug therapy would not reduce the relapse rate in vivax malaria, even in maximum tolerated doses. Attention was directed again to the only known drug having curative properties, namely plasmochin. Accordingly 8-aminoquinolines were studied. Pentaquine and Isopentaquine have been proposed as the most satisfactory.

The antimalarials are classified into five chemical groups (Apothecary 1952, p. 65).

(1) 4-AMINOQUINOLINE derivatives represented by Quinine (natural), Chloroquin, Sontoquin, and Camoquin. Quinine is still used in the treatment of acute malaria because it acts so rapidly. It acts mainly upon trophozoites and has no appreciable effect upon *P. falciparum* gametocytes or upon tissue parasites. Quinine has the disadvantage of precipitating attacks of blackwater fever in some circumstances.

A number of years ago German workers prepared a series of quinoline derivatives which included Sontochin (Nivaquine C. M. or R.) and Resochin (Chloroquin, Aralen, Nivaquine B.) This series was re-examined in the U.S.A. during World War II, and careful comparisons of activity and toxic side-effects were made. A new synthesis of chloroquine was devised and large amounts of the drug are now manufactured. Sontochin (Sontoquin) and Chloroquine are about equal in activity to Mepacrine, and act more rapidly in acute malaria. They have fewer toxic side-effects than mepacrine, and do not stain the skin. Chloroquine is usually effective against strains resistant to Proguanil; it may be given by intramuscular or intravenous injection if the patient is too ill to swallow the dose. The hydrochloride is used to prepare the injections. It is a good suppressant, and in some areas is superior to Proguanil. The action of Sontochin and Chloroquine is upon the trophozoites, and there is no effect on exo-erythrocytic parasites or gametocytes. Camoquin, the third member of the series, has similar properties to Chloroquine but acts slightly less rapidly.

(2) 8-AMINOQUINOLINE derivatives represented by Pamaquin, Pentaquin, Isopentaquine, Primaquine and Rhodoquine. This series of drugs has the property (which is not shared by any other known group of anti-malarials) of killing the tissue stages of *P. vivax*. Pamaquin has long been known to do this and when used with quinine or another schizonticide, effectively puts an end to relapses of vivax malaria in about 90% of cases. Pamaquin has toxic effects and must be used with care. Pentaquine has properties similar to Pamaquin and has been used with Quinine or Chloroquine for the cure of vivax malaria. Isopentaquine has activity equal to Pamaquin but is less toxic. The primary amine Primaquine (SNI, 3272) is less toxic still, and is probably the best

of the series of 8-aminoquinolines so far discovered.

(3) ACRIDINE DERIVATIVES are represented by Quinacrine or Mepacrine. This compound marks another success to German workers on synthetic anti-malarials. It has been widely used as a suppressant, and also for the treatment of acute malaria. It acts only upon trophozoites. Blackwater fever is less liable to occur with Quinacrine than with the Cinchona alkaloids or with Pamaquin. Quinacrine hydrochloride is administered orally. In severe cases of malaria Quinacrine can be administered intramuscularly as a 3% solution of Quinacrine methanesulfonate which has a greater solubility in water than the hydrochloride. A dose of 0.12 gm. Quinacrine methanesulfonate is equivalent to 0.1 gm. of Quinacrine hydrochloride.

(4) BIGUANIDINE DERIVATIVES. The research upon the antimalarial activity of pyrimidine compounds led to the discovery of two isopropylbiguanide chlorophenyl derivatives by Davey and Rose (1945) in England. Of these N1-p-chlorophenyl-N5-isopropyl biguanide (Paludrine) was the most outstanding in its intensity of action and range of activity. This product is official in the U.S.P. XIV as Chloroguanide hydrochloride and in the B.P. Add. I under the name of Proguanil hydrochloride. Since the war, the suppressant and curative properties of this drug have been tested in many parts of the world. Results indicate that it has a wide margin of safety, it cures most strains of falciparum malaria and suppresses all other species. It has some inhibitory effect upon the primary tissue forms of *P. vivax* but is not a certain cure. Relapses frequently occur when medication stops. Its action is slower than that of Quinine, Mepacrine and the new 4-aminoquinoline derivatives. Strains of the parasite vary greatly in their sensitivity to proguanil. Unduly resistant strains have been encountered in West Africa, Eritrea, the Philippines, and elsewhere. Combination of Proguanil with small doses of Quinine or Mepacrine can, however, achieve a radical change against these resistant strains.

(5) 2,4-DIAMINOPYRIMIDINES. In 1948 Hitchings, Elion, Vanderwerff, and Falco found that 2,4-diaminopyrimidines are powerful antagonists of pteroylglutamic acid in cultures of *Lactobacillus casei*. The formal analogy between 2,4-diamino-5-p-chlorophenoxypyrimidine and Proguanil, and the finding that Proguanil was also an antagonist of pteroylglutamic acid, suggested that the pyrimidine compound might have antimalarial activity. This was shown to be the case and as a result a long list of derivatives of 2,4-diaminopyrimidine substituted in the 5-and 6-positions have been prepared and tested against laboratory plasmodial infections. One of these derivatives, 2,4-diamino-5- (4-chlorophenyl) -6-ethyl pyrimidine has been recently released for clinical use and is supplied by B.W. and Co. under the name of Daraprim. This product is named Malocid in countries within the French Union. Daraprim is very active and is said to be a thousand times as potent as quinine in tests as an antimalarial. It is available in tablets 25 mg. each.

AMEBECIDAL DRUGS

The chemotherapy of tropical diseases including amebic dysentery and malaria has seen great advances during the last decade. The need to maintain armies in the tropics during World War II, and the extension of popular travel to all parts of the globe, have stimulated the search for new chemotherapeutic agents.

Statistics compiled by the United States armed forces during World War II show that the incidence of infection among 11,300,000 persons who served overseas from 1942-1945 was as follows: Dysentery and diarrhea 756,849 cases, malaria 572,

950 cases, infectious hepatitis 191,574 cases, and dengue 121,608 cases.

One of the most serious parasitic diseases is amebic dysentery. *E. histolytica* is the specific infective agent of amebiasis, the motile trophozoites of which live in the tissues and multiply by simple division. In most cases of the disease, the multiplication of the parasite is limited greatly by the resistive powers of the host. The infective form of the parasite is the cyst, which sometimes is seen in formed stools, and is capable of existing outside the body at room temperature for 2 to 4 weeks.

Passing through the stomach, the cysts reach the region of the ileocecal valve where excystation occurs, resulting in free trophozoites which may attack the tissues. Trophozoites appear to be especially adapted for life in the tissues. Encystment takes place only in the lumen of the gut.

Amebic infection is acquired by the ingestion of food or drink contaminated by feces containing amebic cysts. So-called carriers or infected individuals, particularly food handlers (who at the time may not have diarrheal or dysenteric stools), are the principal source. Transmission may involve direct contact with unwashed hands, or pollution of swimming pools. Where proper latrines are not used, the cysts may be carried mechanically on the legs of flies, or in their vomitus or dejecta. In many parts of the world, the use of human feces for fertilization of vegetables and fruits leads to infection when this produce is eaten raw. In highly sanitated areas, the food handler is the most important source of infection.

The treatment of this disease is complicated by the different stages it takes. There are three types of amebic infection, the symptomless carrier state in which the host passes cysts in the faeces, the dysentery state in which the amaeba parasites form extensive ulcer in the bowel wall, and the hepatic state produced by the spreading of the infection from the intestine to the liver, producing amebic hepatitis or abscess. No one single drug is effective in the three stages.

A number of drugs are effective against amebic dysentery, and when supplemented with antibiotics to control secondary bacterial infections, the clinical response to treatment is nearly always good. However, relapses are common, and the host often passes cysts for many years and is a potential danger to the community. Such chronic infections are difficult to eradicate.

EMETINE used in the form of its hydrochloride is still considered one of the most potent drugs known against *E. histolytica.* Its main disadvantage, however, is that it is toxic to the host in therapeutic doses and produces unpleasant side-effects upon the gastrointestinal tract and the heart. It is administered in injections and is effective in acute amebic infections and in amebic hepatitis, but rarely produces permanent cures. Treatment must be supplemented with oral doses of emetine bismuth iodide. Many physicians follow a «shot-gun» treatment in which they include emetine, halogenated hydroxyquinolines, arsenicals, sulfonamides and antibiotics.

CONNESSINE. Kurchi bark and its constituent alkaloid conessine have been favorite remedies in India for many years. Recently there have been a number of enthusiastic reports upon the efficacy of conessine, but in most of these trials the patients were not examined for long enough period to ensure that the infection had been eradicated. Conflicting reports about its efficacy in the treatment of amebic dysentery have been published. Some believe that conessine gives results equal to, or better, than those obtained with emetine. Others report that conessine will be of value when given together with emetine or other amebicides. It has the advantage over emetine of being effective when given orally, and it is useful in cases which are emetine-resistant. The hydrobromide is considered to be the most suitable salt. The psychic and nervous manifestations attending its use can be controlled by the use of one of the barbiturates.

HALOGENATED HYDROXYQUINOLINES. Vioform, Chiniofon and Diodoquin are widely used in amebic infections. Diodoquin is of low toxicity and is probably the best drug at present available for the treatment of chronic infections. It is often given together with sulfonamides and with other amebicides.

ARSENICALS. Carbarsone and Acetarsone (Stovarsol) are well-tried remedies and are usually given together with other amebicidal drugs. A bismuth derivative of p-N-glycolylarsanilic acid was introduced under the name of «Wia» in 1943 and has recently been re-examined as «Milibis» or «Win 1011». It is claimed to have good effect in chronic cyst passers but is of little value in acute amebiasis.

Other new arsenical preparations are the thioarsenites. In 1947 Anderson et al. observed that in natural amebic infections in monkeys carbarsone oxide was more effective than its pentavalent analog, carbarsone. Two dithio derivatives of carbarsone «CC 914» or p-carbamido phenyl-bis- (carboxymethylmercapto) arsine and «CC 1037» or p-carbamido phenyl-bis (2-carboxyphenylmercapto) arsine were equally active and less toxic. The former of these two compounds was marketed by Eli Lilly and Co. under the name Thiocarbarsone (Apothecary 1952, p. 45). Clinical trials with these compounds indicated that they are effective in from one-tenth to one-fifth the amounts of Carbarsone. The compounds can be administered most satisfactorily in enteric coated tablets 25 and 50 mg. three times daily over ten days. These dithio compounds provide a greater distribution of the active agent to tissues such as the liver and intestinal tract where the amebic infestation occurs.

Schneider and Dupoux submitted recently a new arsenical compound, bis-(para-arsonophenyl amino)-1:2-ethane or 4763 R. P. for clinical trial. This drug, now sold under the patented name Bemarsal (Specia) was shown to be rapid in action with no toxicity when given in therapeutic doses.

CHLOROQUIN. Chloroquin, like emetine, is selectively cencentrated in liver tissue. It has proved to be very useful in the treatment of amebic hepatitis and liver abscesses, although it is of little value in intestinal amebiasis. Chloroquin is much less toxic than emetine, and has given good results in cases in which treatment with emetine and other remedies had failed.

ANTIBIOTICS. The invasive power of *E. histolytica* is probably related to the presence of certain bacteria in the gut. Amebic ulcers become secondarily infected with bacteria and the local tissue reaction may prevent access of amebicides in adequate concentration to kill the ameba. The introduction of penicillin and sulfonamides to supplement treatment with emetine and other amebicides was a great step forward in the control of acute infection. Most of the available antibiotics have now been tried. Chloramphenicol is of little value. Bacitracin is of value. Aureomycin and Fumagillin are the most promising antibiotics tried so far. Aureomycin affects the bacterial flora of the gut and it has a direct amebicidal action of its own. Treatment with aureomycin rapidly alleviates acute dysentery, but relapses frequently occur. It is best to use aureomycin together with other amebicides. Terramycin has also been tried, but it does not appear to be more active than aureomycin.

Fumagillin is a new crystalline antibiotic produced during the growth of a strain of Aspergillus fumigatus. It has proved to be a potent amebicide. The drug is inactive against most bacteria, fungi and viruses, and hence its action is almost specific on the ameba. Fumagillin is recommended only for the treatment of intestinal amebiasis. There is not yet sufficient evidence to support a recommendation for its use in the treatment of amebic abscesses of the liver or other organs. The recommended dosage of Fumagillin (Fumidil-Abbott) for the average adult is 30

to 60 mg. daily, in divided doses, three or four times a day, for 10 to 14 days. One such course appears sufficient to clear most cases of intestinal amebiasis. Until the drug has had extensive clinical use, it is recommended that 60 mg. daily be considered the maximum doses. If repeated courses of treatment are required, they should be undertaken with caution. For children or severely debilitated patients, dosage should be calculated on the basis of the patient's age and weight.

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NOUVELLE CHIMIOTHÉRAPIE DE L'AMIBIASE INTESTINALE

BÉMARSAL

4763 R.P.

bis-(p.arsonophénylamino)-1, 2 éthane

PUISSANTE ACTIVITÉ THÉRAPEUTIQUE
BONNE TOLÉRANCE GÉNÉRALE
SANS TOXICITÉ

AUX DOSES HABITUELLES

COMPRIMÉS DOSÉS à 0g50 (FLACONS de 20)

POSOLOGIE

ADULTES : 2 g par jour (4 comprimés)
ENFANTS : 0g05 par kg de poids et par jour

Absorber la dose quotidienne
en deux prises égales aux principaux repas

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ÉCHANTILLONS ET LITTÉRATURE SUR DEMANDE

VITAMINS

A GENERAL SURVEY

by **Uthman Kanafani Ph. C.**

In addition to carbohydrates, fats, proteins, mineral salts, and water, it is essential that the diets of man and animals contain small amounts of vitamins. If any one of the vitamins is lacking, a breakdown of the metabolic processes occurs, and may result in either reduced rate or lack of growth in children and young animals, and in symptoms of mal-nutrition in adults that are refered to as «deficiency diseases».

Vitamins are defined as organic compounds that are required for the normal growth and maintenance of life of animals, including man, who are unable to synthesize these compounds that are effective in small amounts, do not furnish energy, and are not utilized as building units, but are essential for the transformation of energy and for the regulation of the metabolism of structural units.

Vitamins are unlike each other in their chemical composition and their function in nature. They are alike only in that they cannot be synthesized in the tissues of animals. Plant tissues are the sources to the animal kingdom of these protective nutritional factors. The functions they serve fall in two categories, the maintenance of normal structural and of normal metabolic functions.

Vitamin A (or Vit. A1): Axerophthol. This is an unsaturated cyclic alcohol which is a pale yellow viscous unsaponifiable oil; it is a derivative of carotene, its precursor. It is insoluble in water, sol. in fat solvents. It is stable in absence of air to heat, but is easily oxidized. Ordinary cooking does not destroy it. The ester forms, such as palmitate and acetate, possess greater stability than the alcohol. It is stored in the liver, and little in lungs and kidneys. Daily adult requirement is 5000 I. U. Deficiency diseases or signs are xerophthalmia (night blindness), loss of weight, retardation of growth, atrophy of epithelial tissue, etc.

Uses: Interference with the normal development of epithelial tissue due to vit. A deficiency may give rise to skin changes, causing a dry, rough skin with a lowered resistance to minor skin infections. Inflamation of the gums might also result. Vit. A leads to revitalization of the affected tissue, usually within two or three weeks. Although severe deficiency of vit. A lowers resistance to infection, there is no justification that it is the «anti-infective vitamin» or that it is of value in the prevention of colds, influenza and other infections. Neither is there sufficient evidence that it prevents the formation of renal calculi or that it may be useful in the treatment of hyperthyroidism, anemia, sunburn, or ulcerative skin conditions. Deficient absorption of the precursors of vit. A occurs in certain conditions such as coeliac disease and sprue, and excessive use of liquid paraffin as a laxative may reduce the utilization of the pro-vitamin by carrying away large amounts in the faeces.

Rich sources are animal fats, cod liver oil, halibut liver oil, shark liver oil, eggs, milk, tomatoes, carrots, lettuce, cabbage, liver, sweet potatoes, green leaves and stems, etc.

Vitamin A2. Vitamin A1 is the form found in mammals and salt-water fish. Vit. A2 is the isomer that occurs in fresh water fish. The biological activity of the two isomers is about the same.

Vitamin B1: Thiamine, Aneurine, Anti-neuritic factor. This is a white crystalline substance, soluble in water and alcohol, insoluble in fat solvents. It is comparatively stable toward dry heat, but is destroyed by autoclaving at 120°C. It is stable in acid solution and may be heated without decomposition, but is unstable in neutral or alkaline solution. Daily adult requirement is 1.2-2 mg. Deficiency diseases or signs are beriberi, polyneuritis, periferal neuritis resulting in paralysis, cardiovascular disturbances, accumulation of pyruvic acid in tissues, loss of apetite, and retardation of growth. This vitamin plays a part in carbohydrate metabolism.

Uses: It is used in the treatment of beriberi, anorexia, fatigue, gastrointestinal disturbances, and irritability caused by deficient diets. It may be employed where aneurine deficiency may be caused by interference with its digestion, absorption, and utilization, or by patients on restricted diets, and those suffering from gastrointestinal diseases, extensive burns, diabetes, impaired kidney or liver function, and alcoholism. Aneurine HCl is usually given by mouth; parenteral use is unnecessary except in patients with impaired absorption or cardiac failure in beriberi. Intravenous and intramuscular injections are well tolerated, but intrathecal ones are painful and dangerous.

Rich sources are wheat embryo, yeast, pork, rice polishings, chickens, liver, green peas and beans, corn and rye germs, and kidneys.

Vitamin B2 : Riboflavin, Vit G. This consists of yellowish brown needle crystals, slightly soluble in water showing green-yellow fluorescence, insoluble in fat solvents, very soluble in alkali. The phosphate and acetate are more soluble. It is stable to heat in dry form and in acid solution, sensitive to light especially in presence of alkali. Daily adult requirement is 2-3 mg. Deficiency diseases or signs are cheilosis, redenning of lips, lesions and sores in the mouth, inflamed tongue; scaling greasy dermatitis; Shark skin, appearance of skin over nose; keratitis, ocular lesions and roughness of eyes; retardation of growth, etc. The vitamin acts as hydrogen carrier.

Uses: There is little evidence that riboflavin is of therapeutic value except in the treatment of its deficiency states. There is no advantage in administering riboflavin parenterally except when it is not utilized if given orally.

Rich sources are wheat germ, yeast, liver, rice polishings, milk, heart muscle, cheese, kidneys, almonds, etc.

Nicotinic Acid: (Niacin), and *Nicotinic Acid Amide* (Niacin Amide); Pellagra Preventive (PP) Factor, previously called Vit. B5.

Both the acid and the amide are white crystalline odorless powders. The acid is converted to the amide in the body. Both are soluble in water and alcohol, the amide being more soluble. The acid is insoluble in ether, but the amide is soluble. Niacin is the most stable of the vitamins — stable to air, light, heat, acids, and alkalies. Daily adult requirement is 10-12 mg.

Deficiency diseases or signs are Pellagra: three d's, dermatitis, diarrhea, and dementia (madness); Symetrical pigmentation, red tongue — cured by three m's, maize meal, molasses, meat (fat pork); and black tongue in dogs. Coenzyme I and II which are involved in carbohydrate metabolism are derived from Nicotinic Acid Amide.

Rich sources are liver, wheat embryo, yeast, eggs, nuts, tuna fish, beans, peanuts, lean pork, etc.

Vitamin B6: Pyridoxine. This consists of colorless crystals, soluble in water,

alcohol, and acetone; slightly in ether. It is stable to heat in acid or alkaline solution; destroyed by light, especially ultraviolet (as all pyridine derivatives).

Deficiency diseases or signs are dermatitis, epileptic attacks, less haemoglobin in blood corpuscles, impairment of growth of lymphatic tissue, etc. Pyridoxine is essential for the utilization of unsaturated fatty acids, and for haemoglobin synthesis.

Rich sources are beef liver, cabbage, yeast, cereal grains, legumes, sweet potatoes, meat, fish, peanuts, vegetables, etc.

Pantothenic Acid. This is a viscous pale yellow oil. The calcium salt is a white crystalline powder. It is soluble in water, slightly soluble in ether, almost insoluble in other fat solvents. The calcium salt is soluble in water and alcohol. It is stable to oxidizing and reducing agents and autoclaving, unstable to dry heat. Daily adult requirement is 2-4mg.

Deficiency diseases or signs are chick dermatitis, lack of pigment in the hair, and skin troubles. Pantothenic acid is essential for the normal hatching of eggs, and for growth and nutrition.

Rich sources are liver, whole wheat peas, peanuts, eggs.

Biotin : Vitamin H. This is a crystalline compound which is slightly soluble in water and in alcohol, but insoluble in fat solvents. It is stable to heat in acid solution, but less stable in alkaline solution.

Deficiency diseases or signs are scaly dermatitis, or egg white injury. Biotin is necessary for cellular fixation of carbon dioxide.

Rich sources are liver, peanuts, peas, egg yolk.

Para-Amino Benzoic Acid: (PAB). This is the growth promoting factor for the chicks. It consists of white or slightly yellow crystalline powder, slightly soluble in water, freely soluble in alcohol, soluble in ether. It is unstable to light.

Deficiency diseases or signs are lack of pigment in the hair. This substance is an essential constituent of cellular metabolism. It is important as a precursor for folic acid.

Rich sources are yeast, liver, wheat germ.

Inositol : Hexahydroxy-cyclohexane. Only the optically inactive isomer meso-inositol is nutritionally active. This consists of sweet white crystals, soluble in water, insoluble in alcohol or ether; stable to strong acid and alkaline hydrolysis.

Deficiency diseases or signs are alopecia (baldness) in mice and spectacle eye in rats. It is necessary for growth, and is a lypotropic substance, i.e. takes part in fat metabolism.

Rich sources are beef heart, beef brain, yeast, cereal grains, liver, kidneys, oranges, peas, etc.

Choline : this is a colorless viscous liquid, soluble in water and alcohol, unstable to alkali.

Deficiency diseases or signs are hemorrhage in eyes and disturbed hepatic function. It is necessary for growth of chicks, turkeys, and dogs.

Rich sources are egg yolk, beans, wheat germ, pork, kidneys, peas, etc.

Folic Acid : PGA, Pteroylglutamic Acid. This is a yellow or yellowish orange, odorless crystalline powder, insoluble in water and alcohol, soluble in hydrochloric acid, sulfuric acid, and in dilute solutions of alkali hydroxides.

Deficiency diseases or signs are sprue. Folic acid is essential for growth and normal metabolism of growing cells and tissues.

Rich sources are liver, beans, wheat, watermelon, peanuts, etc.

*Vitamin B*12 : Cyanocobalamin. This is a complex cobalt, heat-stable compound. It is a dark red hygroscopic crystalline powder which has been isolated from liver extracts. It is sparingly soluble in water, soluble in alcohol.

Deficiency diseases or signs are pernecious anemia, sprue. This vitamin stim-

ulates haemoglobin formation.

Rich sources are liver, milk, cheese, meat, egg yolk, etc.

Vitamin B Complex : Exlusive of ascorbic acid, this term refers to a composite of all the water soluble vitamins found in yeast and liver. These are thiamine, riboflavin, niacin, folic acid, vitamin B12, para-aminobenzoic acid, biotin, choline, inositol, pantothenic acid, and pyridoxine.

Vitamin C : Ascorbic Acid, Cevitamic Acid. This consists of colorless or slightly yellowish crystals, soluble in water and alcohol, insoluble in chloroform or ether. This is the least stable of the vitamins. It is destroyed by cooking, sensitive to alkalies and to oxidation, especially in the presence of iron or copper ions; fairly stable in acid solution. Daily requirement is 50-75 mg.

Deficiency diseases or signs are scurvey (the disease of sailors), bleeding from the teeth and gums, capillary fragility, decrease in haemoglobin formation in blood, and decrease in bone and teeth development. Ascorbic Acid plays a role in biological oxidation due to the ease of its being oxidized and reduced. It is necessary alone or in combination with vitamin P for the maintenance of capillary integrity and prevention of permeability.

Uses: Ascorbic acid is essential for the formation of collagen and intercellular material, and hence for the development of cartilage, bone and teeth, and for the healing of wounds. It influences the formation of hemoglobin. It is used for the prevention of infantile scurvey, anemia, increased capillary fragility, haemophilia, dental caries that are caused by its deficiency, and also in the treatment of influenza, whooping-cough, diphtheria, rheumatic fever, and pneumonia where there is increased excretion of ascorbic acid. It should also be used as a prophylactic measure in gastric and duodenal ulcer when restricted diets are prescribed. Ascorbic acid is usually administered orally as tablets or fruit juice, but in the presence of persistent vomitting, diarrhoea, or other conditions preventing its utilization by mouth, it may be given by parenteral injection as sodium ascorbate.

Rich sources are oranges and all other citrus fruits, pepper, mustard, strawberries, spinach, tomato juice, green vegetables and leaves.

Citrin : Vitamin P; Permeability factor. This is a flavone compound which is not known in pure form. Hesperidin, hesperidin chalcone and the rhamnoglucoside of eriodictyol are collectively known as citrin. It is necessary for the maintenance of the proper permeability of the capillaries. Daily requirement for infants is 25 mg.

Deficiency diseases or signs are capillay fragility.

Rich sources are oranges, lemons, grapes, plums, red pepper, etc.

Rutin : This is a rhamnoglucoside in the form of a tasteless greenish yellow powder, insoluble in water, very slightly soluble in alcohol. Rutin possesses vitamin P activity and is used for the control of capillary fragility.

Vitamin D : Antirachitic Factor. The term Vit. D refers to a mixture of substances (lumisterol, calciferol, and some impurities) which relieve or prevent rickets. It occurs in white odorless crystals, soluble in fats and in organic solvents. It is stable to heat, alkalies, acids, and to oxidation. The D provitamins, the most important of which is ergosterol, are activated to Vit. D by exposure to ultraviolet light. Ergosterol is activated into two D vitamins D1 and D2.

Vitamin D2 refers to calciferol.

Vitamin D3 refers to irradiated 7-dehydrocholesterol.

Daily adult requirement is 400 I. Units. 400-800 I. Units for children. (1 mg. of calciferol is equivalent to 40000 I. Units.)

Deficiency diseases or signs are rickets, bowlegs, knock knees and swollen joints; infantile tetany, low calcium cont-

ent in blood, retarded growth and lack of vigor. Vitamin D deals with the proper utilization of calcium and phosphorus, and is necessary for bone and teeth formation.

Uses: Vit. D is recognised as a specific in the treatment and prophylaxis of infantile rickets, spasmophilia, and osteomalacia. There is no warrant for the claim that it is the only important factor in caries prevention, but an inadequate intake of vit. D results in little utilization of calcium and phosphorus, and this can largely be overcome by normal intake of vit. D. In the treatment of hypocalcaemia due to parathyroid deficiency, continuous administration of large doses is well tolerated, but a careful check should be kept. It has been used with good effects in tuberculous manifestations of slow evolution. It is not sure that massive doses of vit. D are of benefit in chronic arthritis, in allergic disorders, or in psoriasis.

Rich sources are halibut liver oil, cod liver oil, milk, egg yolk, tuna and salmon fish.

Vitamin E: Alpha Tocopherol, Antisterility factor. Alpha, beta, gamma, and delta tocopherols are viscous oils, soluble in fat solvents and insoluble in water; stable to heat in absence of oxygen, to strong acids, and to visible light, unstable to ultraviolet light, alkalies, and oxygen. The esters are more stable. Alpha Tocopherol has the highest biological activity.

Deficiency diseases or signs are sterility — germinal epithelium of testis is destroyed in males, and death of fetus occurs in females; muscular degeneration or dystrophy; nervous disorders. Vitamin E is an antioxidant which preserves easily oxidizable vitamins and unsaturated fatty acids. It is necessary for normal reproduction in many animal species.

Uses: Preparations of vit. E have been advocated for the treatment of muscular dystrophies and in angina pectoris, but they are probably of little therapeutic value in these conditions.

Rich sources are wheat germ oil, cottonseed oil, peanut oil, coconut oil, green leaves and vegetables.

Vitamin K: The antihemorrhagic factor.

*Vitamin K*1, is 2-methyl-3phytyl-1,4-naphthoquinone, a yellow oil which is isolated from green leaves.

*Vitamin K*2 is 2-methyl-3difarnesyl-1,4-naphthoquinone, a yellow crystalline solid which is isolated from putrefying fish meal.

Synthetic Vitamin K or Menaphthone is menadione or 2-methyl-1,4-naphthoquinone,a yellow crystalline powder. This is more active than natural Vit. K1.

Vitamin K is fat-soluble, but some water soluble forms have been made. The fat-soluble forms require bile salts for absorption. It is stable to heat and reducing agents, unstable to oxidizing agents, light, strong acids, and alcoholic alkalies.

Deficiency diseases or signs are internal hemorrhage and prolonged clotting time. This vitamin is necessary for the formation of prothrombin in blood.

Uses: Ordinarily, sufficient vit. K is obtained from the diet or from the products of bacterial metabolism in the intestines, but if there is an inadequate intake of the vitamin in the diet, or if its absorption is impaired owing to inadequate secretion of bile, or if hepatic damage inter-

this mass of shreds takes the same color. One puts the mass in a funnel with an opening of four inches wide.»

« 'Curare which we prepare,' said the Indian, 'is far superior to that which you make there, beyond the seas. *It is the juice of a plant which kills quietly without one knowing whence the blow came.*' »

«One begins by making a cold infusion by pouring water on the shredded material, the ground bark of the mavacure; and a yellowish filtrate, falls, drop by drop, for some hours into the funnel. This water-filtrate is a poisonous liquid but does not acquire its strength until concentrated by evaporation, after the manner of molasses, in a large clay bowl. The Indian invited us to taste the liquid from time to time; one judged by the degree of bitterness whether the concentration by the fire had proceeded far enough. There is no danger in this operation. Curare is not dangerous unless it gains access to the blood; likewise, the vapor produced by heating is not harmful.»

«The concentrated juice of the mavacure is not thick enough to attach to arrows. Therefore, to give body to the poison, another, very glutinous vegetable concentrate, drawn from a large, leafy tree called Kiracaguera, is mixed with it. At the moment that the sticky juice of the Kiracaguera tree is mixed with the poisonous liquid and well concentrated by boiling, it be comes black and coagulates in mass to a consistency of tar or thick syrup. This mass is the curare of commerce.»

In 1844, Claude Bernard, the great French physiologist, described the effect of curare. He studied its action, and proved that it was harmless when administered by mouth.

Claude Bernard proved that the paralyzing effect of curare was exerted upon skeletal muscle and nerves. From his experiments, he deduced that a muscle subjected to curare did not have its irritability impaired and that the innervation of the muscle lost none of its normal function. This directed attention to the connection between the nerve and the muscle — the myoneural junction.

The drug came to be prescribed in rabies, epilepsy and similar disorders. For a long time the substance was considered too dangerous by medical men. It was really a pharmaceutical puzzle, a drug whose composition was hard to harness into a relatively safe agent for conquering disease.

In 1898 Boehm classified the curares into three groups depending on the physical forms in which they were prepared:

1. *Tube curare,* which is cylindrical in shape from having been packed in hollow bamboo canes,

2. *Gourd or Calabash curare* and,

3. *Pot or Jar curare,* which is extremely rare in commerce.

This unfortunate grouping has been the source of much of the confusion concerning the curares. Commercial curare is a very unreliable drug. The potent alkaloidal ingredients are derived from several *Strychnos* species of the Loganiaceae, mainly *S. toxifera;* and from several genera of the Menispermaceae. The

source of tubocurare is said to be *Chondodendron tomentosum* (Menispermaceae). It contains d-tubocurarine and curine. Calabash curare is obtained principally from *Strychnos toxifera* and contains curarine. Pot curare comes from *Strychnos Castelnaei;* and *Cocculus toxiferus* (Menispermaceae), and contains protocurarine and protocurine.

Curare was introduced into modern medicine in the 1930's when R.C. Gill, explorer and naturalist, made available the first authenticated and significant supply of the poison from South America. He brought back to the U.S.A. thirty pounds of various plants, sufficient to carry on more accurate research.

In 1935, Dr. Harold King announced the isolation of crystalline tubocurarine from the amorphous active principle called tubocurarine by Boehm. Its composition was determined, and the relationship between its chemical structure and that of the physiologically inactive alkaloid curine elucidated. But the two samples of tubocurarine which he examined were of unknown botanical derivation. In 1943 Wintersteiner and Dutcher showed that the botanical source of the alkaloid was *Chondodendron tomentosum.*

Curare was first administered to a patient under anesthesia, in 1942 in Montreal, Canada. The successful results led to further trial by other anesthetists and its use became widespread, especially for general anesthesia in abdominal surgery.

The effect of tubocurarine is essentially a blocking of the transmission of nervous impulses at the nerve axon ending in skeletal muscle. Tubocurarine does not prevent, at the motor nerve ends, the formation of acetylcholine, a chemical substance supposedly associated with neural transmission, but it does antagonize completely the action of small amounts of acetylcholine on muscle responses.

Therapeutic doses of tubocurarine produce the following sequence of events in man: On I.V. injection of the ordinary clinical dose, the effects begin to show within 2 minutes, as haziness of vision, drooping of the eyelids, relaxation of the face muscles, sensation of tightness in the throat, huskiness of voice; then inability to raise the head, the arms and then leg; finally shallowness of respiration. The peak is reached in 2.5-3 min. With larger doses, the last structures to be affected are the intercostal muscles and the diaphragm. As these muscles become curarized, respiration becomes shallow and may cease. This sequence follows the order of involvement frequently encountered in myasthenia gravis. Paralysis recedes in reverse order. The extent and duration of action is dependent upon the size of the dose. Following a single I.V. therapeutic dose, recovery of voluntary motion may require 15-20 min. The muscles which are least affected by curare are those which contain the largest amount of utilizable oxygen, and survive longest after the death of the animal. The heart is not affected except with much larger doses.

The rational and safe application of curare in clinical medicine is based upon its muscle relaxing properties. Curare is established as distinctly useful in anesthesiology, in shock treatment of psychopathic patients, in carrying out certain

manipulative procedures, and in spastic and neurologic diseases. In these conditions, it serves as an agent to provide muscular relaxation, facilitating the application of other procedures or therapeutic measures; it has no analgesic or anesthetic properties.

Because patients with myasthenia gravis are exceptionally sensitive to its action, curare can be used as a diagnostic agent in this condition. However, for the same reason, myasthenia gravis constitutes a contraindication for full therapeutic dosage of curare.

Overdosage of curare should be avoided because there is no completely satisfactory antidote. Prostigmine methylsulfate is useful except when the excess of curare has been great, as for instance in the administration of a large dose to an infant. For moderate curare overdosage 1cc. of a 1:2000 dilution (0.5 mg.) of prostigmine methylsulfate intravenously may be helpful.

Curare is contraindicated in, or should be administered with caution to, any patient suffering from respiratory deficiency, pulmonary disorder, renal dysfunction or liver disease. Care should be taken to guard against accidental administration to patients suffering from myasthenia gravis, because such patients are hypersensitive even to extremely small amounts of curare.

BIOLOGICAL ASSAY OF CURARIFORM ACTIVITY.

The chief aims of biological standardization are to insure uniform potency of commercial products of curare alkaloids, and to investigate new curariform agents and compare their action with known substances. All biological assay procedures depend on the action of curare on the voluntary muscle.

The most reliable method for assay is the «Rabbit-Head Drop». The drug is evaluated by finding the intravenous dose which, within 2-3 minutes, just *prevents lifting of the head in the rabbit.* Groups of animals are used for the standard and unknowns and the relative potencies are calculated from the average responses of the groups.

PREPARATIONS AND DERIVATIVES OF TUBE CURARE.

1. Intocostrin E. R. Squibb and Sons was the first pharmaceutical preparation to be launched on the market. It is a purified curare extract made from the plant *Chondodendron tomentosum.*

2. *Tubocurarine Chloride, U.S.P. XIV.* or d-Tubocurarine Chloride is the hydrated Chloride of a quaternary base obtained from the bark and stems of *Chondodendron tomentosum,* and related species. (C38 H44 C12 O6. 5H20)

3. *Dimethyl-Tubocurarine Iodide* or Metubine Iodide-Lilly.

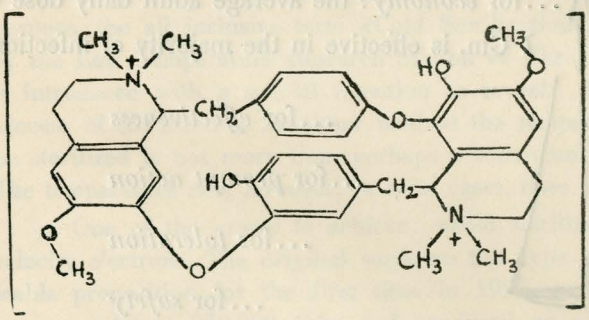
Dimethyl-tubocurarine iodide shares the curare action of tubocurarine chloride. It produces respiratory paralysis less frequently, although its action is of greater duration. The ratio of potency of dimethyl-tubocurarine iodide to d-tubocurarine chloride is approximately 3:1.

SYNTHETIC CURARE-LIKE COMPOUNDS.

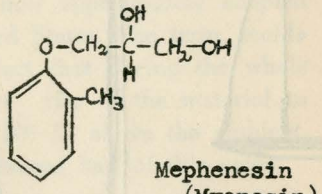
In 1946, Bovet and his collaborators attempted to produce synthetically a simplified version of the d-tubocurarine molecule. They achieved the synthesis of

a series of bis-quinoline derivatives wherein the aromatic structures were connected through a methylene chain by ether linkages. These compounds had a high curariform activity. Shortly thereafter, they examined simple mono- and poly-phenolic ethers of certain amino alcohols and found that these substances also possessed a striking curariform action. In the latter series was the compound 2559 F. *Flaxedil--Specia* or 1,2,3-tris(2-triethylammonium ethoxy) benzene triiodide, which exerted a potent curariform action in the rabbit. Another compound which has a similar action to tubocurarine chloride is Mephenesin (Myanesin-B.D.H. or Lissephen Abbott).

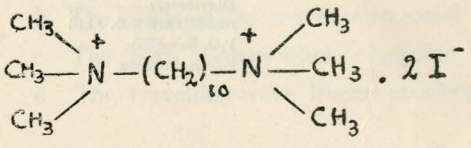
The work of Bovet also established that many organic ammonium compounds with at least two quaternary nitrogen atoms have a high potency as curare-like agents. Later the observations of Barlow and Ing (1948) and Paton and Zaimis (1949) on decamethonium and its analogs indicated that a chain of ten carbons between the nitrogen atoms is optimal. The importance of the substituents on the nitrogen atoms, in modifying qualitatively the effects of synthetic blocking agents, was recently pointed out by Randall (1951). It was observed that in a series of bis-quaternary polymethylene derivatives, those having methyl groups on the nitrogen atoms resembled decamethonium (C10), while their analogs with aromatic groups on the nitrogen atoms resembled d-tubocurarine in their neuromuscular blocking action. Among the compounds belonging to the first group in their action, besides Decamethonium Iodide (Syncurine-B.W., Eulissin — Allen and Han.), may be mentioned succinyl choline, while among the compounds belonging to the latter group Mytolon and Laudolissin may be mentioned. The methyl substituted compounds were not antagonized by Tensilon and Neostigmine — two anticurare agents; whereas the compounds with aromatic substituents were antagonized by both Tensilon and Neostigmine.



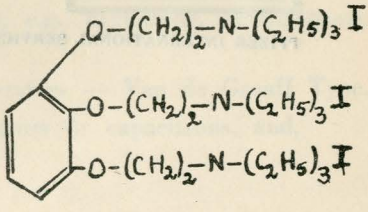
Tubocurarine Chloride



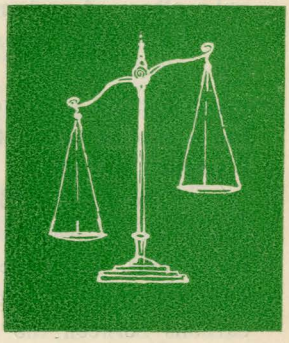
Mephenesin
(Myanesin)



Decamethonium Iodide



Gallamine Triethiodide
(Flaxedil)



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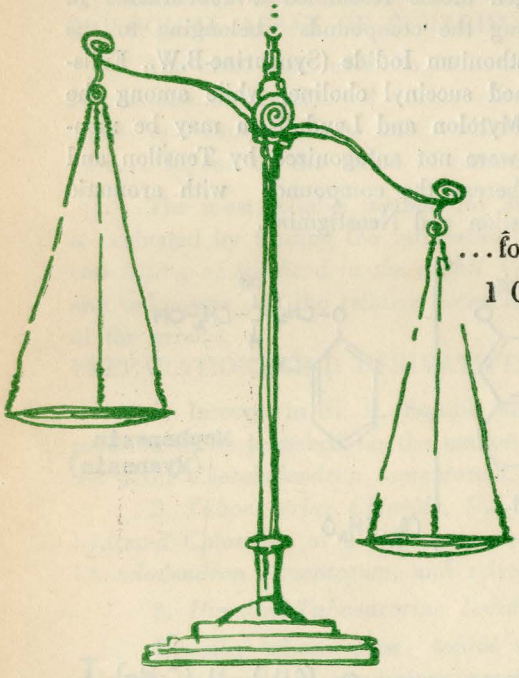

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COLD STERILIZATION

or

STERILIZATION BY ELECTRONS AND ATOMIC RAYS

by **Edward Vorperian B. A., Ph. C.**

The possibility of using high velocity electrons for killing bacteria and other micro-organisms, to ensure sterilization on a commercial scale, is being widely studied in the United States of America and in Great Britain. More recent developments have been concerned with the use of radiations from radioactive atomic fission waste obtainable from atomic energy projects. The main advantage of these processes is to achieve sterilization of a wide variety of products, including pharmaceuticals, without exposing them to the damaging effects of heat or chemical sterilization. Heat treatment or thermal sterilization would almost invariably cause at least a partial if not a total destruction of the original product itself. This is a factor of prime importance when dealing with pharmaceutical products which, in almost every case, are heat stable only within a narrow range of a relatively low temperature, well below the thermal lethal region of micro-organisms. It is therefore in the interest of the manufacturer of pharmaceuticals and of those who deal in these products to become acquainted with these newer methods and techniques of sterilization.

«Electronic Sterilization» was the original name coined by the investigators, to designate a sterilization process in which only high speed electrons were used. But in view of the fact that atomic rays could as well be used for such a purpose, the all inclusive term «Cold Sterilization» is now appropriately adopted by the Low Temperature Research Station of The United States. The term «cold» is introduced with a special intention to reveal the fact that during the whole process of sterilization by either method the temperature rise of the material to be sterilized is not more than perhaps a maximum of 10° C. above the ambient. The temperature rise, however, in most cases, does not exceed half of this value.

One of the means to achieve «cold sterilization» is to make use of high velocity electrons. The original work on this type of sterilization became a practicable proposition for the first time in 1925 when W.D. Coolidge operated a vacuum tube at 350,000 volts and produced an electronic beam of considerable penetrative power. Today, there are at least four different types of high velocity electron or beta-particle generators available:

a. The electromagnetic nuclear accelerators, e.g., cyclotrons, synchrotrons, betatrons, etc.,

b. The electrostatic constant-potential accelerators — Van de Graaff Type,

c. The high voltage electric-impulse generators or capacitrons, and,

d. The travelling-wave linear accelerators.

Electrons or beta-particles are corpuscular radiations different from gamma or X-ray vibrations which are of electromagnetic nature. They have an extremely small mass (-log 18.0141 grams) and carry a negative electric unit charge of (-log 18.7924 Coulombs). If moving at a velocity approaching that of light (299,790 Km/sec.) they acquire a deep penetrating power. On account of their small mass, electrons can easily be deflected from their course and be projected or concentrated on the objective. The penetrability of any given electronic beam is directly proportional to the force with which the electrons are projected — therefore voltage, and inversely proportional to the density of the material to be irradiated. The electronic speed is usually expressed in terms of electron-volts (ev) or million electron-volts (Mev). The electron-speed potentials in common use for «cold» sterilization vary up to 5 Mev., however, for some experimental purposes electron-speeds up to 25 Mev. have been tried.

The bactericidal effect of these corpuscular radiations is produced by the kinetic energy which the moving electrons acquire in the generator. Depending on the absorption characteristics of both container and contents the electron-voltage will vary between wide ranges, usually 1-5 Mev. and 8-10 Mev. In these ranges the electron beams combine deep penetration, well defined target volume, maximum efficiency and minimum danger to the material being sterilized. An accidental fourfold overdosage does not lower the potency of vaccines to any marked extent. The biological effects of these radiations have been studied intensively. The general princip'e being put forth is that the larger organisms are more easily killed than the smaller ones. The most extensive and reliable figures heretofore available have been published by the department of Food Technology of M.I.T. (U.S. A.). Their observed sterilization doses may be grouped as follows:

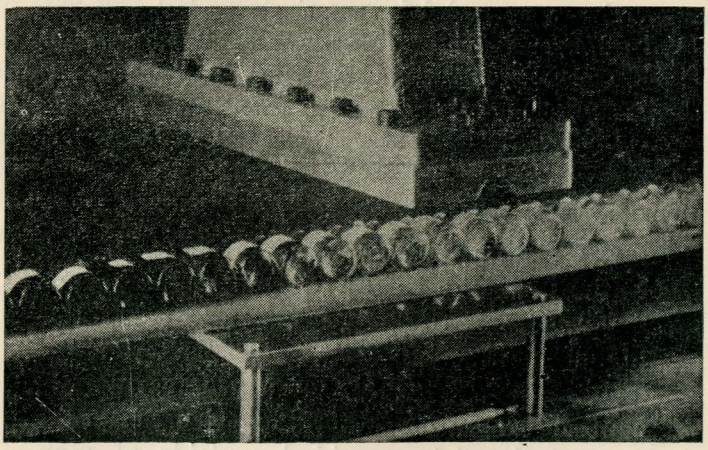
Insects .....100,000 rep or 0.1 Mrep
Vegetative bacteria ..... 500,000 rep or 0.5 Mrep
Moulds and yeast .....1,000,000 rep or 1.0 Mrep
Bacterial Spores ..... 2,000,000 rep or 2.0 Mrep
Viruses — up to .....2,000,000 rep or 5.0 Mrep
Enzymes — up to .....10,000,000 rep or 10.0 Mrep

The «rep» is a very small unit of work, based on the number of ions produced by the impacts of the moving electrons with any particulate matter. Its equivalence is 83.5 ergs of beta-particle energy absorbed per gram of water in biological tissues. One million rep (Mrep), being equal to 8.35 Joules, would therefore correspond to about 2 calories per gram. These figures make the picture clear as to why electronic sterilization is also termed «cold» sterilization. Considering an average use of 2-3 Mrep for the sterilization of most parenteral solutions, the corresponding rise in the temperature would only be 4-6°C.

Lea et al. revealed an important fact concerning the efficiency of impact-kill, which later became known as the «target theory». According to this theory, only a minute part of the entire volume of the micro-organisms need absorb the incident energy to result in a lethal effect. The sensitive volume or the «target» being only 1-6 per cent of the total microbal volume.

In connection with 100 per cent sterilization doses, the question of damage should be considered. Damage in this case is a reaction due to the absorption of energy, and whereas damage to the micro-organism is the objective aimed at, any damage to the carrier, that is drug or food etc., is intolerable. It is important to note here that these energies are not sufficiently high to iduce any radioactivity in the irradiated products. Besides, the absorption of energy by different structures and organisms varies so greatly that it is feasible in very many cases to choose an appropriate Mrep dose to ensure 100 per cent sterilization without causing any damage to the carrier. For instance, applying 1-5 Mrep for complete sterilization, no loss in activity was observed in the following preparations: ephedrine, estradiol, organic gold compounds, procaine, antibiotics, hormones, vaccines, Rh sera, etc. Some vitamins showed complete stability while very few suffered considerable damage. For example, thiamine hydrochloride and ascorbic acid showed 2 and 6 per cent loss of activity respectively, and alpha-tocopherol a very slight loss. Enzymes must be considered to be rather changeable under the impacts of high velocity electrons. Their loss in activity ranges from 5.5 per cent in amylase to 75 per cent in hyaluronidase. Diastase, lipase, urease and some others suffer more or less severe reduction in activity. Antibodies, after electronic irradiation, show losses in activity ranging from 10 to 75 per cent. However, isoagglutinins, typhoid and pneumococcus antibodies remained unaffected. The preparation of «safe» vaccines by the irradiation technique has yielded promising results for the future. A «safe» vaccine is one in which the viruses or bacteria are dead but the antigenic properties have not been impaired.

Apart from application to antibodies, drugs, medicinal preparations, glandular extracts, blood fractions, etc., «cold» sterilization may also be applied to



The « business end » of a 2 MeV. Van de Graaff accelerator, equipped with electron beam scanner for uniform lateral dose distribution. This unit is doing contract sterilization and research in an American factory. (Courtesy of Mfg. Chemist, 23: 453, 1953).

such surgical accessories as bandages, gauzes, sutures, artificial grafts instruments etc.

Another source of ionizing radiation has lately been under consideration for application in «cold» sterilization experiments. Cesium-137, a fission waste material, which is now available in large quantities from atomic pile reactors, has been found to be very promising as a sterilizing agent because of its powerful beta and gamma radiations. This work was part of the program initiated by the Atomic Energy Commission of the U.S.A., to investigate the possible uses of fission by-products, large quantities of which are at present left unused. Columbia and Michigan Universities were the initiators of this original work. They first used the gamma rays from Cobalt-60, but later Cesium-137 proved to be more efficient for «cold» sterilization.

As pointed out, the great advantage of the «cold» sterilization method is that medicinal products can be sterilized after packing, with negligible changes in temperature and without altering the composition of the product. If this method could be widely used, it should eventually prove to be a simpler and cheaper way of producing sterile products than the present complicated and costly aseptic procedures.

However, there are some disadvantages to be considered. Electronic generators and atomic rays are rather expensive, unless they may become cheaper if widely used. Eventually the provision of cheaper waste fission products may completely alter the economics of «cold» sterilization.

Apart from the present high cost of equipment, another disadvantage is that the process must be controlled to ensure that no undesirable side effects are induced. The method can not be used indiscriminately. Conclusive tests are necessary before it can be recommended for any single product.

«Cold» sterilization is in many ways a most attractive process, and it is to be hoped that the pharmaceutical industry will show the interest necessary to ensure its thorough exploration.

Dr. Chisholm, director general of the United Nations World Health Organization, warned that "...almost all bacteria are now controllable. There's no trouble with bacteria; the trouble is with people. We are learning to control even the filterable viruses — the greatest threat to mankind, outside of man himself. But man himself still constitutes a greater threat than any other form of life."

Red Squill - A Potent Raticide

by **Prof. Charles Abou-Chaar**

It was Muhammed Algâfaki who, in the 13th century, is said to have suggested the use of squill as a means of controlling mice (1).

Squill, the bulb of *Urginea maritima*, a well known Mediterranean drug, occurs in two varieties: the white and the red. White squill grows wild in this country all along the coast on elevated ground as well as on the mountains and in most countries bordering on the Mediterranean. White squill is an official drug and contains the well known cardiac glycosides Scillaren A (crystalline) and Scillaren B (amorphous mixture) isolated by Arthur Stoll and co-workers in 1933 at the Sandoz Laboratories in Switzerland. The red variety, however, grows in a more restricted area particularly in Algeria, Italy, Sardinia, and Cyprus. Again, it was Stoll and co-workers who in 1941 succeeded in isolating and characterizing an additional toxic glucoside, found only in red squill and named it scilliroside (1). In 1943 they established its structure.

Stoll and co-workers (1) isolated scilliroside by first extracting red squill, dried at 60° C. and powdered, with absolute alcohol. The residue obtained on evaporation of the alcoholic extract in vacuum, was dissolved in water and treated with lead hydroxide to precipitate tannins and coloring matter. The partially evaporated filtered aqueous solution is defatted with chloroform and the total glycosides of red squill are extracted with chloroform containing 20% n-butyl alcohol. The residue remaining on evaporating the chloroform-butanol solution is suspended in water and extracted with several portions of chloroform containing 5% of n-butyl alcohol which extract scilliroside leaving most of the cardiac glycosides in the aqueous solution. The chloroform-butanol solutions are evaporated to dryness, the residue is taken up in methyl alcohol, crystallized from aqueous methyl alcohol, and further purified by recrystallization from aqueous methyl alcohol. Maximum yield is estimated at about 350 mg./Kg. of fresh bulbs.

Scilliroside has been found to be extremely toxic to rats — the lethal dose for male rats has been estimated at 1.2 mg. and for female rats at 0.6 mg. per kilogram body weight (2), (3).

Red squill is thus the most potent and specific of the raticides. Its specificity, however, stems from the fact that the rat can not vomit and thus can not

rid itself of the poison once the bait has been ingested. Red squill is a safe raticide to use, for although both red and white squills are very toxic to vertebrates including man, they stimulate the vomitting center and the poison is thus expelled. Besides, squill is quite distasteful and is unlikely to be taken by domestic animals or children. Chickens are very resistant to the action of red squill.

Different lots of red squill bulbs exhibit great variations in toxicity not only among those obtained from different regions but also among those collected in the same region (4). Only a small percentage of the bulbs exhibit high toxicity.

The toxicity of the bulb is assayed biologically on albino rats. Of the factors that influence the result of the biological assay, the strain of albino rat used is the most important. Other factors which may be responsible for the variation in the results of the biological assay as performed by various laboratories on the same sample of squill, are the age of the test animal, previous diet fed to the animal and the altitude at which the bioassay is conducted.

Red squill may be used in the form of a fortified powder or in the form of a fortified liquid extract such as «Rodine» (do not confuse it with «Rhodine») and «Finirat». Both powder and extract are mixed with suitable bait attractive to the rat. The preparation must be of such a strength that the rat will get a toxic dose from the first feeding as it may not like to partake again of the bait particularly if it contains the powdered whole bulb, although its taste is not objectionable to rats. Standardized liquid extracts of known strength either in terms of units or mg. of scilliroside ,to be diluted with bait, are preferable. Red squill rodenticide preparations in the U.S.A. should possess an MLD50 (minimum lethal dose killing 50% of the animals) of about 500 mg. per kilogram body weight of male rat (5). Preparations below this strength are brought up to it by addition of liquid extracts of squill. Such preparations are called «fortified». The poisoned bait usually contains 10% of the fortified red squill preparation.

Crabtree, Ward and Garlough (6) of the Denver Wildlife Research Laboratory of the Fish and Wildlife Service. U.S.A., developed a method for fortifying red squill preparations. The method consists essentially of an intermittent, counter-current extraction of powdered red squill with 80% ethyl-alcohol-water solution. According to Crabtree (4), «three extraction cells were incorporated into the extraction process and the solvent routed through the system in such a manner that each charge of squill was extracted five times. The final extract was concentrated in vacuo and proved to be several times more toxic on a dry weight basis than that accomplished by merely extracting a single batch of powder with five separate lots of fresh solvent. The extract obtained from the counter-current process, after concentration, is mixed with a predetermined amount of unextracted powder, the mixture dried at 80° C., and the dried squill «cake» then re-milled to a 20-mesh or finer powder. «Fortified extracts» can be prepared by merely diluting the concentrated extract with glycerin or any other suitable diluent to a desired toxicity level. Preservatives, e.g., sodium benzoate and salicylic acid, are added in small quantities to fluid extracts to enhance their keeping qualities. Control of the process as well as determination of the toxicity of the final product is carried out by bioassay procedures using male albino rats as test animals».

Prebaiting may be necessary and is advisable. Bait free from poison should be left lying around for few days so as to accustom the rat to partake of it and allay its suspicion. According to Silver and Garlough (7) «a variety of baits used separately gives the rat a choice of foods and increases the chances of the bait being taken. Bait should be fresh and of good quality». According to them fish is one of the most attractive baits for rats. Canned fish like salmon, sardine or tuna may be used. The fish should be ground in a meat grinder and mixed in the proportion of 1 part of the «fortified» red squill to every 10 parts of finished bait. The poisoned bait should be free of lumps. Fresh ground meat, cereal meals mixed with milk or water, fresh fruits and vegetables may also be used. Liquid squill extracts should be mixed with a dry bait such as dry cereal meals.

Red squill is not usually used to control mice and is not effective against them, may be because they are nibblers of food, i.e. they eat frequently but take very small morsels of food.

Within two hours of the taking of red squill, the rat will become dull, drowsy and inactive. Later, it will exhibit characteristic tremors and paralysis in the hind legs. This condition is followed by progressive paralysis of the trunk and forelegs, and breathing becomes labored. A convulsive period then sets in and the animal starts to roll over and over in a peculiar manner. If, during a quiet interval, the cage of the animal is disturbed, the rat begins to gyrate. This rolling motion continues at intervals for half an hour, or possibly 24 hours, before death occurs, depending upon the dose taken (8).

The French Codex (1949) gives the following formula of bait for destruction of rats:

Stabilized red squill powder 5 gm., White sugar 15 gm., Wheat flour 150 gm., Water s. q., Coloring matter s. g.

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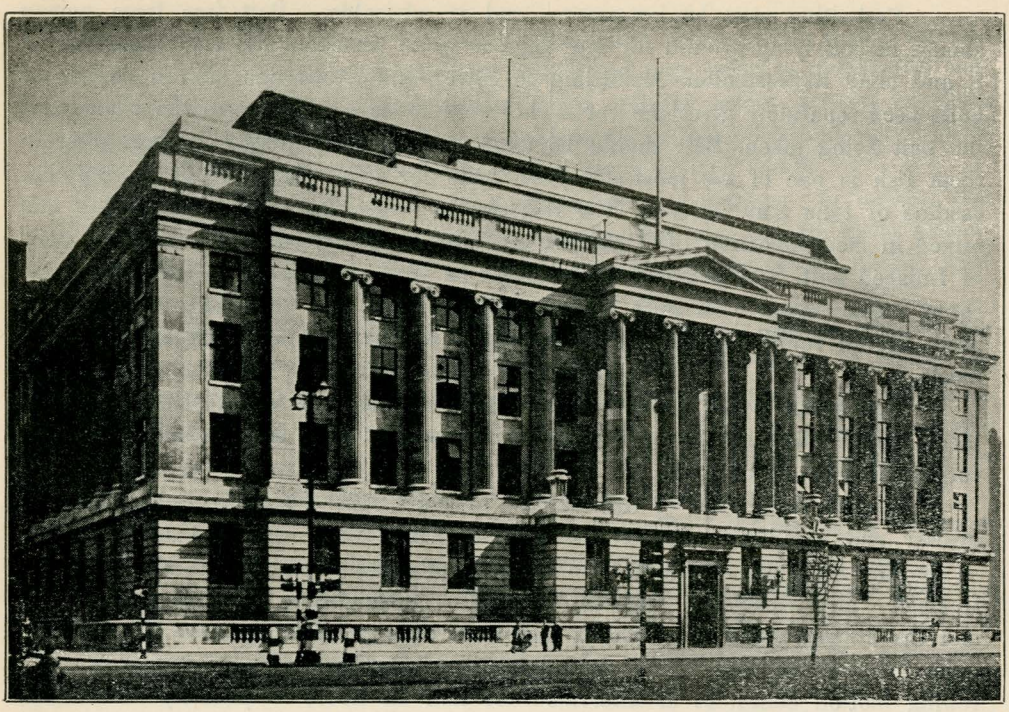

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FIRST AID AND THE PHARMACIST IN CHEMICAL AND ATOMIC WARFARE

by **Sami Halabi**

In the light of present world conditions, teaching people to help themselves is of vital importance. Civilians, and especially those related to the medical professions, must know how to help others when emergency situations demand it. Atomic bomb and gas attacks would bring in their wake cases of shock, burn, severe bleeding, crushing injuries, fractures, and poisoning. Rescuers would need to exercise a high degree of selectivity and judgement so that the most critical cases would receive attention first.

With knowledge in advance, therefore, the civilian pharmacist can assist in driving away the fear of the unknown, and also help to reduce the number of casualties from chemical compounds and atomic weapons.

Chemical warfare

Chemical warfare is defined as «the use in war of chemical agents to obtain military results by direct chemical action» (U.S.D. 24th ed., p. 1395). Physiopathologically, the war gases, are divided into five groups according to the site upon which they exert their predominant action:

The first group comprises the Lachrymators or Eye irritants, which produce temporary inability to see. As their name implies, they act on the eyes, causing intense smarting and profuse flow of tears, but without normally effecting any permanent damage. Examples of this group are Chloracetophenone and Bromlenzylcyanide. The general first aid treatment for this group involves the use of boric acid solution for the eyes, and sodium bicarbonate solution for the skin.

The Sternutators or Nose Irritants constitute the second group of war gases. These give rise to intense pain in the nose, throat and chest, accompanied by nausea, vomitting and mental depression, thereby preventing masking or forcing removal of the mask and exposing the individual to the more toxic gases which are generally used in conjunction with them. Diphenylchlorarsine and Diphenylaminechlorarsine furnish examples of this group. First aid treatment in the case of sternutators should be accompanied by rest. Sodium bicarbonate solution is used as a mouth wash, being also instilled into the nose. Chlorine, breathed from a bleaching powder bottle is also of help.

A third more important group of war gases includes the Lung Irritants, also known as Choking Gases or Asphyxiants. They act on the respiratory system. They are highly lethal, and irritate the throat and lungs, causing coughing

and difficulty in breathing, followed in severe cases by acute pulmonary edema and death. Phosgene and Chloropicrin, belong to this group. Treatment involves absolute rest in a gas-free atmosphere. Artificial respiration must not be given. As much of routine shock therapy as is possible should be given.

An equally important group of war gases is the class of Vesicants or Skin Irritants. These penetrative gases exert an aggressive action on all parts of the body with which they come in contact, whether as vapor or liquid, causing intense irritation, and in severe cases, deep and extensive blisters. Their effect moreover, is somewhat delayed, a circumstance which makes them doubly dangerous. Because of their persistence they were frequently used in preference to other war gases. Examples of this group are Mustard Gas (bis-2-chloroethyl sulfide), and Lewisite (chlorovinylarsine dichloride). The latter, possesses, in addition to the vesicant, lachrimatory and lung irritant effects, a systemic poisonous action due to its arsenic content. To prevent skin burns, the vesicant must be removed from the skin with soap and water, or a weak solution of bleaching powder. If treatment is delayed, skin burns cannot be prevented. Later treatment is that of burns in general. For lewisite, the general measures to minimize the subsequent arsenical intoxication must be taken.

The last group of war gases involves the Systemic Toxic Agents, which include the blood poisons as carbon monoxide, and the nerve gases as hydrocyanic acid. Members of this group have a direct effect upon the blood or nervous system after absorption through the lungs. Treatment in this case is mainly symptomatic, after removal to fresh air, and applying artificial respiration.

When protective devices as masks and special clothing are not available, the prompt application of certain simple first aid measures will frequently prevent the development of serious injury from exposure to war gases. In all such cases the first requirement is immediate removal from the gassed area. Complete relaxation and rest are essential. Warming of the body with loose coverings and drinking hot coffee or tea are helpful. All clothing which may have become contaminated should be quickly removed. In general, there are few, if any, specific means of treatment. Subsequent treatment, once injury has actually occurred, is symptomatic rather than specific.

The basic protective measures against gas attack are of two kinds: (a) Pre-gas-attack protective measures and (b) Post-gas-attack protective measures. Under the former are included gas masks, special clothing, and antigas ointments. The latter measures involve the rapid dispersion of the gases or decontamination of the gassed area by mechanical or chemical means.

Gas detection, the recognition of the presence of gas and identification of its type, is of primary importance in passive defence, especially in the case of the persistent gases. The methods available for gas detection are either subjective or objective, according to whether the senses alone are employed as testing instruments, or use is made of some external physical or chemical aid. The smell, appearance and physiological effects of the gas concerned come under the sub-

jective heading. Taken altogether, these factors indicate the nature of the gas present. The pharmacist, because of his training, is well qualified for such identification.

Atomic and Radiological Warfare

In an atomic explosion all the effects of conventional explosives are still present, but are increased many thousand times in severity. In addition, there now exist injuries of a totally different sort. These are caused by the radiations which accompany release of atomic energy. Protection of the civil population must finally depend to a considerable extent on the individuals themselves. The medical profession, including pharmacists, should therefore be well informed on all the consequences resulting from an atomic detonation.

An atomic explosion differs from one of the conventional type in that the reaction taking place is not merely one of rearrangement of the atoms among themselves, but rather of the redistribution of the extremely small particles among the nuclei of the atoms. The events which culminate in an atomic explosion begin when a chain reaction is set up within the body of the bomb. This reaction proceeds extremely rapidly and results in the liberation of an enormous quantity of energy within a limited space. The resulting temperature may reach over one million degree Fahrenheit, and initial pressure may be of the order of a million pounds per square inch. The first visible effect of the explosion is an enormously bright flash of light accompanied by extreme heat. One of its effects is the heating of the air around the bomb to incandescence so that within a few millionths of a second after the explosion the bomb appears as a luminous sphere or ball of fire. This ball expands rapidly, and ascends like a gas balloon. If the explosion occurs at an altitude less than 400-500 feet, the ball's rapid expansion will cause it to make contact with the earth's surface.

Injuries resulting from the explosion of an atomic bomb are of three general kinds:blast effects, burns, and radiation injuries. Only the last of these is peculiar to an atomic burst; the other two, occurring after any large-scale explosion, are here much more severe. Blast injuries are of two general kinds: secondary effects caused by flying debris or falling structures resulting from the explosion, and direct blast effects upon the body. The former cause many more fatalities than the latter, but differ in no way, except in magnitude, from similar injuries occurring in conventional explosions. Injuries due to direct exposure to the blast are negligible except in cases where the distance is so small that burns or radiation effects would be fatal anyway. Burns are also of two types: flash and flame. Flash burns are caused by direct exposure to the thermal radiation coming from the explosion and may be very severe on unprotected skin at distances up to a mile or more. Since none of the thermal radiation is very penetrating, any solid object, including clothing, provides protection to a degree depending upon the distance from the explosion. Flame burns are really effects resulting from fires started by the explosion and are similar, in their effects, to ordinary thermal burns. It has already been mentioned that nuclear radiation constitutes the only kind of hazard present in an atomic blast that does not exist in any large-scale

explosion. This dangerous radiation is of two types: (1) direct, immediate radiation from the explosion itself, and (2) residual radiation arising from one or more of several sources and persisting for some time after the explosion. The first ends within 60-90 seconds after detonation, while the second may continue for some time depending upon the conditions under which the bomb exploded.

In all cases, the actual radiation injury to personnel results from the absorption by the body of alpha, beta and gamma rays and neutrons (see Vorperian. Radioactive Isotopes in Therapy and Diagnosis, the Apothecary 1952, p. 26). Of these, only gamma rays and neutrons are important as far as the death-dealing effects are concerned. Alpha and beta rays are low in penetrating power and, therefore, are easily stopped, the former by a few sheets of paper and the latter by a thin layer of metal or their equivalents. Gamma radiation, however, can penetrate considerable thicknesses of steel or concrete and still cause death. The walls of an average building, for example, provide almost no protection. Neutrons do not constitute an additional direct hazard, as the range within which they are lethal is appreciably less than the lethal distance for gamma rays. However, as a result of collision with or capture by hydrogen nuclei in some constituents of the body tissues, they may cause secondary radiation which is injurious.

The net effect is that body cells, particularly those in process of formation, are destroyed; the ability of the blood to clot is impaired; and white blood corpuscles which combat disease are killed. If the excessive exposure is confined to a limited portion of the body, there results what is called radiation injury. When all or large portions of the body are exposed to excessive ionizing radiation, the result is known as radiation sickness. General symptoms of the onset of radiation sickness include nausea and vomiting, loss of hair, skin damage of varying degrees of severity, diarrhea, and hemorrhage, accompanied by an extreme susceptibility to other diseases and secondary infections.

Residual radiation, or the radiation hazards which continue after the explosion come from any one of three sources:

(1) radiation from unfissioned uranium or plutonium deposited following the explosion, (2) lingering radioactivity arising from deposits of fission products of the explosion and (3) induced or artificial radioactivity resulting from bombardment of various materials on the earth's surface by neutrons released by the explosion. A low-altitude or underwater explosion produces a so-called base-surge which is essentially a cloud of radioactive materials moving along the surface of the earth. This cloud contains a large portion of the fission products of the explosion and as it moves it envelops everything in its path. Thus, in the case of an underwater atomic blast adjacent to a port city, the residual radiation effects might conceivably cause more casualties than the initial radiation associated directly with the explosion.

There are several precautionary and protective steps that can be taken in a case of atomic explosion, which while not a guarantee against the occurrence of a hopeless situation, do enormously increase the individual's chances of escaping injury or death. Protective steps are divided into two general groups: those

associated with the explosion itself, and those related to the after or residual effects.

The basic principles of most precautionary and protective measures are to provide as effective a shielding as possible, and to stay clear of places where flying objects and falling structures might constitute a hazard. Underground shelters, subways, deep basements, strongly reinforced concrete buildings, all afford reasonably good protection against primary blast effects and also against indirect blast dangers caused by falling buildings, flying rock, and similar secondary dangers. Next best protection against primary blast damage would be a ditch, a ravine, or a depression in the earth. Here, however, protection against secondary blast effects is poor. If possible, one should try to cover himself with a blanket, tarpaulin, or other material to prevent radioactive particles from falling on him.

Protective effects of loose, light- colored clothing against flash burns were demonstrated in the Japanese bombings. Light color tends to reflect rather than absorb the heat, and the loose fit makes for an insulating dead air space between clothing and body.

Lead provides one of the best shields against gamma and similar radiations. In the case of neutrons, the shielding effectiveness of a substance depends upon its ability to capture these particles rather than upon its density. Materials of low atomic weight have the greatest such «capture ability»; thus, hydrogen is the best neutron shield, however, concrete is also reasonably good.

Protective measures against residual radiation are related to some extent to whether the bomb explodes high in the air, at low level, or under water. Here again, the principal protective measure is shielding which must be on all sides including the top. A basement, subway, or air-raid-shelter provides good protection. The individual should be particularly careful not to leave until the surrounding area has been declared safe from residual radiation.

Radioactive material can be introduced into the body by breathing contaminated dust particles, by eating or drinking contaminated substances, or directly through skin scratches or cuts. It is probable that ordinary gas masks containing up-to-date filters will screen out contaminated dust effectively. Food, water, or tobacco in or from a contaminated region, should not be used until it has been tested and found safe, unless it has been in a sealed container. This testing is done by instrument detectors such as the pocket dosimeter, qartz fiber survey meter, the Juno Survey Meter, the Geiger-Müller counter, etc.

Radioactive contamination may be caused by the fission products formed in the detonation of an atomic bomb, by neutron-induced activity in soil and water, and by the deliberate use of specific radioisotopes, apart from their association with the bomb, as radiological warfare agents. These sources would be largely responsible for external contamination. There are essentially three ways whereby the hazard associated with radioactive contamination may be minimized: first, to dispose completely of the material by deep burial in the ground or at sea; second, to keep it at a distance for a sufficient time to permit the radioactivity to decay to a reasonably safe level; and third, to attempt to decontaminate the material.

A very fair degree of decontamination of the exposed skin can be achieved by vigorous rubbing with soap and water, paying particular attention to the hair, nails, skin folds, and areas surrounding body openings and with due care, to avoid abrasion. Certain synthetic detergents have been found to be especially effective in this connection. If the soap and water treatment does not produce the desired decrease in activity, chemical agents, if available, may be used on the skin. Isotonic saline or depilatory agents will lead to the removal of material held tenaciously by the skin. A dilute solution of sodium bicarbonate is useful, especially on mucous membranes, because of its action as a complexing agent for some of the fission products. Care must be taken not to tear the skin, or to drive the loosened material into wounds, body openings or skin folds.

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PRESCRIPTION SURVEY OF AMMAN

by ANIS MUASHSHIR

This is the first prescription survey ever made in the city of Amman, Jordan. It is worth mentioning that, day by day, while working on this survey, I have had a mounting appreciation of the services rendered to this survey by the pharmacists of Amman. Inspite of the fact that very accurate and complete records and registers of the prescriptions are not available in many pharmacies, I did my best to make my records as accurate as possible by taking my information from those collections of prescriptions and registers which I believed were complete and most accurate.

Out of 3000 prescriptions, 2426 (80.87%) were written in French, 524 (17.46%) in English, 48 (1.6%) in Latin and 2 (0.07%) in Arabic. However, the directions in 2112 (70.4%) prescriptions were written in Arabic, 760 (25.33%) in French, 121 (4.03%) in English and 7 (0.24%) in Latin. The metric system was used in 2923 (97.43%) prescriptions and the apothecary system in the remaining 77 (2.57%).

Out of 5000 prescriptions, 3373 (67.46%) called for specialities, while only 1267 (32.54%) called for prescriptions to be compounded.

The data in the Seminar have been condensed in the following tables:

Table I — Ingredients per Recipe (on the basis of 1000 prescriptions).

No. of Ingredients	*Percentage*
1	8.6%
2	17 %
3	25.7%
4	12.5%
5	10.8%
6	3.7%
7	17.8%
8	1.1%
9	2.2%
10	0.6%

Table II — Average Cost per Prescription (on the basis of 3000 prescriptions).

Cost in Fils per Prescription	*Percentage of Prescriptions so Priced*
10-50	7%
50-100	24.26%
100-150	18.4%
150-200	7.76%
200-250	11.86%
250-500	20.36%
500-750	5.46%
750-1000	0.7%
1000-1500	1.23%
1500-2000	1.26%
above 2000	1.66%

Table III — Narcotics

(a) Out of 7540 Prescriptions 5.59% contained narcotics.

(b) Most frequently recurring narcotics are : —

Narcotic	*Percentage of the Total*
Codeine phosphate	51.4%
Opium	13.8%
Pethidine	11 %
Morphine	8.4%
Dionine	7 %
Cocaine	6.8%
Pantopon	1.6%
Sedol	0.8%

Table IV — Pharmaceutical Forms of Compounded Prescriptions, Percentage Occurrence

Solutions	44.0%
Packets	21.2%
Cachets	17.2%
Suspensions	8 %
Ointments	6.8%
Powders	1.4%
Pills	0.6%
Emulsions	0.4%
Suppositories	0.4%

Table V — Frequency of Recurrence of the More Frequently Prescribed Ingredients in 1000 Compounded Prescriptions

Ingredient	*Percentage*
Sod. Benzoate	17.6%
Sod. Bicarbonate	16.2%
Tolu Balsam Syrup	15.6%
Sod. Citrate	15.1%
Belladonna Preparations	13.3%
Sulfa Drugs	12.3%
Orange Syrup	11.6%
Sod. Salicylate	9.6%
Ammonium Acetate	9.5%
Paregoric Elixir	9.5%
Aspirin	8.2%
Compound Cardamom Tincture	7 %
Aminopyrine	6.7%
Antipyrine	5.2%
Paludrine	5.1%
Phenacetine	5.1%
Chlorodyne	4.5%
Caraway Water	4.5%
Bismuth Salts	4.5%
Tannalbin	4.4%
Rhubarb Syrup	4.3%
Santonin	4.3%
Calomel	4.3%
Bromides	4.1%
Methenamine	3.3%
Quinine	2.4%
Benzonaphthol	1.9%
Chloroform Water	1.3%
Taka Diastase	1.2%
Liquorice	1.2%
Charcoal	1.2%
Senega Root and Preparations	1.2%
Buchu	1.1%
Boldo	1 %
Diacode Syrup	0.9%
Gentian and Preparations	0.8%
Aminophylline	0.8%
Iron Ammon. Citrate	0.8%
Desessartz Syrup	0.8%
Pectoral Species	0.8%
Hamamelis	0.6%
Zinc Oxide	0.6%
Valerian and Preparations	0.5%
Zinc Sulfate	0.5%
Hydrastis	0.4%
Hyoscyamus	0.4%
Adrenaline 1/1000 Sol'n.	0.4%
Ichthammol	0.4%
Acriflavine	0.2%
Ephedrine	0.1%

...The pharmacist must be a professional man who understands thoroughly what he is doing, who comprehends the scientific basis of drugs and drug action, who is able to evaluate critically the products he handles, who is competent to advise physicians and members of the other health professions concerning drugs and their uses, who works at his profession creatively and advances its service...

from the report of The Pharmaceutical Survey.
U. S. A.

L'antibiotique véritablement polyvalent, efficace à faible dose, constant dans son action.

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seminars

ABSTRACTS OF SEMINAR PAPERS PRESENTED BY MEMBERS OF THE SENIOR CLASS *

ARRANGED ALPHABETICALLY BY TITLES

ANTI-ANEMIC DRUGS

By Husam Nimr

The chief abnormal finding in anemia is a reduction in the number of circulating red blood cells. Morphologically, the anemias may be classified according to the size of the red cells and their hemoglobin content. The anemia may be microcytic, normocytic, or macrocytic if the cells are, respectively, smaller, equal to, or larger than normal. The anemia may be hypochromic or hyperchromic if the individual cells contain less or more than the normal amount of hemoglobin. The term «hyperchromic» is a misnomer since the cells so described do not contain a higher concentration of hemoglobin but rather are larger than normal (macrocytes) hence contain a greater volume of hemoglobin. The normal hemoglobin content of the blood ranges from 12 or 13 g./100 cc. to 18 g./100 cc.

The following is a useful classification of the anemias, as given in Merck's Manual, 8th ed. p. 31:

I. Anemias of blood loss
   A. Acute post hemorrhagic anemia.
   B. Anemia of chronic blood loss.

II. Hemolytic anemias
   A. Primary hemolytic anemias
      Congenital hemolytic jaundice; sickle cell anemia.

**The original texts of these seminars are available for reference at the* Director's office, School of Pharmacy. *The abstracts have been prepared by* Prof. C. Abou-Char. *Names of graduating students are spelled here according to the transliteration system employed at A.U.B. The spellings of their names as they are written on their diplomas, appear under their photographs in the first part of the yearbook.*

B. Secondary hemolytic anemias
(due to chemical agents, bacterial toxins, hemolysis of immune bodies).

III. Defective or decreased blood formation

A. Macrocytic anemias
Pernicious anemia and other macrocytic anemias (as in sprue, liver disease, gastrointestinal disorders).

B. Hypochromic microcytic anemias
Anemia of chronic blood loss; «nutritional» anemia; hypochromic anemias of pregnancy and childhood.

C. Anemias of decreased blood formation

Primary refractory anemia; myelophthisic anemia.

In macrocytic anemias, the «intrinsic» factor normally present in the gastric juice is absent; thus absorption of the «extrinsic» factor, essential for normal formation of red blood cells by the bone marrow, does not take place. Cyanocobalamin (Vitamin B12) acts as the extrinsic factor. It is found in various foods and, if absorbed, is stored in the liver.

Since the intrinsic factor is absent in pernicious anemia, Cyanocobalamin can be effective only if given by injection. It can be given orally, however, if combined with powdered stomach. Recently an oral tablet «Bifacton» combining both the intrinsic factor concentrate and vitamin B12 appeared on the market thus simplifying oral administration (Amer. Professional Pharmacist, 19: 117 (1953)). Other drugs useful in macrocytic anemias are Liver Injection, Liver with Stomach, and Folic Acid.

In microcytic anemias, however, where there is a deficiency of iron, iron therapy is indicated. Here, ferrous iron is most useful e.g. ferrous sulfate and ferrous chloride and their preparations. Others found useful are Iron and Ammonium Citrate, Saccharated Iron Carbonate, Ferrous Gluconate, Reduced Iron, etc. Iron therapy should be continued for at least one month after the hemoglobin reaches normal levels so that the depleted body iron stores may be replenished. Adequate vitamin supplementation and a high protein diet aid in hemoglobin production.

ANTIBACTERIAL SUBSTANCES FROM HIGHER PLANTS

By Anwar Husayni

Parts of higher plants especially leaves and bulbs have been used from immemorial times as healing agents to wounds and are still used by many peoples of the earth as home remedies for that purpose. The discovery of antibiotics from fungi and bacteria lead many scientists to investigate phanerogam plants for similar active constituents. While practically all higher plants were found to contain antibacterial substances, these were active only in much higher concen-

trations than the antibiotics from bacteria and fungi and many were too toxic to be used, particularly at doses at which they would be effective.

Of the many substances isolated from seed plants and found to possess antibacterial properties some were found to be unsaturated lactones, others alkaloids, others phenolic compounds, others quinones and their derivatives, others unsaturated ketones, others sulfur compounds, etc.

Of the many compounds recorded in the seminar, the following substances are of special interest:

Plumericin is a neutral unstable lactone isolated from the roots of *Plumeria multiflora* a plant related to the ornamental plumeria, *fitneh*, and was found active against gram negative, and gram positive organisms but has greater antifungal activity.

Nordihydroguaiaretic acid or N.D.G.A. was isolated from *Larrea divaricata* belonging to the same family as guaiacum. It is active against staphylococcus aureus, Salmonella paratyphi, S. enteritides at concentrations of 1:5,000 - 1:10,000. It can be used for the sterilization of the skin. It is particularly used, however, for its antioxidant property for preserving fats against rancidity.

Plumbagin from the roots of *Plumbago europoea* is 2-methyl-5-hydroxy-1,4-naphthoquinone inhibited S. aureus and Str. pyogenes at a dilution of 1:100,000. It has also a high fungicidal action.

Juglone, obtained from walnut shells, is 5-hydroxy-1,4-naphthoquinone. It has been recommended as an active fungicide. Juglone is also toxic to the non-cutinized root surfaces and will kill any plant such as tomato and alfalfa which is grown near it.

Cassic acid or rhein (4,5-dihydroxyanthraquinone-2-carboxylic acid) found in rhubarb and originally isolated from *Cassia reticulata*, inhibited the growth of B. subtilis, B. mycoides, S. aureus, N. gonorrhea, etc. It was excreted unchanged in the urine which was found to be bactericidal to S. aureus.

Humulon and Lupulon are unsaturated ketones obtained from the lupulin of hops. Both have bacteriostatic properties enhanced by the presence of low concentrations of vitamin C and are active against S. aureus even after autoclaving. Lupulon is affected by light. Preservation of beer to which hops is usually added is attributed in part to these two antibiotic substances.

Alliin found in garlic is S-allyl-L-cysteine sulfoxide. When it is acted upon by the enzyme alliinase it yields *Allicin* which has a high antibacterial activity against Staph. aureus, S. typhi, Sh. shigae and V. cholerae.

It is a liquid with a garlic-like odor, soluble in water, miscible with alcohol and ether. It was prepared by grinding garlic in 95% alcohol, evaporating the alcohol under vacuum, and the allicin distilled from the aqueous residue at 10-15 mm. pressure keeping the aqueous liquid at constant volume. Allicin was then obtained from the distillate by extraction with ether. It has the following formula.

$CH2 = CH. CH2. S.(O) .S. CH2. CH = CH2$

Its antibacterial activity is destroyed by alkalies.

Allisatin, a proprietary preparation available on the market, is in the form of tablets containing a concentrated preparation of fresh garlic rendered odorless and tasteless by adsorption on highly activated charcoal. It «relieves diarrhea by controlling the intestinal flora». It is recommended in all intestinal disorders associated with abnormal putrefaction and is said to have been employed successfully in the treatment of oxyuriasis.

For a comprehensive list of antibacterial substances from higher plants, consult Florey et al, Antibiotics, Oxford Univ. Press, London, 1949, Vol. I.

ANTIFUNGAL AGENTS

By Edward Burtkush

Fungal infections of man are usually superficial and benign (Superficial mycoses), and rarely deep seated mycoses and fatal (Deep Seated Mycoses). Superficial mycoses are produced by dermatophytes such as species of Microsporon, Trichophyton, Epidermophyton, — all of which produce the various forms of ringworm (Tinea), e.g., of scalp, beard, feet (Athlete's foot), etc., and infections of the smooth skin and nails particularly by species of Trichophyton. Moniliasis — a subacute infection of skin or mucous membranes and nails is caused by Candida albicans. This may become deep seated. Deep seated mycoses may take the form of Actinomycoses caused by Actinomyces bovis, etc., affecting lungs and other internal organs; or the form of Aspergillosis caused by Apergillus fumigatus; or the form of Sporotrichosis caused by Sporotrichium species; and other forms.

Many of the drugs used in treating superficial mycoses fall into the following classes of compounds:

A. Dyes — these are applied locally in the form of 1-2% aqueous or alcoholic solutions, jellies or ointments, after thorough washing of the affected area with soap and water. Among the dyes used may be mentioned: Malachite Green, Brilliant Green, Gentian Violet or Crystal Violet and Magenta or Fuchsin.

B. Acids — the older acids used were Boric Acid, Sulphurous Acid, Benzoic and Salicylic Acids. The last two being ingredients of the well known Whitfield's Ointment. These, however, have been superseded by the very effective fatty acids Undecylenic, Caprylic, and Propionic acids and their salts chiefty the Zinc, Sodium and Calcium salts. The fatty acids are used in the form of powders or ointments and are found on the market under numerous trade names.

C. Inorganic Salts — among these, Ammoniacal Silver Nitrate N.F. is effective particularly in nail infections; others mentioned are Copper Oleate, Sodium Sulfite, Sodium Metabisulfite, Sodium Metahexaphosphate. Mercury Compounds such as Ammoniated Mercury, Mercuric Iodide, Mercur-

ic Nitrate Ointment, Mercury Oleate, and Mercuric Chloride are, however, toxic, particularly the last one.

D. Iodine and Its Preparations — these are effective.

E. Phenols and Phenolic Compounds — such as phenol, cresol, resorcinol and its acetate, pyrogallol, chrysarobin, thymol, and betanaphthol and their ointments. Among the newer ones are (1) Salicylanilide (Ansadol, Shirlan Extra), (2) Dibromosalicylaldehyde (Dalyde), (3) 2,2'-Dihydroxy-5,5'-dichlorodiphenyl methane (Dichlorophene, Didroxane, G.4.), (4) 2-Hydroxy-4-chloro-diphenyl methane (Santophen-1), (5) o-Phenyl phenol (Orthoxenol), (6) m-Cresyl acetate, (7) 1,8-Dihydroxy-anthranol (Dithranol, Cignolin, Anthralin).

F. Sulphur and its Preparations.

G. Ether Derivatives such as: (1) p-Chlorophenyl-alpha-glycerol ether (Chlorphenesin, Mycil), (2) 6-(beta-Diethylamino ethoxy)-2-dimethyl-amino-benzothiazole dihydrochloride (Asterol), (3) 2-Methoxy-5-nitro-furfural (Furaspor).

H. Organic Mercurials — these are less irritating and less toxic than the inorganic salts of mercury. Among them may be mentioned: (1) Phenyl mercuric nitrate (Merfenil, Merphene, Merphenyl Nitrate, Phenmerzyl), (2) Phenyl Mercuric Acetate, (3) Phenyl Mercuric Chloride, (4) Sodium Ethylmercurithio-salicylate (Thiomersalate, Thimersal, Merthiolate), (5) 2-Chloro-4-(hydroxymercuri)-phenol (Semesan, Upsulun), (6) Mercury salicylate.

I. Quinoline Derivatives — (1) Potassium Hydroxyquinoline Sulphate (Chinosol)-equimolecular mixture of potassium sulphate and of 8-hydroxyquinoline, (2) 8-Hydroxyquinoline (Oxyquinoline, Quinophenol, Oxine), (3) 5,7-Dichloro-8-hydroxy quinaldine (Siogen, Steroxyl).

J. Quaternary Ammonium Compounds — of these the following two were found to possess fungistatic properties: Cetyl pyridinium Chloride (Ceepryn Chloride) and Trimethyl Cetyl-ammonium pentachlorophenate (T-CAP).

K. Sulfonamides — useful internally in the treatment of Astinomycoses; externally they are likely to cause sensitization. Of these sulfonamides Sulfanilamide, Sulfadiazine, Sulfamerazine, and Sulfamethazine are the safest.

L. Antibiotics — Aureomycin and Penicillin are useful in the treatment of Actinomycoses; Tyrothricin, Bacitracin, and Actidione in dermatophytoses.

M. Antihistaminics — several antihistaminics have been lately shown to possess fungistatic properties at certain molar concentrations. The phenothiazine derivatives were found to be the more effective compounds: Lergigan, Phenergan, Parsidol and Pyrrolazate. Chlorination of the antihistaminics increased their fungistatic activity. No correlation between fungistatic activity and antihistaminic activity was observed.

N. Miscellaneous Group — S-R 406, Coparaffinate (IsoPar), Triolein Ozonide, etc.

BLOOD AND PLASMA SUBSTITUTES

By Nicolas Trochalakis

The description, use and relative merits of the following blood plasma substitutes are given: acacia, aminoacids, ascitic fluid, okra, isinglass, gelatin, dextran and polyvinylpyrrolidone. The last two are coming into more general use and have been mentioned in the Apothecary 1950 p. 29 and in more detail in the Apothecary 1952 p. 40.

Quoting from the Extra Pharmacopoeia-Martindale, «When dextran (macrose, a polymer of dextrose) is administered I.V. about one-third disappears from the blood stream within 24 hours. Up to 25% of the total amount infused may be recovered from the urine, about half of which is excreted within the first 8 hours. The dextran which is not excreted in the urine is deposited in the reticulo-endothelial system and other tissues; it gradually disappears. It does not cause morphological changes in the tissues. The molecular weight of dextran eliminated is lower than the average of the dextran infused. Immediately after infusion the erythrocyte sedimentation rate is increased and rouleaux can be seen in the blood smear. Since this rouleaux formation may interfere with direct matching tests, a sample of serum should be obtained from the patient as a routine before giving an infusion. Dextran is well tolerated as an infusion and is not pyrogenic, toxic or antigenic. When blood or plasma is not available dextran may be employed as a substitute in cases where an increase in blood volume or in colloid osmotic pressure is desired. It is of particular value in the treatment of burns and in patients with surgical shock or hemorrhage. It may also be used as a prophylactic treatment for shock.»

As to polyvinylpyrrollidone or P.V.P., commercially known as Subtosan, Periston, Kollidon, Plasdone, or Plasmosan, it is a faintly yellow solid occurring commercially as 3.5% solutions which may have the following composition: P.V.P. 35.0 g., Sod Chloride 8.0 g., Pot.Chloride 0.42 g., Cal.Chloride (6H20) 0.50 g., Mag Chloride (6H20) 0.005 g., Sod.Bicarbonate 1.68 g., normal HCl 17.1 ml., double distilled water q.s. ad 1000.0 ml. (Merck Index). According to Martindale: «the exact fate of P.V.P. in the body is not known but it would appear not to become attached to fixed tissue cells but to remain in the blood stream until finally excreted. In ordinary circumstances, 75% of a therapeutic dose can be recovered from the urine. Following intravenous infusions there is some increase in the erthrocytic sedimentation rate but clotting and bleeding times are unaffected, and blood grouping reactions are not disturbed. P.V.P. solution is non-toxic and non-antigenic and is well tolerated. It may be employed as a substitute in all conditions where it is necessary to restore a deficiency in the circulating blood volume and especially in hemorrhagic and traumatic shock and burn injuries. The usual amonut required is from 500-1000 ml., though up to 3500 ml. has been administered in a week.» P.V.P. seems to increase the duration of action of procaine, insulin and penicillin when combined with them. This is explained on the basis of the formation of a molecular complex with each of these and thus delaying its absorption and metabolism.

BURN TREATMENT

By Berin Tutunji

A burn is defined by Dr. R.H. Aldrich as «a loss of continuity of the body surface due to a coagulation and destruction of skin and subcutaneous tissues by thermal changes, including both heat and cold, by chemicals, by electricity, and by radiation.»

The skin consists histologically of two major parts. The outer, known as epidermis or cuticle, is made of five layers each of which consists of different types of cells which in turn are stratified also. The inner layer of the skin is the true skin or corium. The nerve endings and capillaries are in the outer layer of the corium. Below it is a deeper reticular layer consisting largely of fibrous bundles. This layer is in contact with the subcutaneous connective tissue containing lymphatics, vessels, nerves and fat.

«For first aid purposes and surgical treatment burns are classified into two degrees»: Superficial — including first degree burns (involving outer layer of the epidermis), and second degree burns (involving various layers of the epidermis); and deep burns involving both epidermis and corium.

Dr. L. Colebrook advocates the following first aid measures in:

1. Severe and extensive burns, rush immediately to hospital.
2. Small burns outside clothing, apply a freshly ironed towel or sterile cloth and get to hospital.
3. Superficial small burns can be treated at home by smearing burn and surroundings with Water-Soluble Antibacterial Cream: Sodium lauryl sulfate 1.0 g., Sulfanilamide 3.0 g., Castor oil 25.0 g., Beeswax 1.8 g., Wool fat 1.8 g., Cetyl alcohol 5.0 g., Glycerin 10.0 g., Water 52.4 g.. This cream is applied with a knife blade passed through flame or dipped for two minutes in boiling water. Do not attempt to clean the burn or snip blisters. Wrap burn in a sterile cloth or bandage.

No clothing should be removed from covered burns. No grease should be used. Tannic acid should not be used. Dr. H. Ehrlich thinks that the use of gauze and soft petrolatum is the generally accepted local treatment for burns. Dipping or coating with egg white prevents formation of blisters and the burn heals quickly. Immediate and later applications, at intervals, are recommended. This is suitable for first and second degree burns. Applications of sodium bicarbonate dressings will relieve pain and toxemia in first degree burns.

The principal cause of shock resulting from serious burns is the loss of circulating plasma and red cells into the burn zone, hematocrit may rise, the blood thickens, liver, kidney and brain may get damaged. Intravenous fluids such as plasma, and whole blood, combined with normal saline and 5% glucose are indicated, oral fluids are encouraged. Plasma substitutes such as dextran and polyvinylpyrrolidone may be used in emergency. To prevent shock in atomic explosions give NaCl solution 3-4 g. (one teaspoonful) and 2-3 g. (half a teaspoonful) of sodium citrate or bicarbonate in a liter (quart) of water. The patient is given as

much of this solution as he can drink.

Burns are «now considered as open wounds which should be disturbed as little as possible and closure should take place as early as is practical.» Hence if all epithel'al cells are destroyed grafting should be applied to prevent scarring. Modern trend in local treatment is towards the application of minimum medicines and dressings. Two hospital procedures for superficial treatment of burns are what is called «open» or «exposure» method where no dressing of any sort is used but where penicillin is administered systemically and the burned organ kept in a raised position; and the «closed» or «pressure» dressing method which is very widely used and where a dry or impregnated gauze is applied to the burn and the gauze is covered by a mass of cotton wool and an elastic pressure bandage applied. Exposure is the treatment of choice for first degree burns.

Tannic acid treatment of burns is not advisable; tannic acid-silver nitrate applications seem to be harmful when the burnt area is extensive; 1% aqueous picric acid may be used in first and second degree burns of small area, picric acid produces a coagulum which prevents external infection and relieves pain, a 2% ointment may be used also; picric acid should not be used as a first aid treatment in children because of the rash it produces; dyes should not be used in higher concentrations than 0.5%, proflavine may be used in 0.1% concentrations and can preferably be combined with 0.1% brilliant green; solutions of triple dyes retard healing.

The following have shown good results in the treatment of burns: Ascorbic acid in 1% solution in N.S. or in distilled water or in 2% water-soluble ointment base followed by oral or parenteral administration; irrigation with 5% sodium hypoch'orite so'ution continued later as a 2.5% solution, the area being enclosed by a Bunyan-Stannard Envelope; saline baths — here early granulation and skin graft'ng is obtained; hypertonic dressings to prevent poisoning of patients by the decomposi'ion products of dead proteins in extensive burns; ambrine or paraffin dressings — these relieve pain, prevent scar formation and promote quick heal'ng; eucalyptus ointment — keeps the burn clean and healthy; Propamidine Isothionate-B.P.C., is used in treatment of septic burns in the form of a 0.15% methyl ce'lulose jelly or cream covered with paraffin gauze dressing and cotton wool — it acts on staphylococci, streptococci, etc. and unlike sulphonamides is effective in presence of pus; sulphonamides — these should not be used on large areas and if used locally (and not for more than 5 days) they should not be used orally at the same time.

Ointment of Wool Alcohols B.P. may be used as the basis of light screening creams to protect both from ultra-violet rays and prickly heat. A base composed of stearic acid, glycerin, triethanolamine, oil of theobroma and cetyl alcohol is even more effective in light-screening. Tannic acid is effective in preventing sun burn and is the least to cause sensitization, others used are salol, para-aminobenzoic acid, etc. Sun tans allow only the tanning rays to pass through and activate the melanin pigment, while sun screens cut off the sun's rays. Most people with light-colored eyes are liable to sun burn, while nearly all brown-eyed people do not get sun burned.

CHROMATOGRAPHIC METHODS Of ANALYSIS

By Sami Na'man

Chromatography is a new specialized laboratory procedure devised for the separation of the components of mixtures whether of natural products or products produced in the laboratory especially where these components exist in minute quantities or are difficult to separate by the older methods of analysis.

Chromatography affords not only a means of separating those otherwise difficultly separable mixtures but also makes possible their quantitative determination. Many natural products which at one time were thought to be single substances were found to consist of more than one component when they were subjected to chromatographic methods of analysis.

Chromatography is a device which allows the spatial separation of different adsorbed materials on a single adsorbent. In the classical adsorption method a solution of the substances in a suitable solvent is made to pass through a packed column of an adsorbent which may be alumina, calcium hydroxide, charcoal, magnesia, fuller's earth, etc. The components travel down the column at different speeds upon washing the column with a suitable eluant. The column is then extruded and broken into the different zones containing the separate components.

Another form of chromatographic analysis is Partition Chromatography which may be carried on columns of silica gel, starch, etc. (column partition chromatography), or on paper (paper partition chromatography, see Apothecary 1952 p. 66), or on air-liquid interfaces (foam partition chromatography), or on ion-exchange resins (ion-exchange chromatography, see Apothecary 1951 p. 47).

While there is not much difference between adsorption and partition chromatography, the latter may be said to differ from the former in that the substances to be separated «distribute themselves» in a liquid medium supported by the silica, starch, paper, etc. while in adsorption chromatography the substances to be separated are adsorbed to a varying extent on the adsorbent used.

CURARE AND OTHER CURARISING SUBSTANCES

By Eugenie Abu-Shadid

The history, botany and pharmacology of curare are given. The chemistry and pharmacy of curare and of Erythrina alkaloids are then taken up, to be followed by a discussion of the synthetic curare-like compounds. The following synthetic compounds are discussed: Dimethyltubocurarine Iodide, Mephenesin, Gallamine Triethiodide, Succinylcholine Chloride, Decamethonium Iodide, Decamethonium Bromide, Diethamine, Dipropamine, Mytolon, Laudolissin and Cd. 15. Anti-curare agents such as Tensilon (Erdophonium chloride), Neostigmine (Prostigmine), Ro2-2561 and Pentamethonium Bromide are mentioned. Then follow methods of evaluation and of biological assay of curariform activity and finally a discussion of the clinical applications of curare. See article by Miss Abu-Shadid on p. 43.

DRUGS USED IN THE TREATMENT OF HYPERTENSION

By Anis Wahbah

The term «hypertension» is reserved by many to indicate systolic pressure of 160 mm. of mercury or more, and 90 mm. or more diastolic pressure. The blood pressure may be observed to rise rapidly from month to month, more slowly from year to year, or to remain stationary. Approximately 90-95 per cent of hypertensives have what is called essential hypertension — hypertension from unknown causes. Here, definite hereditary tendencies have been observed. Known causes of hypertension may have renal, cerebral, endocrine, or cardiovascular origin.

«The best form of treatment of hypertension is prevention and this is best done by guiding susceptible persons in the less turbulent streams of life. The hypertensive patient should take life easy, shorten hours of work, excessive physical and mental efforts should be avoided and he should take more rest and relaxation. The patient should be kept in good physical tone by moderate daily exercise, best in the form of walking; and as much as possible he should avoid excitement and anger. The only physiotherapy that is of value is light massage to be substituted for exercise in case the patient cannot take the latter. Drugs are the least valuable form of treatment, and whenever indicated they are directed towards protecting the patient from consequencies of the disorder, and the reduction in the blood pressure they produce is usually temporary.

The drugs used in the treatment of hypertension may be divided into two major groups:

A. Autonomic blocking agents. These are all very potent drugs and should be carefully used under the supervision of a physician, since many may give toxic side effects on protracted use and many produce very sharp fall in blood pressure. All are given by injection except for Veratrum alkaloids and the hydrazinophthalazines which may be taken orally also.

I. *Methonium Compounds:*

a. Hexamethonium bromide, C6, Vegolysen, or Bistrium Bromide is 1-6-bis(trimethylammonium)hexane dibromide.

b. Hexamethonium bitartrate, C6, or Vegolysen T.

c. Hexamethonium iodide or Hexathide.

d. Hexamethonium Chloride, Methium Chloride or Esomid Chloride.

e. Pentamethonium iodide, C5, or Antilusin is pentamethylene 1,5-bistrimethylammonium diiodide.

f. Pentamethonium bromide, C5, or Lytensium.

g. Tetraethylammonium bromide, TEAB, or Etrium.

h. Tetraethylammonium chloride, TEAC, TEA Chloride, Beparon, or Etamon.

II. Alkaloids of *Veratrum viride*

Veriloid is a specially prepared and standardized (on dogs) extract of

green hellebore containing the mixed alkaloids of *Veratrum viride*. It is effective in lowering blood pressure. Maison, Gotz and Stutzman (J. Pharm. Pharmacol. 4:792 (1952)) comparing the individual alkaloids of Veratrum with veriloid taken as standard and given the value 1, found the alkaloids to possess the following relative potencies when tested intravenously on anesthetised dogs; germitrine 11, neogermitrine 8.7, germerine 5.3, protoveratrine 4.7, germidine 2.4, veratridine 0.5, veratrine 0.3, veradine 0.18, veratramine 0.06. Germine, rubijervine, jervine, and isorubijervine had practically no action.

Another preparation of Veratrum alkaloids is Veratrone.

III. *Hydrogenated alkaloids of Ergot.*

Of the dihydrogenated alkaloids of the ergotoxine group dihydroergocornine (dihydroergotoxine) and dihydroergokryptine exhibit the greatest hypotensive activity.

Hydergine is an equiproportional mixture of dihydroergocornine, dihydroergokryptine and dihydroergocristine.

IV. *Phthalazine Derivatives.*

a. 1- Hydrazinophthalazine hydrochloride, C-5968, Apresoline, or Hydralazine Hydrochloride.

b. 1.4- Dihydrazinophthalazine sulfate, or Nepresol.

B. The Vasodilators:

I. *Nitrites and Nitrates:*

Sodium nitrite, amyl nitrite, glyceryl trinitrate, erythrityl tetranitrate, and mannitol hexanitrate.

II. *Thiocyanates or rhodanates.*

Potassium thiocyanate, and sodium thiocyanate.

DRUGS USED IN THE TREATMENT OF LEPROSY

By Ara Israbian

Leprosy is a mildly contagious infectious disease characterized by both local, cutaneous and constitutional symptoms and the production of various deformities and mutilations. The causative agent is believed to be an acid fast rod shaped organism *Mycobacterium leprae* first described by A. Hansen in 1874. Diagnosis is confirmed by demonstration of the organism in smears made from skin lesions or nasal septum, or in sections obtained from biopsies of suspicious lesions.

There are two main types of leprosy. (a) neural leprosy, leprides, or tu-

berculoid leprosy — the benign (mitis) type; and (b) a more serious (gravis) type of leprosy which is almost universally known as lepromatous leprosy. Tuberculoid leprosy shows low or no infectivity, the bacilli being few if any, while the lepromatous type shows a comparatively high infectivity, the bacilli occurring in large numbers infiltrating the skin and other organs.

Treatment of leprosy is lengthy requiring months and even years. Such treatment is usually carried in special colonies of hospitals known as leprosaria. The following drugs have been used or tried in the treatment of leprosy.

I. *Chaulmoogra Oil or Hydnocarpus Oil* from the dried ripe seeds of species of Taraktogenos and Hydnocarpus growing in Burma and South-West India.

Ethyl Esters of the fatty acids of chaulmoogra and hydnocarpus oils e.g. Moogrol, Chaulmestrol, etc.,

Iodized Hydnocarpus Oil is actually the iodized ethyl ester of hydnocarpus oil and,

Sodium Chaulmoograte or Hydnocarpate.

All preparations of chaulmoogra, except the oil, are given by injection: subcutaneously, intramuscularly, or intravenously depending on the preparation. The oil is given in capsules or as an emulsion. The oil and its preparations are being gradually replaced by the sulfones, though for mass treatment they will probably be continued to be used for some time.

II. *The Sulfones:*

Dapsone, DADPS,DDS, or Avlosulfon, is p,p -sulfonyldianiline, or 4,4'-diaminodiphenylsulfone. It is used in the treatment of lepromatous and tuberculoid leprosy both orally and by intramuscular or subcutaneous injection. It is absorbed to a much greater extent than the complex sulfones, thus higher blood levels are obtained with smaller doses. Dapsone has also been given in injections dissolved in the ethyl esters of hydnocarpus oil, with good results.

Promanide, or Promin, is sodium 4,4'-diaminodiphenysulfone-N-N'-didextrose sulfonate. It is of more value in lepromatous than in tuberculoid leprosy; best results are obtained when treatment is begun early. It is usually given intravenously. For topical application a 5% jelly is available.

Sulfoxone Sodium, or Diasone Sodium, is disodium sulfonyl-bis(p-phenyleneimino) dimethanesulfinate tetrahydrate. It produces a healing of lesions of the mucous membranes and skin.

Solapsone, Sulphetrone, or Cimedone, is tetrasodium 4,4'-di-(3-phenyl-1,3-disulfopropylamino) diphenylsulfone. It is slowly absorbed from the intestinal tract and is quickly eliminated by the kidneys. It is especially effective in lepromatous leprosy. It is given orally, subcutaneously or intramuscularly. Treatment may continue safely over long periods. It is not acetylated in the body and thus there is no risk of renal or urethral obstruction.

Promizole, or Thiazolsulfone is 4-aminophenyl-2'-aminothiazolyl-5-sulfone. It is well tolerated orally. Quicker response has been observed in the few cases in

which it was used, as compared with promanide and sulfoxone.

I.A. 307, Internal Antiseptic no. 307, or Promacetin, is sodium 4,4'-diaminodiphenylsulfone-2-N-acetylsulfonamide. It is well tolerated orally.

Sulfone treatment has been found effective in leprosy. Dapsone, orally, seems to be very effective and least expensive. However, like other sulfones, it is quite toxic. To lessen toxic effects, a smaller dose over a longer period has been found safer.

III. *Thiacetazone,* Amithiozone, Thiosemicarbazone, Livasone, Conteben, Tibione, TB1/698, etc, etc., is p-acetylaminobenzaldehydethiosemicarbazone.

This drug, like promanide, sulfoxone, solapsone, and promizole — all originally introduced for the treatment of tuberculosis, is now being investigated in leprosy with promising results.

IV. *The Antibiotics.*

Of the antibiotics, streptomycin and dihydrostreptomycin have been found of value particularly as local applications and also in cases showing idiosyncrasy or resistance to sulfones.

V. *Miscellaneous.*

Vitamin D. has been found a useful adjuvant to the sulfones, and B.C.G. vaccine may have possible protective effects against leprosy. Oxygen under high pressure and methylene blue seem to yield interesting results with some patients.

A real cure for leprosy has not yet been found. Though sulfones are very effective, they seem to possess only a bacteriostatic action.

DRUGS USEFUL IN PEPTIC ULCER TREATMENT

By Nuha Baddurah

«Peptic ulcer is a circumscribed erosion of the mucous membrane of the lower end of the esophagus, in the stomach, or duodenum, or on the jujunal side of a gastrojejunostomy.»

«The exact etiology of peptic ulcer is still obscure. Hypersecretion of acid gastric juice is an important factor in the production of a peptic ulcer and in the reactivation of healed ulcers. Peptic ulcers are not encountered in achlorydric patients. Psychic disturbances such as increased emotional tension and psychologic conflicts play an exceedingly important though poorly defined role in the mechanism of ulcer formation.»

«The tall asthenic individual is more likely to develop peptic ulcer than the stocky extroverted pyknic; however, there are exceptions to this tendency.»

«X-ray examination of the gastrointestinal tract establishes the diagnosis in 95 % of the cases.»

«The three basic principles important in healing a peptic ulcer are: (1) Rest - mental, physical, and gastric; (2) suppression of gastric motor and secretory activity; and (3) improvement of the nutritional status of the patient, particularly with regard to protein.»

«Medication should be aimed at minimizing the hyperacidity and intestinal spasm. Sedatives should be given to allay anxiety and reduce nervous tension. A bedtime hypnotic may be desirable. The tendency to constipation may be effectively prevented by the use of liquid petrolatum and, if necessary, a small dose of milk of magnesia.» Quotations from The Merck Manual, 8th ed.

Among the drugs used to minimize the hyperacidity, the following have been discussed: Aluminum Hydroxide Gel, Aluminum Phosphate Gel, Dihydroxy Aluminum Amino Acetate, and Magnesium Trisilicate.

1. Aluminum Hydroxide Gel (containing 6.1% Al (OH)3) while neutralizing the free acid in the stomach, does not increase the pH to a point where it would interfere with peptic digestion. It does not stimulate a compensatory increase in the free gastric acidity and has astringent and demulcent properties. While its astringency may cause constipation, it, however, favors healing and aids in arresting hemorrhage. It has the tendency to increase mucin secretion which forms a protective layer on the mucosa. Excessive administration may interfere with the absorption of certain minerals and cause phosphorus deficiency. In addition to the gel or suspension form, it is also available as tablets dessicated in such a way as to preserve the therapeutic value of the gel. Both forms are available also under many trade names such as Creamalin, Amphojel, Alkajel, Alocol, etc.

2. Aluminum Phosphate Gel (containing 4.1% AlPO4) does not interfere with the phosphate absorption from the intestines. Its acid combining property is less than half of Aluminum Hydroxide Gel. It is specially used in peptic ulcer patients who have a deficiency in pancreatic juice or a dietary deficiency in phosphorus. It is available also under such trade names as Phosphaljel and Aluphos.

3. Magnesium Trisilicate quickly neutralizes the acidity. It is combined effectively with Aluminum Hydroxide Gel and Gastric Mucin in a preparation known as Mucotin. Magnesium Trisilicate has a gelatinous nature which it assumes in the stomach, causing it to adhere to the crater of the ulcer. It does not produce alkalosis and does not interfere with peptic digestion. In Alamag, Magnesium Trisilicate is combined with Aluminum Hydroxide. The Aluminum Hydroxide combination with Magnesium Trisilicate is the most useful antacid.

4. Aluminum Hydroxide Gel has also been combined with Magnesium Hydroxide as in Alimex; with Calcium Carbonate, Bismuth Subcarbonate, Sodium Chloride, Acacia and Dextrose in Alomin, etc.

5. Dihydroxy Aluminum Aminoacetate is a basic aluminum salt of Amino Acetic acid containing small amounts of Aluminum Hydroxide. It is given either in suspension or tablet form. Some of its proprietary forms are Alglyn, Aspogen, Alzinox, Robalate, etc.

6. Milk and protein hydrolyzates are beneficial both as buffering agents and to replace depleted protein. Aminoacetic acid and Calcium Carbonate combined in the proportion 3:7 as in Titralac produce an acid neutralization curve simulating that of whole milk — the rapid buffering action of aminoacetic acid or glycine supplementing the alkalinizing effect of calcium carbonate.

7. Sodium Carboxymethylcellulose (Tylose Sodium, Cellofas B. etc.) approaches the requirements for an ideal antacid. While going into solution, it passes first through a gel stage, then it forms a viscous solution that adheres firmly to the mucosal surface. It does not constipate but relieves constipation when given in sufficient quantity. It is excreted unchanged. Combined with magnesium oxide it is available as Carmethose.

8. Polyamine-Methylene Resin (Exorbin, Resinat, etc.) is an anionic exchange resin. It absorbs the acid molecularly and releases it in the intestine. Unless its taste is suitably masked, it may give rise to nausea and vomiting. It is given in powder, capsule or tablet form.

Among the drugs used in minimizing intestinal spasm are the following:

1. Methantheline Bromide, or Banthine Bromide, is beta-diethylamino-ethyl-9-xanthene-carboxylate methobromide (Apothecary 1951 p. 31).

2. Prantal Methylsulfate or N,N-dimethyl-4-piperidylidene-1,1-diphenyl-methane methylsulfate. Like methantheline bromide, it is essentially an anticholinergic agent inhibiting gastric motility and gastric secretion.

3. Ocyphenium Bromide, Antrenyl, or Ba-5473 is p-(phenyl-cyclohexyl-hydroxy-acetoxy)-triethyl-methyl-ammonium bromide.

4. Hexamethonium Iodide, or Hexathide is Hexamethylene-1,6-bis-trimethyl-ammonium di-iodide. See p. 76.

Like Methantheline Bromide, Prantal, Antrenyl, and Atropine, Hexamethonium Iodide is a ganglionic blocking agent. All of them are very potent drugs, not without side effects and in particular Hexamethonium Iodide.

ESTABLISHMENT OF A NEW PHARMACY

By Amal Abu-Ghazalah

It is wiser for the newly graduating pharmacist to obtain practical experience, working for someone else, before attempting to open a pharmacy of his own.

Many points will have to be considered before opening a new pharmacy. Among these may be mentioned: the source of the capital needed — it is wiser here if the candidate himself supplied at least the major part of the fund needed from his personal resources rather than have to depend mostly on borrowed

money; the amount of capital needed; the location of the pharmacy — an important factor in the success of the future establishment; the purchase of a certain minimum equipment necessary for efficient dispensing — this includes sensitive balances, weights, measures, usual pharmaceutical ware, a refrigerator, and an adequate pharmaceutical library; and the acquisition of an adequate stock.

Attention should be paid to modern fixtures, design and lighting. Show windows should be neat, changed frequently and should not be clattered with many and crowded items. Specialities and chemicals dispensed only on prescription should not be exposed in the show window. The pharmacy may be conveniently divided into departments such as prescription department, baby department, surgical instruments, etc. Particular attention should be paid to the training of assistants. Proper customer approach is important for the success of the pharmacy. Neatness of the pharmacy and of the pharmacist and his assistants, courtesy, promptness of service, thorough knowledge of the items on sale, and in particular the personality and honesty of the pharmacist and his assistants, are paramount factors for insuring the success of the establishment.

The seminar also included many designs for show windows, for prescription counters and for show cases; lists of apparatus, books, pharmaceuticals and other items needed; also a discussion of advertising to and detailing the physician, etc.

FIRST AID AND THE PHARMACIST IN CHEMICAL AND ATOMIC WARFARE

By Sami Halabi

A detailed abstract of this seminar, prepared by Sami Halabi, appears on p. 57.

GUM ARABIC

By William Habashi

It is said that the Egyptians brought gum arabic from the gulf of Aden as early as the 17th century B.C. The major part of the world production of the gum comes from Sudan which in 1950 is estimated to have exported 40 thousand tons. It is now directly exported from Sudan to numerous countries but chiefly to the United Kingdom and the United States.

Next in importance to Sudan among the gum exporting countries is French

West Africa, which, prior to World War II, exported 3 to 6 thousand tons annually against some 20 thousand tons for the Sudan.

The cleanest, whitest (sun bleached) and tasteless Kordofan gum constitutes gum acacia. Of the many designations of commercially available Kordofan gum may be mentioned: Kordofan Cleaned, Kordofan Cleaned and Sifted, Kordofan Bleached Extra, Kordofan Bleached No. 1, Kordofan Bleached No. 2, Kordofan bleached No. 3. The inferior grades are Gezirah, Gebelaine, and Gedaref. Commercial varieties of Senegal gum are known as Gomme du bas du fleuve (best), Gomme du haut du fleuve and Gomme friable or Sadra beida (poorest). Gum arabic is also produced but in much smaller quantities in Nigeria and Tanganyika.

In eastern Sudan acacia is known as Hashab and in Senegal as Verek. Talha gum is not obtained from *Acacia senegal* (*A. verek*) but from *A. seyal* and is inferior to acacia and should not be substituted for it. Acacia is tapped in Sudan mostly from cultivated trees during February and March — strips of bark having been previously removed from the trunk thus stimulating the production of gum by the proliferating cambial zone and the newly formed phloem.

Many theories have been advanced to explain the formation of gum but none has been generally accepted. Trees yield gum if tapped when 6 to 7 years old but yield less gum as they reach their 25-to 30-year life span.

Sudan gum may be «hard» (tough and not inclined to break — December/January/February arrivals), or «soft» (friable — March/April/May arrivals). Arrivals of June and later months are mostly «soft» if free from rain damage otherwise they are likely to be «hard».

If the gum is to be ground into powder as a preliminary process then importers grind nothing unless it is at least a year old. Very early gum is likely to be difficult to dissolve and it is only on storage over 2 to 3 months that the gum will become normally and completely soluble. Hard gum has the greatest viscosity but has a tendency to stringiness.

For bleaching purposes Kordofan gum is used. After separating the small pieces, siftings, dark colored pieces and pieces containing portions of the bark, the big gum pieces are broken into moderate sizes and exposed to direct sun light for about three weeks, after which the gum is graded.

Bleaching of Kordofan gum is done at Omdurman where the ground is rocky. Whiteness and appearance of the bleached gum depend on the weather during the months when the gum is bleached i.e. March, April, May. On absorbing moisture, the white bleached gum acquires a yellow color.

Acacia consists primarily of the calcium salt (with traces of magnesium and potassium) of arabic acid. Arabic acid consists of a chain of galactose molecules showing 1-3 linkages. Every other molecule in that chain carries a similar branch chain different from the similar chains on the adjacent molecule of galactose; so that every repeating unit of the arabic acid molecule consists of 4 galactose molecules (two of which are in the main chain), two molecules of l-arabinose, and one molecule each of l-rhamnose and glucuronic acid.

The quantity of acacia depends on the viscosity of its solutions and varies from one sample to another. Gum arabic undergoes no change by age when kept in a dry place. Its concentrated aqueous solution remains for a considerable time unaltered but ultimately becomes sour from production of acetic acid. The disposition to sour is increased by using hot water in preparing the solution.

Gum arabic is used in pharmacy, in the textile industry and by confectioners. Because acacia may produce serious liver damage when injected, its use as a plasma substitute is not in favor.

A colored film taken by Habashi, showing the processing of acacia in Sudan was shown to the class and subsequently presented to the School.

LOCAL ANTI-INFECTIVES

By Wasfi al-Khazin

The N.N.R. 1952 includes under this heading antibacterials, fungicides and antiprotozoan agents. «The antibacterials include disinfectants (the names germicide and bactericide are synonyms), antiseptics (bacteriostatic or growth preventing substances) and antibiotics. No sharp distinction can be drawn between disinfectants and antiseptics. Antibiotics are effective as disinfectants and/or antiseptics». From the foregoing, it can be easily seen that this is a very broad subject, some aspects of which have been treated separately in other seminars of this and past years and thus will not be included in this summary — although included in the seminar because of the personal interest taken in the subject by Khazin.

Quoting again from the N.N.R. : «The ideal disinfectant or antiseptic would possess the following aspects: High coefficient of disinfection, stability, solubility and penetrability even in the presence of organic matter. It would be highly bacteriostatic, but nontoxic, non-corrosive and non-bleaching. Antiseptics and disinfectants should possess non-specific action on micro-organisms.» Local anti-infectives may be divided into the following classes:

A. Anthracene Derivatives

1. Chrysarobin.
2. Anthralin, Dithranol, Cignolin, or Dioxyanthranol, is 1,8,9-anthratriol or 1,8-dihydroxyanthranol. It is similar to chrysarobin but is 3—4 times as active. Stains may be removed from clothing with kerosene, and from the skin with olive oil.

B. Antibiotics

Bacitracin, Neomycin, Polymyxin B, Tyrothricin and combinations of these under various trade names.

C. Antifungal agents

see p. 70.

D. *Phenol and Its Derivatives*

1. Phenol, Cresols, meta-Cresyl Acetate (cresatin), etc.,

2. Resorcinol, Resorcinol Monoacetate (Acetylresorcinol, Euresol), Hexylresorcinol (Caprokol, 1,3-dihydroxy-4-hexylbenzene), etc.,

3. Solution of Cresol with Soap (Lysol), also a substitute of lysol consisting of a fraction collected above the cresol fraction. The latter has been prepared only recently and is believed to have a greater bactericidal effect but a lower toxicity (Pharm J., 170:59 (1953)).

E. Chloroxylenol (p-chlorometaxylenol), Solution of Chloroxylenol, B.P. (Roxenol), and D.C.M.X. (2,4-dichloro-3,5-dimethylphenol or, 2,4-dichloro-sym-m-xylenol). Roxenol is effective against a wide variety of organisms and is used as a general disinfectant for surgical and personal use.

F. Hexachlorophene (Gamophen, Hex-O-San, pHisoHex, Septisol, Vestal, or Germa-Medica, is 2.2'-methylene-bis-(3,4,6-trichlorophenol).

G. Dyes

1. *Acridine Derivatives* such as Euflavine (Acriflavine, Gonacrine, Neutral Acriflavine, Neutral Trypaflavine), Acriflavine Hydrochloride (Acid Acriflavine, Acid Trypaflavine, Trypaflavine), Proflavine, Aminacrine (Acramine, Acramidine), etc.,

2. *Triphenylmethane Derivatives* or Rosaniline Derivatives, such as Fuchsin, Methylrosaniline Chloride (Gentian Violet, Crystal Violet), Brilliant Green, etc.,

H. Furan Derivatives

Nitrofurazone (Furacin, Furalone, Vabrocid, or 5-nitro-2-furaldehyde semicarbazone), etc.,

I. Halogen Compounds

1. The Hypochlorites such as Dakin's Solution, Labarraque's Solution, Javelle Solution,

2. The Organic Chlorine Compounds such as Chloramine-T (Chlorazene, Chlorazone, or sodium p-toluene sulfonchloramide), Halazone (p-dichlorosulfonaminobenzoic acid or, p-sulfondichloramidobenzoic acid), Chlorazodin (Azochloramid or N,N-dichloroazodicarbonamidine), etc,

J. Iodine and Its Derivatives

1. Iodine and its solutions,

2. Organic Iodine Compounds such as Thymol Iodide, Diglycocol Hydriodide-Iodine (Bursoline), Iodoform, etc.

K. Bismuth Compounds such as Bismuth Tribromophenate (Xeroform), etc.,

L. Mercury Compounds

1. Inorganic salts such as Mercuric Chloride, Mercuric Iodide, Mercury Oxycyanide, etc.,
dide-Iodine (Bursoline), Iooform, etc.

2. Organic Mercury Compounds such as Merbromine (Mercurochrome or, the disodium salt of 2,7-dibromo-4-hydroxymercurifluorescein), Acetomeroctol (Merbak, or 2-acetoxymercuri-4-(1,1,3,3-tetra methylbutyl) phenol), Mercocresols (Mercresin), Phenylmercuric Nitrate (Merphenyl Nitrate-basic), Thimerosal (Thiomersalate, Merthiolate or, sodium ethylmercurithiosalicylate), etc.,

M. *Silver Compounds* such as Silver Nitrate, Ammoniacal Silver Nitrate Solution, Colloidal Silver Protein preparations, Colloidal Silver Iodide (Neo-Silvol), Colloidal Silver Chloride (Lunosol), Silver Picrate (Picragol) etc.,

N. *Pediculocides* — see Apothecary 1952 p. 65.

O. *Peroxides* such as Hydrogen Peroxide Solution, Medicinal Zinc Peroxide, Sodium Perborate, and other oxidizing compounds as Potassium Permanganate, Potassium Chlorate, etc.,

P. *Scabicides* — see Apothecary 1952 p. 74.

Q. *Surface Active Agents*

1. Anionic surface active agents such as the sodium salts of fatty acids such as Soap, Ammonium and Calcium Mandelate, Alkyl Sulfates, etc.,
2. Cationic surface active agents such as the quaternary ammonium compounds, see Apothecary 1952 p. 63. These are incompatible with the first group.

R. Organic Local Disinfectants such as Alcohol (most antiseptic strength being the 70% w/w), Formaldehyde, Thymol, Chlorthymol, etc., etc..

NEWER DRUGS USED IN THE TREATMENT OF TUBERCULOSIS

By George Dayian

The Greek Aretaeus, 2nd to 3rd century A.D., was the first to give a full description of an advanced case of pulmonary tuberculosis. Klebs, in the latter part of the 19th century, proved that sputum from a tuberculous person could infect animals with the disease. In 1882 Koch demonstrated the presence of the bacillus Mycobacterium tuberculosis in sputum thus establishing the etiology of the disease.

Following infection with the bacillus, the following sequence of pathological changes takes place in the tissues of the lungs in pulmonary tuberculosis: the appearance of an exudate in the air spaces and a preponderance of polymorphonuclear leucocytes, the collection of macrophages in the surrounding alveolar spaces, and appearance of stainable fat and liquid material in the cellular elements of the exudate and degeneration of their cytoplasm. Nodules or tubercles appear around the infected area and their cells develop into the characteristic multinucleated giant cells of Langhans. This process is followed by caseation, in which the

necrotic cells become fused into an irregularly staining homogenous mass. The caseated area may then undergo softening, the result of which is the imbibition of fluid which leads to swelling of the necrotic cells. This is followed by immigration of leucocytes which on disintegration liberate enzymes which have a digestive effect on the caseated area, forming the liquid tuberculous pus which escapes through the air passages and is coughed up leaving behind a cavity.

A train of symptoms characteristic of a tuberculous infection is: lassitude — the person feels run down and becomes easily tired; a low rise in temperature in the afternoon — the rise becoming gradually more pronounced; sweating may be moderate to severe; increased irritability and sexual disturbances; cough is mild and dry at the outset later becoming persistent and, where cavitation is present, it becomes looser and sputum is produced. Sputum is at first muco-purulent, later purulent and then bloody — this being, occasionally, the first symptom of the presence of disease.

Koch had great hopes in 1870 when he developed his tuberculin which, however, became valuable only as a diagnostic tool. Chemotherapeutic agents useful in the treatment of tuberculosis are few and are still far from perfect. Waksman received the Nobel prize because of his discovery of *Streptomycin* which has proven so useful in the treatment of tuberculosis. *Dihydrostreptomycin* has the same effect. Combination of strestomycin and *p-Aminosalicylic Acid* (PAS) was found to be even more effective and retarded the development of streptomycin resistant bacilli. Newer antibiotics which hold promise of usefulness are *Viomycin* and *Magnamycin*. Others are *Erythromycin* (Erythrocin, Ilotycin), *Mycobacidin* and, to a smaller extent, *Neomycin*.

Another group showing tuberculostatic activity is the *Sulfones*, first discovered in 1939. Thus *Promin*, *Diasone*, *Sulphetrone*, and *Promizole* were developed (Apothecary 1951 p. 50). These compounds, however, were found to be quite toxic.

Of the large number of *Thiosemicarbazones* investigated *Thiacetazone* proved to be the most effective (Apothecary 1951 p. 39). For synonyms of sulfones and thiacetazone see under Drugs Used in the Treatment of Leprosy.

The latest drug developed and one which holds great promise is the much publicized isonicotinic acid hydrazide which now bears the generic name *Isoniazid*. Among the trade names under which it is now marketed are the following: Nidrazid, Rimifon — both being the first to appear (see Apothecary 1952 p. 37). Others are Armazide, Cotinazin, Dinacrin, Ditubin, INH, Isolyn, Mybasan, Neoteben, Niadrin, Niceta!, Niconyl, Nidaton, Pycazide, Pyricidin, Tubomel, Tisin, Tyvid. Pyridine or picoline (p-methyl-pyridine) is the basic material for preparing isonicotinic acid. The ethyl ester of the latter can then be made to react with hydrazide hydrate to yield isoniazid.

Tubercle bacilli can develop resistance to isoniazid also. In acute condictions combinations of isoniazid with streptomycin have been found useful — isoniazid in daily doses of 3-5 mg. per Kg. body weight along with 1 gm. of strep-

tomycin or dihydrostreptomycin twice weekly. Combination of isoniazid with PAS has also given favorable results: usual dose of isoniazid plus 10-15 g. PAS daily. In fulminating forms of tuberculosis the use of all three combined may be justified, the isoniazid being given in doses of 7 mg. per Kg. body weight for the first week and thereafter reduced to 3-5 mg.

Many methods, chiefly spectrophotometric, have been suggested for the quantitative assay of isoniazid in both pharmaceutical and biological fluids. For more details on isoniazid see Apethecary 1952 p. 37.

NEWER HYPNOTICS, SEDATIVES, AND SYNTHETIC MORPHINE SUBSTITUTES

By Joseph Andonian

Newer Hypnotics

Methyl pentynol, Methyl parafynol, Dormison, Somnesin, or 3-methyl-1-pentyn-3-ol is a new hypnotic which is not a barbiturate derivative and has a very simple structure. It is a pure highly volatile liquid available in 250 mg. capsules. Sleep is induced in most cases within half an hour, and lasts five hours or more. It is believed to have a wide margin of safety, to be rapidly assimilated and non-cumulative, and to show no evidence of habit forming. Patients awaken refreshed as from normal sleep. It should not be taken concomitantly with barbiturates.

Sedatives and Synthetic Morphine Substitutes, *see p.* 27.

Prisilidene Hydrochloride, or Nisentil, is 1,3-dimethyl-4-phenyl-4-propionoxypiperidine.

Pethidine Hydrochloride, Meperidine Hydrochloride, Dolantin, Demerol, Dolosal, Dolvanol, Dispadol, Dolantol, Eudolat, or Isonipecaine, is ethyl 1-methyl-4-phenyl-piperidine-4-carboxylate.

Phenadoxone, CB 11, or Heptalgin, is 6-morpholino-4,4-diphenyl-3-heptanone.

Methadone Hydrochloride, Amidone Hydrochloride, dl-Methadone Hydrochloride, Hoechst10820, Adanon, Dolophine, Diaminon, Physeptone, Polamidon, Miadone, or Butalgin, is dl-6-dimethylamino-4,4-diphenyl-3-heptanone hydrochloride.

PRESCRIPTION SURVEY OF AMMAN

By Anis Muashshir

This is the 5th in the series of prescription surveys to be carried out for the first time in this part of the world. These surveys were made by members of the senior class of the School and were all published in the Apothecary. For a detailed summary of the survey made by Muashshir see p. 64.

SPECTROPHOTOMETRIC METHODS OF ANALYSIS

By Ilyas Farah

A review of the theoretical principles behind the methods and instruments used in spectrophotometric analysis is given. The methods of spectrophotometry are briefly discussed and a list of applications is appended. See Photometry And Its Applications in Pharmaceutical Analysis by A. Acra, The Apothecary 1952 p. 49.

END OF SEMINARS

Briefly Noted

Dean Norman B. Nelson, Dean of the Medical Faculty, resigned his position at A.U.B. and has accepted the position of Dean of the Medical School at Iowa State University, Iowa City. Dr. Nelson will be succeeded by Dr. Joseph John Mc Donald, now in the U.S.A., who two years ago was chairman of the department of surgery at A.U.B. Dr. and Mrs. Nelson will be really missed. Sincerest good wishes to them and their children Ann and Norman Jr. We hope that we shall have occasion to see them again among us.

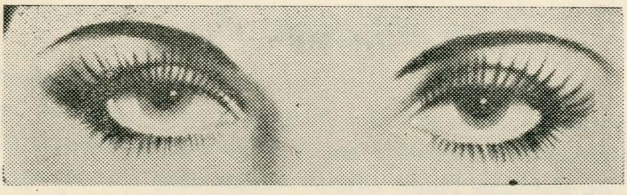
Dean Norman Nelson was awarded the gold medal of the Lebanese Order of Merit at a dinner held in his honor by the faculty of the Medical Division on May 19, 1953. His excellency the prime minister, Saeb Salaam, presented the award in the name of the President of the Republic.

Prof. Amin Haddad spent three weeks in Europe last summer visiting hospital pharmacies and pharmaceutical manufacturing houses in both Switzerland and France. He attended the first International Congress of Hospital Pharmacists which was held in Basle, Switzerland, on September 17 to 20, at the invitation of the Swiss Society of Hospital Pharmacists.

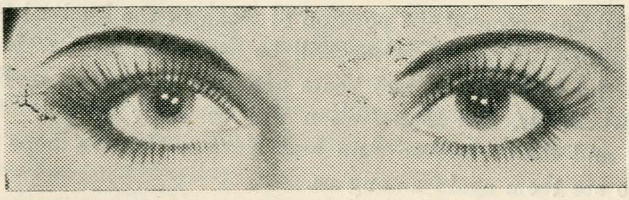
Dean Elliott Emerson Leuallen, is now dean of Columbia University School of Pharmacy. Dr. Leuallen taught at our school as pharmacy instructor from 1935-1937.

You Can Get Quick Relief from Tired Eyes

Make this simple test today!



EYES FEEL TIRED? You can soothe and refresh them in seconds with two drops of gentle, comforting Murine in each eye. You get —



QUICK RELIEF. Instantly your eyes feel refreshed. Murine's scientific blend of seven ingredients cleanses and soothes eyes tired from overwork or exposure to sun, wind and dust.

MURINE
FOR YOUR EYES

THE PHARMACEUTICAL SOCIETY

A Report by the Cabinet

This year marks the twentieth anniversary of the Pharmaceutical Society. From the time it was founded in 1933, the Society has rapidly grown to assume its position as one of the most active and flourishing of student societies on the campus. We cannot but look with pride at the high prestige acquired by the Society through the devotion and cooperation of its members. We earnestly hope that future members will honestly continue in assuming the responsibilities of maintaining and adding to the good name and heritage of their Society bequeathed to them by their predecessors. Only through such societies will students' interests be served. The Society has always played an important role in providing a variety of activities enriching students' life in the school.

For the first time, cabinet members for this year were elected in May 1952 rather than in October. The Officers elected were Messrs. Sami Halabi, President; Sami Naman, First Vice-President; Charles Nassar, Second Vice-President; Ibrahim Durr, Secretary; Husayn Tazziz, Treasurer; Levon Karamanukian, Faculty Adviser. For the first time, also, the new Cabinet included a non-voting observer from Pharmacy I, hitherto unrepresented in the cabinet. The candidate, elected by his classmates, was Mr. Sami Malak.

The Cabinet with the wise guidance of its kind adviser and the ardent support of the society members, have efficiently discharged their duties which led to the success of this year's program. The various pleasant activities climaxed in a Grand Ball in the Alumni Club, a Variety Show «Tales from the Mortar» directed by Mr. Joseph Andonian Ph. IV, and a trip to Egypt. From the proceeds of the first two of these activities the cabinet granted eight scholarships of L.L. 100.0 each to eight students in the second semester. A special combined committee of faculty and students chose the recipients from among the candidates. The athletic teams were also granted L.L. 80. Furthermore, a special sum was alloted to help students buy their textbooks, repayment being divided into eight installments. The Director of the School, Professor Amin Haddad, kindly addressed a large audience on his summer trip to Europe. This proved to be both interesting and useful. Even during two weeks of the Spring vacation, a group of students enjoyed a very pleasant trip to Egypt where they visited the various important and historic places accompanied by two government representatives. They had also the chance of meeting the Premier General Mohammad Naguib who heartily welcomed the group and sent with them greetings to the faculty and students of the School. It was possible to issue the Pharmacy News twice only. The following served on its editorial board: Messrs. Ibrahim Durr, Editor; Anwar Husayni, Science Editor; Raymond Habr, Make-up Editor. It is earnestly hoped that the News will appear more frequently in the future.

The Society ended its social activities of the year by holding a 20th anniversary reception followed by a farewell party in honor of the graduating class on the evening of May 22. At this evening, Prof. Amin Haddad was made an honorary member of the Society. Silver medals bearing a pestle and a mortar and inscribed with the name of the Society and date of its foundation were awarded to Prof. Amin Haddad on the occasion of extending to him the honorary membership of the Society, to Dean Norman Nelson in token of mutual friendship and respect, and to Prof. Charles Abou-Chaar in token of his efforts in the publication of the Yearbook of the School — The Apothecary.

It may be mentioned that those medals or badges were first designed and made for the class of 1952 by the president of the Pharmaceutical Society in 1951-52, Mr. Elie Nuwayser, and were given as mementoes to the members of the graduating class of 1952.

Elections of new officers for the year 1953-54 took place on May 28. Thus ended another successful year in the life of our beloved Pharmaceutical Society.

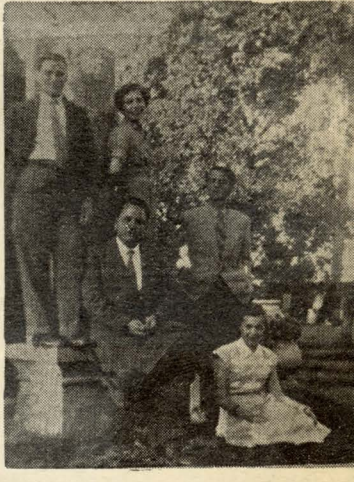
تحياتي لكلية بيروت ولأشبالها الكرام
واحترامي للأساتذة العظام - ولتحيا العروبة وابناؤها الامجاد

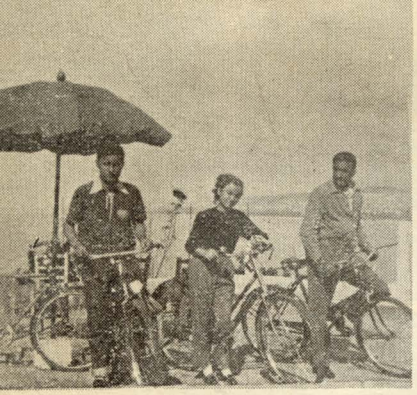
محمد نجيب

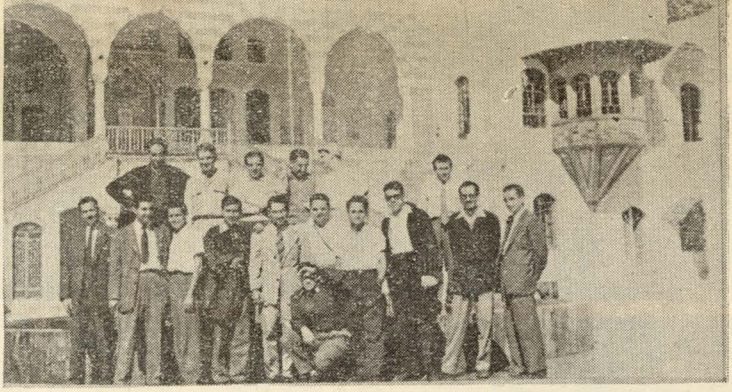
القاهرة ١١/٤/٥٣ لواء أ.ح.

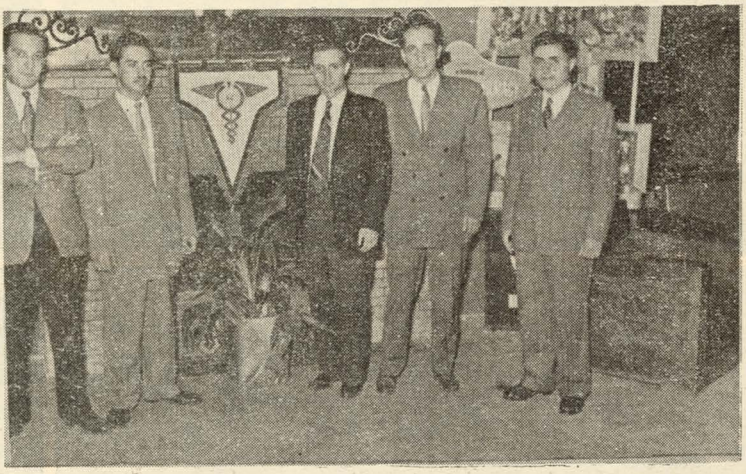
The following is a list of activities sponsored by the Society. A pictorial record appears on the following pages of which the first page represents scenes from the trip to Egypt.

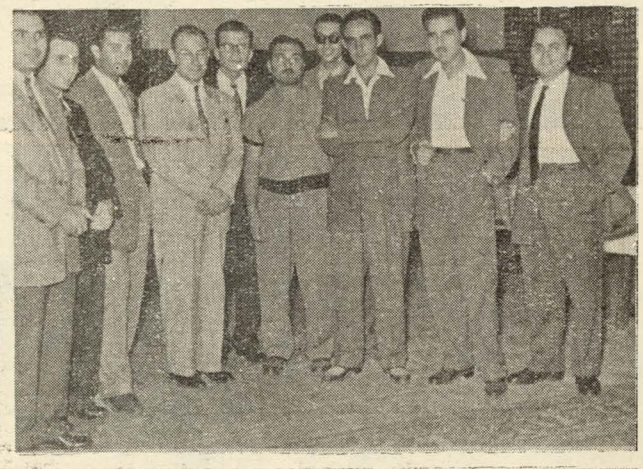
1 — Oct. 23, 1952 — Opening Reception, W.H.C.M.
2 — Nov. 2, 1952 — Trip to Nab-es-Safa, Barouk, Beit-ed-Din.
3 — Nov. 18, 1952 — General Knowledge Contest, Ph. IV won over Ph. III
4 — Nov. 22, 1952 — Joint Trip with Student Nurses to Sidon, Litani, and Kasimiyyah Project.
5 — Dec. 6, 1952 — Grand Ball, Alumni Club.
6 — Jan. 17, 1953 — Variety Show, «Tales from the Mortar», W.H.C.M.
7 — Jan. 24, 1953 — Dancing Party, Alumni Club.
8 — Feb. 22, 1953 — Cycling Trip, Damour-Sidon.
9 — Feb. 27, 1953 — General Knowledge Contest, Ph. I won over Ph. II.
10 — Mar. 5, 1953 — Lecture by Prof. A. Haddad — «My Trip to Europe».
11 — Mar. 13, 1953 — Championship Knowledge Contest, Ph. I vs. Ph. IV DRAW.
12 — Mar. 20, 1953 — Championship Knowledge Contest, Ph. IV won over Ph. I.
13 — Mar. 29, 1953 — Spring Vacation Trip to Egypt.
14 — May 1, 1953 — Film Show, Squibb House and Streptomycin, Pharm. Bldg.
15 — May 12, 1953 — Film Show, Antihistaminics, by Ciba, Pharm. Bldg.
16 — May 22, 1953 — 20th Anniversary and Farewell Reception, Alumni Club.
17 — May 28, 1953 — Election of Officers for the year 1953-54, Pharm. Bldg.

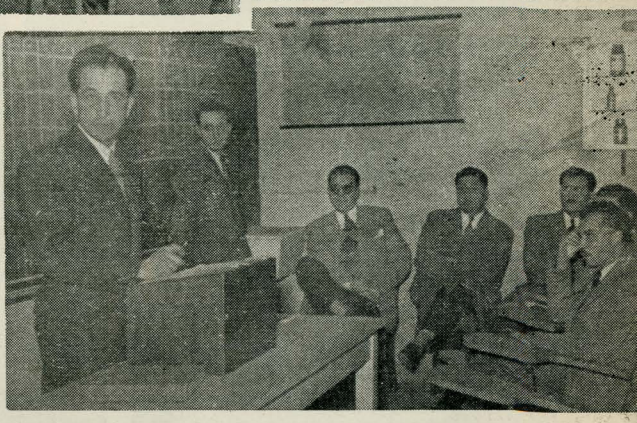


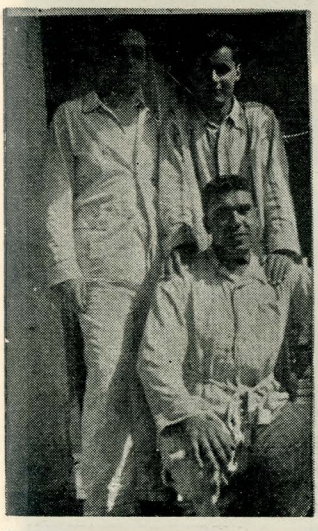


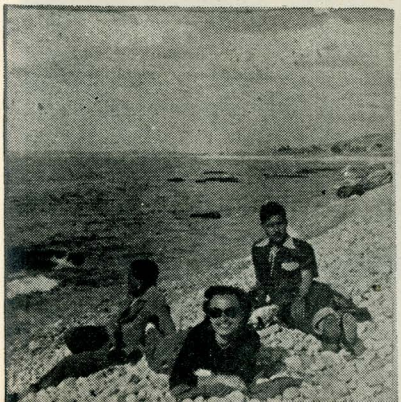


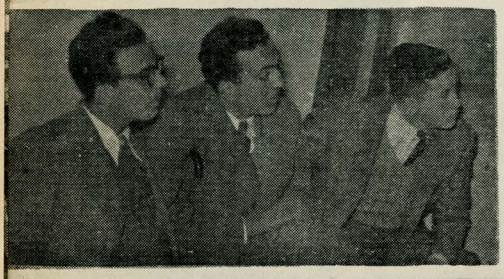


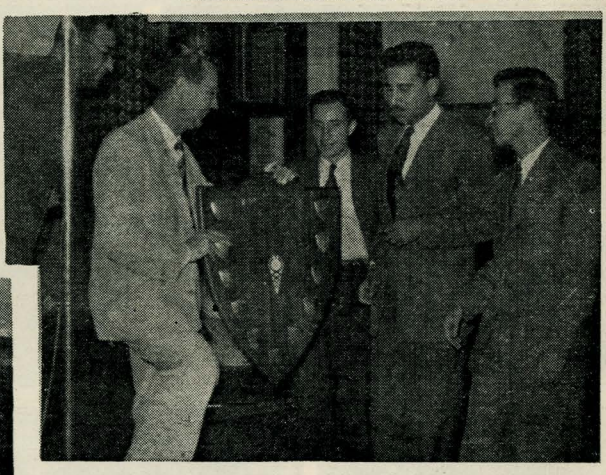


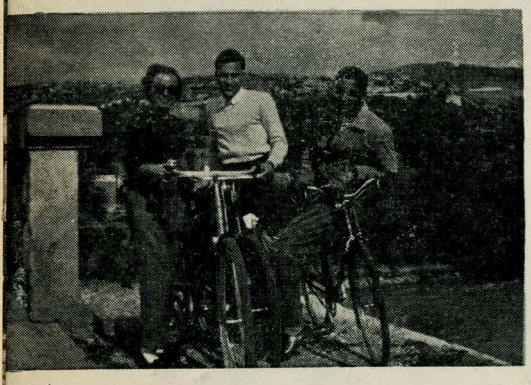


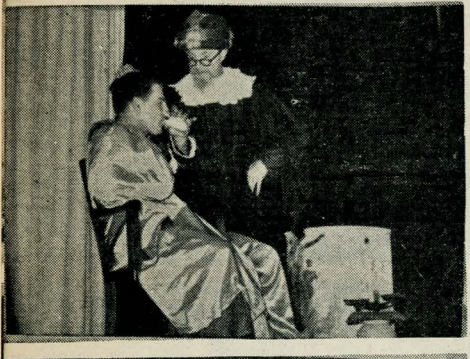


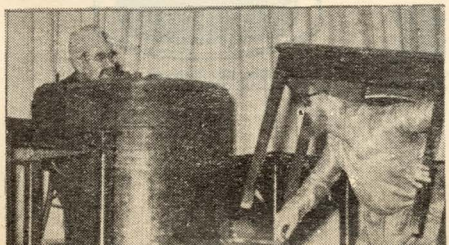


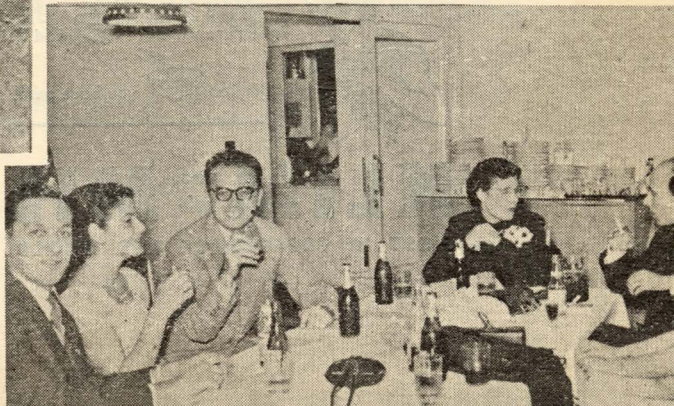












8

KLIM is produced under strictest control

We wish you could see the care taken in making KLIM under the Borden System of Quality Control.

Scrupulous selection of dairy herds and close supervision of fresh milk production are among the steps taken in safeguarding KLIM. Continuous laboratory tests guarantee unchanging quality. Every step of the way—from the farm through processing and packing—KLIM is protected to give you the best milk it is possible to provide.

1. KLIM is pure, safe milk

2. KLIM keeps without refrigeration

3. KLIM quality is always uniform

4. KLIM is excellent for growing children

5. KLIM adds nourishment to cooked dishes

6. KLIM is recommended for infant feeding

7. KLIM is safe in the specially-packed tin

8 KLIM *IS PRODUCED UNDER STRICTEST CONTROL*

Take pure water, add KLIM, stir and you have pure, safe milk

KLIM *pure safe* **MILK**

2538 FIRST IN PREFERENCE THE WORLD OVER

Athletic Activities

by **LEVON M. KARAMANUKIAN B. A., Ph. C.**

Staff Athletic representative on the University Schools Athletic Committee.

As a result of the fine work that Nadim Masri, Pharmacy II, did last year, he was elected to be the student representative on the University Schools Athletic Committee, for 1952-53, with the unanimous vote of the student body of the School of Pharmacy.

Again this year, the Football team showed promise of success, did a fine job winning many games, and was one of the best teams on the campus, though it won no championships.

Besides Football, Volleyball and Basketball teams were organized also, and they too participated in interschool championships. Due to the limited number of students and insufficient practice, our teams could not compete successfully with the strong teams on the campus.

Pharmacy I challenged the upper three classes of the School to a ping-pong tournament. Khalid Sulayman, champion of Pharmacy I, played against Naim Farraj, Pharmacy III, champion of the upper classes and won. The winner received a cup presented by a member of the staff of the School of Pharmacy.

Three students, Raymond Habr, V. Etyemezian and N. Masri attended the refereeing classes of A.U.B. in Football and R. Habr that in Basketball too.

Before ending, I would like to thank our ahtletic representative Nadim Masri, our football captain, Anwar Husayni, our volleyball captain, Ara Israbian, our basketball captain, Diran Palanjian, and all members of our teams, for the fine work they have done throughout the year. My congratulations go to them all for their fine spirit of sportsmanship.

INTERCLASS GENERAL KNOWLEDGE CHAMPIONS

Pharmacy IV

S. Na'man G. Dayian N. Trochalakis

Prize Awards

Prizes Awarded 1951-52

Several students received various awards at the farewell reception held by the Pharmaceutical Society in West Hall on May 30, 1952.

Awards By The Pharmaceutical Society:

One copy of The Merck Index to Mr. Samih Afifi for being the most active member outside the Cabinet.

A silver cup to Mr. Nadim Masri for his efforts in successfully organizing the athletic activities.

Awards By The School of Pharmacy:

One copy of The Merck Index to Mr. Daniel Abdulian for attaining the highest average in the senior class.

One copy of The Merck Index to Mr. Elie Nuwayser for being the most active student in planning useful extra curricular activities for the students of the School.

One copy of The Merck Index to Miss Berin Tutunji for academic excellence during 1950-51.

Awards By The Apothecary:

One pair of book-ends to Mr. Fadlu Shaban for his activity as the business manager of the Apothecary.

Prizes Awarded 1952-53

At the farewell party held by the Pharmaceutical Society On May 22, 1953, the following prizes were awarded.

Awards By The Pharmaceutical Society:

Silver medal to the most active member outside the Cabinet, Mr. Varoujan Etyemezian.

Silver medal to the Athletic Representative, Mr. Nadim Masri.

Silver cup to the Captain of the football team, Mr. Anwar Husayni.

Ribbons to all the athletic teams.

Awards By The School Of Pharmacy

One copy of The Merck Index to Mr. Sami Halabi for being the most active student in planning useful extra curricular activities for the students of the School.

One copy of The Extra Pharmacopoeia — Martindale Vol. I to Miss Berin Tutunji for attaining the highest grade average in the three previous scholastic years.

One copy of The Extra Pharmacopoeia — Martindale Vol. I to Mr. Anwar Husayni for attaining the next highest grade average in the three previous scholastic years.

Award By The Apothecary

One copy of The Extra Pharmacopoeia — Martindale Vol. I to Mr. Fadlu Shaban for his efforts as the business manager of the Apothecary.

Award By Mr. Levon Karamanoukian

A silver cup to the champion of the ping-pong tournament, Mr. Khalid Sulayman.

The Order of Pharmacists of Lebanon

(Syndicate of Lebanon Pharmacists)

The cabinet for 1953 was constituted as follows; Messrs. Muhyiddin Mahmasani Ph. C. '28, President; Muhyiddin Raad Ph. C. '34; Adib Kaddurah Ph. C. '38; Luder Ishkhanian Ph. C. '38; the others, who are not A.U.B. graduates, are Messrs. Pierre Jemayel Vice-President; Fareed Makhloof; Husni el-Khuja, Treasurer; Joseph Faris, Secretary; and George Baroody, all of whom except Mr. Khuja, are graduates of the F.F.M.Ph.

Mr. Muhyiddin Mahmasani has been recently appointed head of the newly organized Pharmaceutical Bureau at the Ministry of Health and will be at the same time Inspector of Pharmacy. He has, therefore, resigned his position in the Order. The vice-president, Mr. Jemayel, assumes at present the chairmanship of the cabinet of the Order.

Prof. Amin Haddad is chairman of the Scientific Committee of the Order. He was also elected editor of the Lebanese Pharmaceutical Journal.

Mr. Hassan Kaidbey Ph. C. '38 was elected member of the Diciplinary Committee. George Constantinides, F.F.M.Ph. is the second elected member.

The Lebanese Pharmaceutical Journal

The *Apothecary* wishes to extend its cordial greetings to the first association pharmaceutical journal ever to be published in Lebanon, «The Lebanese Pharmaceutical Journal», organ of the Order of Pharmacists of Lebanon. The first issue of this quarterly journal appeared in January 1953 and the second in April. To its editor, Prof. Amin Haddad, go our sincere good wishes and congratulations on a work well done.

The Journal is trilingual. Alumni and faculty members of both A.U.B. and the F.F.M. Ph. are on its editorial board.

Food for thought

«*...As matters now stand the Federal, Food and Drug Administration* have a law, making it possible for them to *force* pharmacists to do what they should have done all along. This becomes a pattern of our civilization. As we fail to live up to our responsibilities as citizens, new laws are passed supposedly to correct the attendant evils created. But as less and less is left to individual initiative and decision, our moral fiber is weakened and we lose the ability to act with vision, responsibility, and courage.

It is this trend in all civilized countries — wherein self-interest is the prime motivating force, expediency the rule of the day, and compromise with evil the sign of wisdom and statesmanship — which will eventually lead to regimentation and autocracy, such as the world has never seen. Only a world-wide acceptance of the philosophy expressed by the phrase, «I am my brother's keeper» with all that this entails can stem the tide of gross materialism and human debasement. The professions dedicating themselves to the relief of human suffering should be the foremost among those wherein such a philosophy is practiced.

Prof. L.F. Tice
Am. J. Pharmacy, 124: 42, 1952.

What is the hardest of all things ?
That which you think is the easiest :
to see with your eyes
what is before your eyes.

Goethe

Excerpts

FROM OUR MAIL

Miss Maria Widacka Ph. C. '50, writes from England :

«I thank you for the copy of the Apothecary. It was such a pleasure to read our year-book again. There is no need to assure you that I liked this year's (1952) copy very much indeed. Would you believe that it was from the Apothecary that I've learnt about the International Pharmacopoeia?...

Speaking of the licensing examinations she took last summer, Miss Widacka says: The forensic pharmacy examination (written) I did well, inspite of the fact that everybody considered it a very difficult one. The oral examination and the practical as well were held at Technical College in Brighton. I was asked twenty doses and was given prescriptions to read and translate (from Latin to English)... It might interest you, so here are the prescriptions — the time was three hours:

(1) **Prepare six ampoules each to provide the following dose :**
Apomorphine HCl gr. 1/40
Aquam ad. m. XV

(2) **Cupr. Sulph. gr. ss**
Ol. Theobrom. q. s.
Fiat suppositorium.
Mitte sex.

(3) **Benzyl Benz. 25 °/°**
Cerae Emulsif. 2 °/o
Aquam ad. ounces iii
Fiat Emulsio.

(4) **Acid Acetlsalyicyl gr. X**
Liq. Ammon. Acet. drachm IV
Aq. Chlorof. ad. ounces i
Fiat Mistura.
Mitte ounces VI.

(5) Prepare 30 ml. of Aqueous Solution of Iodine B.P.

Since I wrote you last, the shilling charge for the N.H.S. (National Health Service) prescription has come into use. The number of prescriptions dispensed has dropped something like 20-25%. It shows how much of the medicines prescribed were wasted previously... The longer I am here the more I miss Lebanon... Just while going to post this letter I've received a paper from the Pharm. Soc. of G.B. saying that I've succeeded in the qualifying exam. I'm so very glad of it and of the fact that I didn't bring shame to our School and the A.U.B. Only few more formalities and I'll be registered as a member of the Pharm. Soc.»

In another letter, «I am still working with Timothy, Whites and Taylors, Ltd. Since July, I am on so called relief job!.. I'm running those pharmacies where the qualified chemist is on holiday. It means changing the place every fortnight or every week. This gives me an opportunity to get acquainted with different districts of London and with different branches of our firm... There is an apprentice at the branch where I work now and I'm explaining many things to him, teaching him how to make certain preparations, calculations, etc. This seems funny to me sometimes — not such a long time ago I was a student and I had to listen to

the instructions, directions and so on, now I am kind of teaching. I'm demonstrating to him how to make a successful emulsion even I, who was so good at breaking the emulsions when I was in the first and second years of Pharmacy. I'm getting the Pharmaceutical Journal now and I've subscribed to the «Chemist and Druggist»...»

In another letter «I am a qualified and registered chemist now. My wages are 11 Strlg. per week from which the National Insurance and the income tax are deducted. The income tax is rather heavy and there are no means of escaping it. I was working as a locum till the end of September. This gave me an opportunity of seeing some more of London and suburbs and also of different pharmacies (but all belonging to Timothy, Whites and Taylors). In one of them I had an official visit by the inspector of the Pharm. Soc. He looked into the Dangerous Drugs Register, the prescription book and Sched. IV folder... I am in a permanent place now... I have bought the new edition of Martindale. It is 55 shillings, but it is really worth that money... I had a nice visit from Rauf Salfity (Ph. C. 50) He is in Nottingham, taking a 9-months course in biochemical analysis. He may come down to London for Christmas with another A.U.B. graduate who studies Law at Oxford.... The New-Year's day is not celebrated in this country and everybody must work on that day. Altogether there are very few holidays during the year here: two days for Xmas, one day for Easter, and two bank-holidays (one in June and the other in August). One gets a fortnight holiday each year. So this isn't much and I'm missing all the feasts and holidays we had in Beirut... The most fashionable product in England is chlorophyll tablets, tooth-paste, cream, air-purifiers, soaps, etc., and those things are selling very well indeed...»

In another letter «...Your letter was the first one we received at the new address and I was very happy about «mabrouk» you sent us. We consider it a very good omen. It is rarely that I hear that word now, occasionally, from mother when I buy something new. You see, we still use some Arabic expressions at home and mother often forgets about pennies and shillings and says the prices in piasters or liras. I don't recall if I ever told you how my mother did her first shopping in London: she asked the grocer for «toum» and «batata» and was rather astonished at not being understood. She also can't say that she came in a bus or trolley-bus, she still travels in trams, like in the old good days in Beirut (there are no trams in London)... I wish I were a second year student now and could use that demonstration eye-piece in pharmacognosy lab. I'm sure it saves you a lot of trouble and helps the students a great deal. Do I remember anything from my pharmacognosy course? You know I liked the course very much and I wasn't so bad in it. I remember a lot even binomial names of most of the drugs... I must admit quite frankly that all the knowledge of pharmacognosy we acquired at school doesn't help me in any way in my daily work, perhaps the uses of drugs only. Yet I believe that a pharmacist must know something about the crude drugs even if he doesn't handle them in his practice. What would one say, for instance, about an engineer constructing a bridge, who doesn't know anything about steel, concrete or any other material used in erecting the structure?... Throughout summer

and autumn I was helping two Indian boys to prepare for their qualifying examination. It took quite a lot of my time yet I was glad I could be of help to my colleagues by profession, and what's more, it gave me a pleasure to learn that both of them have succeeded in the examination... I am enclosing 2 Strlg as my contribution to the Apothecary and I wish a success to our year-book...»

And in another letter «...I had quite a nice Easter this year. I'm sure it would be much nicer if it were not for the miserable weather. We are having April's showers now and absolutely too much of them. Of course, from the agricultural point of view, the rain is much appreciated as the past few weeks were very dry. I am sure that all the farmers, gardeners and so on are saying something to the effect of the Arab proverb: «Rain is the mercy of God». Well, I quite agree, yet not being 100% free from selfishness, I would prefer to have a lot of sunshine during Easter .. I know how much it costs to have the Apothecary printed, how expensive are the prints of the photographs, the binding, etc. With the price of a single copy being as low as possible, it isn't easy for the committee to meet both ends. I think that those Alumni who are on their own feet, and standing well, should contribute each year...»

Mr. Adel Maksad Ph. C. '51, writes from Sudan :

«...I am now at the civil government hospital in Juba. Imagine that I am the first pharmacist to come to this hospital. I was needed very badly here. My duty now is to organize a good and well-equipped pharmacy. I'll be giving also instruction in materia medica and dispensing to few students so that they become assist nt dispensers. I'll be training, also, medical assistants in dispensing each for few mon hs. As you can see, the work is quite a lot, and furthermore, I have to supply around twenty outside dispensaries with drugs, monthly and semi-monthly. I have eleven wards in our hospital plus the male and female outpatient clinics which should have their regular drugs in stock. Juba is a nice little town, it is the capital of the Equatorial Province of Southern Sudan. We have plenty of delicious tropical fruits such as papaya, mango, pineapple, custard-apple, etc. The climate is very hot now (March), but it will be cooler soon when rain begins next month and continues until November...»

Mr. Hamdi Dürüst Ph. C. '51, writes from Turkey :

We of the Medical Corps Reserve were drafted in late last June, so that we were ready for the thorough course of four months by July 1, 1952... The four-mon hs training is really a strenuous one including theoretical and practical aspects of the military training in general as well as those of the tactics of the Medical Corps, etc.... The professional subjects, such as military hygiene, epidemiology, tactics of the medical corps, surgery of war (knowledge of the types of wo nds inf cted by the various weapons and their treatment on the field), che-

mistry of gas warfare, medical services in the army, are all taught by senior medical officers... These are the professional courses which we take exclusively from the highest medical personnel of the armed forces. Our practical experience is given in the hospitals and laboratories of the Supreme Academy of Military Medecine. In addition to these, our eight-hours-a-day training includes basic army subjects such as the study of weapons, military jurisprudence, topography, army organization, tactics of defence and attack, communications, drilling in the field, etc.... The examinations, ever so frequent are not easy; but the common ideals and the high standard of dicipline among the youth taking them end in really exceptional and bright results. We all work very hard knowing that the facilities provided are those of a whole nation for the very upper crust of its intellectuals and the best of its youth; and our efforts are not only for ourselves but for the safety, security and independence of our country and the preservation of the ideals of peace and the ideals of the United Nations. We all take a sincere pride in our duties and sacred obligations to our country and to the world peace at large. We all give with pride of our sweat, time, and toil for these ideals and, should the time and the occasion arise, would willfully be ready to give of our blood for the same ideals, and even our whole life. In my opinion, an army experience is really necessary for every young man, not that it preaches of one's obligations to one's country only, but also, through its various restrictions, teaches self dicipline, respect for authorities, and moulds the hitherto carefree spirits of the youth into manly maturity. In as much as it is hard to be away from one's sweet home, I feel indebted to my country for having given me these opportunities of direct service.... The spirit of cooperation, the eagerness of every cadet, the sacredness of the duty and the common ideals that keep us all under this same roof, add a special flavour to our life here. As soon as we complete the required course of training and are prepared to serve as reserve officers in the medical corps of the army, navy or air-forces, we will be given our commissions.... On the eve of my departure, my wife and I were very pleased to get a copy of the 1952 Apothecary, which was indeed a fine surprise. My brother-in-law, who is an internist, and I spent a whole day reviewing the text which we found so useful.»

And in another letter: «The last I recall, I was writing to you from the Reserve Officers Training College at Ankara. On October 21, 1952 I got my commission *cum laude*, changed my military uniform to an officer's uniform, added the golden bars and the golden «snake and laurel» insignia of the military pharmacist. In addition to a beautiful uniform, and a beautiful diploma, the *cum laude* graduates received beautiful Omega wrist watches as souvenirs and presents. Following our graduation we were given a ten-day leave to spend in our home towns, before joining our assigned posts in the various military hospitals. My post was one at the General Pharmaceutical Supply Division stationed at Ankara and affiliated directly with the Ministry of National Defence. All the commissioned personnel of the section, headed by a colonel, are regular military pharmacists. It was really a nice thing to be in a place where one is surrounded by members of one's own profession from colonel down to lieutenants...»

In his last letter Dürüst says: «...I am in Istanbul on a short leave.... With a surprise decree of the government, the Reserve Officers' term of service was extended another six months. This means that I'll still be in uniform by the New-Year's eve and even for sometime to follow... Most pleased am I to read (in Outlook) of the publicity our School is getting through the Society's campus-wide activities. As any other veteran-member would, my heart swells with pride when I read about the achievements of the Society...»

Mr. George Passaris Ph. C. '41, writes from Queensland, Australia :

«...A couple of weeks ago I have been appointed officially as chief chemist of the above works (C.Q.M.E. Pty. Ltd., Lakes Creek, Rockhampton) where I have been working for the past few years. This means that I have under my supervision four qualified industrial chemists, two senior assistants and four junior assistants. ...My main scope in the works is routine analysis of all canned meats, fats and oils, fertilizers and several other by-products. Bacteriological tests are performed to keep up the hygienic condition of the meat works, and research work is carried for the improvement of our products both in quality and price. On many occasions I used my knowledge in pharmacognosy when we found unlabelled containers of different condiments. I have done a good research work on agar which has saved the company few thousand pounds. It is now that I realize what a good educational system we have in the School of Pharmacy. In my opinion the A.U.B. School of Pharmacy prepares its students better than many other schools in the world.... In my present advancement I owe a lot to our beloved Prof. Pauly with whom I had the luck and privilege to work in the Public Analyst Laboratory. Another type of work which is of great importance is the softening of water. We have dams with several sources of water which we first make soft and then pass into the boiler to create steam for power as well as for cooking the canned meats. The meat works where I am employed is the biggest cannery in the southern hemisphere. The main type of meat is beef. We kill 5000 bullocks a week, and we prepare 150,000 cans of meat daily, of different kinds and sizes — sizes varying between 12 oz. and 6 lbs.... I am still a bachelor...»

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«...The Arab Medical Association for our area is doing its best to raise the standard of the profession, but we are met with many difficulties. ...Why not call for a meeting of A.U.B. pharmacy alumni for a conference, it will be of wider benefit if other pharmacists are included. We will have a better chance to discuss our daily problems, and listen to some scientific lectures to be delivered by the faculty of the School of Pharmacy. I think you will be doing us great service if you find it suitable to call for such a conference....»

(*What do other alumni think of this good suggestion ? Editor*).

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(*What do other alumni think of this good suggestion ? Editor*).

Mr. Manook Kemelian Ph. C. '51, writes from Aleppo :

«I take this opportunity to express once more, on behalf of all pharmacy graduates of Aleppo, our post-graduate thanks to the faculty of the School of Pharmacy for their efforts to give us valuable up-to-date information (through the Apothecary). We are all proud of being members of a noble profession. We are practising our profession successfully because of the highly scientific training we received at A.U.B. Personally, I am continuing teaching at Aleppo College and directing Adrouny's Pharmacy. I decided to prepare a botany laboratory manual for the use of Aleppo College students. Our flora is not as rich as that of Lebanon but I am sure I shall find enough plant material for a botany manual to be used in the general course in botany....»

Dr. R. J. Pauly writes from Albany, N. Y.

«...We plunge in at 8:00 a.m. Monday morning and emerge at 5:00 p.m. on Friday very much like the days of teaching, except that during this time we have been thinking about some 180 pharmaceutical projects, consulting with the people working on their formulation, conferring with others who might have some advice on the problems, writing letters to the commercial men who want to know how the items are coming, etc., etc.... Ralph graduates this June (from College of Wooster, Wooster, Ohio) We will probably drive over for Commencement and then bring him back with us. If he doesn't have to do his army service right away he will probably do graduate work in marine biology at the University of Florida next year. Lore and Heidel both like their colleges (Keuka and Colby, resp.) and Hansi is doing fairly well here at Milne High School... *Dr. Pauly is director of Pharmacy Division, Sterling-Winthrop Research Institute, Rensselaer, N.Y.*

To present a bouquet of flowers,
to make a child happy, or to listen to someone in need,
to help your neighbour by understanding
when he can find no further comfort
on this earth,
these are the really great things in life.

Bohlau

ALUMNI NEWS

The Apothecary takes pleasure in extending the greetings and sincere goodwishes of the Director and Faculty of the School to all its graduates wherever they may be. Only news which has become available to us, and not previously published, is included below.

BIRTHS

Heartiest Congratulations to Parents and Long Life to the New-Come

Tanas Atallah '37, Droguerie T. Atallah and Co., Beirut, a daughter Leena, on July 27, 1952.

Bicharah Azzam '44, scientific representative of P.D. and Co. in Aleppo, a son Ramsi, on January 5, 1953.

Jamil Barghash '43, University Pharmacist, A.U.B., a daughter Rita, on July 4, 1952.

Krikor Juljulian '36, Juljulian's Pharmacy, Aleppo, a daughter Eugenie, on November 29, 1952.

Nurud-din Issa '43, Droguerie Khayyat, Aleppo, a son Samir, on October 22, 1952.

Maria Korabinska '48, Argentine, married and now has a daughter.

Ludmila Kregiel '47, (M.S., Phil. Coll. Pharm. and Sci.; Ph.D., Univ. Maryland), now Mrs. Frank Stass, Prof. at Xavier Univ. School of Pharmacy, New Orleans, La., a boy Francis Jan, on January 20, 1953.

Partig Partigian '50, pharmacist, Augusta Victoria Hospital and senior pharmacist, UNRWA, Jerusalem, Jordan, a son Krikor, on January 14, 1953.

Hrant Seraydarian '38, Mfg. Laboratory, Aleppo, a daughter Aida.

John Shakarjian '51, Aleppo College, a son Freddy, on November 30, 1952.

Edward Vorperian '44, School of Pharmacy, A.U.B., a son Vatche Jerry, on December 4, 1952.

ENGAGEMENTS

Sincerest good wishes, may wedding bells be near

Mamduh Abu-Laban '44, Pharmacy Abu-Laban, Idlib. Engaged.

Ramiz Afifi '47, chemistry teacher, Prep. School, A.U.B., to Miss Faouzié Nsouli, herself a pharmacy graduate from F.F.M.Ph.

Samih Afifi '52, Clinical Biochemical Laboratory, A.U.B., to Miss Samirah Husayni.

Fahd Farraj '50, Amman, to Miss Hind Succar.

Assadour Gulvartian '47, Pharmacie Ideale, Beirut, to Miss Sonia Chinchinian.

Amin Kamal Ismail '52, National Pharmacy, Jenin, Jordan, to Miss Jumana Sughayyar.

Joseph Kronfli '41, Kronfli's Pharmacy, Khartoum, to Miss Nelly Kronfli.

Samuel Manushakian '51, Manushakian's Parmacy, Aleppo, to Miss Kantarjian.

Karekin Sagherian '51, Pharmacie Sagherian, Beirut, to Miss Knar Merdjanian.

George Tarazi '49, New Sha'ab Pharmacy, Jerusalem. Engaged.

WEDDINGS

A full measure of happiness and a blessed home

Aft'm Acra '46, Clinical Biochemical Laboratory, A.U.B., to Miss Nadia Haddad, on August 30, 1952.

Hanna Araj '48, Beit Jala, Jordan. Married in August 1952.

Samih Darwazah '54, A.U.B., to Miss Samira Fadly on Oct. 19, 1952.

Garabed Demerjian '46, Pharmacie Louis, Aleppo, to Miss Annalee Shnorhokian, on December 27, 1952.

Julia Federowicz '48, qualified in Montreal, Canada, married in 1952.

Fouad Hamdan '47, Kuweit, to Miss Itaf Himadeh, in July 1952.

Theodore Hembekides Jr. '51, Pharmacie Hembekides, Beirut, to Miss Hilda Ekmekjian, on June 6, 1953.

Salamah Kayyali '51, Petra Pharmacy, Amman, to Miss Fadwa Kayyali, on August 28, 1952.

Subhi Khuri Nasr '51, Government Hospital, Kuweit, to Miss Nadia Habibi, summer 1952.

Aram Ojakian '35, Victory Pharmacy, San Francisco, to Miss Sofie Bedrossion, on November 23, 1952.

Fouad Stephan '32 (Dr. Pharm., Paris, '50), Dean, Royal College of Pharmacy, Baghdad, to Miss Olga Jahil, summer 1952. Special congratulations to Dr. Stephan on his new appointment.

MISCELLANEOUS NEWS

Daniel Abdulian '51, Univ. of Chicago, School of Medicine, is studying for his M.S. in pharmacology.

Tewfik Zard Abou-Jawdah '48, Jel-el-Deeb, Lebanon, runs his own pharmacy — Pharmacie El-Metn.

Mohammad Sadik Ali (Musuli) '38, Basrah, Iraq, is in charge of Maude Memorial Hospital Pharmacy and inspector of pharmacies in Basrah.

Abdel-Al Awad '52, Port-Said, Egypt, runs his new pharmacy.

Zuhayr Annab '48, Amman, Jordan, is chief chemist and bacteriologist for the Jordanian Army Central Hospital, grade lieutenant.

Atallah Atallah '26, Amman, Jordan, opened Atallah and Co. Pharmacy in Amman.

Goubran Atallah '52, Cairo, is director of Antikhana Pharmacy.

Yousef Badri '37, Omdurman, Sudan, is director of al-Ahfad High School for boys and three other preparatory schools. He worked previously for two years as hospital pharmacist with the Sudanese government.

Adib Bashshur '49, Homs, Syria, is working at the I.P.C.

Badi Batshon '51, Amman, is responsible chemist of Raghdan Pharmacy.

Fawzi Bicharah '33, New Delhi, is Medical Supply Officer, South East Asia Regional Office, W.H.O.

George Brussalian '45, Research Labs. of the Presbyterian Hospital, New York, is doing research work on the biochemistry of steroids and studying for his M.A. at Columbia Univ. He passed successfully the state-board examinations of New York State and works part-time in a retail pharmacy.

Abdul-Kadir Buhayri '50, Beirut, is pharmacist at the Tapline Hospital.

Marc Donikian '38, Beirut, Marc Laboratories, obtained the M.D. degree in June 1952, A.U.B.

Hanna Giacaman '42, Bethlehem, owns Bethlehem Pharmacy.

Mulhim Haddad '22, moved from Amman to Beirut where he now operates a drugstore.

Zaven Hadidian '38, Albany N. Y., passed the New York State-Board examination. He emigrated to the U.S.A. with his family last summer.

Alexander Hananiyya '44, Jerusalem, runs his own National Pharmacy, and teaches at Frères College.

Elias Hawwa '52, Beirut, is research assistant to Dr. George Fawwaz, Pharmacology Dept., A.U.B.

Theodore Hembekides Sr. '22, Beirut, is member of the executive committee of the Alumni Association.

Ghalib Hidayah '45, Cairo, is pharmacist in charge of the dispensary of «Mabarrat Mohammad Ali».

Riyad Sami Ikladius '38, Quina, Egypt, is owner of a pharmacy in Quina.

Edward Ishkhanian '50, Beirut, is manager of the pharmacy department of AMLEVCO—Beirut, representatives of Abbott Labs.

Fathi Jardanah '46, Amman, is owner of a new pharmacy.

Vahé Jebejian '38, Beirut, runs Hadidian's pharmacy.

Abdul-Rahman Kadri '49, Nablus, is proprietor of Kadri's Pharmacy.

Maurice Karam '52, Tripoli, Lebanon, Pharmacie Orientale.

Danuta Kazatel '47, London, is a branch manageress working with «London Cooperative Chemists».

Sarkis Kevorkian '51, Aleppo, Syria, runs Kendirji's Pharmacy.

Albert Krikorian '51, Beirut (Bourdj Hammoud), is owner of the newly opened Krikorian Pharmacy.

Mohammad Kurdi '52, Amman, teaches physics and chemistry at the Islamic College in Amman.

Antoine Masa'ad '52, Ramallah-Bireh, is owner of New Jaffa Pharmacy.

Hagop Mekhtchian '50, Jerusalem, works at Atallah Pharmacy, will soon own a dental depot in Amman.

Maria Michajlow '48, Toronto, Canada, qualified in 1952 and now works in a big pharmacy in Toronto.

Ibrahim Kasim Mukhayyar '37, Omdurman, Sudan, is owner and manager of the first pharmacy to be opened in Omdurman. He was a member of the Sudanese parliament. He is one of the most efficient social reformers who worked for the betterment of the health and sanitary schemes in his native town Omdurman.

Fahmi Nahhas '38, Amman, has a drugstore in Ramallah and a pharmacy in Bireh. He continues to be the agent of Bayer in the Jordan.

Elie Nuwaysir '52, Beirut, works at the Clinical Biochemical Laboratory, A.U.B.

Najib Salman '24, Khartoum, Sudan, is lecturer of pharmacology at Khartoum School of Medicine. He works at Khartoum Civil Hospital and is also director and teacher of Khartoum School of Dispensers. Najib is the oldest pharmacy Alumnus in Sudan where he has worked for the last 27 years.

Elias Shammas '47, Beirut, A.U.B., is research assistant to Dr. W. Adolph, on nutrition.

Musa Shirkawi '46, Basrah, Iraq, owns Shirkawi Pharmacy, Ashar-Basrah.

Wadi Shoucair '35, Khartoum, is owner of a pharmacy and drugstore and agent for Ciba, Abbott and B.D.H.

Yusef Sukhtyan '43, is owner of a pharmacy in Hijaz.

Ibrahim Tarazi '45, Zarka, Jordan, runs his own pharmacy.

Nubar Tepelian '52, Beirut, details for Lederle.

Ursula Zalot '48, is now Mrs. Juszko (since May 1951). She works as a dispenser in a polish pharmacy in London.

Judeh (Theodore) Zarzar '40, Bethlehem, is owner of Zarzar pharmacy and a member of the municipal council of Bethlehem.

* * *

The Pharmaceutical Society of the Eastern Part of the Jordan

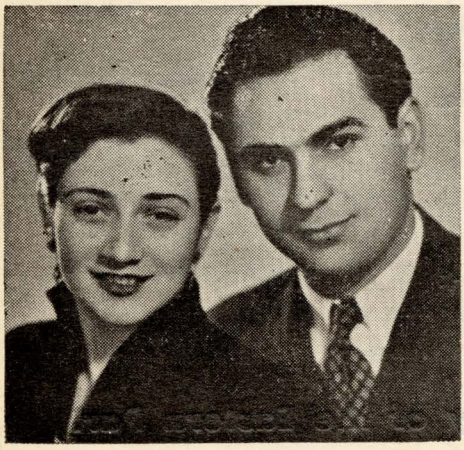
Ishak Halabi '50, President; Nizar Jardanah '48, Secretary; Rauf Salfity '50, member.

IN MEMORIAM

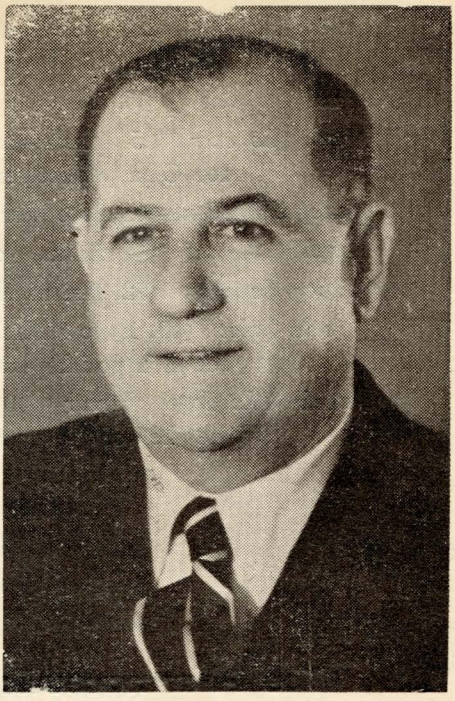
Dr. Moses Albert (Pharm. M. 1910) passed away on September 6, 1952, in Beirut.

Mr. Rashed R'shani (Pharm. M. 1919) passed away on January 23, 1953, in Beirut.

Summer News

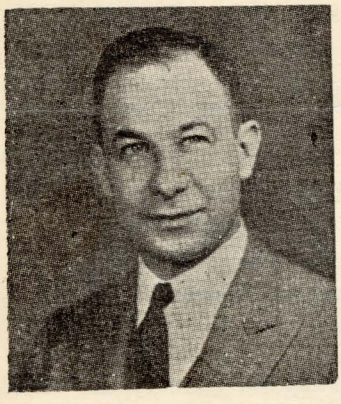


THEODORE HEMBEKIDES, Jr., B. A., Ph. C. '51, and his bride



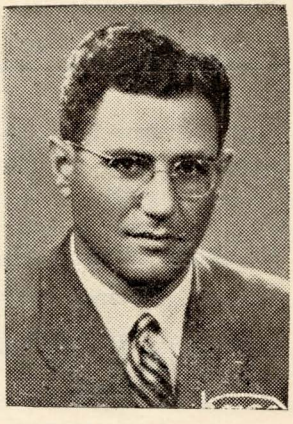
Dr. MUSA GHANTUS

Associate Dean of the Medical Faculty will be Acting Dean untill new Dean, Dr. Joseph Macdonald arrives next September. Dr. Ghantus was awarded recently the Lebanese Order of Education, First Class.



PROF. CHARLES ABOU-CHAAR

expects to attend the 15th meeting of the International Pharmaceutical Federation to be held in Paris during week of Sept. 13 to Sept. 22, 1953.



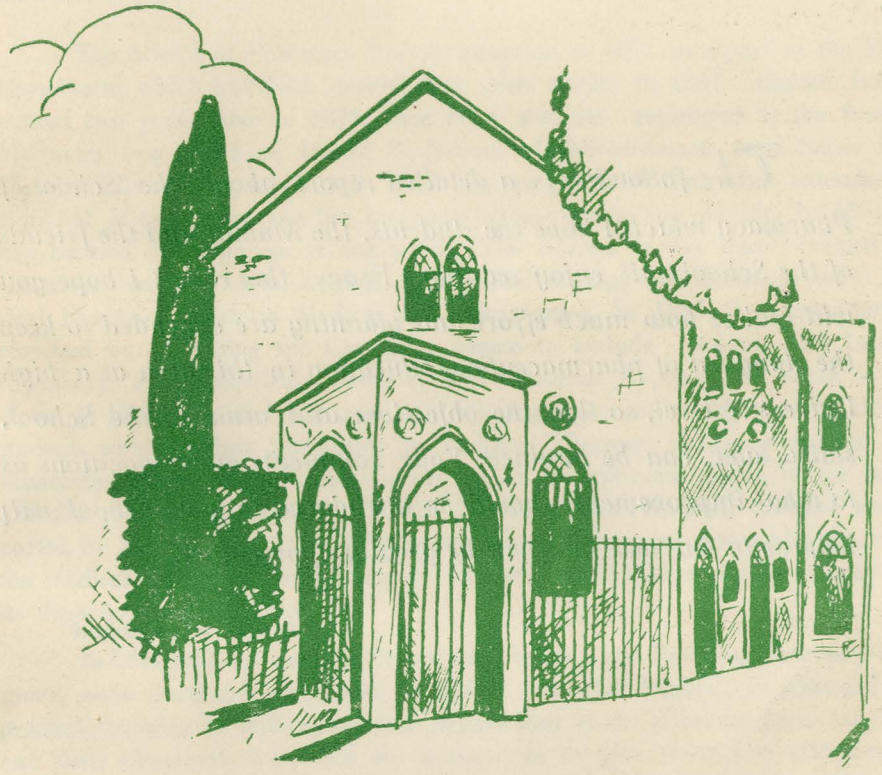
EDWARD VORPERIAN B. A., Ph. C. '44

will be spending the summer at College of Pharmacy, Ohio State University, to complete the requirements for the M. S. degree.

THE SCHOOL OF PHARMACY

American University of Beirut

Beirut, Lebanon



A Report by the Director

The following is a detailed report about the School of Pharmacy which I hope the students, the Alumni and the friends of the School will enjoy reading. From this report I hope you will realize how much effort and planning are expended to keep the standard of pharmaceutical education in this area at a high University level, so that the objectives and aims of the School, stated later, can be attained. Your comments and suggestions as to what improvements should be introduced to your School will help us in our task and will be greatly appreciated.

Amin F. Haddad

History

The School of Pharmacy had its inception in 1871 as a part of the Medical Department which had been opened four years earlier in 1867. Classes, however, started two years later in 1873 when three students registered in the first year Pharmacy two of whom, Daoud B. Nahoul of Deir-el-Kamar and Salim Hallag (B.A.) of Ba'aklin, graduated in 1875. The program of study thus extended over a period of two years and the language of instruction was Arabic. In 1881 English became the language of instruction. The courses taught were Chemistry and Chemical Analysis, Latin, English, Botany and Zoology (on alternate years), Practical Pharmacy, Materia Medica and Therapeutics. In 1883 the curriculum was enriched by expanding the Chemistry course to include Organic and Inorganic Chemistry, Pharmaceutical Chemistry and Chemical Analysis. A course in Principles of Pharmacy and a course in Toxicology were also added. Until 1892 the students received their instruction in Practical Pharmacy in the pharmacy of the Johanniter Hospital, under the supervision of the «pharmaceutist» of the hospital and the professor of Materia Medica. The Johanniter Hospital founded and supported by the Knights of the Johanniter Order of Germany was under the care of the medical faculty of the University. Students of Medicine did their practice in its departments and clinics.

In 1892 two new courses, Prescription writing and Practical Pharmacy Laboratory, were instituted. Beginning with that year the Seniors in Pharmacy had practical training in making official preparations in the pharmaceutical laboratory, and their classroom work was so arranged as to give them free afternoons for work in compounding and dispensing prescriptions in Beirut pharmacies which belonged to graduates of the School. In 1894 a practical course in Bacteriology was added to the curriculum. In 1896 Daoud F. Aftimus, a graduate of 1890, was the first pharmacy graduate to be appointed as Instructor of Pharmacy on the Medical Faculty. In 1898 practical experience became a requirement for graduation. Before admission to the final examination each student had to present a satisfactory certificate of having had not less than 6 months of practical experience in a pharmacy, three months of which must have been done during the long vacation. At the close of the course of pharmaceutical study, students who received the necessary certificates of attendance were also examined, and if they passed their examinations satisfactorily received a certificate which entitled them by Vi-

zierial Order, to appear before the Imperial Medical Faculty at Constantinople for examination for the degree of «Pharmaceutist», which gave them the right to practice their profession. The period 1900-1903 was significant in the history of the School of Pharmacy. The School was recognized as a separate unit of the Medical Division, Professor James E. Patch was appointed to the chair of Analytical and Pharmaceutical Chemistry, and the late Professor T.C. Ladakis who graduated in 1901 was appointed in October of the same year to teach the Theory and Practice of Pharmacy and Analytical Chemistry. During the same period a course of Business Methods was introduced. In 1903 Pharmaceutical Physics and First Aid were given for the first time to students of Pharmacy. In that year the Master of Pharmacy degree began to be awarded and its holders were required to pass the examination of the Imperial Commission (of the Imperial Medical School of Constantinople) held in Beirut, to obtain the license to practice pharmacy. Holders of this degree were allowed to practice pharmacy in Egypt without further examination. Another significant event took place in 1903. An adequately equipped model pharmacy was established in the Chemical Laboratory (The present Pharmacy building). The Pharmaceutical Laboratory was adjoining to the dispensing room, of the pharmacy. These two departments occupied the site of the present University Pharmacy and the present School of Pharmacy office.

During the academic year 1904-1905 the course of study was completely re-organized and became two years of study and one year of practical dispensing in an approved pharmacy. Practice of Pharmacy Laboratory and Dispensing were increased in connection with the College Pharmacy (the present University Pharmacy). The prescriptions of the College physician were prepared here. All the work was done by the senior students in sections under the immediate supervision of the Instructor of Pharmacy, who thus demonstrated and put into practice, the principles taught in the class room. Expansion in the course of study continued from year to year and newer courses were introduced as need arose in order to keep pace with advances in pharmaceutical education. In 1910 two post graduate courses were instituted, one leading to the degree of Doctor of Pharmacy which was discontinued in 1920 and the second leading to the certificate of Public Analyst which was discontinued in 1950.

1920-1921 was the beginning of a new period in the life of the Syrian Protestant College. On November 18, 1920 the Board of Regents of the University of the State of New York changed the name of the institution from S.P.C. to the American University of Beirut (A.U.B.). Expansion in all departments of the University was started including the School of Pharmacy. In 1920-1921 Dr. T.C. Ladakis became the principal of the School of Pharmacy and four years later its director and remained in this capacity and as Professor of Pharmacy until his retirement in 1941. In 1921 the curriculum of the School of Pharmacy was lengthened to a period of three years of academic study and one year of practical experience in an approved pharmacy. For admission to first year Pharmacy, completion of the Freshman class of the School of Arts and Sciences was required. The Phar. M. degree was last awarded to the graduates of 1922 and was replaced by

the newly adopted Pharmaceutical Chemist degree (Ph.C.) which was first awarded to the graduates of 1923.

In 1927 Dr. R.J. Pauly who had previously served as a staffite at the A.U.B. rejoined the University and was appointed first as adjunct professor of Pharmaceutical Chemistry and was later promoted to the rank of full professor. In 1942 he took over the direction of the School upon the retirement of Prof. T. C. Ladakis and remained in this capacity and as Professor of Pharmaceutical Chemistry until 1949. He and the late Prof. Ladakis laid the sound foundation of the School on which the present generation is building. Both have contributed tremendously to the development of pharmacy and pharmaceutical education in this part of the world.

In 1931 the School of Pharmacy occupied the whole of its present building which was previously shared with the Chemistry Department. In 1932 a full four-year course of studies and one year of practice was begun. The extension of the course of study permitted the enriching of the curriculum of the School with courses in Biodrug Assay, Drug Chemistry, History of Pharmacy, Library Practice, Jurisprudence and Pharmaceutical Ethics. In addition to this the older courses were expanded and their contents enriched with recent developments. The minimum standard for admission remained to be the completion of the Freshman year of the School of Arts and Sciences. In 1938, however, Lebanese students were required to have the Lebanese Baccalaureate or its equivalent before admission to first year Pharmacy. Similarly Syrian students were required to have the Syrian Baccalaureate or its equivalent. During the period between 1937-1941 the degree of Graduate in Pharmacy was granted to students from Palestine, Iraq and Jordan upon completion of three years of study and one year of practice. This degree was accepted by the government of these countries. It was discontinued after June 1941. In 1952 the English name of the degree was changed from Pharmaceutical Chemist to Bachelor of Science in Pharmacy — a university degree granted by colleges and schools of Pharmacy in England, the United States of America, Canada, Egypt, etc. With this change the admission standards were raised. Many certificates which previously admitted to first year Pharmacy now admit only to the prepharmacy Freshman class of the School of Arts and Sciences.

In 1933 the enrollment increased to almost double the number of students who registered in any one of the previous years and in 1934-1935 the School had the highest enrollment in its history (105 students). A student Pharmaceutical Society was started in 1933.

As with the majority of pharmacy schools connected with universities the basic science courses and the medical science courses taken by the Pharmacy students were and are still taught by professors in specialized fields from the faculties of the School of Arts and Sciences and of Medicine respectively. The list of names of the present University personnel teaching the students of pharmacy is given on the following pages. Among the names of the early teachers from other departments of the University who taught pharmacy students we may mention George

Post, Edwin Lewis, Walter B. Adams, Harris Graham, Alfred E. Day, Yakoub Sarruf, F.C. Wells, Edward F. Nickoley, Najib Ardati, William Van Dyck. Charles A. Webster who taught Pharmacy as far back as 1895 and James E. Patch, who was the first professor of Pharmaceutical Chemistry, are still living.

The School is also proud of its Alumni. Many were pioneers of the pharmacy profession in their mother countries. By June 1953 the total number of graduates amounted to 692 of which 22 are women. The majority of the graduates established their own private pharmacies and are honestly serving their communities. Others are working as, detail men for big drug companies, wholesale druggists, biochemical analysts, government inspectors of pharmacies, teachers of science in secondary schools, teachers in other schools of Pharmacy, control chemists in petroleum refineries, hospital pharmacists, etc.

The tracing of the history of the School of Pharmacy is a true picture of the development of western pharmaceutical education in the Middle East, adapted to meet the needs of the countries of this area. It can be clearly seen that the progress and the development of the contents of the curriculum and the duration of the period of study took a natural and normal course thus keeping pace with the progress made in the pharmaceutical, medical and chemical sciences. The present status of the curriculum, admission requirements etc. are given on the following pages.

Objectives

The objectives of the School of Pharmacy are far from being only to teach students factual knowledge which prepares them to pass licensing examinations set up by governments or to help them fill the ordinary day's prescriptions. These are important by themselves, but the goal of pharmaceutical education is much broader and the objectives are much wider. The School of Pharmacy aims at training the pharmacist to become a truly educated professional man and a useful citizen to his community and to his country. The objectives of the School of Pharmacy can not be expressed in better terms than those mentioned in President Penrose's foreword to the A.U.B. catalogue in which the aims of the American University of Beirut, as a whole, are stated:

«The American University of Beirut has many activities with but one purpose, that of educating men and women for creative, responsible lives in their own communities.

This education is essentially a training in true scholarship, a training which inspires men to think freely, to value truth in all phases of human experience, and to live by principle rather than by expediency.

Such scholarship is the foundation of the professional training of the University which aims to produce physicians and nurses, pharmacists and teachers, engineers and businessmen who are competent in their fields, leaders who will

inspire and increase respect for their professions, and citizens who will be devoted servants of the public welfare.

The strategic location of the American University in Beirut, the meeting place of western and Near Eastern civilizations, creates an opportunity and responsibility for integrating the positive values of both civilizations and for analyzing and nullifying the negative values. The University aims to produce in each student the perception and the objectivity which will enable him to create a worthy personal synthesis for today and the future.

The University believes that these aims cannot be realized by attendance at classes alone. It defines its educational role in broader terms. Close relationship between the professors and the students creates both a sense of personal and intellectual honesty and a breadth of learning and interest. Student activities outside the classroom are encouraged because they inspire the same values and give the students responsibility for the management of their own affairs as well as opportunities for the cultivation of personal reslationships and individual talents which cannot be classed as «academic» in the traditional meaning of the word.

The American University of Beirut is American both in its democratic spirit and in its educational philosophy. However, it builds on the foundation laid by the educational systems of the national governments of the Near East. It makes every effort to harmonize the values of these governmental systems with the values which have been derived from American experience, avoiding both absorption in any national educational system and an attitude of indifference toward them.

In many regards, both in its educational philosophy and in its student body, the American University is as cosmopolitan as any university in the world. As such it has an opportunity to serve young people from a tremendous population scattered over a wide area. In this service the University hopes to measure up to its motto: *That they may have life and have it more abundantly.*»

Courses of Study

The School of Pharmacy offers a four year course leading to the degree of Bachelor of Science in Pharmacy which must be taken in conjunction with (beginning 1953) nine months of practical experience in an approved pharmacy in addition to that which is given in the dispensing laboratories of the School. This program of study meets the requirements of the Board of Regents of the State of New York where the University is incorporated and qualifies for the licensing examinations of the various Near Eastern countries. In planning its curriculum the School of Pharmacy aims at giving the student a thorough professional training as well as a basic scientific education which will develop in him the ability: to prepare, preserve, standardize, test and dispense substances used in medical practice; to use properly the Pharmacopoeias recognized in the Middle Eastern countries and other well known reference works on drugs; to cooperate

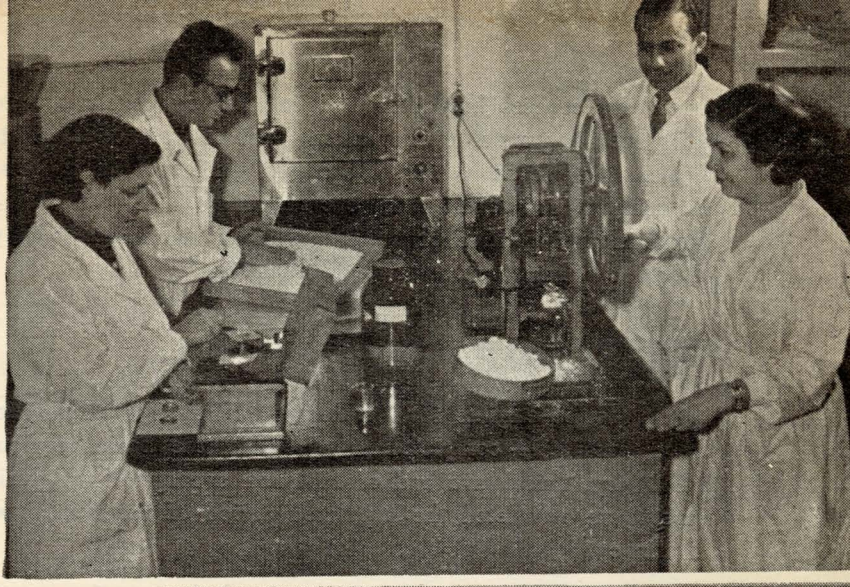
with members of the other health professions in preserving the health and prosperity of his community; to furnish accurate and scientific information to physicians and members of the other health professions concerning drugs and their action; to win, and deservedly to keep public confidence and respect for his profession; to practice his profession in accordance with the generally accepted codes of ethics; and to assume the responsibilities of citizenship befitting professional men; to aid the government in the control of habit forming drugs and the enforcement of all laws for public welfare; to contribute to the profession by participating in the activities of pharmaceutical and medical organizations in his locality; to keep abreast with the advances in the pharmaceutical and allied sciences so that he retains for his profession its respectable position among the health professions; and to provide the student with an adequate foundation for graduate work in the various subjects of the curriculum at European and American Universities. These aims are accomplished in the classroom, in the laboratory, and by student-teacher personal contacts in class and through extracurricular activities.

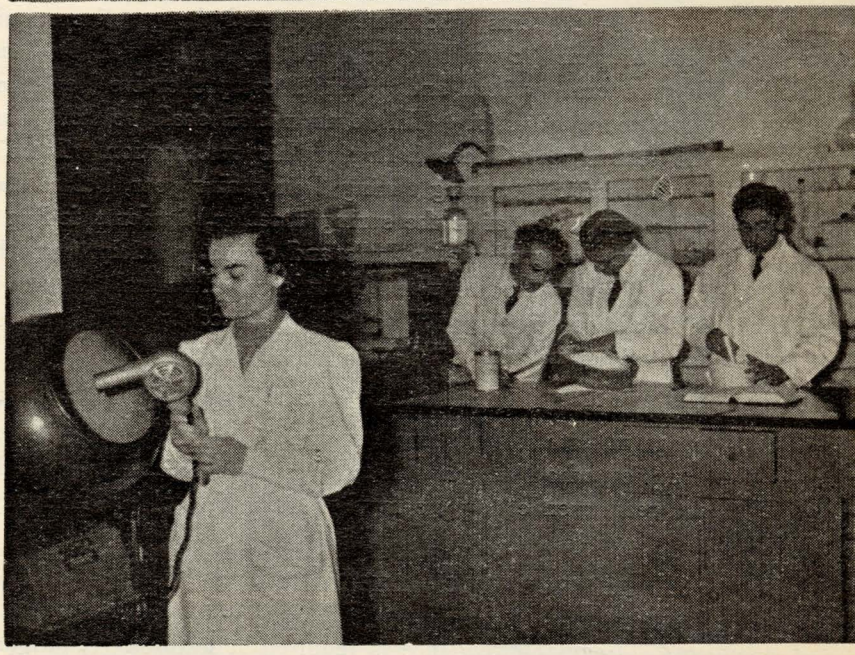
Admission

To be eligible for admission a student must be at least 17 years old, must have completed the legal prepharmacy educational requirement of his country and must have completed the science program of the Freshman class of the School of Arts and Sciences at A.U.B. or its equivalent. The courses studied in the Freshman science program are: Arab Culture and Philosophy (6 cr. hrs.), English Communication Skills (6 cr. hrs), General Chemistry (8 cr. hrs.), General Physics (9 cr. hrs), and Mathematics (8 cr. hrs.). To gain admission to first year Pharmacy a student must have passed in all these courses and attained a minimum grade average of 70 in at least 12 credit hours including either Chemistry, Physics or Mathematics. Students intending to take the Lebanese licensing examination are required either to submit a Lebanese Baccalaureate Part II or to complete the Sophomore class of the School of Arts and Sciences before admission to first year Pharmacy. Similarly, students preparing for the Syrian licensing examination must submit a Syrian Unified Baccalaureate, a Syrian Baccalaureate Part II, or a legally equivalent certificate before admission to the first year class.

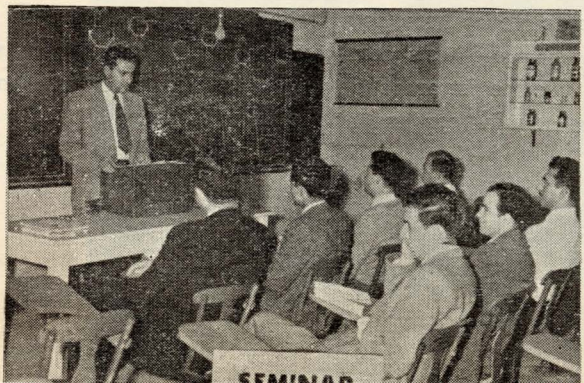
Grades and Promotion

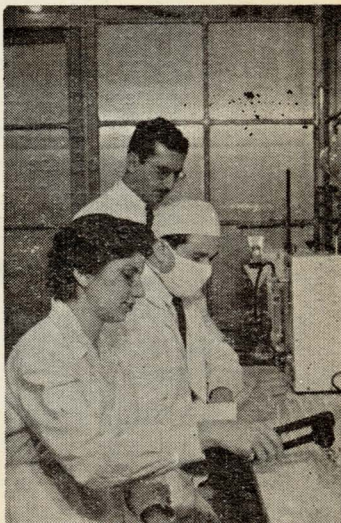
The passing grade for the first and second years is 60, and 70 for the third and fourth years. For promotion to the next higher class the student must have passed all his courses and must have received a minimum average of 65, if completing the first and second years, or 75, if completing the third and fourth years. A student failing one course may be allowed to take a make up examination after the summer vacation in October, provided his reported grade was not more than ten points below the minimum passing grade for his class and provided his general average was not below the minimum required for promotion. A student passing





PHARMACY IV





in all his courses but with an unsatisfactory general average will be required to pass special general examinations before promotion or to repeat the year. No student may repeat a class more than once and if he fails to meet promotion or graduation standards after repeating a year he will be requested to withdraw. Students failing three or more courses in any semester may be dropped from the School of Pharmacy.

Requirements for Graduation

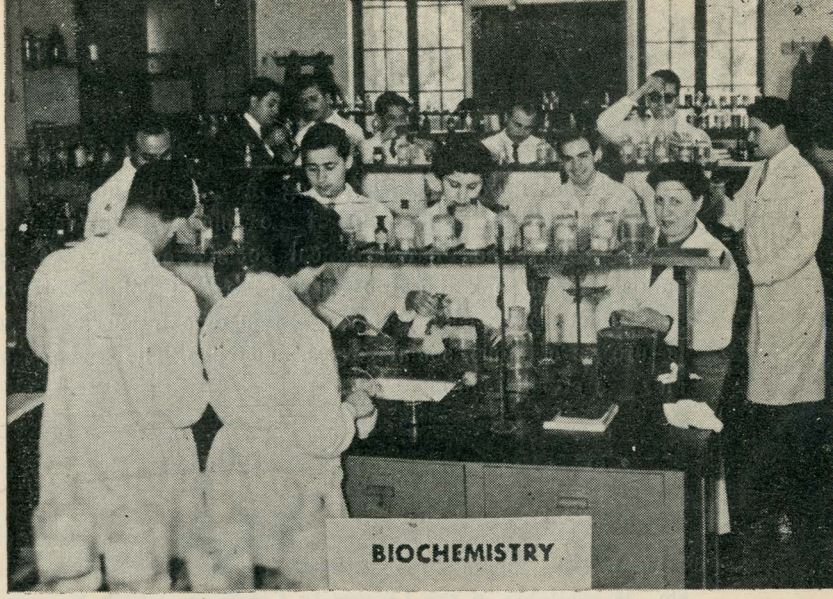
To be eligible for the degree of Bachelor of Science in Pharmacy, a student must have completed satisfactorily the basic curriculum of the School of Pharmacy, must have had a minimum average of 75 during his final year, and must have completed the stipulated period of practical experience in an approved pharmacy.

All students who have completed the practice requirements and the third year of pharmacy will be required, beginning with the class graduating in 1954, to pass oral, written and practical comprehensive examinations on Theory and Practice of Pharmacy. This examination shall be held during the first week of the senior year. Those failing in this examination will be required to take additional practical training during their senior year, before they are allowed a make-up examination after the spring vacation. Students failing this make-up examination can not graduate in June and cannot participate in the commencement exercises. They will be required to undergo additional training in Theory and Practice of Pharmacy for a period to be determined by the Faculty, before they can appear for re-examination.

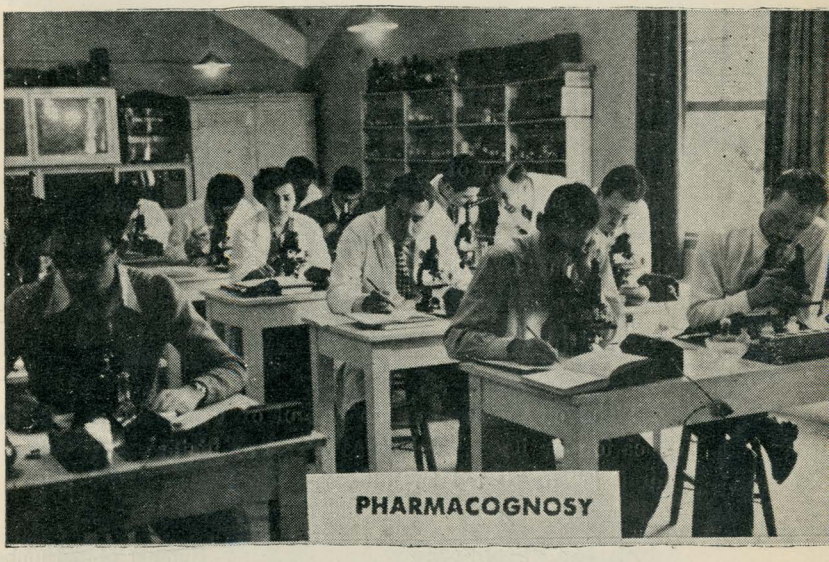
The degree is granted with distinction to students who have completed the program with a minimum average of 85, who have incurred no academic delinquencies, who have completed three years in residence at the University, and who are recommended by the faculty of the School of Pharmacy.

Attendance and Examinations

Regular attendance is required at lectures, recitations, and laboratories. The School year is divided into two terms, sixteen weeks each, excluding vacations. It begins about the middle of October and ends about the end of June. Two major written examinations are given each year, one at mid-year and the other at the end of the academic year. Apart from these examinations, the teachers having charge of the respective courses hold tests at weekly or monthly intervals, to determine proficiency. These tests constitute a part of the student's rating reported to the Registrar. The Registrar reports these grades to the student and to his parents or guardians at mid-year and at the end of the year.



BIOCHEMISTRY



PHARMACOGNOSY

Student Activities

In addition to participating in general University intellectual, social and athletic activities, the students of the School of Pharmacy have their own professional Society, the Pharmaceutical Society, and in co-operation with the faculty, publish a yearbook the *Apothecary*, the first volume of which appeared in 1946. The Society plans each year a program of extracurricular activities in the form of lectures, excursions, social parties, and balls. The students also have their foot-ball and basket-ball teams.

Catalogue

More detailed information and information regarding preliminary registration, fees, scholarships, general University regulations, description of courses, etc., is available in the University Catalogue which is supplied free upon demand from the Registrar.

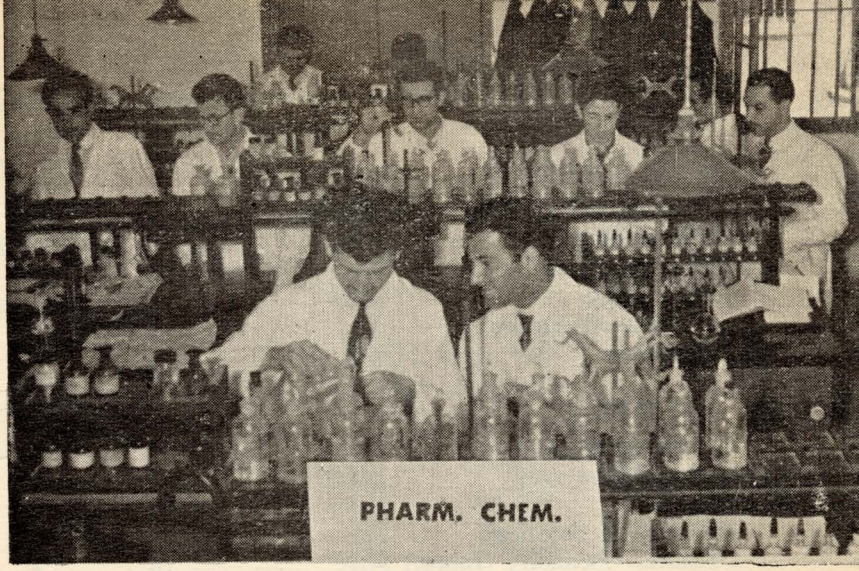
Practice Certificates

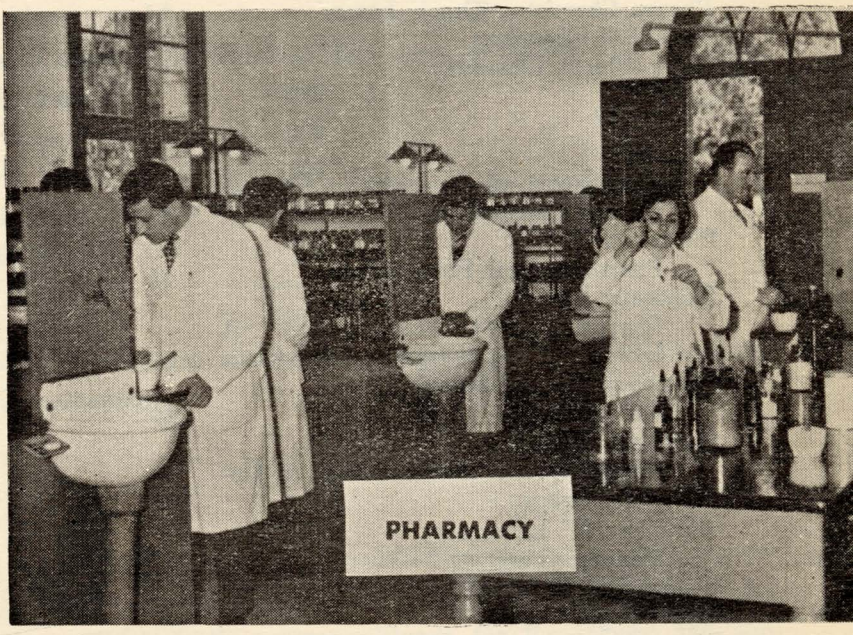
Certificates of summer practice and books are to be presented by all pharmacy students at the time of registration. Students who do not present certificates of practice and books at the time of registration will not be given credit for practice for that summer.

Curriculum

The curriculum of the School of Pharmacy is based on one year of College education or its equivalent as a pre-requisite. Analysis of the curriculum shows that it is constituted as follows:

Admission Requirement	Number of weeks	Number of didactic hrs. per week	Laboratory hrs. per week	Class
One year of College including the following courses or their equivalents:				
Arab Culture and Philosophy	32	3	-	Pre-Pharm.
English Communication Skills	32	3	-	»
General Chemistry	32	3	2	»
General Physics	32	3	2	»
Mathematics	32	4	-	»
Curriculum				
Biological Sciences				
General Biology (Zoology-Botany)	32	2	3	I
Pharmaceutical Botany	16	3	-	II


PHARM. CHEM.


PHARMACY

	Number of weeks	Number of didactic hrs. per week	Laboratory hrs. per week	Class
Pharmaceutical Botany (Taxonomy)	16	1	2	II
Microbiology	16	3	3	II
Pharmacognosy	32	3	6	III
Physiology	16	3	3	III
Pharmacodynamics	16	3	3	IV
Pesticides	16	1	-	IV
Chemistry				
Qualitative	16	2	6	I
Quantitative	16	2	6	I
Organic	32	3	4	II
Theory of Solutions	32	2	-	I
Pharm. Chemistry (Inorg.)	16	4	6	III
Pharm. Chemistry (Org.)	16	4	6	III
Biological Chemistry	16	6	6	IV
Drug (Plant) Chemistry	16	3	6	IV
Pharmacy				
Pharmacy I Pharmaceutical Processes — Principles and Calculations	32	3	2	I
Pharmacy II Pharmaceutical Preparations	32	3	3	II
Pharmacy III Pharmacy and Pharmacology of Inorg. and Metal-Organic Compounds	32	2	-	III
Pharmacy III Laboratory Laboratory	32	-	3	III
Pharmacy IV Pharmacy and Pharmacology of Organic Drugs	32	4	-	IV
Pharmacy IV Laboratory Manufacturing	32	-	3	IV
History of Pharmacy	16	1	-	IV
Dispensing I	32	-	2	I
Dispensing II	32	-	2	II
Seminar	32	1	-	IV
Jurisprudence and Ethics	16	1	-	IV
Miscellaneous				
Library Practice	16	1	-	III
Public Health	16	2	-	III
Psychology	16	3	-	I
Sociology	16	3	-	I
First Aid (beginning Oct. 1954)	16	1	-	IV
Business Methods	32	3	-	IV

Total Number of Didactic and Laboratory hours

Admission Requirements	Didactic hrs. per year	Laboratory hrs. per year	Total
Arab Culture and Philosophy	96	-	96
English	96	-	96
Physics and Mathematics	224	64	288
Chemistry	96	64	160
	512	128	640
Professional Years			
Biological Sciences	384	464	848
Chemistry	496	704	1200
Pharmacy	448	480	928
Miscellaneous	256	-	256
Total	~~2906~~ 2096	1776	3872

This number of hours is divided over the classes as follows:

Prepharmacy	640
First Year	800
Second Year	768
Third Year	880
Fourth Year	784
	3872

In addition to the above, nine months of practice in an approved pharmacy are required before graduation.

Library

In addition to the 625 volumes of pharmaceutical books available in the teachers' offices, the faculty and students of the School of Pharmacy also make use of Medical Library which is the common library for the faculty and students of the Schools of Medicine, Pharmacy and Nursing. It is located in the Medical Science Building close to the Pharmacy Building. It has 21,500 volumes of books and bound journals and subscribes to 293 current medical journals in English, French, German and Arabic, including 15 Pharmacy journals. The Medical Library is also equipped with a most up-to-date microfilm machine. The main University Library (Nami Jafet Memorial Library) which is located in a most modern library building about 200 meters away from the School of Pharmacy, is also available for use by the faculty and students of the School of Pharmacy. It has some 80,000 volumes on various subjects.

Faculty

Administration

Bayard Dodge, D.D., L.L.D., *President Emeritus of the University*
Stephen B.L. Penrose, Ph.D., L.L.D. *President of the University*
Costi Kayser Zurayk, Ph.D., *Vice President of the University*
Archie Stuart Crawford, M.A., *Vice President and Treasurer of the University*
Fuad Sarruf, B.A., *Vice President of the University*
Norman B. Nelson, M.D., *Dean of the Medical Division*
Musa Ghantus M.D., *Associate Dean of the Medical Division*
Amin F. Haddad, Ph.C., M.S., *Director of the School of Pharmacy*
Farid Amin Fuleihan, B.B.A., *Registrar of the University*

Teaching Personnel

From the School of Pharmacy

	Name	Courses taught	Class
1.	Amin Farid Haddad, Ph.C., M.S.	Jurisprudence and Ethics	Pharm. IV
		Pharmacy IV	Pharm. IV
		Seminar	Pharm. IV
		Pharmacy II	Pharm. II
		Pharmacy I	Pharm. I
2.	Charles Abou-Chaar, Ph.C., M.S. (Abu-Shar)	Drug Chemistry	Pharm. IV
		History of Pharmacy	Pharm. IV
		Pesticides	Pharm. IV
		Seminar	Pharm. IV
		Pharmacognosy	Pharm. III
		Pharmaceutical Botany	Pharm. II
3.	Edward Vorperian, B.A. Ph.C.	Inorganic Pharm. Chem.	Pharm. III
		Organic Pharm. Chem.	Pharm. III
		Theory of Solutions	Pharm. I
4.	Levon Karamanukian, B.A., Ph.C.	Drug Chemistry Lab.	Pharm. IV
		Pharmacy III	Pharm. III
		Qualitative Chemistry	Pharm. I
		Quantitative Chemistry	Pharm. I
5.	Uthman Kanafani, Ph.C.	Pharmacy IV Lab.	Pharm. IV
		Pharmacy III Lab.	Pharm. III
		Pharmacy II Lab.	Pharm. II
		Pharmacy I Lab.	Pharm. I
		Drug Chemistry Lab.	Pharm. IV

From the School of Medicine

6.	Stanley E. Kerr, Ph.D.	Biological Chemistry	Pharm. IV
7.	Zeken Shakhashir M.S., M.D.	Public Health	Pharm. IV

8. Munir As'ad Kan'an, M.D.	Pharmacodynamics	Pharm. IV
9. Joseph Dabbas, M.D.	Physiology	Pharm. III
10. Hanna B. Doany, Ph.C.	Microbiology	Pharm. III
11. George Abu-Haydar, B.A., M.A.	Biological Chemistry Lab.	Pharm. IV
12. Nicholas D. Constan, Ph.M., D.Sc.	Organic Chemistry	Pharm. II
13. C. Issidorides, Ph.D.	Organic Chemistry	Pharm. II
14. John I. Mirhij, Ph.D.	Biology	Pharm. I
15. Levon H. Melikian, M.A.	Psychology	Pharm. I
16. Levon G. Babikian, B.A., M.A.	Biology	Pharm. I
17. G. Hirabayashi, Ph.D.	Sociology	Pharm. I
18. Mufid Abu Khadra, B.B.A.	Business Methods	Pharm. IV
19. Mrs. L. Giacci, Ph.D.	Biology Lab.	Pharm. I
20. Richard Sabbagh, B.A.	Biology Lab.	Pharm. I

Physical Plant

The Pharmaceutical courses are taught in the Pharmacy Building. On the first floor of the building are the office of the Director, the laboratories for Pharmaceutical Chemistry, Practical Pharmacy, Manufacturing Pharmacy, the Ampul Manufacturing Room, and the completely equipped modern University Pharmacy. On the second floor are lecture rooms, teachers' offices, a laboratory for pharmacognosy, and a reading room for students. The biological science courses, the chemistry courses and the medical courses are taught in the Biology Department, Chemistry Building, Medical Science Building and the Bacteriology Building.

University Pharmacy

The University Pharmacy is affiliated with the School of Pharmacy. It has its separate staff and is directed by the Director of the School. The staff is composed of a full time University Pharmacist, a part time Assistant University Pharmacist, a full time technician, a full time assistant technician, a part time bookkeeper and two orderlies. Its main function is to supply medicines and drugs to the University Hospital, University Infirmary, Out Patient Department and other departments of the University. In previous years when the classes of the School of Pharmacy were small, students were allowed to do dispensing in the University Pharmacy under the supervision of the University Pharmacist. Because of the larger classes at present this arrangement has been discontinued and the students get practical dispensing experience in the Dispensing Laboratory. This is in addition to the practical experience the students acquire during their practice in an approved pharmacy. Some Pharmacy students receive their practical experience in the University Pharmacy. A detailed description of the functions of the University Pharmacy was published in the *Apothecary* 1950.

CORRIGENDA

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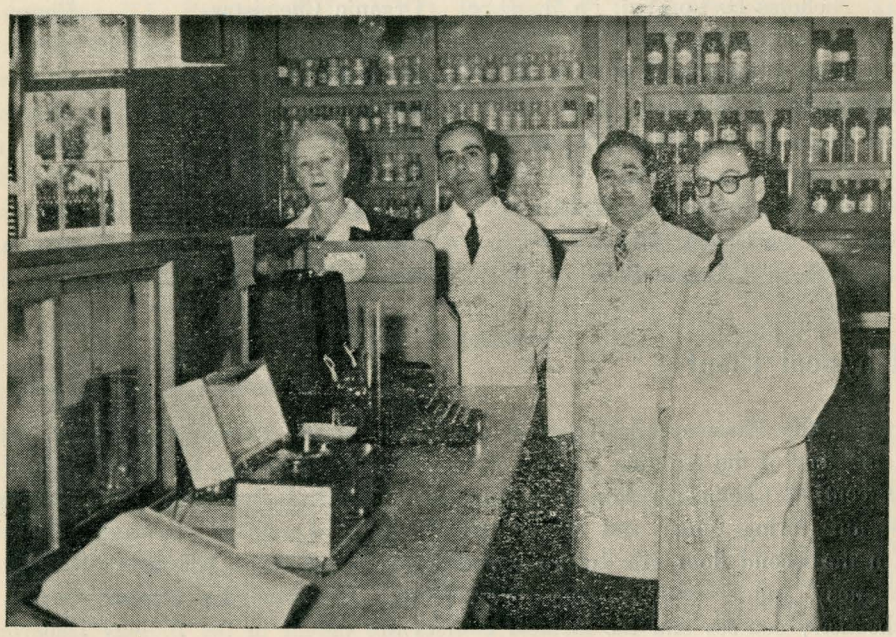
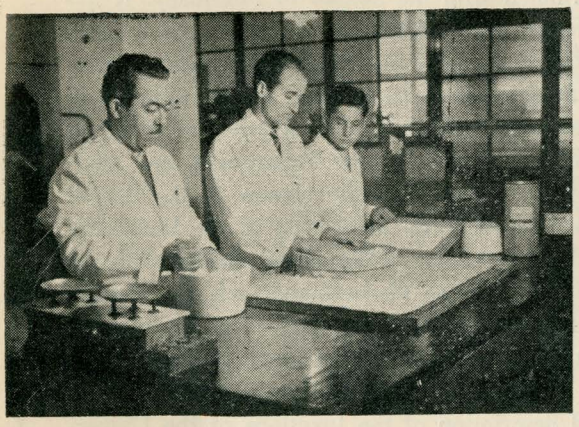
From the School of Arts & Sciences

The University Pharmacy



AT THE PRESCRIPTION COUNTER

standing from l. to r. : Mrs. Seraphine Sivinsky (secy.), Jamil Barghash Ph. C. (pharmacist), John Adil (technician), Hagop Derghazarian B. A., Ph. C. (asst. pharmacist)



TABLET PREPARATION FOR THE UNIVERSITY HOSPITAL

from l. to r. : Butrus Musa, Hani Sha'ar, François Nahhas

DRUG BASKETS READY FOR DELIVERY TO WARDS

from l. to r. : Maroun Costantin, Ahmad Zantut

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