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THE PHARMACEUTICAL SOCIETY OF GHANA'S

32ND CONFERENCE AND EXHIBITION, 1973

IS SCHEDULED TO TAKE PLACE IN ACCRA

AUGUST 2—6, 1973

THE THEME OF THE CONFERENCE IS

"PHARMACY AND NATIONAL DEVELOPMENT"

Further details will be issued by the

National Secretariat soon.

KEEP THE DATES OPEN!!

P. O. Box 2133.
Accra.

HON. GENERAL SECRETARY

FOREWORD

It is my singular pleasure to have been offered the opportunity of writing a foreword to the maiden issue of the Ghana Pharmaceutical Journal and, I do so on behalf of the entire body of practising pharmacists in this country.

When the Pharmaceutical Society was formed from the Chemists Defence Association in 1935, a great need was felt for a journal or at least a Newsletter to keep members in the outstations informed of what was going on in Accra and to bring together those in the public and private services for a united front to fight the disabilities under which we were working.

This country was then under British rule and there were no privileges nor special facilities for the blackman. Membership of the Pharmaceutical Society was very small and the cost of publishing a Paper, even at long intervals, was very prohibitive. However, what was supposed to be the beginning of a regular information medium, the Handbook was published in October, 1936; but alas, that first issue was also the last. Efforts were subsequently made to find another one but for one reason or another these have also remained mere dreams.

Today the memory of these failures and the eventual realisation of the project gives me a feeling which I cannot adequately express in human language.

The possession of a medium through which information, ideas and views can be conveyed and a healthy public relations be built up has been very crucial to success all down the ages in all human affairs. And, this is even more so in an era like this when there is so much proliferation of new fundamental knowledge and ordinary information waiting to be spread around instantly. In an age when you need to project your public image by your performance and to convince society to pay attention to you, the need for an outlet like this Journal is much greater than ever before.

Members of the pharmaceutical profession have a colourful and romantic past and to belong to such a calling is a priceless heritage. As the oldest professional body in this country I urge you to share your experiences with the newer associations and to utilize the pages of the Journal to give increasing and quality service to your fellow men for "WE ARE FRIENDS OF THE HUMAN RACE".

S.K. Ollennu,
Labadi, Accra

EDITORIAL

The appearance of the Ghana Pharmaceutical Journal in May, 1973 constitutes an important landmark in the annals of Pharmacy in this country, and in as much as journals, newsletters, and house organs form vital equipment of professional and other associations the acquisition of this journal by the Pharmaceutical Society of Ghana can be recorded as a distinctive success story.

To the journals of the other health professions we proudly announce our debut and we pledge to them our support and cooperation for the furtherance of better health in the Nation.

In a world of ever increasing magnitude and complexity of health needs, it requires a constant review of the concepts and grounds of our actions in order to be within step of the times. The mortar and pestle days are fleeting past us and the whole craft of the rewarding days of SECUNDEM ARTEM are no more; at least not in the form they were practised with joyful results. In their places have emerged in very rapid succession, very new needs and, therefore, equally new practice patterns. The rapidity of technological requirements made necessary by scientific advancement, finance capital demands as a prerequisite of a cash economy culture, and a total re-orientation of our life styles, have made such demands on our intellectual and financial resources that a great many of us are left looking back with nostalgia in utter disequilibrium and confusion. It is in such a situation of flux that we of this journal have found ourselves upon our birth. The changes in our occupational situations will necessarily require a redefinition of our professional roles and, in certain cases provide innovations to our goals relevant to our training, qualifications, and competence.

Published by the Pharmaceutical Society of Ghana as its official organ, the journal shall be the voice of Pharmacy and Pharmacists. It shall promote and advance the profession of pharmacy by the dissemination of scientific and cultural knowledge among its members. The build-up of scientific information during the past twenty years or more is so tremendous that without a calculated effort to sift and collect the relevant from the bulk of scientific knowledge for needs of society there will be dissipation of energy. Culture too, has undergone changes but a gradual transition from the folksy to the modern should be watched so as not to throw away much that is beautiful and sublime.

It will be our constant duty to remind our members of their obligation to the public, especially to those who are placed in positions for public service.

By means of this Journal we shall generate an awareness of professional responsibility and self-respect and to stand guard over the maintenance of standards.

We feel that a sound fellowship and goodwill should be fostered amongst all components of the healthcare team for the ultimate good of medical care recipients. To this end we shall encourage members of our profession to always adopt a wholesome and cooperative attitude towards members of the other healthcare professions.

The needs of the new man in pharmacy must also be identified so as to create an avenue for him to exercise his academic faculties in solving the myriad problems of science, technology and industry. We shall involve ourselves in the search for this role.

Under the stresses and pressures of modern living, much that enhances prestige and value, is invariably substituted for material gains, thus reducing life to a mere mechanical existence. We hope to be able to arrest this tendency by virtually prescribing directions in which the public posture of Pharmacy might be improved and maintained.

Above all, we shall address ourselves seriously to our relations with the Government, education, industry and ethical pharmaceutical practice generally; in fact, in any direction where our welfare and interests are affected.

THE PHARMACEUTICAL SOCIETY OF GHANA

The Pharmaceutical Society of Ghana is a Society of Pharmacists registered in Ghana. It was founded in 1935 and has superceded the Gold Coast Pharmacists' and Druggists' Union and the Chemists' Defence Association which had existed in a small way since 1929.

It was constituted by the Governor's Licence dated July 31, 1936
issued by His Excellency Sir Arnold Wienholt Hodson, Governor and Commander-in-Chief of the Gold Coast. The Certificate of Incorporation of the Supreme Court was issued by the Registrar of Companies on September 2, 1936, as a Company limited by guarantee without the addition of the word "LIMITED" to its name.

The Society was admitted into membership of the Federation Internationale Pharmaceutique and the Commonwealth Pharmaceutical Association in 1960 and 1969 respectively.
The objects are:

1. To promote the cause of the Science, Art and Profession of Pharmacy.
2. To participate in matters of interest to the profession of Pharmacy, allied and related subjects and to co-ordinate with the Government of Ghana in all matters relating to the control and advancement of the practice of Pharmacy.
3. To promote cordial relations and unity between the Pharmaceutical, Medical and allied professions in Ghana.
4. To maintain the honour and high ethical standards at all levels of the profession and to support a high professional conduct.
5. To establish a library for the use of its members and maintain an interchange of ideas between its members and members of the allied professions for the fulfilment of the high ideals of raising the standard of health of the community in consonance with its motto: "Amicus Humani Generis".
6. To do all such other things as are incidental or conducive to the attainment of the above objectives.

The management of the affairs of the Society is vested in a National Council with its headquarters in Accra. There are also Branches of the Society in the Regions and the affairs of the Regional Branches are looked after by the respective Branch Executive Committees under the direction of the National Council.

The composition of the current **National Council** is as follows:

V.K. Aidoo, MPSG, M.I. Pharm., M. (President)*

K. Sarpong, B. Pharm., Ph.D., MPSG, (Vice President)*

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S.S. Okunor, L.L.B., MPSG (Nominee, Commissioner for Health

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HOSPITAL PHARMACY IN GHANA

By E. Osei-Tutu, Dip. Pharm., M.I. Pharm. M., M.P.S.G.

Principal Pharmacists, Korle-Bu Teaching Hospital, Accra

The load of work in our hospital pharmacies is so heavy that the existing ones seem to be inadequate, poorly planned and some badly located. One has to visit for example a modern hospital like Komfo Anokye Hospital in Kumasi to see how ill patients have to struggle along a narrow corridor to reach the despatching window of the pharmacy for their drugs. In locating pharmacies for hospitals, the pharmacist should advise the architect on functional planning.

Organization of pharmaceutical service within the Government Hospital

The Pharmacist in charge of the Pharmacy Department of the hospital, as other professional departmental heads within the hospital, shall be directly responsible to the Administrator in charge of the hospital. The pharmacist in charge shall initiate and develop rules and regulations pertaining to the administrative policies of the department.

Pharmacy and Therapeutics Committee

For a Pharmacy Department in a hospital to run successfully and efficiently, there must be a committee called the "Pharmacy and Therapeutics Committee" as existing in the Korle-Bu Teaching Hospital. The members of this committee are chosen from the several divisions of the medical staff of the hospital and the head of the pharmacy department is a member and secretary to the committee.

Purpose:

This committee serves as an advisory group to recommend therapeutically effective drugs and preparations for use in the hospital, and as basic supply in the pharmacy. In order to accomplish this purpose and to best serve the needs of the patient and the hospital, the committee functions as follows:- I. Prepares and keeps up-to-date a hospital formulary, containing selected therapeutically effecitve drugs. This formulary serves (a) as an aid in teaching medical students and student nurses and (b) as a standard for prescribing drugs to both in/and out-patients. 2. Evaluates clinical data concerning drugs requested for inclusion in the hospital formulary. Depending on the available data the committee may add to or delete drugs from the formulary.

The Hospital Formulary

The formulary indicates to the pharmacy staff, medical staff and nursing staff of the hospital the drugs that are stocked in the pharmacy with —

(a) Composition

(b) Strength

(c) Dose

(d) Manner of administration, etc.

Drugs listed in the hospital formulary are listed by the official title or generic name .All proprietary titles of formulary drugs are therefore synonymous titles for these official preparations. The hospital pharmacy is given permission by the Pharmacy and Therapeutics Committee to dispense the official preparation under the official title whenever a staff member prescribes by the synonymous title.

Once a formulary system has been put into operation the duplication of drugs is eliminated and therefore cost reduced. Forkner in an article entitled "Drug Mixtures" said "Today many thousands of useless drugs and vitamin preparations exist; thousands being duplicated under misleading names. Exploitation of the public by the existence of such a situation constitutes an important item in the high cost of medical care. Who is going to devise a remedy for this insidious disease?". This disease can only be eradicated in hospitals by the Pharmacy and Therapeutics Committee working through the specificity of a Hospital Formulary system.

High Cost of Drugs: It is recommended that the Hospital Formulary system should be used in all Government Hospitals in the Country. This formulary system operates in most hospitals in the United States, Britain and Canada. The intention is to avoid duplication of drugs and bring down the cost of medication. It is worthy of note that most drugs marketted in their official or generic names are cheaper than their proprietary equivalents.

Pharmacy Administration: The hospital pharmacist combines both the professional and administrative aspects of his work during his daily routine duties. Adequate pharmaceutical and administrative facilities shall therefore be provided including the following:

(a) the necessary equipment for the compounding, dispensing and manufacture of pharmaceuticals and parenteral preparations.

(b) special locked storage space to meet the legal requirements for storage of narcotics, alcohol, and other prescribed drugs.

(c) Refrigerators for the storage of thermolabile products.

(d) Adequate floor space for all pharmacy operations and storage.

(e) Book-keeping, supplies and related materials and equipment necessary for the proper administration of the department.

(f) **Library facilities:-** an adequate and up-to-date library to furnish information concerning drugs, to both pharmacists and physicians.

Personnel: The personnel listed represent the ultimate in a hospital pharmacy staffing and may be varied depending on the size of the pharmacy:

(1) The head of the Pharmacy Department of Hospital

(2) Deputy head

(3) Senior Pharmacists

(4) Staff Pharmacists

(5) Dispensing Assistants — Grade 1

(6) Dispensing Assistants — Grade 2

(7) Dispensary Attendants

(8) Orderlies

(9) Messenger

(10) Typist/Secretary

Indenting for drugs: Unfortunately, due to the fact that about 90% of the drugs used in our hospitals are imported from overseas there should be proper planning ahead to avoid drug shortages. To this end, the head of the hospital pharmacy section should, in consultation with the pharmacist in charge of the drug formulary prepare a comprehensive list of all drugs in the hospital formulary that will be required during every financial year. This list should comprise:- (a) Name of the drug (official or generic name) (b) Annual Consumption (c) Present Stock (d) Quantity required during the year. (e) Cost. Supplimentary lists may be prepared from time to time based on the stock levels. It is imperative that the head of the pharmacy service gives his written approval before any drug is indented for. This will among other things ensure that only drugs listed in the formulary are ordered.

Drug Purchases on Local Purchase Orders (LPO).

With proper planning as envisaged above there will be very little need to resort to local purchases. Purchasing if done at all should be of the right quality in the right quantity, at the right time from the right source. Since "drugs are not ordinary commodities of commerce" their purchasing must be restricted to the pharmacist. It is the pharmacist who knows all about the composition, stability, pharmacological action and proper storage conditions of the drug. The Pharmacy is the only department therefore which is usually not advisable to have purchasing done by a general purchasing officer.

Supply of Containers to Patients: It is the pharmacist's duty to ensure that the medicines dispensed are sufficiently stable during the treatment course. This responsibility obviously necessitates a study of the stability of all the drugs and the containers. To ensure that the patient receives the maximum potency of the prescribed drug, it is imperative that proper containers be used, even if it will involve an extra cost to the drug. The present system whereby out-patients bring in their own containers for drugs should be discouraged. Bottles brought in by these patients are most of the time not clean, some containing residues of kerosine, alcohol etc. which apart from being poisonous at times might interact or might be incompatible with the liquid medicament.

Prepackaging of Drugs: Providing patients with suitable containers will also facilitate the prepackaging of most of the drugs. For example mixtures can be prepacked in 4 floz, 8 floz, 16 floz etc. and labelled ready to be supplied to the patient when the prescription is presented. Some tablets may also be pre-packed e.g.

Tab. Chloroquin 10 Tab. per packet

Tab. Codeine Co 20 Tab. per packet

Tab. A.P.C. 20 Tab. per packet

Tab. Aspirin 20 Tab. per packet

This cuts down the waiting time of the patient.

Shortage of Pharmacy Staff: It is unfortunate to note that despite the Government's efforts to train more Pharmacists at the U.S.T. Kumasi there continues to be an acute shortage of pharmacists in our Government hospitals. The drain of pharmacists from the Government service to the private sector still continues due to the poor service conditions of government pharmacists. It is high-time this situation be remedied.

What the pharmacist can do:- With better working facilities there are so many preparations, which the pharmacist, with his high standard of training, can make to conserve our much needed foreign exchange. For example, it is just incredible that we still continue to import intravenous infusions for use in our hospitals. Intravenous Infusions such as Normal Saline, Dextrose 5% can easily be manufactured in our pharmacies.

MILESTONES IN PHARMACEUTICAL EDUCATION IN GHANA

By Dr. G.H. Konning

The introduction of pharmacy into Ghana was to satisfy a definite need for personnel with a specialized knowledge about the preparation, storage and distribution of drugs. Since its very inception in the country, pharmaceutical education has encountered many seemingly unsurmountable problems and yet has overcome many to achieve its present status in the nations educational set-up. Today the opportunities existing for the professionally qualified pharmacist are immense and all indications seem to point to an even brighter future. It is perhaps pertinent, therefore to look back at the history of pharmaceutical education in the country.

Towards the end of the 19th Century, the government in about 1897 mooted an idea to establish a school for training the personnel to dispense doctors' prescriptions. The early organization of the training is not very clear. It does seem, however, that there were many deficiencies in the training scheme. In about 1923, a Sergeant Compounder in the Royal Army Medical Corps, Seargent Hart was recruited to train local personnel in the art of dispensing at the only hospital in Accra, then situated at the site now occupied by the High Court Buildings. The entrance qualification was the then Standard VII Certificate, and the duration of training two years. Not more than three trainee-dispensers could be taken on at any one time. When the Korle-Bu Hospital was commissioned in about 1927, the dispensing school was transferred there to allow it room for expansion.

The up-surge in demand for medical and dispensary services compelled the government in 1930 to institute a training scheme for Medical Assistants; people with a fair knowledge in both nursing and dispensing to diagnose, prescribe and compound drugs for simple ailments for patients in small hospitals and clinics which could not be staffed with resident medical officers. Students for this course were drawn from secondary school leavers who held the Cambridge School Certificate, and who had had some education in the basic sciences, particularly biology and chemistry. Mr. Captan was engaged to organise the course. The first nine months were devoted to basic nursing, both medical and surgical, on the wards. On successful completion of the first part, the trainee-medical assistant embarked on a course of instructions in dispensing for $2\frac{1}{2}$ years; subjects taught included materia medica, toxicology, therapeutics and simple calculations in pharmaceutics. This period was then followed by brief spells of training lasting 3 — 6 months at the Medical Stores to learn stock control, and at the Surgical Theatre to acquire the technique of administering general anaesthetics. From about 1927 to 1943 the Dispensing Certificate was awarded to successful trainees.

One of the most remarkable jumps in the evolution of pharmacy in the country could be said to have taken place in 1944 with the appointment of Mr. Eric Allman, a Chemist and Druggist to reorganize the Dispensing School. Mr. Allman had been working with a local drug company prior to his entry to the school and was therefore quite familiar with the local needs. Nursing was immediately divorced from dispensing to allow more time for training in pharmacy proper. The course content was upgraded, and the title trainee-dispenser changed accordingly to trainne-pharmacist. On passing the final examination at the end of the third year the student was awarded the certificate designated as Certificate of Competency to Practise as a Pharmacist.

In the later years when some of the trained dispensers owned their private drug stores another type of dispensing training emerged, namely the "apprenticeship" training scheme. A would-be dispenser registered as an apprentice of a qualified dispenser and under-studied him in his shop for a period. On completion of his apprenticeship he, on the condition of passing the Government Druggist Qualifying Examination, was certified as competent to be a master on his own. In or around 1945, at the instance of Mr. Allman, night classes in both theory and practice of pharmacy were also organised for outsiders to become qualified dispensers. Many of the older generation still in practice were products of these various courses. There is no gainsaying that many of them have rendered commendable service to the profession and the country at large.

A revolution in scientific and technological education that was soon to take place in the country was, as it were, destined to change the fate of several technological training schemes including pharmacy. Early in the 1950's the Colonial Government proposed to consolidate technological education in Ghana (then Gold Coast) as a necessary step towards meeting the future man-power requirements of the country which was soon to achieve independence. The subsequent establishment of the erstwhile Kumasi College of Technology (K.C.T.) in 1952 (now University of Science and Technology) is perhaps also the renaissance of pharmaceutical education in the country. The Dispensing School still under the headship of Mr. Allman was transferred from Accra to Kumasi to

become one of the schools of the new institution. The transfer was to allow the school to expand as rapidly as possible both its course content and its student uptake.

For sometime past there had been a growing need for a more competent pharmacist to handle the ever-increasing problems associated with hospital pharmacy. It was to satisfy this gnawing deficiency that the pharmacy and Poisons Board Certificate was introduced in 1953. The duration of the course was four years after the G.C.E. O-level. The initial two years were devoted to teaching students up to a stage equivalent to the G.C.E. A-level in biology, chemistry and physics and the final two years to a concentrated course in pharmacy — comprising pharmaceutical chemistry (organic, physical and inorganic), pharmaceutics (general and microbiology), pharmacognosy, pharmacology and forensic pharmacy. The institution pharmacist much better for his future role in society than any of his predecessors. In the hospital of this course, no doubt, prepared the would-be the new diplomate was able to hold his own and often offered useful advice to the medic who perhaps for the first time became aware of the presence of a pharmacist confident and in full control of his territory in the hospital set-up. The final batch of students for the Pharmacy and Poison Board Certificate completed their studies in 1963.

The development of pharmaceutical education in the country, henceforth, became tied up with the apron strings of the K.C.T. In 1957 when Ghana became an independent nation the government proposed to convert, at a future date, the K.C.T. which had only one undergraduate school viz School of Engineering then associated with the University of London, into a fully fledged autonomous University.

The new University of Science and Technology (U.S.T.) under its own charter was created in October, 1961. At the birth of U.S.T., the School of Pharmacy which had hitherto trained only diplomates became a Faculty under the Deanship of Mr. Eric Allman and henceforth geared its course of instructions to the degree level; the up-grading was dictated by circumstances. Firstly, the armamentarium of drugs which had literally been pouring into use after World War II had been such that a proper appreciation of all their complex properties was absolutely essential. Additionally, the setting into motion of the spade of industrial build-up in the country by the Nkrumah government soon after political independence rightly pointed to the awareness that it would not be long before qualified Ghanaian pharmacists of high educational calibre were urgently required to man Ghana's own future Drug Houses. The institution of the degree work as a culmination of these and other factors has amply been justified as would be seen later.

The first batch of seven undergraduate-pharmacists were admitted to the three-year degree studies in October, 1961. Though a baby faculty, the degree course was organised and run as best as facilities available at the time would allow. In those three academic years, the students were exposed in their first year to biochemistry, physiology-anatomy, pharmacognosy and pharmaceutical chemistry. At the end of the academic year the student wrote examination papers in physiology-anatomy and pharmacognosy for the B.Pharm Part I. in the second and final years lectures were given in pharmaceutical chemistry in all its aspects, pharmacology, pharmaceutics (including pharmaceutical microbiology) and forensic pharmacy. The greatest single problem at the time was the very fluid staffing situation. Lecturers, mostly expartriates, were recruited and almost soon afterwards resigned their posts with the result that continuity in certain subjects was lacking. Undaunted by these teething difficulties, staff and students alike determinedly pressed on with the materials and resources at their disposal. Dead on schedule, the Faculty, now under the Deanship of Prof. A.N. Tackie, presented in June, 1964 the first batch of students for the first-ever final B. Pharm degree in the annals of the University. The Faculty has not looked back since. From 1964 till June, 1971, a total number of 154 pharmacy graduates has been produced.

Special mention should perhaps be made at this juncture of the tremendous benefits the faculty has derived from its long standing association with certain overseas institutions including the Departments of Pharmacy of the Chelsea College of Science and Technology (University of London), Universities of Manchester, Nottingham etc. The readiness with which the institutions offered help on organisation, course design, and furthermore seconded lecturers to Kumasi in times past when an urgent need arose has been of immense assistance. Additionally some of them have annually been associated with the conduct of the degree examinations as external examiners since the institution of the degree work, a practice which, needless to point out, has helped tremendously to raise and sustain the high academic standards prevailing at Kumasi.

The introduction of degree studies in pharmacy at Kumasi was only the first step towards many more major goals of achievements. As from 1967 the course of studies was modified to suit a three-year honours degree project. Pharmacy it must be remembered is an actively growing science, and the drama of pharmaceutical education is not so much the catalogue of subjects studied as the content. With the introduction of new techniques and new areas of studies necessary for preparing the would-be-pharmacist to cope with todays trends in pharmaceutical practice, it soon became obvious that a three-year course of studies was woefully inadequate. Already the third year (final) student was doing the maximal number of school hours a week excluding the extra hours per week he must necessarily take out of his leisure hours to be able to complete project assignments, dissertations etc. To avoid breaking down the physical

health of the student, and perhaps mental as well with additional load of lectures, siminars, tutorials and laboratory work, the new four-year (Hons) course was mounted in 1969 as perhaps the best solution to a very delicate issue. It might suffice to briefly brush over the layout of the new training scheme at it obtains now. During the first year all freshmen attend a course of lectures and practicals in pharmaceutics, (dispensing and physical pharmacy) mathematics, biology, chemistry and social studies. The first year work is designed purposely to equip the student for the pharmacy course proper. At the end of the year the student has to write and pass the First University Examination before proceeding to the next stage. The 2nd and 3rd years are devoted to studies of the rudiments of pharmacy as outlined above with the addition of Statistics in the 2nd year. This is followed by the B. Pharm Part I examination at the end of the 3rd year. The 4th (final) year student is taken through an advanced instrumentation course, biopharmaceutics, pharmacology, and pharmacognosy. He is assigned a practical problem and is closely supervised by a member of staff. The student must submit a report on the project work. Not only must he pass his final written papers but he must also present a satisfactory project report. The 4th year course is therefore deliberately designed not only to offer the student the basic industrial pharmaceutical training but also his first experience in research and presentation of research report. Having thus satisfied all the requirements, the student is awarded the degree B. Pharm and he is now a qualified pharmacist. However, the first year after graduation is devoted to internship — a period of on-the-field-training under an experienced practising pharmacist. The young graduate is registered by the Pharmaceutical Society to practise as a pharmacist only after his internship. Therefore in all it takes five years to train a professional pharmacist.

Perhaps the most important leap forward in the development of pharmaceutical education in the country since 1961 has been the institution of post graduate studies in the faculty. Since 1964 post-graduate opportunities leading to the degree M. Pharm by research have been offered in all the relevant disciplines. Some of the students who worked for and obtained their masters degree have been signed on as members of the academic staff.

Another significant landmark in the history of the pharmaceutical education in this country was the re-introduction of a non-degree course in 1968. The Ministry of Health collaborated with the faculty in that year to mount a two-year diploma course on an experimental basis. For this course the faculty admitted candidates who obtained one or two A-level passes in chemistry, biology (zoology or botany) or physics — instead of the three subjects required of a candidate to qualify to read for the degree in pharmacy — but who were nevertheless considered good enough to benefit by such a course. The main purpose of this short course leading to the Certificate of Pharmacy Technologist was to augment the annual output of graduate pharmacists, a mere 17 — 25 since 1965. Each year since 1970 a batch of pharmacy technologists numbering some 14 — 20 has been produced. This course is, however, being phased out now. Problems arising out of the institution of this course including lack of teaching laboratories to run a degree and a non-degree course concurrently, overstretching of the meagre resources of the faculty, registration of pharmacy technologists etc. weaved into the reasons for its termination this year. The discontinuation of this latest diploma course will surely make room for the really big increase in the intake of students for the degree course during this and the subsequent years.

The opportunities open to the new graduate pharmacist are really vast, although openings in each field are limited in numbers at present; an opportunity for nearly every type of talent which relates to health, science and commerce.

The hospitals, mostly government owned, draw heavily on the annual output of pharmacists from the faculty not only because nearly every pharmaceutical student is on a government scholarship award and is therefore bonded to serve in the civil service for a specified period but also because the government and privately owned hospitals together offer the greatest number of avenues for employment. Hospital pharmacy, as it is at present, is exciting but not so challenging intellectually. The hospital pharmacist works as part of a collosal team comprising doctors, dental surgeons, nurses and a host of other ancillary staff. Apart from his usual routine job to purchase, stock and distribute drugs one of his other most important responsibilities is to offer advice on drugs to the medic, the nurse etc. In some of the big hospitals he may be a member of several hospital committees.

In Ghana today one field which holds increasing attraction for the young pharmacist is in the promotion and sale to hospitals and other health institutions of medicinal products imported by local subsidiary companies of giant drug establishments like May and Baker, Pfizer, Sterling Products etc. This branch of the profession often referred to as "medical representation" is immensely interesting and offers the man-on-the-job a constant touch with new dosage forms, their pharmacological action, toxicity etc. Though tiring because of the constant mobility involved, it is nevertheless, financially rewarding.

Closely related to medical representation is the retail business. The retail pharmacist is both a professional and a businessman. He sells his stock to the general public. Very few of the existing pharmacy shops have turnovers high enough to be able to employ more than one pharmacist on the premises at any one time. Therefore the number of young aspiring pharmacists who can ever hope to have an attachment to a pharmacy shop owned by someone else is very small indeed.

This contrasts sharply with the situation in the more advanced countries where most newly qualified pharmacists soon enter the retail business. It must, however, be pointed out that most of the practising pharmacists today are in retail as shop-proprietors.

It is perhaps in industrial pharmacy, teaching apart, that a pharmacist can really assert himself and offer an invaluable contribution to research and progress. Research in industry requires an agglomeration of scientists in the field of pharmaceutical chemistry, pharmacology, pharmaceutics, microbiology etc; the pharmacist has a working knowledge of each of them. Since the drug houses in Ghana are few and small compared with the huge drug complexes elsewhere, a very small percentage of the yearly output of pharmacists can be absorbed by industry at present. Work in industry, undoubtedly is challenging, interesting and rewarding.

To emphasize the vast area in which pharmacists are making their humble contributions to the national cause it might suffice merely to mention the Government Chemical Laboratories, Food Research Institute, Forest Products Research Institute etc.

The Faculty of Pharmacy as at present is constituted by 108 students including 6 graduate-students reading for their Master's degree. There are potentials for increasing the student population substantially when the new Faculty Buildings under construction are commissioned. The faculty is headed by Dean A.N. Tackie, B. Pharm; Ph.D. (London) and all departments by Professors or Associate Professors. There are also 21 lecturers all of whom except 2 are Ghanaians holding degree not below the Masters. Their work is assisted by 12 laboratory technicians of various grades and 6 administrative personnel.

It might soon be desirable to introduce short courses in management, administration and perhaps sales promotion to cater for the needs of those who might find business more attractive. In addition a breif course in clinical pharmacy, such as has already been introduced in the U.S.A. and Britain might be of immense benefit to the student who is hospital-orientated. Indeed, the future looks immensely promising for the profession and the academic training which leads to it.

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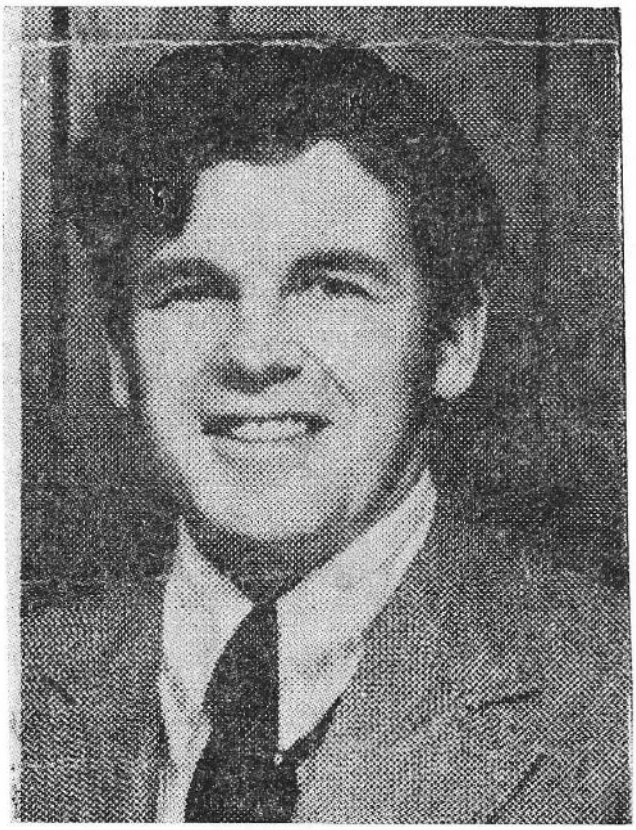
DRUG INTERACTIONS— THE PHARMACIST'S OPPORTUNITIES AND HIS LIMITATION



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The explosion of information on drug interactions has made all health professionals well aware of their occurrence and possible danger. Pharmacists in particular, have developed a considerable interest in these situations since they are often in a unique position to recognize potential problems of this type. A look at some of the reasons for the increased evidence of drug interactions demonstrates the important role the pharmacist may play in preventing and correcting possible difficulties with multiple drug therapy.

Many individuals are taking more than one potent drug. Most drugs used in today's therapy do not just possess one specific type of activity but have the capacity to influence many physiologic systems. Therefore, there is an increased possibility that two concomitantly administered drugs will affect some of the same systems. When considering the potential for interactions between drug there is often a tendency to only be concern with the primary effects of the drugs involved a to overlook the secondary activities they posse Combined therapy with a phenothiazine antips chotic [eg, chlorpromazine (Thorazine)], a tricyclic antidepressant [eg, amitriptyline (Elavil)] and an anti-Parkinsonism agent [eg, benztropine (Cogentin)] is frequently employed. Each of these agents has a considerably different primary effect; however, all of them possess anticholinergic activity. Even though the anticholinergic effect of any one of the drugs may be slight, the additive effects of the three agents may be significant.

As the number of drugs a patient takes increases, it is obvious that the monitoring of the drug therapy as well as the keeping of accurate patient medication records becomes more complex. Many pharmacists are now maintaining patient medication records and have found them to be of great value in detecting and preventing problems related to drug therapy.

It is necessary for some individuals to go to more than one physician and some others make a practice of doing this even though it is not necessary. It is frequently difficult for one physician to learn completely what medications have been prescribed for a patient by another physician, if indeed the patient has even told him he is seeing another physician. Many difficulties could arise from such situations. For example, an ophthalmologist may prescribe pilocarpine eye drops for a patient who is also taking an anticholinergic preparation prescribed by another physician for a gastrointestinal condition.

Even though the patient is seeing different physicians, he will usually get the prescription dispensed at the same pharmacy. In these situations the pharmacist is often the one who is most aware of what medications a patient is receiving and his opportunities for assisting in the monitoring of drug therapy are evident.

Many reports of drug interactions have involved the concurrent use of a prescription drug with a non-prescription drug (eg, aspirin, antacids, sympathomimetic amines in cold and allergy remedies). When a physician questions a patient about medications that he is taking, the patient will often neglect to mention the non-prescription medications that he has purchased since he does not consider these to be "drugs."

A pharmacist who keeps patient medication records is frequently in a position to detect problems involving the use of non-prescription drugs. However, many individuals will have their prescriptions dispensed in their local pharmacy, but purchase

their non-prescription drugs in a supermarket or department store, thus making the identification of potential problems extremely difficult. For this reason, patients should be encouraged to obtain both their prescription and non-prescription medications at a pharmacy. Such advice is justified, however, only when the pharmacist personally supervises the sale of non-prescription medications with which problems may develop.

Literature Evaluation

The volume of information on drug interactions that has been generated during the last several years gives the impression that there has been considerable progress in identifying and correcting the problems that may develop. Although this may be true for a limited number of situations, a careful analysis of the many reports and reviews reveals that much of the information is conflicting, incomplete, and, too frequently, misleading.

The use of this latter type of information has unfortunately in a number of situations, led to an undue degree of alarm. Caution is needed, therefore, in evaluating and using the information available because by misusing information or by overreacting to a possible problem, a more difficult situation might result than what would have occurred if nothing were done.

In considering the literature on drug interactions and in deciding what action is appropriate, a number of factors should be kept in mind.

In most cases, two drugs that are known to interact can be administered concurrently as long as adequate precautions are taken (eg, closer monitoring of therapy, dosage adjustments to compensate for the altered response). Although there are situations where the use of one drug is usually contraindicated while another is being given, such combinations are not likely to be employed frequently and there may be exceptions to the contraindication under certain circumstances.

Serious reactions have been reported to occur following the concurrent use of a MAO inhibitor [eg, tranylcypromine (Parnate)] with a sympathomimetic amine (eg, amphetamine) or a tricyclic antidepressant [eg, amitriptyline (Elavil)], and the use of such combinations is contraindicated. However, the feeling has been expressed by some[1,2] that such reactions are only rarely seen and that these combinations, when very cautiously used, may be of great benefit in some patients when conventional drug therapy has failed. The fact that these combinations may be used beneficially in some patients does not excuse the pharmacist from his responsibility in checking the therapy with the physician. However, he should be aware that certain circumstances may justify the concomitant use of even "contraindicated" drugs.

It should be recognized that sometimes a second drug is prescribed deliberately to modify the effects of another. Such an approach might be utilized in an effort to enhance the effectiveness or to reduce the adverse effects of the primary agent. In these situations the efficacy and/or safety of a drug is increased indicating that interactions are not always harmful as frequently thought, but can also be beneficial.

The ability of probenecid (Benemid) to increase the serum levels and prolong the activity of penicillin derivatives (by blocking their tubular excretion) has been known for many years. The wide availability of many of the penicillin preparations at reasonable prices has diminished the need to give probenecid concurrently for economic reasons. However, with some of the newer penicillin derivatives, such as carbenicillin (Geopen, Pyopen), that are often given parenterally in large doses at frequent intervals, the concomitant administration of probenecid may provide a practical means of reducing the dosage and, thus, the cost of therapy.

Probenecid may also contribute to the effectiveness of therapy with penicillin derivatives. In the treatment of venereal disease it is often preferable to give the antibiotic in a single dose to assure that the patient receives all the drug intended. A recent study[3] of men who acquired gonococcal urethritis indicated that a single oral dose of 3.5 gm of ampicillin with probenecid resulted in only eight failures of 202 patients, whereas the same dose of ampicillin without probenecid resulted in 12 failures of 40 patients. Other studies have also noted improved results when probenecid was given concurrently with ampicillin or procaine penicillin G in the treatment of gonorrhea. The current recommendation of the Venereal Diseases Branch, Communicable Diseases Center of the USPHS, for the treatment of uncomplicated gonorrhea indicates that either aqueous procaine penicillin G (4.8 million units intramuscularly divided into at least two doses and injected at different sites at one visit) or ampicillin (3.5 gm orally) is the preferred treatment. It is also recommended that one gm of probenecid be given, administered simultaneously with ampicillin or preferably 30 minutes before an injection of procaine penicillin G.

An example of a situation where one drug is given to minimize the undesirable effects of another is seen with the use of an anti-Parkinsonism drug with a phenothiazine tranquilizer in an effort to reduce the extrapyramidal effects of the latter.

Many reports of drug interactions are based on animal studies. Although such data may be of value in anticipating potential problems in humans, there is no guarantee that the results seen in animals can be extrapolated to the clinical situation. It is known that a number of drugs are handled differently (eg, metabolism, excretion) and can produce a different type and intensity of effect in animals than they will in man. Thus, the pharmacist must be aware of the source of the data.

Sources of Information

Reports and reviews of interactions often attach importance to isolated observations of problems

in one patient or a limited number of patients. On several occasions a suspected interaction that was observed in a single patient has been reported in a number of reviews and tables without qualification as to the nature of the report or the possible significance of the interaction. The fact that such an interaction is now included in a number of publications understandably provides an impression that the problem is well documented and clinically significant.

Many of the charts and tables of drug interactions do not provide enough information about specific situations for a pharmacist to knowledgeably discuss them with a physician. The mere mention of an increased or decreased effect of one drug in the presence of another is not enough to form a judgment as to clinical importance and potential severity of the situation or to provide the basis for a recommendation that would avert possible difficulty. Because of this, most references of this type should be used only to initially screen for possible interactions and other sources should be consulted for further information.

One of the shortcomings of many of the charts and tables of drug interactions that have appeared (this author's included) is that no references to the original source of the information are included. This can place the pharmacist in an awkward position when the physician whom he has contacted requests further information or wishes to know the source of the information that has prompted the pharmacist to contact him. Needless to say, the physician is not likely to be impressed with the reply that the information is found on a chart in a pharmaceutical journal.

It is not the intent of this discussion to discredit the charts and tables of drug interactions that have appeared. When used properly, they may be useful in initially identifying a potential interaction. However, their brevity usually precludes usefulness beyond this initial step and the limitations previously described should be recognized.

Ideally, the pharmacist should be able to refer to the original clinical reports of interactions when he prepares to discuss a particular situation with a physician. In most cases, however, this is an unrealistic possibility and the pharmacist must rely on secondary references to obtain the information desired. Although secondary references, such as textbooks or reviews of drug interaction information, can be useful sources of information, they represent abstracts of the original report that may or may not contain the specific information needed. The use of a secondary reference also introduces an additional interpretation of the original data which may be (a) undesirable, in that the findings and impressions of the author of the original paper may not be adequately conveyed in the secondary reference, and/or (b) desirable, if the reviewer is in a position to accurately comment on the interpretation and significance of the data.

Since the pharmacist must depend so heavily on secondary references and recommendations, it is unfortunate that more attention has not been directed towards the development of comprehensive and authoritative analyses of the available literature. It was with this in mind that APhA embarked on a Drug Interaction Pilot Project that has resulted in the prototype compilation "Evaluations of Drug Interactions."[4] Although a secondary reference, the information presented represents the opinion of a panel of individuals who have reviewed the appropriate literature rather than that of a single individual, thus lending greater authority to the conclusions developed. In addition, comments are made as to the clinical significance of the data that is discussed and recommendations are made as to what, if any, action is indicated to prevent or correct possible problems. It is hoped that this approach will be a forward step in remedying the information void that presently exists.

It is extremely important to constantly review the current literature since new evidence may change the significance of earlier reports. The existence of conflicting reports will also become evident as the literature is carefully searched. Information concerning drug interactions is changing so rapidly that references published as recently as two or three years ago may be of only limited usefulness now. Although there is no assurance that more recent information is more accurate or pertinent, the date of publication of a particular reference should be noted and it should also be recognized that most papers do not actually appear in print for a period ranging from several months to two years after they have been written.

The pharmacist should be aware of trends in therapy that may result in an increased incidence and severity of drug interactions. Although there is considerable controversy regarding the efficacy of ascorbic acid in preventing or treating colds, there is no doubt that its use has increased considerably since the publication of Dr. Linus Pauling's book, **Vitamin C and the Common Cold.**

Ascorbic acid has been widely used for many years but in relatively low doses. The present recommendation by Dr. Pauling that large doses of ascorbic acid (up to 15 gm daily) be employed will undoubtedly produce effects that have not been noted (or observed only under selected circumstances) with this agent previously. One case report[5] suggests that ascorbic acid caused a reduction in the prothrombin time of a patient receiving warfarin (Coumadin). Earlier animal studies had suggested the possibility of this; however, the likelihood of problems in humans was considered doubtful. Although a study[6] in five patients indicates that ascorbic acid in a dose of one gm daily is not likely to interfere with the activity of warfarin, the influence of larger doses on warfarin activity remains to be clarified.

Large doses of ascorbic acid can also decrease urinary pH which may influence the rate of excretion and activity of certain agents.

Many times a statement will appear in the product literature that caution should be exercised when two products are given together because of the possibility of an altered response. However, only occasionally are specific recommendations included as to what action to take to prevent interactions. At this time there is not enough information available on most of the reported interactions to permit the development of firm guidelines to govern such combination therapy. When such guidelines are presented they can be extremely helpful and the increasing number of such statements in the literature for various products serves as evidence that the pharmaceutical industry is trying to make such information available when possible. A statement[7] in the literature for clofibrate (Atromid S) can be used as an example — **Caution should be exercised when anticoagulants are given in conjunction with Atromid S (clofibrate). The dosage of the anticoagulant should be reduced by one-third to one-half (depending on the individual case) to maintain the prothrombin time at the desired level to prevent bleeding complications. Frequent prothrombin determinations are advisable until it has been definitely determined that the levels have been stabilized.**

Even after the previously discussed factors have been considered and the data has been critically analyzed, the possibility of interactions developing should be viewed in perspective. Although an altered response appears likely, it might not be clinically significant in many patients. In these situations, a patient should not be deprived of needed therapy because of the possibility of an interaction, but such therapy should be closely monitored.

In spite of the fact that certain interactions are well documented, it is extremely difficult, if not impossible, in even these situations to predict the severity of an interaction, if indeed it does develop. The presence of many variables that, usually to an unknown extent, will influence the activity of a drug and its ability to interact with other agents, is the reason for the existing uncertainty. These variables include dosage, time of administration, route of administration, severity of the disease state being treated, presence of other disease states (eg, liver impairment that may alter drug metabolism), and individual variation in the metabolism of drugs. The influence of these factors is seldom mentioned in the reports of interactions and it is obvious that much work remains to be done.

To better understand some of the difficulties encountered in trying to determine how and what extent one drug can influence the activity of another, reports involving the following combinations are briefly summarized. In several of the situations the discrepancy between reports is such that definite conclusions cannot be drawn at this time.

Interactions With Anticoagulants

Chloral Hydrate — The first report,[8] of a chloral hydrate-anticoagulant interaction suggested that the former agent could decrease the effect of bishydroxycoumarin (Dicumarol). It was presumed that chloral hydrate could act similarly to phenobarbital and stimulate the activity of the liver microsomal enzymes that are involved in the metabolism of anticoagulants. Another study[9] in 10 patients compared the effects of chloral betaine (Beta-Chlor), glutethimide (Doriden) and phenobarbital on plasma warfarin levels and prothrombin time. The results showed that all three agents reduced the half-life of warfarin; however, chloral betaine (which would be expected to act in a similar manner to chloral hydrate) had a lesser effect than phenobarbital and glutethimide. In contrast to the other two agents, chloral betaine did not interfere with the hypoprothrombinemic effect of warfarin.

A subsequent investigation[10] of these situations indicated that chloral hydrate may potentiate the response to warfarin. It is suggested that trichloroacetic acid, a major metabolite of chloral hydrate that is highly protein-bound, can displace warfarin from protein-binding sites, thus making more "free" warfarin available and increasing the anticoagulant response. The increased response to warfarin was noted[10-12] in three volunteers and in 13 of 52 patients in whom it was possible to compare the combination therapy to a control period with warfarin alone. In none of the patients was a reduction in the anticoagulant response noted. These investigators recommend[10] that a reduction in the warfarin requirements should be anticipated when chloral hydrate therapy is begun.

Another report[13] indicates that neither the plasma warfarin levels nor the anticoagulant effect of warfarin appear to be influenced by chloral hydrate in doses of 0.5 or 1.0 gm daily or by chloral betaine in equivalent doses. These investigators have therefore questioned the clinical significance of an interaction between warfarin and chloral hydrate in patients receiving long-term therapy with warfarin under conditions that parallel those of their study. This study generated further discussion in the literature[14-16] as to the reasons for the different results reported.

Further evidence of an increased anticoagulant effect in patients also receiving chloral hydrate has appeared in a recent report[17] which noted that patients receiving continuous chloral hydrate therapy require less warfarin during the induction phase of anticoagulant therapy.

Other studies and observations concerning the potential interaction have also appeared in the literature.[18-22] The fact that differing reports concerning this interaction have appeared emphasizes the importance of keeping current in the literature so that all evidence can be considered in evaluating a potential problem. Whereas the most recent studies indicate the likelihood of an increased anticoagulant effect in those patients in whom the interaction develops, many of the early tables and charts of drug interactions indicate that chloral hydrate will decrease anticoagulant activity.

Aspirin — It is well known that aspirin can cause a lowering of plasma prothrombin levels, but it is unlikely that this effect will be significant unless large dosage are ingested. Patients on anticoagulant therapy, however, may be more sensitive to this effect of aspirin and the activity of the anticoagulant may be increased. It is difficult to determine from the literature what quantity of aspirin may alter control with an anticoagulant and when one considers the many variables that may influence anticoagulant therapy it is understandable that uniform guidelines regarding aspirin dosage have not been developed.

The following recommendations from authoritative references regarding the concurrent use of aspirin and anticoagulants give an indication as to the difference of feeling that exists —

Its (aspirin) use should be strictly avoided in patients receiving warfarin.[23]
If salicylates are to be given to patients on therapy with anticoagulants, the dosage of the latter should be reduced.[24]
Patients taking coumarin drugs ..... may take salicylates occasionally but not in large dosage.[25]

It is likely that occasional small doses of aspirin (or another salicylate) will not cause difficulty in patients who are well stabilized on anticoagulant therapy. However, aspirin must be given very cautiously and, preferably not at all, to patients in whom there is difficulty in maintaining a constant anticoagulant effect. Continuing changes in anticoagulant dosage may serve as an indication to the pharmacist that the patient's therapy is not well controlled.

Acetaminophen — It has been suggested that acetaminophen (Tylenol, Tempra, Nebs, Valadol) be used as a substitute for the salicylates in patients receiving anticoagulants since it was not thought likely to interact with them. However, in 1968 a report[26] appeared that raised questions as to the validity of this suggestion. This study indicated that acetaminophen (650 mg four times daily for a two or four week period) could potentiate the activity of concurrently administered anticoagulants. A subsequent study[27] was designed to determine the immediate effect of acetaminophen on the prothrombin time in patients receiving anticoagulants. This investigation indicated that the administration of two 650 mg doses of acetaminophen (four hours apart) had no effect on the prothrombin times of these patients. Another study[28] has failed to note any potentiation of warfarin with the addition of acetaminophen. Therefore, it is generally felt[25,28] once again that this is a safe analgesic to use during anticoagulant therapy. It is important to recognize that although acetaminophen has analgesic and antipyretic activity that is similar to that of aspirin, it is not an effective anti-inflammatory agent. Therefore, it would not be a suitable alternative for aspirin when this latter action is desired.

Methylphenidate — Conflicting reports have appeared concerning the ability of methylphenidate (Ritalin) to alter the activity of anticoagulants. One study[29] has indicated that methylphenidate may enhance the action of ethyl biscoumacetate (Tromexan) by inhibiting its metabolism. However, a subsequent investigation[30] has failed to confirm these findings and the authors conclude that methylphenidate does not influence the metabolism of ethyl biscoumacetate when given for a period of four days (the approximate length of therapy employed in the earlier study).

Although ethyl biscoumacetate is no longer marketed, it is likely that other coumarin anticoagulants will act similarly. Therefore, it would be desirable to conduct further studies to clarify the uncertain status of combination therapy with methylphenidate.

Tolbutamide — A consideration of the reports of concurrent tolbutamide (Orinase)-anticoagulant therapy provides an insight into the number of factors that may be involved in the development of an interaction and the difficulties encountered in accurately interpreting the information obtained.

An early report[31] has described the prolongation of the prothrombin time in two patients who were receiving bishydroxycoumarin and tolbutamide simultaneously. However, the authors were unable to reach any definite conclusions since in three other patients in whom the same combination was used, an unusual prolongation of the prothrombin time was not noted. Poucher and Vecchio,[32] in a retrospective study of 224 diabetic patients, have indicated that there is no potentiating or inhibitory effect of tolbutamide (as compared to insulin) on anticoagulant therapy.

Another group of investigators[33] has studied interactions involving bishydroxycoumarin using the dog as an experimental model. When tolbutamide was given to dogs that had been receiving bishydroxycoumarin, it was noted that the anticoagulant activity was first enhanced and then antagonized. The initial enhancement of the effect was attributed to the ability of tolbutamide to displace the anticoagulant from plasma protein-binding sites, thereby making increased quantities of the "free" anticoagulant available. The subsequent decrease in the anticoagulant effect was thought to be due to the action of tolbutamide in stimulating liver enzymes that metabolize the anticoagulant, resulting in an increased rate of metabolism and more rapid excretion. These authors[33] indicate that the order of administration of tolbutamide and bishydroxycoumarin is important with regard to interactions that might develop. Their studies involved the administration of tolbutamide to dogs that were already receiving anticoagulants whereas the Poucher and Vecchio study[32] involved patients who were receving tolbutamide or insulin and were subsequently placed on anticoagulant therapy.

Another factor to be considered is that it is possible for a drug to exhibit properties in man that are different from those seen in animals. It has been noted[34] that tolbutamide is metabolized very slowly in the dog and therefore remains in the plasma for prolonged periods with the ability to displace an anticoagulant from protein binding sites. In man, however, tolbutamide is metabolized rapidly and might not achieve the plasma concentrations necessary to cause significant displacement of the anticoagulant unless the patient metabolizes tolbutamide at a slower than usual rate.

Even though the effect of a hypoglycemic agent on the response to an anticoagulant is still in question, it does appear that the response to the hypoglycemic agent can be changed when these agents are given concomitantly. Kristensen and Hasen[35] have reported a potentiated effect of tolbutamide in patients receiving bishydroxycoumarin simultaneously. In this study they note that the half-life of tolbutamide in the blood is increased from the normal average of 4.9 hours to an average of 17.5 hours and suggest that bishydroxycoumarin might cause this effect by inhibiting the conversion of tolbutamide to carboxytolbutamide (an inactive metabolite) in the liver. The effect of phenindione (Danilone, Hedulin) was also investigated and this agent was shown not to have a similar effect on the metabolism of tolbutamide.

One report[36] has attributed the increased hypoglycemic response with this combination to the displacement of tolbutamide from plasma protein binding sites by bishydroxycoumarin. Although this factor might contribute to the effect, it would not explain the prolonged plasma half-life of tolbutamide that was noted in the previously cited study.

Diphenylhydantoin-Phenobarbital Interaction

Several studies have suggested that phenobarbital, by stimulating liver microsomal enzymes, may increase the rate of metabolism of diphenylhydantoin (Dilantin), resulting in a reduction of the blood levels and activity of the latter. Even though the rate of metabolism of diphenylhydantoin may be increased, the effect is probably of little clinical significance in most patients since both drugs possess anticonvulsant activity. In the few patients in whom there is difficulty in achieving anticonvulsant control with usual doses of these agents, the interaction might be suspected of being a factor. However, for the majority of patients, this combination, which has been successfully used for many years, represents rational and effective therapy and there is little need for concern about a reduction in effectiveness.

Some of the comments that have appeared with regard to the potential interaction between phenobarbital and diphenylhydantoin would give the impression that such combinations are possibly dangerous or undesirable. This observer feels that such conclusions are not justified and may lead to unnecessary concern regarding the efficacy of the therapy.

Orphenadrine-Propoxyphene Interaction

The product literature for orphenadrine (Disipal, Norflex) and propoxyphene (Darvon) preparations includes a statement that the concomitant use of these agents is contraindicated. It is mentioned[37] that mental confusion, anxiety and tremors have been reported in patients receiving both agents; however, there is very little evidence of such problems in the medical literature.

Several have questioned[38,39] the significance of this alleged interaction and this has prompted the reporting[40] of a case history in which an interaction was suspected. Although the manufacturers have a few other similar reports in their files, it would appear that the chance of a serious problem when these agents are used in combination is slight. Exaggerated effects that might result from combined therapy may be due to excessive dosage or an additive effect of the activities that are shared by both agents.

Gentamicin-Carbenicillin Interaction

Both carbenicillin (Geopen, Pyopen) and gentamicin (Garamycin) have proved to be very valuable in the treatment of infections caused by certain gram-negative organisms. **In vitro** studies[41] have suggested that the combination of these agents may be synergistic in treating some strains of **Pseudomonas.** Although **in vivo** synergism has not been conclusively demonstrated, the use of these agents in combination in certain clinical situations has been advocated[42] and favourble results have been reported.[43,44]

These agents have often been used together in life-threatening situations and therefore there was considerable concern when the results of one study[45] suggested that the antimicrobial activity of gentamicin may be antagonized by carbenicillin and that, in certain circumstances, the combination may be less effective than one of the agents alone. This report prompted extensive discussion in the literature and other studies and commentaries of the use of these agents in combination have also appeared.[46–58]

The loss of gentamicin activity in the presence of carbenicillin can probably be attributed to a physicochemical interaction[57] which would be most likely to occur if the two antibiotics are physically mixed, such as in a solution intended for intravenous administration. Therefore, it is recommended that gentamicin should not be physically mixed with other agents but should be given separately. When it is given in such a manner to patients with normal renal function who are also receiving carbenicillin, antagonism is not likely to occur and the use of these two agents continues to be regarded as a valuable therapeutic approach to the treatment of severe **Pseudomonas** infections. However, if the two agents were given concurrently intravenously (in the same solution) or if impaired renal function permitted sufficient time for high concentrations of carbenicillin to inactivate gentamicin, the possibility of antagonism may exist.

Conclusion

Although it is evident that much remains to be learnt about drug interactions and significant limitations exist in trying to predict the results of combination therapy, the pharmacist should recognize that the physician faces the same handicaps. Since much of the information has only become available in the last several years, most pharmacists and physicians have received very little information about this subject while in school. Therefore, knowledge of these problems is gained largely by self-education and extensive individual effort. The pharmacist, by keeping current in the literature, can develop an expertise in this area that will provide the opportunity for greater communication with the physician.

Communication between pharmacists and physicians is, unfortunately, nonexistent in many situations. By assuming an active concern for preventing interactions and other problems related to therapy, the pharmacist can develop communication and rapport with the physician. When contacting the physician, the therapy should not be challenged, but discussed. The pharmacist cannot be expected to know all the answers regarding potential problems with drugs that may interact; however, he should be able to knowledgeably discuss the current status of information that pertains to the combination in question even though no definite solution can be provided. In discussing the situation he can also learn from the physician's observations and past experience with the drugs involved.

It is hoped that the pharmacist will take advantage of these opportunities by becoming familiar with the potential problems and by judiciously reacting in trying to prevent them. It is anticipated that two benefits will result from such efforts. First, the effectiveness and safety of drug therapy for the patient will be improved, and, secondly, there will be an increased respect for the pharmacist and a recognition that he has an essential role in the delivery of the best possible health care.

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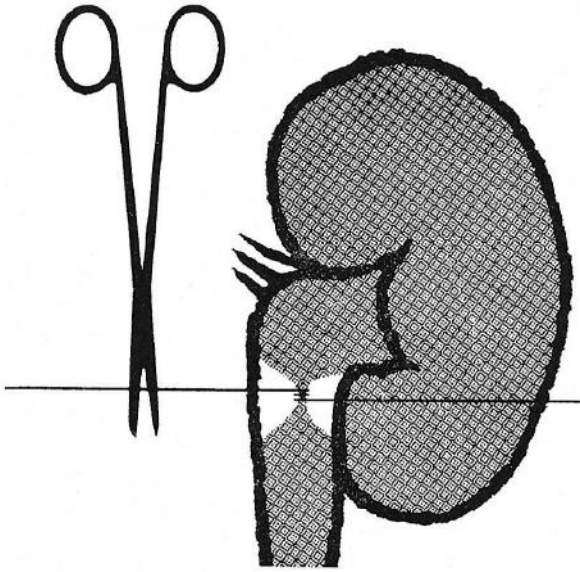

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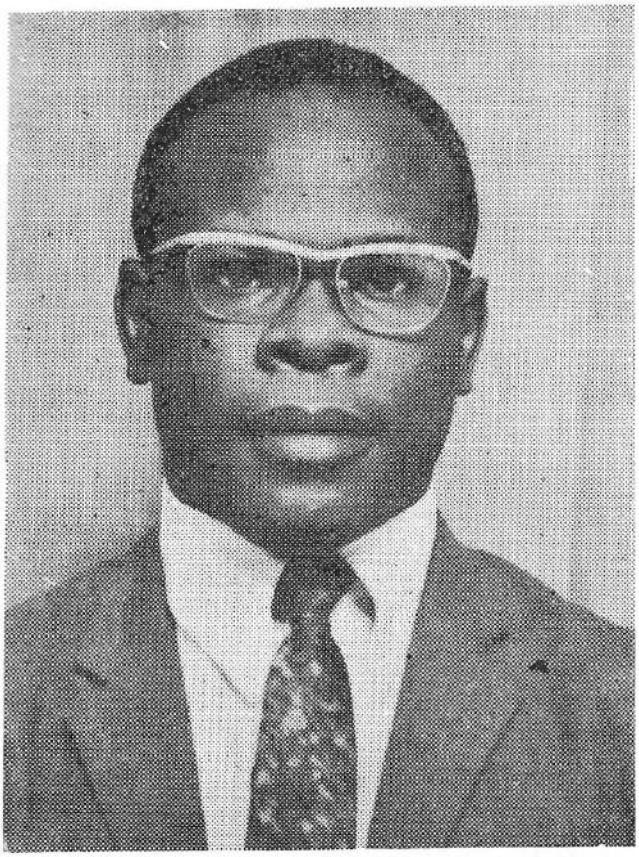
PRINCIPLES OF QUALITY CONTROL OF DRUGS

By: J.Y. Binka, B. Pharm., M.P.S.G., M.Sc. (Lond), Government Chemical Laboratory, Accra



More potent but dangerous drugs are being used in our time more than ever before and their quality and use call for close scrutiny. Finished pharmaceutical products do not always get to the patient in the form and quality they are expected. This could be due to:-

i. Inadequate manufacturing control;
ii Inadequate product quality specifications,

Hence, the main principles involved in Drug Quality Control are the manufacturing control and product quality specification.

MANUFACTURING CONTROL

The cornerstone of a good quality control of a product is good manufacturing control. Inadequate manufacturing control can bring about incomplete mixing of ingredients, particulate and microbiological contamination of the products, wrong packaging and labelling. Cross-contamination from another drug which is air-borne in the production area is a well known manufacturing hazard.

In United State, manufactureres of penicillin preparations are required by the Food and Drugs Administration to institute adequate control of manufacture, handling and storage of drugs and their preparations to limit cross-contamination of one product by another. Trace amounts of antibiotics in a product could lead to sensitization of patients and production of resistant microbial strains.

The quality of raw materials and the equipment used in the manufacture of drugs could affect the quality of the finished product. Solvent action on reaction vessels could lead to traces of metals like copper, zinc and iron in the final product. Copper ions are known to accelerate certain oxidative degradation of drugs. Wrong choice of containers for packaging could also affect the quality of finished product. Alkali sensitive Drugs like Atropine Sulphate which is sterilized by autoclaving must be packed in glass ampoules which comply with test for freedom from alkalinity. Plastic containers and closures if not carefully evaluated, could yield undesirable additive and also loss of the pharmaceuticals stored in them. Polyethylenes are known to be good barriers for alcohols, water, Acids, (Carboxylic), Nitro-derivatives and aldehydes. However, low polarity drugs in chemical groups such as ketones, esters, ether or hydrocarbons are known to permeate and are absorbed by polyethylene **(Pinsky J, 1967). DiCenzo (1967)** gave a list of Pharmaceuticals that are suitable for storage in polyethylene containers. He suggested that Phenylephrine hydrochloride solution, U.S P. 1%, and oxytetracycline Oral suspension should not be stored in polyethylene bottles at temperatures greater than 100°F and 73°F respectively.

The quality control tests performed on a drug during production and after production are necessary steps to ensure that the finished drug is suitable for administration. Such quality tests might include:-

i. determination of the content of the drug;
ii. tests for impurities likely to be present.
iii. stability tests to establish the shelf-life of the drug;
iv. drug availability tests, viz:- Disintegration, Dissolution rate and physiological availability tests.

DRUG CONTENT DETERMINATION

The potency of a formulated drug depends on the amount of the active ingredients present and, hence, it is essential that the contents of a drug are accurately estimated in control tests. However, the results from a quantitative analysis of a drug might not always reflect the actual content of the drug if the method of analysis is not specific. Straight photometric analysis of Aspirin containing salicylic acid as impurity might give false results if interfering absorbance due to salicylic acid is not corrected. A gas chromatographic technique, which is more specific will give an accurate answer.

Pharmacopoeia standards require assay of drug content in a solid dosage forms from a powdered number of the dosage forms. A batch of tablets or

capsules which contain varying amounts of the active constituents might escape detection through a composite pharmacopoea methods. For example, tablets of hydrocortisone in 10 lots analysed separately by U.S.P. procedure (tolerances allowed 90 – 110%) gave one result 87.3% and the other 91.8%. The same number of tablets from the same bottle analysed individually gave results varying from 68.4 to 151.2% (French et al, 1967). The varying content of the tablets does reflect inadequate assay specification to detect discrepancies in the manufacturing process.

TESTS FOR IMPURITIES

Finished pharmaceutical products are known to contain impurities. These are substances closely related to the drug such as isomers of drug or substances carried through as intermediate or degradatory products from the drug. Morphine, a potent narcotic drug, serves as a raw material for the manufacture of codein and B.P. has a limit test for morphine in codein phosphate. The content of a closely related compound, 4 – chloroacetanilide is limited in phenacetin in B.P., Selenium is used as catalyst for the manufacture of dexamethasone, prednisone and other steroids and many monographs include limit tests for selenium.

The kind of limit test for a given drug is thus different from another drug depending upon its method of manufacture and the property of the drug. It is thus evident that with thousands of manufacturers in the world using different methods of manufacturing process, official monographs may not always give the right type of limit tests to be applied to a product. The public thus depends on the tests performed by the manufacturers.

STABILITY

Stability tests are essential aspects of quality control. A drug from the manufacturing plant might be subjected to adverse environmental conditions before the patient takes it. Environmental conditions in which drugs are kept are the temperature, light, relative humidity, the surrounding gases and the type of container used. The high temperatures, high relative humidity and the intense sunshine in the tropics are not conducive to the stability of drugs. In spite of this, there is virtually no comprehensive work done on stability of drugs in the tropics. The drugs imported into tropics are usually subjected to short term accelerated tests and the shelf-lives of the drugs are estimated from such kinetic studies. However, such results have been found to have very little relation to the stability of the drugs when in market. Hence, predicted shelf-lives of drugs need also to be evaluated under the conditions they are to be marketed.

Degradatory products from a drug apart from reducing the potency of the drug could also be toxic. Degradatory products from tetracycline have been found to be nephrotoxic (Frimpter, 1963 and Cleveland et al, 1965). The epitetracyclines are particularly known to be toxic (Walton, 1970).

AVAILABILITY TESTS

It is now known that different formulations of the same drug could give different therapeutic effects. **Levy** and **Nelson** (1964) reported of a patient responding differently to two different brands of prednisolone tablets.

To check such discrepancies between drug formulations, the amount of drug available in the body is evaluated by such tests as disentegration, dissolution and blood level determinations. The amount of drug available in the body could be influenced by:

1. The particle size of the drug;
2. The Crystal form of the active substance.

Buckwalter, (1958) found that penicillin concentrations obtained in the blood were inversely proportional to the crystal size of the procaine penicillin employed.

Chloramphenicol can exist in several polymorphous forms and only one of these could be absorbed (Armando 1967). The type of excipients in a formulated drug can also affect the amount of drug available in the body when the drug is administered. Middleton et al, 1964, investigated the absorption of riboflavin from multivitamin tablets. As a measure of the availability, they used a relation between the percentage of the compound that was excreted in the urine after ingestion of the formulated product in question, and the percentage excreted after ingestion of the compound in aqueous solution. The results of their investigation are as shown below:-

Drug	Availability
G	98%
E	94%
D	88%
B	87%
C	36%
F	12%

NB: (Drugs G,E,D,B,C,F, are different brands from different manufacturers)

It is clear from the results that the different brands of the same drug tested presented different blood levels, which could affect their efficacy.

CLINICAL TESTS

Clinical tests are essential aspect in drug evaluation. They give overall picture of the efficacy of a given formulated drug. Every formulated drug before it is circulated in the market must be clinically tested.

However, because of time involved in clinical tests they do not form part of day to day routine quality control in drug manufacturing. The thalidomide disaster (1960 – 1961) has generated intense study in drug toxicity. Carcinogenic and tetratogenic properties of new drugs are screened by many manufacturers before they are marketed. In fact, many drug registration bodies demand data on

carcinogenicity and tetratogenicity of drugs before the drugs are accepted for use by the public.

Thus, it is evident that quality control of drugs is a complicated task due to many-sidedness of the problem and the difficulty of finding suitable control methods. Hence, it takes concerted effort of manufacturers, governments and other private institutions to bring about adequate quality control of drugs.

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Under Clause II of the Constitution of the Commonwealth Pharmaceutical Association (CPA) one person has been appointed from each member country as a CPA Correspondent. Among other duties, these persons can provide some information to visiting Pharmacists from other member countries.

For example, a CPA Correspondent in a Commonwealth country you are visiting can give you, on request, the following details:

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single-dose

Combantrin*

PYRANTEL PAMOATE

Outstanding Clinical Results with Combantrin*

Roundworm

Evaluation Trials

In five separate investigations involving 429 patients, consistently high cure rates were obtained with a single dose of Combantrin.

No. of Patients	% of Patients Cured
79	100%[1]
189	95%[1]
38	97%[2]
68	99%[1]
55	98%[1]

Pinworm (Threadworm)

In 219 patients treated with Combantrin in five separate investigations, consistently high cure rates were obtained with a single dose of Combantrin.

No. of Patients	% of Patients Cured
12	100%
86	98%[3]
28	96%[4]
30	100%[5]
43	95%[1]
20	90%[6]

Hookworm

Seven separate investigations have proven that Combantrin provides an effective treatment for Hookworm infection in children and adults. Patients infected with both of the medically important genera viz. Ancylostoma duodenale and Necator americanus were included in the studies.

Species	No. of Patients	% of Patients Cured
N. americanus	42[1]	98%[2]
N. americanus	97[1]	96%[1]
A. duodenale	62	94%[1]
A. duodenale	72	99%[1]
A. duodenale	35	91%[1]

*Combantrin dose employed 10 mg. /kilo body weight given on three successive days.

Over 40 studies throughout the world have established Combantrin's efficacy in Roundworm, Pinworm (Threadworm), and Hookworm alone or together...Over 15 comparative trials against the most widely used anthelmintic agents have proven the superioriy of Combanrin.

Comparative Trials

In two separate clinical trials involving a total of 274 patients, a single dose of Combantrin was compared with piperazine at recommended doses. Combantrin was found to be markedly more effective in both studies.

	No. of Patients	% of Patients Cured
Combantrin	63	89%[7]
Piperazine	51	57%[7]
Combantrin	39	100%[1]
Combantrin	40	90%[1]
Combantrin	40	90%[1]
Piperazine	41	71%[1]

Three separate investigators compared Combantrin with pyrvinium pamoate. The cure rates obtained with Combantrin were significantly higher than those obtained with pyrvinium pamoate in all three studies.

	No. of Patients	% of Patients Cured
Combantrin	50	96%[1]
Pyrvinium	54	81%[1]
Combantrin	50	94%[1]
Pyrvinium	50	70%[1]
Combantrin	20	90%[5]
Pyrvinium	20	85%[6]

In three separate investigations comparing Combantrin with bephenium hydroxynaphthoate at recommended doses in patients with A. duodenale, Combantrin proved to be superior.

	No. of Patients	% of Patients Cured
Combantrin	20	95%[1]
Bephenium	16	94%[1]
Combantrin	49	86%[1]
Bephenium	51	77%[1]
Combantrin	41	98%[1]
Bephenium	41	71%[1]

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Single-dose Combantrin*

a major therapeutic breakthrough in...

Polyparasitism

"Ascaris lumbricoides has been often found in association with Trichuris trichiura, hookworm, (Ancylostoma duodenale and Necator americanus), and Enterobius vermicularis when either swab or adhesive tape examination of the peri-anal region is made in addition to stool examination."[8]

The author of a recent article commenting on polyparasitism stated– *"Multiple infection with several species of parasite is extremely common and remarkable cases occur."* After reviewing a few selected cases, the author continued– *"Polyparasitism could be explained environmentally i.e., conditions suitable for one species generally favouring the entry of others. Alternatively, the effects of one or two parasitic infections may weaken resistance to subsequent invasion with others, or there might even be a symbiotic relationship between two or more species. 'Where one worm is found look for the others' is a sound principle of diagnosis. In any case, the effects on general health, development, resistance to acute infections or poor diet, and working capacity must be devastating."*[9]

Combantrin Results Activity in mixed infestations substantiated.

Study No.	1[3]	2[3]	3[3]	4[3]	5[3]
No. of persons treated with Combantrin single-dose	74	100	38	69	97
No. of Patients harboring:					
Roundworm	55	79	38	45	68
Pinworm	—	43	12	—	—
A. duodenale	35	—	—	—	72
N. americanus	21	—	—	40	—
Undifferentiated H.W.	—	15	—	—	—
Cure rates with Combantrin					
Roundworm	98%	100%	97%	87%	99%
Pinworm	—	84%	100%	—	—
A. duodenale	91%	—	—	—	99%
N. americanus	71%	—	—	83%	—
Undifferentiated H.W.	—	87%	—	—	—

Combantrin*

PYRANTEL PAMOATE

Unparalleled ▪ Efficacy ▪ Toleration ▪ Convenience

Pfizer SCIENCE FOR THE WORLD'S WELL-BEING SINCE 1849

OUR PLANT RESOURCES

DR. K. SARPONG

Man has from the beginning of his history depended upon plants as sources for both food and medicine, and in fact for his existence. Apart from the value as sources for food and drugs, many plant parts provide raw materials in various industries.

From the earliest times man has used plants to cure diseases and to relieve pain. The ancient man had no accumulated knowledge or precedent to draw upon. The pre-historic man made discoveries of medicinal plants only by accident or by time consuming trial and error but compiled no literature. In addition, man observed animals who showed instinctive discrimination of plants, being able to avoid toxic ones and in some instances choosing those which were beneficial from the nutritional and medicinal stand-point. For example it is believed that man seemed to have learned the healing powers of **Rauwolfia** against snake bites from the little animal, mongoose also known as weasel. Before this animal attacks the snake, it fortifies itself by eating some leaves of **Rauwolfia.** Again if it is injured in a combat with a snake, it looks out for the plant, eats the leaves, rests a little while and then rushes forward to attack again.

It is therefore probable that through the combination of the knowledge acquired empirically and observations on animals, man was able to build up some store of facts on medicinal and food plants which he passed on to his descendants. Although progress in medicinal knowledge was extremely slow, succeeding generations through the same process of trial and error and observations on animals, in addition to the scanty pieces of information passed on from their predecessors, struggled, failed and somehow succeeded in laying down some foundation upon which modern medicine is built.

The production and distribution of plant products have had a profound influence on the economic and social life of all nations of the world, affecting both domestic conditions and international relations.

It will be appreciated that the subject matter is so wide and deeply involved that it will not be possible to review in detail all its aspects and their fundamental bearing on human affairs and activities. A few examples may be permitted by way of illustration and for these examples the medicinal values of some of our plants will be emphasized. Only a brief mention of uses of plants for other purposes e.g. flavouring and scenting will be made.

One of the most remarkable drugs that has been a great boon to mankind is the alkaloid QUININE which we are all familiar with. This drug came to the relief of millions and millions of people all over the world especially in Africa where the killer, malaria was prevalent. Several synthetic products related chemically to quinine are now known and have to a large extent replaced the natural drug. It is now known that several strains of malaria parasite are resistant to the synthetic drugs.

Quinine and the closely related natural drugs are obtained from the bark of a tree called **Cinchona** belonging to the family, Rubiaceae. The plants are native to the highlands of the Andes in South America. There is no reference to the plant **Cinchona** in our flora neither is it known in Ghanaian native medicine. The plants require a high altitude to grow for the maximum yield of alkaloids. They grow well at low levels but produce practically no alkaloids. It is likely then that any attempt to cultivate Cinchona in Ghana would be futile. Fortunately, there are a large number of plants in the same family as well as in other families (e.g. Menispermaceae) which have been shown by preliminary investigation to contain alkaloids with the same basic structure as quinine. Research workers in the Faculty are seriously looking into these plants for antimalarial activity. Who knows — the answer to the resistant strains of malaria parasite may lie in these species.

The well known Coca plant, **Erythroxylon,** a native of South America grows well in Ghana. It is one of the oldest known drugs and continues to play a leading role in modern medicine. Coca is the source of the most renowned local anaesthetic cocaine. Such a plant can be cultivated on a large scale in Ghana for cocaine. However, being one of the drugs of abuse, its cultivation must be strictly under Governmental control.

Alkaloids related chemically to cocaine are atropine, hyoscine and hyoscyamine i.e. the Solanaceous alkaloids. The use of atropine in opthalmology is too well known to be recounted. Some of these Solanaceous plants grow in Ghana and can be used as sources of these important drugs.

Rauwolfia, popularly known locally in Akan as "Kakapenpen" is another important crude drug. This plant is the source of the drug reserpine which has been used for the control of hypertension over a very long period of time. It has been one of the most effective drugs for lowering blood pressure and is also indicated in the treatment of some mental diseases. Crude **Rauwolfia** has been used for centuries in both Africa and Asia for treating various mental disorders.

The modern story of **Rauwolfia** began in 1930 when some research fellows in India began seriously to investigate some of the crude drugs used in Indian folk-lore medicine. At the time this drug was used for the treatment of mental disorders. In 1931 various chemical substances were isolated from **Rauwolfia** and at the same time researchers in India reported that **Rauwolfia** not only caused sedation, but also lowered the blood pressure. This drug continued to be used only in that country for high blood pressure because there was no interest in the drug outside India.

In 1952, an American physician accepted the fact that there might be some merit in Rauwolfia and used it with great success on his patients. In the same year the compound reserpine was isolated and found to be the hypotensive principle in Rauwolfia.

We are fortunate to have a great drug such as **Rauwolfia** growing in Ghana. Still encouraging is the fact that the percentage of reserpine in the Ghanaian species, **R. Vomitoria** is higher than that of the Asian species. Much simpler methods have been developed for isolating reserpine in very high yield. What a boon if **Rauwolfia** is cultivated here on a commercial scale!

Certain anticancer agents used today are obtained from the plant **Vinca rosea (Catharanthus roseus).** This ornamental plant is very common around our houses and in our gardens. Modern scientific investigation of **Vinca** was prompted by folk-lore assertion of the plant as an oral hypoglycaemic agent. Nearly sixty alkaloids have been isolated from **Vinca.** Two of them, vincalencoblastine (VLB) and vincristine are marketed under the proprietary names of Velban and Oncovin respectively. These compounds are very expensive, and therefore the cultivation of **Vinca** in Ghana on a large scale for export as a booster of our economy cannot be over-emphasized.

Other important groups of drugs that need mention are the GLYCOSIDES particularly the cardiac, the anthraquinones and the saponins. The most important of the cardiac glycosides, **Digitalis** would not grow under our climatic conditions. Other plants, for example **Strophanthus,** which contain similar chemical compounds grow in Ghana.

Of the anthracene or anthraquinone glycosides containing plants (the purgative drugs), Senna is the most important. Over thirty species of Senna **(Cassia)** grow in this country and out of these at least sixteen have been screened in our laboratories and have been found to contain purgative principles which match both in quantity and activity with that of the official species, **C. angustifolia** and **C. acutifolia.** Practically no use is made of **Cassia** in this country.

Millions and millions of people throughout the world are taking birth regulating tablets, either to promote or prevent pregnancy. Both types of drugs belong to the same chemical group — the steroids which constitute a very interesting class of compounds.

These substances were originally intented to cure sterility but today the emphasis is on birth control. The compounds are also used in treating arthritis, rheumatism, asthma, burns, skin and eye diseases. The whole story of the birth control pill and other cortical hormones began from the wild yam — **Dioscorea.**

Work in this field was started by Prof. Russel Marker in 1928 with special interest in the sex-hormones. About this time, the female hormone oestrone, the male ones androsterone and testosterone were known together with progesterone — the pregnancy hormone. Progesterone was very expensive and people could not afford it to arrest the very high percentage of miscarriages in pregnancy at the time. It was this that stimulated Marker's interest.

Having in mind that plants of the order Hilides were rich in steroids, Marker concentrated on some plant families. He was successful in isolating compounds called plant sapogenins which were to serve as the starting materials for the manufacture of sex and cortical hormones. He later described how the pregnancy hormone — progesterone, and the male hormone testosterone could be synthesised from the sapogenin, diosgenin isolated from **Dioscorea.** Diosgenin and similar compounds are now used as starting materials for the synthesis of numerous cortical hormones.

There are many Ghanaian plants containing steroidal sapogenins, for example, species of **Dioscorea, Solanum** and **Agave.** A good number of **Solanum** species are known in Ghana. Those that have been investigated have been found to contain steroidal saponins in fairly high concentrations. The merit of **Agave sisalana,** the sisal hemp plant, as the source of steroidal saponin is that the plant is cultivated on a large scale for its fibre. The crude saponin is obtained as a by-product in the fibre industry. Hydrolysis of the saponin gives the aglycone, hecogenin which has been widely used as a starting material for the synthesis of a large number of corticosteroids.

Essential oils constitute one of the most commercially viable plant products. These oils may be used for a definite therapeutic action but generally they are used for flavouring and for scenting drugs and cosmetics and food. Plants containing essential oils are abundant in the country. Cinnamon, **Ocinum** (Akan: Nunum), **Clausena,** Lemon grass, ginger, orange peel are only a few examples. Orange peel is actually considered as a waste product but is the source of an oil widely used as a flavour.

Our purified cassava starch is a good disintergrating agent. **Albizia** gum (Akan: Okro) is a bind-

ing and disintergrating agent. It has been found to be sixteen times more effective as an emulsifying agent than the universally acclaimed **Acacia** gum. These are some of the plants that need to be cultivated.

Ghana has not made any attempt to export any vegetable drug in any appreciable amount. Many indigeneous medicinal plants can be cultivated on a commercial scale and some exotic plants can be introduced. Some of the crude drugs could be exported while others could be processed locally. Ghana can therefore take her fair share of the international drug trade in this area. It is a fact that scientific investigations of the pharmaceutical possibilities of plants in this country is in its infancy. Lack of modern scientific equipment for rapid analysis is one of our handicaps. The number of personnel adequately trained in this field is also small. Despite these and other setbacks, the Faculty of Pharmacy is actively investigating some of our medicinal plants. Medicinal plants research must be encouraged in a very liberal way through grants for the survey of our flora and investigation of folk-lore cures. Promising plants can then be subjected to phytochemical and biological assays. The creation of a vast ensemble of phytochemical and pharmacological research in this country would be very helpful. It is fervently hoped that within the next few years, botanical drugs will be developed and mass produced in Ghana.

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DRUG SUBSTITUTION— A PROBLEM FOR THE PHYSICIAN, PHARMACIST, AND THE PATIENT

By J.E. Akyirem, B. Pharm.,MPSG, G.N.T.C. — Clinic, Accra

Variations in Therapeutic response to a particular drug from different sources have made physicians aware of specifying the products they prescribe. This has also caused the pharmaceutical industry to float the market with several branded products. Aspirin for instance, has been marketed under the names, Aspro, Cafenol, Dispirin and Inspirin. It is now known that drugs which conform to the same chemical standards do not necessarily produce the same therapeutic response. This has been termed therapeutic non-equivalence. The subject of drug substitution continues to be more controversial as more reports of therapeutic non-equivalence of branded products are issued.

The principles underlying this phenomenon of therapeutic non-equivalence are the factors which control the release of drugs to their site of action after administration. Such factors as physical form of the drug, Optical Isomerism, Polymorphism, variation in particle size and varying degrees of hydration affect the availability of the drug to the body (bioavailability).

Certain substances exhibit polymorphism. These polymorphic forms have different physical properties, particularly solubility, hence the different polymorphs will show variable therapeutic response. It is known that Chloramphenicol exists in 3 (three) forms; only one is therapeutically active. Cortisone, Prednisolone, Barbiturates and Sex Hormones are also known to show Polymorphism.

Particle size affects Bioavailability in that increase in surface area of the drug enhances absorption from the Gastro-intertinal tract. Thus a particular drug prepared with different particle sizes will show different absorption rates and variable therapeutic response.

Many natural products such as Alkaloids and Steroids exist as either the Dextro or Laevo Isomer. Frequently only one form shows Pharmacological activity. Atropine for instance exists as the Dextro or the Laevo form; the Laevo Form is active, whilst the dextro form is inactive. A racemic mixture of the two forms may thus show half the activity of the laevo form, when the actions of equal amounts of the former and the latter are compared.

Drugs in the Amorphous form are often more soluble than those in Crystalline Form. Crystalline esters of Chloramphenicol are inactive but the Amorphous Form with a small particle size dissolves rapidly enough to permit Hydrolysis to Chloramphenicol. It is also known that Amorphous Novobiocin is 10 times more soluble than the Crystalline Form.

The factors given above either affect the Therapeutic efficacy of the drug directly or indirectly by interfering with absorption of the drug. In drug formulation, these and many other factors should therefore be taken into consideration.

DIFFICULTY:-

It is very difficult, in fact, very expensive to carry out Clinical trials of thousands of pharmaceutical products which have been put on the market, to assess their therapeutic efficacy.

This Phonomenon of therapeutic non-equivalence has been found to be common with certain drugs. Substances for which evidence of this therapeutic non-equivalence appears to be particularly strong are:- Chloramphenicol, Digoxin, Nitrofurantoin, Oxytetracycline, Phenindione, Phenylbutazone, Phenytoin, Tetracycline and Tolbutamide.

GUIDE:-

As a guide to pharmacists in dealing with the problems presented by the varying therapeutic potencies of different preparations of the same drug, the British Pharmaceutical Society's Department of Pharmaceutical Sciences has, on the evidence available, compiled lists of drugs whose preparations have differing availabilities or are suspected to have different therapeutic potencies.

Included in such lists are:-

Acetohexamide
Aminophylline
Ampicillin
Bishydroxycoumarin
Chloramphenicol
Chlortetracycline
Digoxin
Erythromycin
Ferrous Sulphate
Griseofulvin
Hydrocortisone
Hydrochlorthiazide
Indomethacin
Isoniazid
Meprobamate
Methandrostenolone
Methylprednisolone
Nitrofurantoin
(Pentaerythritol — tetranitrate)
Penicillin G Potassium
Penicillin V Potassium
Pentobaribitone Sodium
Phenindione
Phenylbutazone
Phenytoin

Prednisolone
Prednisone
Quinidine
Quinalbarbitone Sodium
Reserpine
Sodium Aminosalicylate
Stilboestrol
Spironolactone
Sulphadiazine
Sulphafurazole
Sulphamethoxazole
Tetracycline
Theophylline/ephedrine/Phenobarbitone Tabs
Thyroid
Tolbutamide
Warfarin Sodium

PROBLEMS:-

The Pharmacist often meets many problems relating to this subject. Should he dispense paracetamol tablets when the prescription states Panadol tablets? Should he supply any of the proprietary products — Inspirin, Aspro or Dispirin, when Aspirin is prescribed? Should he allow the poor patient to leave his pharmacy without any help simply because the Physician prescribed Fergon tablets but he has Ferrous Gluconate tablets or should the patient be allowed to suffer when Saroten (Warner) can be supplied in the absence of Triptizol (M.S.D.)?

Admittedly, our pharmacies, both hospital and retail cannot stock the thousands of pharmaceutical products to satisfy every prescriber. Now the tradition of using official names of drugs in prescriptions is gradually giving way to the use of proprietary names because of the variation in Therapeutic potency of different proprietary products of the same drug.

These are the problems associated with this subject of drug substitution. The subject itself is a controversial matter which always needs a compromise between the prescriber and the supplier.

CONFUSION:-

The situation becomes more confusing when physicians describe to their patients, the type of drug being prescribed for them. In such instances the prescriber forgets that drug manufacturing is a dynamic occurrence and changes are taking place from time to time, to suit conditions. It is also controlled by the availability of raw materials. This habit was experienced in a hospital where a medical officer used to tell his patients the colour and shape of the tablets or capsules he prescribed for them. The unethical habit was detected from patient's reactions and the doctor's attention had to be drawn to the harmful implications.

It should be noted that, the Pharmacist, in compounding certain drugs, may put in some adjuvants which may change the normal state of the drug. What will happen if the doctor tells the patient that he will be supplied with a "Yellow Mixture" and he is given a mixture which has been coloured red with liqour Azorubri? This obviously brings chao and the doctor does more harm to the patient. Th patient will think that he has not been supplie with the correct drug. Psychologically, he may nc be cured even if he takes the drug.

In another hospital a Pharmacist supplied Cliac suspension as substitute to Fenocin suspensio prescribed by a doctor. These two drugs are pro prietary products of Phenoxymethyl Penicillin Po tassium. There was no Fenocin suspension in stoc but the prescriber insisted that what he prescribe should be dispensed. The medical officer coul not come to a compromise with the pharmacist The approach of the medical officer to the pharma cist was not cordial and this eventually resulte into a quarrel. This quarrel brought no fruitful re sult to the patient.

Some medical officers are in the habit of instructing their patients to show them the drugs dispensed from the dispensary. Is there any nee for this? If there is, what does it imply? This has occurred in many instances and in most cases, the result is not in the interest of the patient.

Any Physician who does this creates the impression that he wants to check the drug dispensed from a pharmacy. This act is incompatible with the professional ethics of pharmacy and medicine. Any medical practitioner who does this, doubts the professional integrity of the pharmacist who compounded and dispensed the drug.

A recent personal bitter experience was when compound Benzoic Acid Ointment was dispensed for a prescription which stated Whitfield's Ointment. The patient who brought this prescription had searched for Whitfield's Ointment for two days but could not get any. Compound Benzoic Acid Ointment was therefore, dispensed to him from my pharmacy. The next day, the patient returned the drug to my pharmacy saying "The doctor says you did not give me the correct drug". There was nothing wrong in specifying Whitfield's Ointment in the prescription. Could the prescriber not help the poor patient who had been searching for Whitfield's Ointment for two days by accepting the fact that Whitfield's Ointment is a proprietary product of compound Benzoic Acid Ointment which is basically 6% Benzoic and 3% Salicylic Acid in emulsifying Ointment? Was the doctor ignorant of this fact or could he not identify compound benzoic acid ointment?

It could also be that the prescriber wanted to be conservative. Such conservatism would make the patient suffer. The patient could even spend about one week just, searching for Whitfield's Ointment. During this period the patient's infection would not be cured; it would rather be made worse.

This topic can be a long debate, the result of which will not solve the problem. Many reasons can be raised to defend the case but these will not help the patient either.

SOLUTION:-

There are many unpleasant experiences relating to this subject of drug substitution. In all cases, the substitution is done without any sinister motive; it is done just to help the patient to get a drug similar to the one prescribed in the absence of the latter.

This is a problem in therapy which needs a careful and diplomatic approach. It will be more beneficial for the physician and the pharmacist to come to a compromise on the use of a particular drug.

The practice of describing the drugs prescribed to the patient is also unethical. What impression will a patient get of the staff of a pharmacy if he gets drugs which are different from the ones described to him by his doctor? The Psychological implications are obvious. A Physician who does this is not curing his patients effectively.

The Physician and the pharmacist should work as a team. They should often communicate with each other and discuss various products being put on the market. Where there is no evidence of therapautic non-equivalence, the physician should be less specific and as much as possible use official names so that the pharmacist will supply the product he has. This will solve the problems patients encounter when they cannot get the drugs prescribed for them.

We reproduce below a notice which appeared in the "Ghana Gazette" No. 22 of 9th March, 1973.

MINISTRY OF HEALTH—PHARMACY BOARD

CANCELLATION OF CERTIFICATES OF REGISTRATION AS PHARMACISTS

It is hereby notified for general information that, in pursuance of the provisions of section 9, subsection (3) of the Pharmacy and Drugs Act, 1961, the Pharmacy Board has, with immediate effect, cancelled the certificate of registration as Pharmacists of the following persons:-

Acheampong, P. A.
Acquah, M. C,
Adai, G. K.
Adams, E. B.
Akoto, J. W.
Akuetteh, E. E.
Anderson, J. L.
Anthony, J. A.
Armah, G. T. A.
Asiedu, R. B. K.
Asiedu, S. K.
Atta-Nyamekye, J.
Awua, J. Y.
Ayitey-Smith, E. (Dr.)
Ben-Smith, Andrews
Baofo, G.V. K.
Commey-Sackeyfio, A.
Da-Rocha, Alexander
Demor, A. A.
Ferguson, T. S.
Fiegbe, N. I. Y.
Heman-Ackah, S. M. (Dr.)
Hutton, Fredrick
Kennedy J. G.
Kusi-Asomani, R. B. K.
Larbi, S. O.
Lartey, H. B.
Laryea, J. A.
Laryea, J. H.
Mainoo-Senya, P. K.
Mingle, J. A. A.
Nyarko, A M. D
Odoi, Fred A.
Ogunro, J. A.
Quashie, J. K. A.
Quartey, W. O.
Sampong, A. G. E. M.
Sencherey, H. K.
Takper, S. K.
Temeng-Forson, A.
Woode, J. K. A.
Yirenkyi, T. R. L.

They therefore forfeit all rights, privileges and obligations as pharmacists.

R. A. COFFIE
Acting Registrar, Pharmacy Board

Bowl of Hygeia

"Bowl of Hygeia" Award Program

The A.H. Robins Company's "Bowl of Hygeia" Award, for outstanding community service by a registered pharmacist, is designed to provide recognition to men and women of pharmacy for the many and varied services rendered to their respective communities, above and beyond their professional duties.

The award has been accepted for annual presentation by the pharmaceutical associations in all 50 of the United States, in the District of Columbia, Puerto Rico, in each of the ten provinces of Canada and in many other foreign countries.

The pharmaceutical association in each state, province, or area concerned selects each year its own recipient — who must be a registered pharmacist. A.H. Robins plays no part in these selections, which honor only living persons, but simply makes available the handsome mahogany plaque which symbolizes the award. The plaque measures 10 by 13 inches, and features in cast bronze the "Bowl of Hygeia," most widely recognized international symbol of pharmacy.

The identity of a recipient usually is not disclosed until the actual presentation is made at his state's annual meeting, but each state association makes its own decision in this regard.

An appreciation of the time and personal sacrifice devoted by pharmacists to the welfare of their respective communities prompted E. Claiborne Robins, chairman of the board of A.H. Robins, to establish the award in 1958. Mr. Robins is himself a third-generation pharmacist in his family, and is active in many fields of civic endeavor.

Aside from the honor of the award itself, the attendant publicity — both local and national — provides additional recognition to the pharmacist and the part he plays in the life of his community.

Each year since 1963, winners of the "Bowl of Hygeia" Award have been featured in a special A.H. Robins advertisement published during National Pharmacy week in TIME magazine. During the same period, recipients have been guests of the company and are honored with a reception and dinner. In 1966, the winners included three women.

The "Bowl of Hygeia" symbol derives from Greek mythology. Hygeia was the daughter and assistant of Aesculapius (sometimes spelled Asklepios), the God of Medicine and Healing. Her classical symbol was a bowl containing a medicinal potion, with the serpent of Wisdom (or guardianship) partaking of it. This is the same serpent of Wisdom which appears on the caduceus, the staff of Aesculapius which is the Symbol of Medicine.

The "Bowl of Hygeia" was widely depicted in ancient Greek and Roman sculpture and wall paintings. Through the centuries it has appeared in many guises, taking on the characteristics of a particular nationality or time period. It is believed to be used more widely as a symbol of pharmacy than even the well-known mortar and pestle, and thus was a natural choice for an award designed for presentation to pharmacists.

The company plans to continue offering the coveted award each year and in 1973 will award it for the first time to a pharmacist from Ghana.

A plaque similar to that offered in the United States of America will be presented by the A.H. Robins Company to the pharmacist selected by the Pharmaceutical Society of Ghana as having rendered the best service to his or her community, above and beyond their professional duties.

In addition the A.H. Robins Company will also honour the recipient at a dinner to be held in Accra in the company of leading dignitaries and will place advertisements announcing the award in the national press.

The A.H. Robins Company is represented in Ghana by Messrs. Asubonteng Brothers Limited of Accra and Kumasi who distribute famous specialities such as ROBITUSSIN cough expectorant, DONNAGEL antidiarrheal suspension, DONNATAL antispasmodic tablets, ROBAXIN muscle relaxants, amongst many others. All the above products are considered to be leaders in their field in numbers of prescriptions and purchases, through pharmacies in the United States of America, and are fast finding their rightful place as the most prescribed products in Ghana.

The A.H. Robins Company is proud to recognise the pharmacists of Ghana in this way and looks forward to future successful associations.

FROM THE HON. GENERAL SECRETARY'S DESK

It is not intended that this column should be a regular feature of the Journal but since this is the maiden issue I wish to report on certain matters which, probably because of the lack of a proper medium of communication, might have passed unnoticed by several members.

DIPLOMA COURSE IN PHARMACY AT THE UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

It will be recalled that in 1968 the Ministry of Health in conjunction with the University initiated a Diploma Course in Pharmacy (in addition to the Degree Course) which they expected to be registrable in spite of the Society's and the Pharmacy Board's advice that the content of this Diploma Course was not up to the standard that would be acceptable for registration. Of course, the Ministry insisted that the University should run the course in spite of this advice from the profession so the first batch of Diplomates came out in June 1970. The Pharmacy Board and the Society refused to register these holders of the Diploma as qualified pharmacists, and consequently the Ministry of Health and the Establishment Secretariat created a new non-professional grade of Pharmacy Technologists for these people.

One of the first acts of the present National Council when it came into office was to open negotiations with the Ministry of Health and the Ministry of Education, Culture and Sports on the future of this diploma course.

It is noteworthy that the Commissioners for the two Ministries agreed with the Society and the Board that the Course should be discontinued and so no students were admitted to the course when the University's 1972/73 Academic year started in October, 1972.

It was agreed that what was needed to supplement the professional grade was a crop of Pharmacy Technicians who could be trained in one of the country's Technical Schools at less expense to the Government than the two-year diploma course at the University. The Society has since submitted a syllabus for such Technicians Course to the two Ministries for study. The Society has also suggested that possibly the course should be mounted at one of the Technical Schools in Kumasi so that Pharmacy Lecturers at the University in Kumasi could conveniently help in the teaching.

It was further decided that a scheme should be started to re-train the Pharmacy Technologists to enable them become registrable as pharmacists and consequently the Pharmacy Board decided:-

(a) The Pharmacy Technologists should undergo two years practical training under registered pharmacists.

(b) At the end of each year of practical training, the Technologists should pursue an intensive 3 months academic course at the University in Kumasi.

(c) At the end of the second 3-month academic course at the University those Technologists who pass the prescribed examination would then become registrable.

COMMITTEES OF COUNCIL

The National Council has appointed a number of Committees to look after specific sectors of the Society's activities. The Committees are Editorial, Public Relations, Hospital Pharmacy, Forensic Pharmacy, Education, Drugs, Building Fund, and Co-operative Pharmacy.

The publication of this Journal was initiated following the recommendations of the Editorial Committee to the Council. All the other Committees are actively working on their assignments.

THE PROFESSIONAL BODIES REGISTRATION DECREE, 1973

The National Council is actively working with the Councils of other recognised professions in the country to ensure the full implementation of the provisions of this decree, which vests in each professional Society or Association, the right to control the training, registration and discipline of persons practising that profession in Ghana.

Under this Decree heavy penalties are prescribed for any person who, not being a registered member of a particular professional Association holds himself up as belonging to that profession or practises it. Again under the Decree, the approved Disciplinary Authority of a professional Association shall "have such powers, rights and privileges as are vested in a High Court" in respect of

i) "enforcing the attendance of witnesses and examining witnesses" and

ii) "compelling the production of documents" when conducting any disciplinary enquiry.

Appeals against decisions of the Disciplinary Authority lie with the Court of Appeal.

To bring the Constitution of the Society in line with the extra functions that the Decree entrusts to the Society the National Council appointed a Constitutional Review Committee which has already submitted its proposals to the Council. The final draft after Council approval, will be submitted for ratification to the National Conference scheduled for August.

An Association of Recognised Professional Bodies in Ghana has been formed and the Society is

one of its eight foundation members. Already the Commonwealth Foundation has promised the Association £30,000 towards the cost of building a Professional Centre in Accra.

IMPORTATION OF PHARMACEUTICALS INTO GHANA

In the face of the economic situation of the country, the Society and the Ghana Medical Association jointly set up a Committee of six (three members from each of the two professions) to review the country's Drug requirements with the view of making sure that the available foreign exchange resources were utilized in importing only "essential" drugs. The Joint Committee's report has already been submitted to the Ministry of Health and the Pharmacy Board.

Prior to this, the Society had made representations to the Ministry of Health requesting the Government to make reasonable import licences available to importers of both pharmaceutical raw materials and finished products to avert a possible serious shortage of Drugs in the country.

NEWS FROM NATIONAL HEADQUARTERS SECRETARIAT

The following notices have been issued by the National Headquarters Secretariat during the past few weeks:-

Registration under the Professional Bodies Registration Decree 1973 (National Redemption Council Decree 1973)

Under the provisions of this Decree, the Society is required to register with the Registrar-General's Department as a Professional Body. Among details that have to be submitted to the Registrar-General for the purposes of this registration are:-

The full name, qualifications, and current address of each member of the Society.

As you will realize, quite a number of members have changed their addresses during the past year but some of these members concerned have not notified the National Headquarters Secretariat about their new addresses.

To facilitate the registration under the Decree therefore, every member is requested, as a matter of urgency, to notify the National Secretariat of his/her current address together with his/her qualifications if any additional qualifications have been acquired since that member was first registered by the Society.

These details will obviously also help the Pharmacy Board to publish more accurate information on individual Pharmacists in the Gazette in accordance with the provisions of Section 12 of the Pharmacy and Drugs Act, 1961.

All members who have not already supplied these details to the National Secretariat should please do so without any further delay.

The National Headquarters Building Project

The attention of all Pharmacists is being drawn to a circular letter dated 26th August, 1967 to all the Regional Branches on the above subject. The National Council of the Society at the time decided that in order to accomplish the objectives of the Fund, each member of the Society should be called upon to make a special subscription of (C100.00) One hundred Cedis as his or her contribution to the project. The target of the fund is C100,000.00. Concession to pay this amount by instalments was given to any member desirous of doing so by yearly payments of (C25.00) Twenty five Cedis thus spreading full payment over a period of four years with effect from January, 1967.

At the time this Circular went out, the Society had realized (C6,139.96) Six thousand, One hundred and Thirty-nine Cedis, Ninety-six Pesewas, being donations from some drug manufacturers and trading firms both in Ghana and Overseas and prominent personalities in Ghana.

The present National Council endorses this decision taken by the former one and has therefore set up a Committee of eight to be known as "The Building Committee" to carry on from where the previous committee left off. The Committee has been empowered to collect the special subscriptions from members of the Society and to make any other special effort, which will enable the Society to achieve the goal within the shortest possible time.

The Committee is composed of the following members:-

Mr. E. Osei-Tutu	— Chairman
Mr. I.N. Kankam	— Secretary
Mr. K.A. Ohene-Manu	— Member
Mr. T.E.C. Sagoe	— Member
Mr. M.A. Dako	— Member
Mr. A.A. Asiedu	— Member
Capt. M.T. Quarcoo	— Member
Mr. M.S. Donkor	— Member

REMITTANCES — should be made, preferably by Cheque, Money Order or Postal Order. If payment is made by Cheque, it will be advisable to insert the words "Commission to Drawers A/C" if the account is outside Accra. All Cheques, and Postal and Money Orders should be crossed and all remittances made payable to:

"The Pharmaceutical Society of Ghana's Building Fund".

All letters should be addressed to:

Mr. E. Osei-Tutu, MPSG, (Hon. Treasurer)
c/o Korle-Bu Teaching Hospital,
Accra.

or to:

Hon. Treasurer,
The Pharmaceutical Society of Ghana,
National Headquarters,
P.O. Box 2133,
Accra.

The National Council appeals to members to make every effort to pay these subscriptions without delay.

OTHER MATTERS

Late January, the Government appointed a 7-member Committee of Enquiry into the Affairs of the Korle-Bu Teaching Hospital following reports of unsatisfactory service at the Hospital. The Government asked the Society to nominate one representative to serve on this Committee. The Hon. General Secretary, Mr. K.A. Ohene-Manu represents the Society on this Committee.

The National Council mounted a "Pay your Arrears of Retention Fees" Campaign during last year. By the end of February 1973 most of the defaulting members had paid up and those who failed to comply had their Certificates of Registration as Pharmacists cancelled on 9th March 1973 by the Pharmacy Board at the request of the Council in accordance with Section 9(3) of the Pharmacy and Drugs Act, 1961, Act 64.

The names of those whose Certificates have been cancelled appear elsewhere in this issue of the Journal.

After several years of negotiations the Establishment Secretariat and the Ministry of Health agreed last year to raise the salaries of Government hospital Pharmacists to a level which the Society and the Government Pharmacists Association requested in 1968. These new salaries, asked for five years ago, are of course un-realistic now but it is an improvement on the old salaries. Details for implementing the new approved salary scales are being worked out.

EASTER REFRESHER COURSE IN PHARMACY

The National Council of the Pharmaceutical Society of Ghana in association with the Faculty of Pharmacy, University of Science and Technology, Kumasi, held a 4-day Refresher Course for Pharmacists at the University of Science and Technology, Kumasi, during the Easter Holidays.

The Course which was fully residential was inaugurated on Thursday 19th April and ended on Sunday 22nd April with participants departing on Monday 23rd April.

The course fee was C30.00 per person and this covered all expenses including boarding and lodging.

The Course Programme was:

THURSDAY 19TH APRIL

7.30 p.m.
Official Opening

by Prof. A.N. Tackie,
Dean, Faculty of Pharmacy

Lecture:

"The Practice of Pharmacy in Ghana as I see it".

by Prof. D.K. Santra

Chairman: Dr. K. Sarpong

FRIDAY 20TH APRIL

6.45 a.m. — 7.30 a.m. Breakfast
8.00 a.m. — 9.00 a.m. Lecture
Chemistry (Methods of Analysis)
9.00 a.m. — 10.00 a.m. Lecture
Pharmacognosy (Chromatographic methods).
10.00 a.m. — 10.30 a.m. Coffee Break
10.30 a.m. — 12.30 p.m. Practical Chromatography

(Paper, Thin-layer and Gas)
12.30 p.m. — 1.30 p.m. Practical Microbiology
1.30 p.m. — 2.30 p.m. Lunch break
3.00 p.m. — 6.00 p.m. Practical Chemistry (Methods of analysis)
6.00 p.m. — 7.00 p.m. Super
7.30 p.m. — 8.30 p.m. Lecture:
"Professional Ethics".
by Mr. K.A. Ohene-Manu
Chairman:
Prof. H.C. Mital
8.30 p.m. Cocktail:
(By courtesy of Ashanti Regional Branch)

SATURDAY 21ST APRIL

6.45 a.m. — 7.30 a.m. Breakfast
8.00 a.m. — 9.00 a.m. Lecture:
"Incompatibility or Solubilisation".
by Dr. D.O.Gyane

9.00 a.m. — 10.00 a.m. Lecture:
"Pharmacy & Drugs Act. Present and Future"
by Dr. C. Buadu

10.00 a.m. — 10.30 a.m. Coffee Break
10.30 a.m. — 11.30 a.m. Lecture:
"Promotion & Marketing of Pharmaceutical products"
by Mr. Seth Abadji

11.30 a.m. — 1.30 p.m. Practical Pharmaceutics (Incompatibility)
1.30 p.m. — 2.30 p.m. Lunch
4.30 p.m. — 6.00 p.m. Symposium:
"Drug Interaction"
Panelists: Dr. G.D. Lutterodt,
Mr. Kottoh-Motty
Dr. G.H. Konning
Chairman:
Prof. E.A. Gyang

6.00 p.m. — 7.00 p.m. Supper
7.30 p.m. Drinks Party

SUNDAY 22ND APRIL

7.00 a.m. — 8.00 a.m. Breakfast
9.00 a.m. — 11.30 a.m. Symposium
"Misuse of Drugs"
(Antibiotics, Purgatives Aphrodisiacs. etc.)
Panelists: Mr. S.A. Offei
R. Ansa-Asamoah
Mr. A. Gyesie
Chairman:
Dr. J. Ocran

12.30 p.m. Lunch
2.30 — 6.00 p.m. Excursion to Lake Bosomtwi.
7.30 p.m. End of Course — Dinner

MONDAY 23RD APRIL

7.00 a.m. — 8.00 a.m. Breakfast and Departure

THE PHARMACEUTICAL SOCIETY OF GHANA

NATIONAL HEADQUARTERS BUILDING FUND

The SOCIETY solicits your kind
assistance towards the cost of
erecting its

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The Fund was launched by the late
Lt. General E. K. KOTOKA, G. S. O.
the then Commissioner Responsible for Health

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* Kiwi Polish Co Shoe Polish
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NEWS FROM REGIONAL BRANCHES

The Greater-Accra Regional Branch

EXECUTIVE COMMITTEE is currently composed by:

R.Q. Lamptey, (Chairman)

S.A. Anaman (Vice Chairman)

D. Anim-Addo (Secretary)

Capt. M.T. Quarcoo (Asst. Secretary)

Miss B.J. Mills (Treasurer)

A. Gyesie (Financial Secretary)

M.A. Dako (Member)

M.S. Donkor (Member)

T. Ofosu-Eck (Member)

In addition to their regular business meetings, the Branch held a symposium on "Current Drug Import restrictions and its Implications" in November, 1972 and organised a cocktail party for its members on 14th December, 1972.

They held a discussion forum on "Pharmacy and The Law" — The Pharmacy and Drugs Act of 1961 and The Professional Bodies Registration Decree (NRCD 143) of 1973. Under the auspices of the Branch, a Consultant from the Management Development and Productivity Institute, Accra, gave a lecture on "Business Management with Special Reference to Pharmacy" on 14th March, 1973.

The Branch Members will be holding their regular meetings at the Education Block of the National Museum, Barnes Road, Accra, on the following dates:

April 4, May 2, June 6, July 4, September 5, 1973. All meetings start at 5.30 p.m. and election of new officers will take place at the September 5 meeting.

The **Ashanti Regional Branch** is currently governed by the following members who constitute the Executive Committee:

Dr. J. Ocran (Chairman)

E.K. Bortey (Vice-Chairman)

I.K. Ampah (Secretary)

F.G. Akubia (Assistant Secretary)

I.O. Boadu (Treasurer)

S.A.A. Offei (Financial Secretary)

R. Ansa-Asamoah (Member)

J.K. Oppong (Member)

E.B.K. Mensah (Member)

Towards the end of 1972, the Ashanti Regional Branch organised a lecture on "The Civil Rights of the Citizen" which was very well attended. The speaker was Mr. C.F. Hayfron-Benjamin, a Kumasi Legal Practitioner. Their regular monthly meetings are held on the first Wednesday of each month.

Northern/Upper Regional Branch

Mr. J. Brown-Pobee is the Chairman of the Branch Executive Committee and Mr. D.C. Ashiabor is the Secretary. The Branch's regular monthly meetings are scheduled as follows:

May 25, June 29, and July 27.
There will be a cocktail party on 27th April and a lecture on 31st August, 1973.

Central Regional Branch

The current members of the Branch Executive include:

Mr. J.E. Amuquandoh (Chairman)

Mr. T.C. Corquaye (Secretary) and

Mr. S.R. Boakye (Treasurer).

Western Regional Branch

Mr. R.B. Fynn has been elected Chairman of the new Executive Committee; Mr. R.K. Quartey-Papafio is the Vice-Chairman, while Mr. F. Hutton is the Secretary and Mr. E.K. Sagoe, the Treasurer. The new Committee is in the process of planning its programme for the year.

The number of Pharmacists in the **Volta Region** has increased significantly and these members in the region are now in the process of organising their own branch. Members in the Volta Region are, for the moment, considered as belonging to the Eastern Regional Branch.

Compiled by the National Secretariat.

CPA PERSONAL MEMBERSHIP

The Commonwealth Pharmaceutical Association is a body representing the interests of the profession of pharmacy throughout the Commonwealth and in certain dependent territories. Full members of the Association are those organisations or bodies which represent the profession of pharmacy in each of the member countries, and full membership is open to one such national association from each country.

The Association's principal aims are to promote liaison between Commonwealth pharmacists, to foster high standards of professional conduct, pharmaceutical education and practice, and also a high standard of control of the quality and distribution of drugs and medicines, both by professional means and appropriate legislation. The Council of the Association will work towards fulfilling these objectives through meetings of the Council and the Executive Committee, the five yearly Commonwealth Conference, the Association's Newsletter which is to be circulated at least twice each year, and the appointment of persons within each country who will be responsible for contact with C.P.A. and with any pharmacists wishing to visit or obtain information about the country concerned.

At its meeting in February 1972, the council decided that the clause in the Constitution which permits the establishment of a class of Personal Members of the Association should be implemented. By this means any pharmacist who is registered to practise in a Commonwealth country or dependent territory can now become associated with C.P.A. and its general objective of promoting pharmaceutical standards and liaison throughout the Commonwealth.

The conditions of Personal Membership are as follows:-

1. Applications for personal membership shall be made to the Commonwealth Pharmaceutical Association Correspondent in the applicant's country, who shall maintain a register of personal members residing in his own country. The CPA Secretariat shall maintain a register of all Personal Members.

2. Personal Members shall receive copies of the C.P.A. newsletter and any other documents that the Council decide to circulate fully.

3. Personal Members may be allowed a small reduction in their application fee for attendance at C.P.A. Conferences.

4. The Secretariat will, on request, obtain and send to Personal Members any information that they might require about aspects of pharmacy within other member countries.

5. Personal Members will be asked to give full particulars of their qualifications and pharmaceutical experience, and also to indicate whether they will be prepared to give advice on matters within their experience, if requested to do so by C.P.A.

6. Personal Members shall be required to pay an annual subscription of £1 sterling or the equivalent. If an application to become a Personal Member is made after August 31, the £1 subscription will be effective for the following year ending December 31.

7. Upon registration, Personal Members will be supplied with a copy of the Constitution together with recent issues of the Association's newsletter.

Application forms are available from:

K.A. Ohene-Manu Esq.,
(CPA Correspondent)
Pharmaceutical Society of Ghana,
P.O. Box 2133, Accra.

PHARMACEUTICAL SOCIETY OF GHANA

HEADQUARTERS BUILDING FUND

HAVE YOU PAID YOUR SUBSCRIPTION?

START PAYING NOW!!

DRUGS COMMITTEE OF THE PHARMACEUTICAL SOCIETY OF GHANA

A Drugs Committee has been formed nuder the Pharmaceutical Society of Ghana to undertake the following duties:

1. To compile data on adverse reactions of drugs as they occur in Ghana.
2. To compile data on drugs pertaining to their quality, biological availability etc.
3. To disseminate information on data collected in (1) and (2) to appropriate bodies, eg. Ministry of Health, Hospitals, Pharmaceutical Industries and other Pharmaceutical Houses.

The members of the committee are:

J.Y. Binka, B.Pharm., M.P.S.G., MSc. (Chairman) Government Chemical Laboratory, Accra.

Ayitey-Smith, B.Pharm., M.P.S.G., Ph.D. (Secretary), Dept. of Pharmacology Ghana Medical School, Accra.

Mrs. A. Brookman-Amissah, B.Pharm., M.P.S.G.

E. Osei-Tutu, M.P.S.G., M.I. Pharm. M. Korle-Bu Teaching Hospital, Korle-Bu.

David Anim-Addo, B.Pharm., M.P.S.G. Hoechst (Ghana) Ltd., Accra.

Mrs. Gavu, B.Pharm., M.P.S.G., Korle-Bu Teaching Hospital, Accra.

D.O. Gyane, B.Pharm., M.P.S.G., Ph.D., Faculty of Pharmacy, University of Science and Technology.

Miss B.J. Mills, B.Pharm., M.P.S.G., Korle-Bu Teaching Hospital, Accra.

The various Pharmacists in charge of Regional hospitals were appointed as Reporting officers. The Committee has drafted two formats for drug reporting:

(1) Drug Adverse Reaction Report (See Format I)

(2) Quality Evaluation of Drugs (format II)

The Adverse Reaction Report forms have been sent to Pharmacy Superintendents for their distribution and collection. Unfortunately, the response has not been encouraging. The Drugs Committee would therefore like to appeal once again to all pharmacists in the hospitals to make this scheme a success. Individual Pharmacists interested in this exercise may contact any of the members of the Committee or write to the Society's Headquaters The specifications on the format could be printed out by any interested person for use in drug reporting.

We cannot over-emphasize the importance of Pharmacists being able to advise the public on the use of drugs. An exercise of collecting data on drugs pertaining to their use in a given community could yield very relevant and valuable information to the Pharmacist. All of us are called upon to help in this drug reporting exercise.

DRUG ADVERSE REACTION REGISTRY

(DRUGS COMMITTEE—PHARMACEUTICAL SOCIETY OF GHANA)

FORMAT I

DRUGS COMMITTEE:
CHAIRMAN: J.Y. BINKA, B.Pharm., M.P.S.G. MSc.,
SECRETARY: E. AYITEY-SMITH, B. Pharm., MSc., Ph.D., M.P.S.G.

for official use only

1. Patient's Name:.....

Sex:..... Hosp. Card No.....

Address:.....

Occupation:..... Age:.....

Diagnosis:.....

2. Reporting Officer

Name:.....

Address:.....

Tel.:.....

3. Adverse Reaction(s).....

Date of Onset:..... Date of Diagnosis:.....

Was onset of Reaction (A) Acute explosive

(B) Slowly developing

4. Clinical Description of Adverse Reaction(s)

5. Result of Relevant Diagnostic tests e.g. Autopsy, X-ray Biopsy etc.

6. Information on Drugs/toxic agents recently used by the patient. (During the previous three months).

Name of Drug/Agent	Total daily dose	Route i.v. im. etc.	Dates used	Any adverse reaction?

7. Types of food eaten 3 days before the reaction:

8. Circumstances leading to the above adverse reaction

A — Self medication by patient
B — Accidental exposure
C — Occupational exposure
D — Drug mislabelled
E — Decomposition of drug
F — Contamination of drug
G — Drug outdated
H — Interaction of two or more drugs
I — Normal Therapy

9. Outcome of case

a) Recovered
b) Alive with after effects
c) Still under treatment
d) Died

10. Sources of Suspected Drug

A. Physician
B. Physician's Sample
C. Hospital
D. Pharmacy
E. Other Retail Source (peddlar/market)

QUALITY EVALUATION OF DRUGS
(DRUGS COMMITTEE – PHARMACEUTICAL SOCIETY OF GHANA

FORMAT II

OFFICE USE ONLY

CHAIRMAN: J.Y. BINKA, B.Pharm. MPs., MSc.,

SECRETARY: E. AYITEY-SMITH, B.Pharm MPs., MSs., Ph.D.

1. Name of Drug.....
   (Trade & generic names)

2. Manufacturer.....

3. Local Agent.....

4. Date of Manufacture.....

5. **DESCRIPTION SAMPLE**

A) Colour.....

B) Form (Liquid, Solid or Gas).....

C) Previous state of Drug.....
   (Colour & Form)

D) Any other Information.....

E) Storage (Fridge or Room etc.).....

F) Duration of Storage.....

.....
Name of Reporting Officer

Address.....

.....

Telephone:

THE PHARMACEUTICAL SOCIETY OF GHANA —THE NEW ROLE

By E.T. Lamptey, MPSG

Dear Editor,

It is my belief that the Pharmaceutical Society of Ghana has justified its **long** years of existence as a professional body seeking advancement of pharmaceutical knowledge. It has provided the cornerstone of pharmacy as a discipline and as a service and a vital one too to the Ghanaian Community.

The maintainance of these goals generated the usual confrontation with other bodies with identical or unlike aspirations and we have sought to keep the ethics of our course and keep the fraternity among pharmacists.

We believe that problem solving makes life go on and we have the fortitude and drive to be effective.

We are venturing to seek more responsibility in our country. This responsibility we are not shy of and which we are capable of discharging. We have no spite for the Pharmacy Board. On the contrary we have admiration for the efforts of the Board. The Pharmaceutical Society has the intention of making representations to government that the functions of the Pharmacy Board belong appropriately to the Pharmaceutical Society of Ghana.

This is in conformity with international practice.

This responsibility which the Pharmaceutical Society wishes to assume raises the fundamental question of the criterion for making the request in the first place. It is our contention that as practising phramacists, our hands are strengthened because of our present involvement. If the pharmacy profession should stand on its feet the sustaining power is an observation of some ethics. We contend that the Society has the competence to ensure the appropriate moral standards and can set a machinery into operation to bring non-co-operative elements to book.

As a professional body we are interested in the educational and professional training of pharmacists. The university which offers the training needs the feed back information on the effectiveness or otherwise of their products. We contend that the Pharmaceutical Society of Ghana is the forum where this feed back information can be gathered and disseminated. The Society needs the recognition and the authority to render this service.

The profession has proved very attractive especially of late and we need protection or we should protect our profession from infiltration. The danger posed by the situation is ugly and the Society feels government can rely on practising pharmacists to curb if not eliminate the intruders for the ultimate benefit of the Ghanaian community. Tied up with the personnel who wish to force their way into an area where they have no business is the movement of drugs. The Society is alarmed by the way drugs with all their harzards and complications find their way into the hands of certain persons. The Society is seeking authority to reverse this trend. It should not be entertained in any civilized society.

Our preoccupation with just a few of the many problems underscores the fact that the Pharmaceutical Society of Ghana has an awareness; it is not scared by the difficulties of solving these problems; it is confident of discharging responsibility which is self-inflicted and all we are asking for is that government may charge the right body, that is, the Pharmaceutical Society of Ghana, with the responsibility of all matters on Pharmacy. We shall stand squarely to the challenge.

S.K. OLLENNU RETIRES FROM ACTIVE PRACTICE

Shedrach Koi Ollennu until lately the proprietor of a neighbourhood pharmacy at Labadi and the oldest surviving foundation member of the Pharmaceutical Society has folded his practice after 70 years of active service.

Mr. Ollennu is the latest of a family of five children—5 boys and 2 girls. He was born at Oyarefa, a village of about 15 miles from Accra on the road to Aburi on 23, June 1882, and baptised at Abokobi in July 23, 1883.

He was educated at the Basel Mission School, Osu, from where he completed in 1902. He joined Government Medical Service in the same year and having gone through the usual training for 3 years he passed the Druggists Qualifying examination and was awarded a certificate on the 11th of July, 1905.

Mr. Ollennu took charge of various Medical Stations chief among which were:

'C' Company of the Gold Coast Regiment, as it then was, at Cantonments, Accra; James Fort Prisons, Accra; Sefwi Asafo

'D' Company in 1907. Sewfi Akwantamra Dunkwa; Tamale, Accra; Ada; Saltpond; Accra again and Kumasi from where he retired from the Government Service in 1932.

Mr. Ollennu joined the then West African Drug Company at Cape Coast for another 9 years. He moved to Labadi, his hometown and set up practice in 1941. He retired in August, 1972.

He was a foundation member of the Pharmaceutical Society and took an active part during the formative and difficult period of the organisation.

In the days when the Colonial Government ruled the Country through the native 'Chief' Mr. Ollennu and the late Willaim Ayia-Hanson attended a conference of Chiefs at Mankessim to appeal for recognition of the Society.

His reputation as a cricketer was known in some of the stations where he worked, especially at Dunkwa and Ada. The only hobby he could afford to indulge in at present is a backyard poultry and goat rearing.

Mr. Ollennu and his wife have been known to be very ardent Christians and have played outstanding part in churchwork everywhere they have been. They are wardens in the Anglican Church at Labadi.

Mr. Ollennu is 91.

RETIREMENT FROM THE PHARMACEUTICAL SERVICE OF MINISTRY OF HEALTH: MR. SHAW E. TAYLOR

Mr. Taylor joined the Ministry of Health in September, 1934, as a Nurse-in-Training. He qualified Q.R.N. in 1937 and proceeded to the School of Pharmacy. His studies was interrupted when he was drafted into the Army on the outbreak of the Second world war in 1939. He was demobilised in 1945 and qualified as a pharmacist a year after.

Mr. Taylor served in outstation hospitals and Clinics until 1963 when he was appointed Inspecting Pharmacist. He retired in February, 1973 with the rank of Principal Pharmacist.

LETTERS TO THE EDITOR

TOWARDS IMPROVED PHARMACEUTICAL SERVICE

Sir,

Some pharmacists and members of the public have been worried for sometime about the low ebb of Pharmacy practice in the country. On examining this problem myself, I find three major contributing factors:-

1. The shortage of Pharmacists in the country.
2. The lack of emphasis on ethical practice.
3. The poor conditions of service in certain areas, especially in the Hospital Service.

On the shortage of pharmacists, I do not anticipate that this problem would be solved overnight. It would take more than a decade. However, the problem can be tackled by utilising locum practice, as used in many countries to solve such a problem. The use of locum practice in Pharmacy shops, hospitals and other institutions would help eliminate the glaring dangerous situation where potent drugs are left in the hands of unqualified people. This situation is very much prominent in our hospitals and some people in higher circles are very much concerned about its consequences. No one knows how many people get wrong drugs dispensed to them by unqualified people! The use of locum, whereby, pharmacists not permanently employed by a company or an institution can render services to such bodies, would also bring about the much needed advice on drugs to patients. The Pharmacists permanently employed by a body would not be unnecessarily overtaxed and might have more time to plan and improve his work.

On ethical practice, I propose that all pharmacists serving over-the-counter are to wear white overalls (perferably light material to avoid excessive heat) with a label:-

Pharmacist and the name of the Pharmacist.

The premises of most pharmaceutical shops need thorough cleaning to give the much needed professional atmosphere. Perhaps, here the society could organise annual competition on the "Best kept Pharmacy in Ghana".

The advisory role of pharmacists on drugs should intensify. Pharmacists should not be content with literature or leaflets inserted in drug packages but should consult other sources like journals. Hence, Pharmacists employed in institutions like hospitals should insist on the employers making available the relevant books like Martindale & B.P.C. and journals like The Pharmaceutical Journal, MIMS, American Pharmaceutical Assoc'ation Journal etc.

The conditions of service of Pharmacists in certain sectors need improvement. The hospital service seems to offer the poorest conditions of service. However, those in the Government hospital service have had their salaries brought to the professional scale as other professions in the civil service. But nobody knows what is causing the delay in its full implementation. It is hoped that when the implementation comes about, the number and morale of pharmacists in the Government hospitals would be improved.

I have raised these points hoping that other readers of the journal would join in the debate on "Towards Improved Pharmaceutical Service."

— Yaw Binka, Accra.

LET THE SOCIETY BE ACTIVE NOW

Sir,

I welcome and congratulate the National Council on the recent initiated efforts to bring out the first quarterly "Ghana Pharmaceutical Journal", the first of its kind since the Pharmaceutical Society was founded in 1935 out of the former Gold Coast Pharmacists and Druggists Union, and the Chemists Defence Association which was established in 1929.

In addition to such an impressive start of this Society this year, I would like to put forward this suggestion to bring the activities of the Society into a closer relation with the public and above all make it much more active in existence. That is, a programme should be drawn up for the Society Members to include a NATIONAL PHARMACY WEEK, as celebrated in most countries. During such periods Pharmacists take advantage of the National Pharmacy Week to focus attention on, among other things, the ever-growing drug abuse problem. Extensive newspaper coverage of the week is arranged, editorial and news stories are sent to local papers, radio and TV Spots are provided, window displays on drug abuse are set up for the public. Pharmacists are also encouraged to pass out information and brochures on Hashish (Marijuana) and many other potently dangerous drugs.

Such drug information programmes or speakers bureaux are set up and usually designed to pinpoint the pharmacist as a prominent public health informant.

Most members may recall that the Student Pharmaceutical Society in the University of Science and Technology, Kumasi celebrates Pharmacy Week every year and I think it will be proper if the National Council will arrange so that their Pharmacy Week coincides with that on the National level. This will help to project the image of this our noble profession.

— S.Y. Bediako-Donkor, Accra.

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