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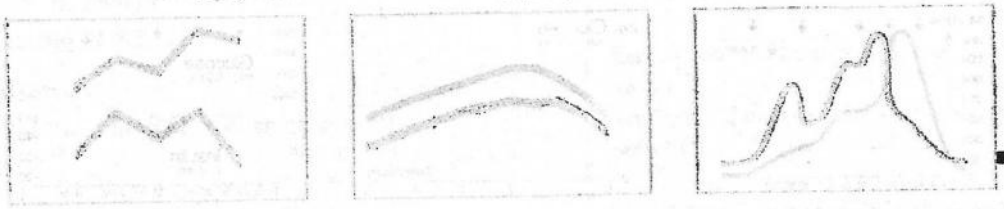

The Ghana Pharmaceutical Journal

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VOL. 2 No. 1 JANUARY, 1974

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OPENING OF THE FIFTH SESSION OF THE PHARMACY BOARD IN ACCRA ON WEDNESDAY 16th JANUARY, 1974

Address by Major A. H. Selormey, Commissioner for Health, read on his behalf by Mr S. E. Arthur, Principal Secretary, Ministry of Health.

1. It is my singular pleasure to be here with you this morning to inaugurate the 5th Session of the Pharmacy Board, which will run for the next term of 3 years. Three years is a short period but it is overburdened with circumstances, actions and incidents. Some of them make happy recollections, others are loatheful to remember. Today many of the old faces which had become so familiar are no more. Their places have been taken by new ones. These are some of the circumstances which we must learn to accept in every aspect of life, the Pharmacy Board not being an exception.

2. Three years ago, the Pharmacy Board was accommodated in the offices of Ministry of Health at the Ministries. Soon after my appointment as Commissioner for Health pleas were made to me to examine the situation of the Pharmacy Board. It was contended that every effort towards progress had been stifled; every effort which would enable the Board make an impact on the people and ensure that the Pharmacy Profession is identified and respected by the public was restrained. The Board, according to the report, was so rigidly held in the trammels of ministerial administration that even the implementation of statutory decisions was either ingeniously side-stepped or deliberately denied. These had always been done under the cloak of administrative convenience. The Board painfully repeated the pleas made to previous authorities, without success, that it was unjustly precluded from exercising its statutory authority.

3. In an interview between myself and representatives of the Pharmacy Board many of these grievances were emphasized and elucidated. After careful consideration of the points discussed I realised that many of the points raised were of a general nature which concerned other autonomous institutions under the general direction of the Ministry. People were unwilling to divest themselves of the authority and responsibilities they had hitherto exercised and which in the light of changing circumstances they could no longer adequately perform. But plainly, the setting up of the Board was going to make some people a little less powerful. I therefore took the following decision: That all the Statutory Boards under the Ministry of Health should forthwith cease to be controlled by the Administration, and should be autonomous. They should only be guided by the Administration on Government policies. To make implementation easy, I have directed that the Boards should be moved out of the Ministry. They should be accommodated at the offices previously occupied by the School of Hygiene at Adjabeng. The first to be moved was the Pharmacy Board, followed by the Medical and Dental Board (now Medical and Dental Council.) It is hoped that when the City Council relinquishes the units presently occupied by their staff, and rooms are made available, the Boards of the other allied Medical Professions such

as the Nurses/Midwives Board will be moved into these premises.

I have also directed that all matters concerning the Pharmacy Board should be communicated directly to me by the Secretary of the Board.

4. I have indicated with concern, certain areas in the administration of the Pharmacy Profession which require urgent attention. Among these are the following:-

The Pharmacy and Drugs Act, 1961—Act 64:

Like the Acts and Regulations of the other professional bodies under the Ministry of Health, the Pharmacy and Drugs Act requires urgent review and amendment. Some of the provisions are ambiguous and obsolete; they require some streamlining to make them precise and effective. This must be given careful consideration. New provisions also need to be incorporated to prevent certain regrettable irregularities which have constantly wriggled through the law with impunity because there is no definite provision to restrain them.

5. In connection with these projected amendments I have directed the Secretary of the Board to expedite action on a legal instrument which shall ensure that payment of the new Retention Fees of the Pharmaceutical Society recommended by the Pharmacists themselves is introduced with immediate effect.

6. There is also the question of Chemical Sellers. I am informed that this is a very touchy question to the pharmacist and that the chemical sellers have posed a malignant opposition to the pharmacist in his own profession and have enjoyed the support of authorities in previous governments. Now that the Pharmacy Board is autonomous I hope it will more diligently attend to this problem. Without being repressive it should realistically consider some action to reduce the number of chemical sellers in areas which are adequately served by registered pharmacies. In this regard the Board is assured of my full support. For this reason I caution the pharmacists to be purposeful. There is abundant evidence that some pharmacists register for one pharmacy, but use that as a blind and hop from one pharmacy to another.

7. Many of the drug stores, where the most obnoxious unethical offences are committed actually operate under licence granted to so-called reputed qualified pharmacists. In the gross abuse of their own professional ethics and regulations they unashamedly collect monthly 'retainer' fees from these drug stores but never visit them. The situation is intolerable and I urge this Board to take effective, even if drastic measures, to eliminate this serious irregularity.

8. I thank the Pharmaceutical Society of Ghana for communicating to me suggestions for averting future drug shortages in the country. Cognizance will be taken of them in the implementation of a general exercise to avert future shortages. It is, in my view, all a matter of planning and cooperation and the new measures and procedures we are instituting must be able to deal with the situation.

9. Representations have also been made to me against the system hitherto employed for issuing import licences for drugs. It has been observed that the system was ineffective in controlling the types of drugs imported into the country, and that it was highly susceptible to abuse. I have examined these representations and directed that the system should be changed. I shall ensure that action is expedited in this connection to satisfy all importers.

10. The information that the Pharmaceutical Society is organising Pharmacy co-operatives is very welcome. I assure the Society of my personal support and encouragement to this action as well as to any other action which the Society takes in the right direction to improve the availability of drugs to the public. Properly guided, this action will allay the anxiety of all pharmacists. It will eliminate the horde of interlopers who callously intrude on the drug business; it will open up new vistas of operation which will enable the pharmacist to enjoy, unhindered, the full benefits of his profession. I therefore exhort the Pharmacy Board to encourage and facilitate the formation of these co-operatives. We appreciate also, the initiative taken by the Pharmaceutical Society to establish all-night pharmacies.

11. At long last, we have endeavoured to resolve the contention over the training of pharmacists by eliminating the introduction of the slipshod system of training subprofessional grades, under the guise of producing qualified pharmacists within two years, when modern trends indicate that the training of a qualified pharmacist takes between three and seven years. The introduction of this course was vehemently rejected both by the Pharmacy Board and the Pharmaceutical Society of Ghana—they considered that it was calculated to lower the standard of Pharmacy in Ghana. The Degree Course has been reinstated. We congratulate the Pharmacy Board and the Pharmaceutical Society for exercising restraint and accepting a compromise to tide over the unfortunate diplomates whose future would have been hard hit by the change.

12. We have also agreed, in consultation with the Ministry of Education that the Dispensing Assistants Course, which, hitherto, was strictly an in-service scheme organised by the Ministry of Health should cease forthwith. It is to be replaced by the Pharmacy Technicians Course which will be run in the Kumasi Polytechnic under the direction of the Ministry of Education. It is essential to note that the entry requirements for this course have been raised and the content of the training greatly improved. This course will produce a more competent auxilliary to assist the pharmacist. It must be mentioned that provision has been made for the present cadre of Dispensing Assistants to benefit from this course. The Pharmacy Board might wish to consider some regulations to control the employment of Pharmacy Technicians when they complete the course.

13. But let me share with you a few frank thoughts about the whole system of Professional training and recognition in this country.

14. Very well meaning citizens have made representation to members of this government that by agreeing to institute such strict regulations and entry requirement for professional bodies in this country we are merely being used by older people in these professions for the protection of purely iconoclastic selfish privileges. That having entered these professions with similar or even sometimes lower qualifications our professional men at the top now endeavour to make it far more difficult for others to enter those professions not because they want to protect the common weal but the privileges they

enjoy as a result of the scarcity of their numbers. But bluntly, the contention is that a good number of those who today control the Pharmacy and other professional bodies entered their preserves with initial qualifications sometimes even lower than those they reject today. That in a country where druggists and quacks are daily dispensing dangerous drugs to our people, while we look on helplessly in spite of the law because there are so few pharmacists, it becomes inward looking, to quote a former politician to insist on ridiculously high entry requirements. I must confess that the arguments have a lot of attractive sides. Let us examine our own consciences closely and find out whether some of these observations are not true. For myself I must say, without hesitation, that I have confidence in the integrity of our professional men. But integrity is not enough. We can sometimes be so shut up in ourselves as not to properly be in the frame of mind to separate our own self interests from the purely professional ones. In other words there is sometimes only a thin line of demarcation between the selfish and altruistic motive.

15. For these reasons, I have for sometime now been examining the entry requirements and course content of many of the professional bodies under my Ministry and hope soon to be in a position to advise myself. In the meantime please, permit me to ask one question. What prevents us, for instance, from making the course content of the present Pharmacy Technicians course in such a way that the enterprising Pharmacy Technician, after a period of practical work can proceed to the University of Science and Technology to do a degree course in Pharmacy. I will like you to turn over this suggestion in your own mind.

16. Another matter to which I will like to draw attention is that of the work of the Pharmacist himself. Is a pharmacist the medical man who merely mixes and dispenses drugs prescribed by the doctor? Common sense should tell us that a pharmacist should be something more than that. My lay man's understanding is that the pharmacist, properly, so called, should be the medical man who not only examines the pharmacological content of drugs but is able to compound all those proprietary drugs for which we presently spend valuable foreign exchange to import.

17. I have observed, that, in spite of the Ghanaian Business Promotion Act most of the pharmaceutical agencies in the country are run by aliens. This is very much regretted. I suggest that the Pharmacy Board and the Pharmaceutical Society of Ghana should, together examine this problem and consider appropriate measures to ensure that Pharmaceutical agencies operated in this country are controlled by Ghanaian Pharmacists.

18. In conclusion I wish you, the new Pharmacy Board all the best in your arduous task during the next three years. I assure you of our interest and support at all times.

I now leave you to your deliberations.

THE PHARMACEUTICAL SOCIETY OF GHANA

The NATIONAL HEADQUARTERS SECRETARIAT

announces for the information of all members that:

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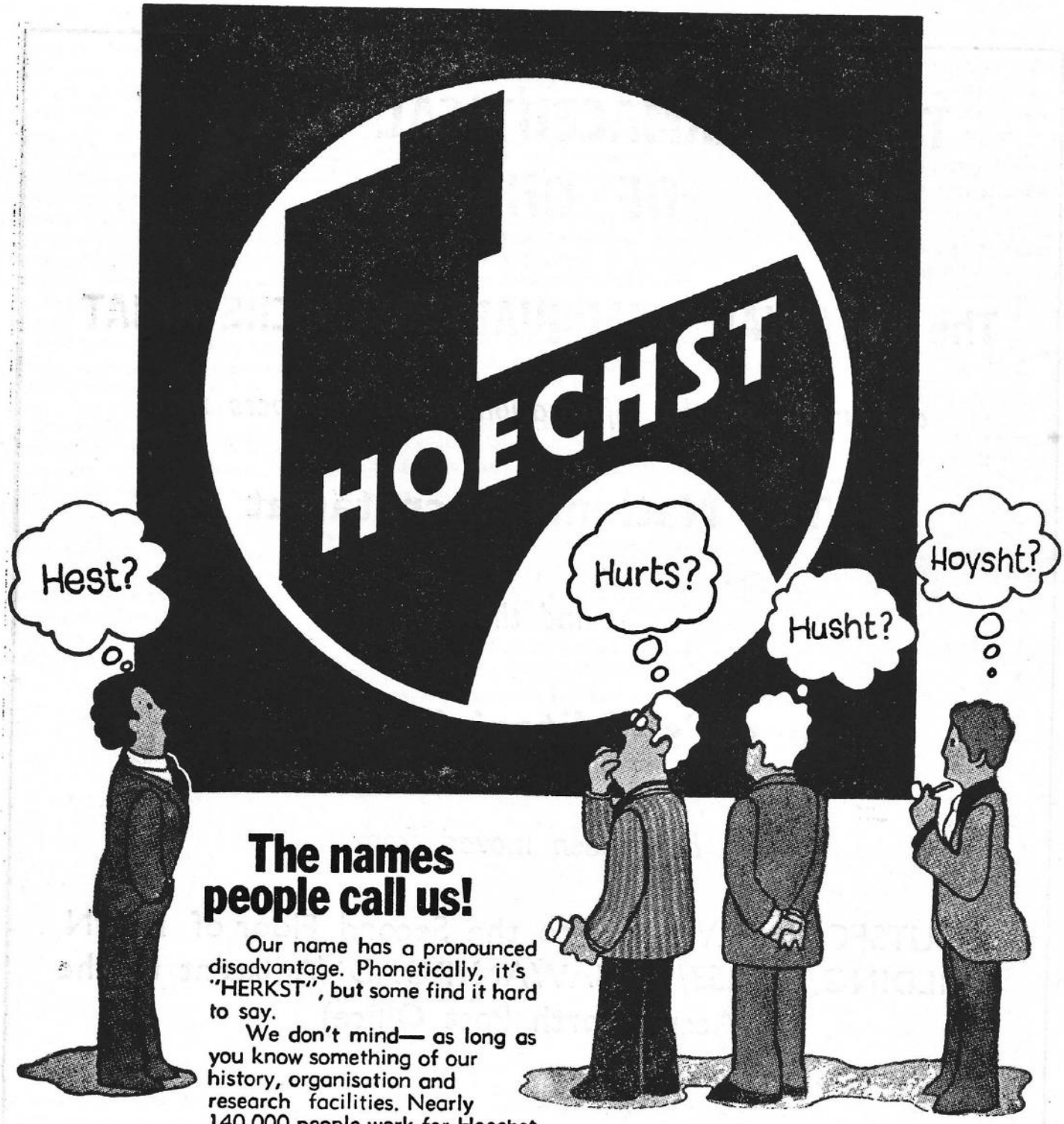

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THE 33RD INTERNATIONAL CONGRESS

OF THE FEDERATION INTERNATIONALE PHARMACEUTIQUE (F.I.P.), STOCKHOLM SWEDEN 3RD-7TH SEPTEMBER, 1973

By A Correspondent

INTRODUCTION

The 33rd International Congress of Pharmaceutical Sciences of the FIP was held last year in Stockholm, Sweden. The Congress was attended by over 3,000 delegates from about fifty countries. There were delegates from three African countries, Senegal Nigeria and Ghana. Ghana was represented by Mr J. Y. Binka as a Government delegate.

The International Federation of Pharmaceutical Sciences of the FIP is a non - governmental organisation which works in close collaboration with the World Health Organisation.

The members of the organisation comprise of legally constituted national pharmaceutical associations and individual pharmacists who serve as associate members of the Federation.

At present, there are 53 national association and a total of 3,300 associate members.

The main object of the Federation is the development of Pharmacy in the international sphere as a profession and as an applied science and the enlargement of the role of the pharmacist in the field of public health.

The scientific activities of the Federation are organised by a Board of Pharmaceutical Sciences.

A number of scientific groups operate under the Board; these are: *biopharmacy, medicinal chemistry, technology, analysis and control, biological origin and chemistry of natural products, and scientific information integration.*

The Federation has one major permanent Committee—*The Committee for Laboratory Services and Official Control of Drugs.* This Committee comprises mainly of Pharmacists engaged in the Quality Control of Drugs, preparation of Drug Standards and Pharmacopoeia monographs. The Committee collaborates with WHO to prepare the International Pharmacopoeia. Mr J. Y. Binka serves on this committee.

The committee normally meets some days before the main Conference of the Federation. Last year, the Committee met from 30th August to 1st Septemher.

PROCEEDINGS:

(a) *The Committee for Laboratory Services and Official Control of Drugs.*

The first business session of the Committee dealt with the Confirmation of new nominated members to the Committee. Reports from special working groups were read. The working groups were:

(a) The Contact Group for Industries
(b) Microbiological Purity for Pharmaceutical Products
(c) Collaborative Group for Oestrogens
(d) Dissolution rate for slow released drugs

These reports emphasized the importance of observation of good manufacturing practice and development of specific and selective methods for drug evaluation. The background work for microbiological control for *oral preparations* is almost complete and very soon drug manufacturers will be required to have not more than 10,000 bacteria counts/G in their oral preparations.

Dissolution rate measurement is found to be useful for monitoring the quality of slow-releasing pharmaceutical preparations.

There was a special section for reading of scientific papers. This gave the members of the committee the opportunity to share with their colleagues the latest development in analytical techniques and quality control problems encountered. Mr Binka presented a paper on the "Quality Control Problems In Tropical Africa." The paper was based on the analytical results from the Quality Control of Drugs Programme conducted by the Drugs Section of the Government Chemical Laboratory. The attention of the committee was drawn to the drug stability problems faced in the tropics and also the possible influence of diet and genetic background on drug metabolism in Africans. It was pointed out that the current method of short-term accelerated tests for evaluating Drug Stability are inadequate and that such tests should be followed up by programmed drug testing. The efficacy of drugs must be monitored as drugs are given to patients.

A paper presented by a colleague from Sweden introduced a new and less expensive method for assaying Insulin and Glucagon using Blood Glucose Levels in Mice. Most of the present pharmacopoeia use Rabbit (relatively expensive animal) and their methods are time consuming.

Professor A. H. Beckett, Chairman of Scientific Board of F.I.P. delivering a speech at the opening session of the ~~34rd~~ 33rd Congress of F.I.P. in Stockholm.

THE CONGRESS SESSIONS

(*i*) *Drugs Science and People*— INAUGURAL LECTURE

The inaugural session of the 33rd International Congress of Pharmaceutical Sciences of the FIP was opened by DR ARNE ENGSTROM (Secretary of the Swedish Government Research Advisory Board). He spoke on "*Drugs Science* and People." and he emphasised during his speech that both the medical profession and the public were calling for more effective drugs, while both the public and governments were demanding lower prices. It was indicated that *the cost of medicines would increase at least three-fold in the next twenty years*, with pharmaceutical research costs approaching those of space and nuclear research. Governments are therefore called upon to participate in drug research, in the production of new drugs and improvement of testing procedures.

The problems of long-term drug therapy and drug interactions in the modern medical practice were highlighted, and the establishment of an international register of toxicological data (Drug Adverse Reaction Reports) would help solve these problems.

It was emphasised that the health care for the people should be the responsibility of an inter-disciplinary team, with the pharmacist as an integral part of that team,

(*ii*) *Introduction of New Drugs*—

Main Symposium

The main symposium of the Congress dealt with the basis for introduction of new drugs. Papers were presented on the importance of drug therapy for modern health care, the kind of new drugs that are needed, new dosage forms and the safety aspects of long-term medication. Five parallel symposia dealt, more specifically, with the chemical and pharmacological, formulation and stability, analytical, toxicological and legal aspects of the subject.

The limited usefulness of pre-clinical evaluation of new drugs was pointed out. It was suggested that *additional post marketing studies are necessary*. They should include consumption and interaction studies as well as the monitoring of adverse reactions.

The usefulness and specificity in the use of the Gas Chromatograph coupled with Mass Spectrometer were demonstrated by the various papers presented on the analytical aspects of drugs, especially, in the determination of metabolites and degradatory products. Immunochemical technique and the use of High pressure liquid chromatography for drug assays were also indicated to be very valuable in drug quality evaluation.

(*iii*) *Sectional Meetings*

Sectional meetings covering different aspects of Pharmacy were held. Clinical Pharmacy was the main subject for the Hospital Pharmacists Group, and the *Military Pharmacists* Group were concerned with antidotes to biochemical warfare che-

micals like Cholinesterase inhibitors.

The influence of genetic and environmental factors on Cannabis sativa (Indian Hemp) was the subject of the *Medicinal Plant Sectional meeting*. Documentation needs for registration of new drugs were considered by the *Press and Documentation Section*, and international legislation on new drugs was dealt with by the *Industrial Pharmaceutical Group*. *The General Practice of Pharmacy Group* turned their attention to aspects of the distribution of medicines. Pharmaceutical education and its future was the subject of the inaugural symposium of the *Academic Section*.

Dr Roy from India spoke on Pharmaceutical Education in developing countries. He noted that the existing curriculum for pharmacy in most developing countries is heavy. He emphasised that pharmaceutical education should take into account environmental needs in the particular country. The 1974 Congress takes place in Rome in September.

DRUG NOMENCLATURE IN WEST AFRICA

ROGER A. LEWIS, Professor of Pharmacology and*
*E. EBEN-MOUSSI**, Professor of Pharmacology.*

During a short teaching visit to the Cameroons, it became obvious that there was more than a language difference with respect to the drugs used in the practice of medicine.

METHOD

A list of important drugs used in Ghana had been compiled for teaching purposes. The French equivalent for each of these drugs was sought in text books (1), (2) and in the pharmaceutical guide known as Vidal, (3). Later official names were checked in the French pharmoacopea (4). The English names were also checked in text books (5), (6) and in the pharmaceutical guide known as African Mims, (7). The original list was modified to include French prototypes and frequently used French drugs. However, mixtures and preparations containing more than one active ingredient were omitted. Some 240 items have been classified under 44 headings in Table I. The non-proprietary name, or official name, is given in small letters while the proprietary name, or at least one of the proprietary names, is given with a capital letter. Both English and French names are listed for those drugs which are available in Anglophone and Francophone countries. Due to lack of space not all of the important drugs could be listed, not all of the proprietary names could be given and in some cases the salt of the active base is not mentioned. The most recently developed drugs are included even though data on their nomenclature is difficult to find.

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RESULTS

Trade names of English and French products were the same or nearly the same in 67 of tne 240 drugs listed. In approximately the same number of cases the proprietary names were entirely different. Of course in some instances there was no proprietary name, epinephrine, atropine, morphine etc. And in some instances, to be mentioned later, there was no equivalent drug in one system to match the other. A few examples of the difference in trade name will suffice—chloramphenicol is known as Chloromycetin in Anglophone countries and as Tifomycine in Francophone areas; Similarly isoproterenol is known as Norisodrine and Aleudrine respectively; and phenytoin as Epanutin and Dihydan respectively. The other 55 cases can be seen in Table. I

A more confusing and unfortunate situation arises when the trade name used in one country becomes the official name in another country. This seems to be the case where phenylephrine has the trade name of Neosynephrine in Anglophone countries and the official name neosynephrine in Francophone countries. Mercaptopurine is known by the trade name Purinethol in English areas and by the official name, purinéthol in French areas. Suxaméthonium is a trade name in Francophone areas and an official name in Britain.

Official names were the same in both systems for 174 drugs but different in the case of 22 drugs. Thus the most potent antidiabetic drug is known in English as glibenclamide and in French as amiphénazole. The most widely used drug in leprosy is known in Ghana as dapsone and in Francophone areas as diaphenylsufone. It is also confusing that the cardiac glycoside called digitoxin in Britain, is called digitaline in France where digitalis is called digitale.

Another complication, not shown in the Table, is that an alkaloid may be dispensed as a different salt. Thus, tablets of quinine in Anglophone countries contain the sulfate while tablets of quinine in Francophone countries contain the dihydrochloride. In this case the difference is unimportant, but as will be seen later, in the case of chloroquine the salt used has a significant effect on the weight of the tablet. The duration of action of steriods is affected by the ester that is used so that testosterone propionate may have a longer action than testosterone acetate. If a nitrogen atom is quaternized as, in changing from promethazine or Phenergan to thiazinium or Multergan, there may be a change in pharmacologic action. Even formulation may affect activity and toxicity (8).

A possible cause of error in the prescription of drugs arises when tablets of the same drug, even the same salt, contain different amounts of the active ingredient. British Nivaquine sulfate tablets contain 200 mg of the sulfate or 150 mg of base. German Resochin contains 250 mg of the phosphate or 150 mg of base. American Aralen contains 250 mg of phosphate or 150 mg of base. But the French Nivaquine tablets contain only 100 mg of base. British tablets of metronidazole (Flagyl) contain 200 mg while the French tablets contain 250 mg.

It is worth mentioning that there may be differences in the concentration of the active ingredient in some solutions. With sodium hypochorite the difference between English and French preparations is small but with tincture of iodine the difference is large; two per cent iodine in Anglophone countries and five per cent iodine in Francophone areas.

There are 18 drugs in the English list not included in the French sources and 15 drugs in the French

list not included in English sources. In some instances there is a reciprocal relationship. Ferrous sulfate is used in Anglophone countries and ferrous oxalate in Francophone areas, Benzalkonium in English countries is replaced by cetrivinium in French countries. Melarsoprol is used in Anglophone areas and melarsonyl in Francophone areas. Similarly carbarsone and diphetarsone are reciprocally related and both obsolete. Mercuramide appears only on the English list but mercurophylline appears on both lists. Sodium lactate solution can be replaced by Sodium bicarbonate for intravenous use. Ergonovine does not appear in the French list but can be replaced by methylergonovine. Thiazinium does not appear on the English list but there are many antihistaminics. Dextromoramide is a narcotic which is not used in the Anglophone countries. Similarly the antispasmodic, propyramazine, is not used in Anglophone countries. Benziodarone, a uricosuric agent, listed by the French may be replaced by probenecid. Broxyquinolein is almost identical with iodochloroquin.

This leaves only two French products that are unique. One is adenosine, of doubtful value, and the other gamma hydroxyaminobutyric acid, a very useful intravenous general anaesthetic that was introduced only recently.

There are ten English products that are unique. Carbenoxolone is of doubtful value in the treatment of peptic ulcer but the other agents are very useful, bethanechol to stimulate contraction of the urinary bladder, homatropine for short term dilatation of the pupil, paraldehyde for the management of tetanus convulsions, pitressin for diabetes insipidus, iron sorbitol citrate (now advertised in French Journals) and iron dextran for parenteral administration, folinic acid for the treatment of tromexan overdosage and benzoic and salicylic acids for treating epidermophytosis.

COMMENTARY

Vidal lists only two preparations of ephedrine containing no other ingredient but five preparations of ephedrine containing other ingredients including caffeine, lobeline amidopyrine, bromide, phlocodeine, bromoforme, sodium iodine, codethylene, belladonna, p-methoxy-cinnamate, extract guindelia or tincture drosera. African Mims lists no preparations of ephedrine alone but eleven containing other ingredients including theophylline, phenobarbitone, diprophylline, amylobarbitone, dipyrone, clemizole, phenacetin bromvaletone, benzyphthalate, guaiphenesin, trifluoperazine, diphenylpyraline, thenyldiamine, chlormezanone, chlorphenoxamine, diethylamiphenazone, papaverine, diethylaminotheophylline, camylofin, chlorphenoxamine, etamiphylline, prednisone and glyceryl guaicolate.

Competent authorities (9) have written that such "mixtures are not recommended as initial therapy or as a substitute for a single entity drug preparation unless there is definite evidence that a better response can be achieved with fewer adverse reactions in a particular patient."

Especially in developing countries, the practice of polypharmacy should be discouraged because, in addition to fostering careless diagnosis and inappropriate therapy, it imposes an unnecessary drain on the financial resources of the individual, the hospital, and the country.

The 3rd Regional Conference on Tuberculosis that met in Upper Volta in December, 1972 "asked all doctors in the African Region and public health services to resist the economic pressure of pharmaceutical firms, who under diverse pretexts, would impose on Africa, in the chemotherapy of the first line, drugs that are costly and whose practical effectiveness is not superior to those drugs that are already known", (10).

CONCLUSION

There is a need for greater international co-operation rather than for greater competition on the part of Pharmaceutical Companies and Organizations. There is also a need for keen discrimination in teaching, practice and regulation of commerce in drugs. Improvements are needed in terminology and in containing the tendency for the development of polypharmacy.

TABLE I

OFFICIAL AND PROPRIETARY NAMES

ENGLISH	*FRENCH*
(Cholinergic)	(Cholinergique)
neostigmine (Prostigmine)	néostigmine (Prostigmine)
bethanechol (Urecholine)	
flurophate (Floropryl)	fluostigmine (Diflupyl)
(Adrenergic)	(Adrenergique)
metariminol (Aramine)	mtéariminol (Aramine)
epinephrine	adrénaline
levarterenol (Levophed)	noradrénaline (Lévophed)
levodopa (Larodopa)	lévodopa (Larodopa) (Sobiodopa)
ephedrine	éphédrine (Ephédroides)
amphetamine (Durophet M)	amphétamine
isoproterenol (Norisodrine)	isoprénaline (Aleudrine) (Isoprol)
phenylephrine (Neosynephrine)	néosynéphrine (Phenylephrine)
orciprenaline (Alupent)	orciprenaline (Alupent)
dexamphetamine (Dexedrine)	dexamphétamine (Maxiton)
(Anticholinergic)	(Anticholinergique)
atropine	atropine
homatropine	
scopolamine = hyoscine	scopolamine (Scopos)
propantheline (Probanthine)	propanthéline (Probanthine)
	propyramazine (Diaspasmyl)
trimethophan (Arfonad)	methoplégium (Arfonad)
d-tubocurarine (Curarin)	d-tubocurarine
succinylcholine = suxamethonium (Scoline)	succinylcholine (Suxaméthonium)
decamethonium (Syncurine)	décaméthonium (Curam)
(Adrenolytic)	(Adrénolytique)
phentolamine (Regitine)	phentolamine (Regitine)
propanolol (Inderal)	propanolol (Alvocardyl)
guanethidine (Ismelin)	guanethidine (Isméline)
methyldopa (Aldomet)	méthyldopa (Aldomet)
	pindolol (Visken)
aloprenol (Aptin)	aloprénol (Gibernal)
(Hypnotic)	(Hypnotique)
phenobarbital (Gardenal)	phénobarbital (Gardénal)
butobarbital (Soneryl)	butobarbital (Sonéryl)
pentobarbital (Nembutal)	pentobarbital (Nembutal)
secobarbital (Seconal)	sécobarbital (Imménoctal)
thiopental (Pentothal)	penthiobarbital (Nesdonal) (Pentothal)
methaqualone (Melsedin)	méthaqualone (Toraflon)
chloral hydrate (Noctec)	chloral hydrate
paraldehyde	
	mecloqualone (Nubarene)
Convulsant & Anticonvulsant)	(Convulsivant & Anticonvulsivant)
nikethamide (Coramine)	nicéthamide (Coramine)
caffeine	caféine
phenytoin (Epanutin)	phenytoine (Dihydan)
trimethadione (Tridione)	trimethadione (Epidione)
(Antipyretic)	(Antipyretique)
acetylsalicylic acid (Aspirin)	acide acetylsalicylique (Aspirine)
acetaminophen = paracetamol (Febrilix)	paracétamol (Doliprane)
phenyl butazone (Butazolidin)	phénylbutazone (Butazolidine)
phenacetin	phenacetin

Table I continues

ENGLISH	*FRENCH*
(Narcotic)	(Stupifiant)
morphine	morphine
pethidine = meperidine (Dolantin)	péthidine (Dolosal)
codeine	codéine
methadone (Dolophine)	méthadone (Amidone)
	dextromoramide (Palfium)
nalorphine (Nalline)	nalorphine
(General Anesthetics)	(Anesthesiques (Generaux)
ether	éther éthylique
nitrous oxide	protoxyde d'azote
cyclopropane	cyclopropane
halothane (Fluothane)	halothane (Fluothane)
	acide 4-hydroxyaminobutyrique (Gabob)
methoxyfluorane	méthoxyfluorane (Penthirane)
(Alcohol)	(Alcool)
ethyl alcohol	alcool éthylique
methyl alcohol	alcool méthylique
glycerine	glycerine
(Local Anesthetics)	(Anesthesiques Locaux)
cocaine	cocaine
procaine (Novutox)	procaine
lignocaine (Xylocaine)	lidocaine (Xylocaine)
(Psychotropic)	(Psychotropes)
	levomepromazine (Nozinan)
chlorpromazine (Largactil)	chlorpromazine (Largactil)
reserpine (Serpasil)	reserpine (Serpasil)
diazepam (Valium)	diazepam (Valium)
meprobamate (Equanil)	meprobamate (Equanil) (Procalmadiol)
imipramine (Tofranil)	imipramine (Tofranil)
tranylcypromine (Parnate)	tranylcypromine (Tylciprine)
haloperidol (Haldol)	haloperidol
(Autocoids & Antihistamines)	(Autocoides & Antihistaminiques)
histamine	histamine
hyaluronidase (Hyalase)	hyaluronidase
promethazine (Phenergan)	promethazine (Phenergan)
	thiazinium (Multergan)
dimenhydrinate (Dramamine)	chloranautine (Dramamine)
(Antacids)	(Anti-Acides)
sodium bicarbonate	bicarbonate de sodium
aluminium hydroxide (Aludrox)	hydroxide d'aluminium
magnesium trisilicate	trisilicate de magnesium
carbenoxolone (Biogastrone)	
bismuth subcarbonate	bismuth subcarbonate
(Laxatives)	(Laxatifs)
magnesium sulfate	sulfate de magnesium
bisacodyl (Dulcolax)	bisacodyle (Dulcolax)
castor oil	huile de ricin
liquid petrolatum	huile de vaseline
(Costives)	(Antidiarrheiques)
diphenoxylate (Lomotil)	dephenoxylate (Diarsed)
butylhyoscine (Buscopan)	scopolamine N butyl (Buscopan)
(Cardiac Drugs)	(Drogues Cardiaques)
digitalis	digitale

Table I continues

ENGLISH	*FRENCH*
digoxin (Lanoxin)	digoxine (Coragoxine)
digitoxin (Crystodigin)	digitaline
procaine amide (Pronestyl)	procaine amide (Pronestyl)
quinidine	quinidine (Quinicardine)
(Vasodilators)	(Vaso-dilatateurs)
nitroglycerine	nitroglycerine (Trinitrine)
aminophylline	aminophylline (Carena)
papavarine (Pavabid)	papavarine
tolazoline (Priscoline)	tolazoline (Priscol)
(Anticoagulant)	(Anticoagulantes)
heparin (Liquaemin)	heparine (Liquemine)
ethylbiscoumacetate (Tromexan)	biscoumacetate diéthyle (Tromexan)
phenindione (Dindevan)	phenindione (Pindoine)
warfarin (Marevan)	warfarin (Coumadine)
(Diuretics)	(Diuretiques)
mercurophylline (Mercuxanthin)	mercourophylline (Novurit)
mercuramide (Neptal)	
hydrochlorthiazide (Esidrex)	hydrochlorthiazide (Esidrex)
frusemide (Lasix)	furosemide (Lasilix)
acetazolamide (Diamox)	acetazolamide (Diamox)
ammonium chloride	chlorure d'ammonium
spironolactone (Aldactone)	spironolactone (Aldactone)
triamterene (Dytac)	triamterene (Teriam)
ethacrynic acid (Edecrin)	acide éthacrynique (Edecrine)
(Gout)	(Goute)
colchicine	colchicine
probenecid (Benemid)	probenecide (Benemide)
	benziodarone (Amplivix)
allopurinol (Zyloric)	allopurinol (Zyloric)
(Calcium and Vitamine D)	(Calcium et Calciferol)
calcium gluconate	gluconate de calcium
calciferol (Drisdol)	ergocalciferol (Sterogyl)
cholecalciferol	cholécalciferol
(Antidiabetic)	(Traitement du Diabete)
insulin regular	insuline (Insulyl)
insulin zinc suspension (Lente)	insuline zinc (Lente)
protamine zinc insulin	insuline protamine zinc (Endopancrine)
chlorpropamide (Diabinase)	chlorpropamide (Diabinese)
glibenclamide (Daonil)	amiphenazole (Daonil)
phenformin (Insoral)	phenformine (Insoral)
metformin (Glucophage)	metformin (Glucophage)
saccharin	saccharine
(Pituitary Hormones)	(Hormones Hypophysaires)
vasopressin (Pitressin)	
oxytocin (Syntocin)	oxytocine (Syntocine)
chorionic gonadotrophin (Physex)	gonadotrophine chorionique
corticotrophin (Acthar)	corticotrophine
(Uterine Drugs)	(Alkaloides de l'Ergot)
ergonovine (Ergotrate)	
methylergometrine (Methergin)	methylérgobasine (Methergin)
(Sex Hormones)	(Hormones Sexuelles)
diethylstilbestrol	diéthylstilboestrol (Distilbene)
testosterone propionate (Neo-hombreol)	testosterone (Sterandryl)

Table I continues

ENGLISH	*FRENCH*
testosterone acetate (Acetosterandryl)	acetate de testosterone (acetoster andryl)
methyltestosterone (Teston)	méthyltestosterone (Glossosterandryl)
methoxyethinylestradiol (Mestranol)	mathoxyéthinylaestradiol (Mestranol)
norethynodrel + Mestranol (Enavid)	norethynodrel + Mestranol (Enidrel)
methandrostenolone (Dianabol)	Métandienone (Dianabol)
clomiphene (Clomid)	clomifene (Clomid)
(Thyroid & Antithyroid)	(Thyroidienne et Antithyroidienne)
liothyronine (Cytomel)	tri-iodothyronine (Trithyrone)
methimazole (Tapazole)	thiamazole (Basolan)
Lugol's solution	solute dit de Lugol
(Adrenal Hormones)	(Hormones Cortico-Surrenales)
hydrocortisone (Efcortelan)	hydrocortisone (Cortomister)
prednisone (Decortisyl)	deltacortisone (Cortancyl)
dexamethasone (Decadron)	dexamethasone (Decadron)
fluocinolone (Synalar)	fluocinolone (Synalar)
(Antianemic Drugs)	(Medicaments Anti-anemiques)
ferrous sulfate (Feosol)	oxalate de fer
ferric ammonium citrate	citrate de fer ammociacal
iron sorbitol citric acid (Jectofer)	acide folique (Foldine)
iron dextran (Imferon)	adenosine (Nucleocardyl)
folic acid (Folvite)	
folinic acid (Leucovorin)	
(Vitamins)	(Vitamines)
ascorbic acid (Ascorvel)	acide ascorbique (Vitascorbol)
thiamine (Benerva)	thiamine (Benerva)
riboflavine (Beflavit)	riboflavine (B-Deugyl)
vitamin A	retinol (Arovit)
menadione sodium (Synkavit)	manadione sodium (Bilkavy)
nicotinamide (Benerva)	nicotinamide (Nicobion)
pyridoxine	pyridoxine
hydroxycobalamine (Cobalex)	hydroxycobalamine (Dolcelan)
(Nutrients)	(Modificateurs de Metabolisme)
sodium chloride	adenosine (Nucleocardyl)
sodium bicarbonate	chlorure de sodium
sodium lactate	carbonate monosodique
potassium chloride	chlorure de potassium
glucose	glucose
dextran (Macrodex)	dextran (Rheomacrodex)
(Chelating Agents)	(Chelates)
pralidoxime (Protopam)	pralidoxime (Contrathion)
desferrioxamine (Desferal)	desferrioxamine B (Desferal)
dimercaprol	dimercaprol
calcium disodium edetate (Versenate)	calciedetate de sodium (Calcitetra-acemate)
(Sulfonamides etc.)	(Sulfamides etc.)
Sulfadiazine	sulfidiazine (Adiazine)
sulfamethoxazole (Gantanol)	sulfisomazole (Gantanol)
sulfaguanidine (Ivax)	sulfaguanidine (Ganidan)
sulfacetamide (Sulamyd)	sulfacetamide (Antebor)
dapsone (Avlosulfone)	diaphenylsulfone (Disulone)
nitrofurantoin (Furadentin)	nitrofurantoine (Furandentoine)
naledixic acid (Negram)	acide naledixique (Negram)

Table I continues

ENGLISH	FRENCH
(Penicillins)	(Penicillines)
penicillin G	penicillin G (Specilline)
procaine penicillin G (Crysticillin)	procaine penicillin G
benzathine penicillin G (Bicillin)	benzathine penicillin G (Extencillin)
the three above (Penadur)	trois (Extencillin-Bipenicillin)
penicillin V (Compocillin)	penicilline V (Dracilline)
oxacillin (Prostaphlin)	oxacilline (Bustopen)
carbenicillin (Pyopen)	
ampicillin (Penbritin)	ampicilline (Totapen) (Penbritin)
cephaloridine (Loridine)	cephaloridine (Ceporine)
(Broad Spectrum Antibiotics)	(Antibiotiques Large Spectre)
tetracycline (Tetracin)	tetracycline (Tetracyne)
chloramphenicol (Chloromycetin)	chloramphenicol (Tifomycine)
erythromycin (Ilotycin)	erythromycine (Abboticine)
(Antituberculosis Drugs)	(Drogues contre Tuberculose)
streptomycin	streptomycin
aminosalicylic acid (Pamisyl)	acide aminosalicylique
isoniazid (Nydrazid)	isoniazide (Rimifon)
thiacetazone	thiacetazone
rifampin (Rifadin)	rifampicine (Rifadine)
neomycin (Mycifradin)	neomycine
ethambutol (Myambutol)	ethambutol (Myambutol)
(Metallic Drugs)	(Metalloides)
antimony potassium tartrate	emetique
tryparsamide	tryparsamide
stibophen (Fuadin)	stibophene (Fouadine)
melarsoprol Arsobal)	
	melarsonyl (Trimelarsen)
(Antiamebic Drugs))	(Drogues contre l'Amibiase)
metronidazole (Flagyl)	metronidazole (Flagyl)
emetine	emetine
iodochloroquin (Enteroviofoform)	chloroiodoquin (Enteroviform)
carbarsone (Leukarsone)	broxyquindein (Colipar)
	diphetarsone (Bemarsal)
(Antimalarials)	(Antipaludisme)
pyrimethamine (Daraprim)	pyrimethamine (Malocide)
chloroquine (Nivaquine)	chloroquine (Nivaquine)
proguanil (Paludrine)	proguanyl (Paludrine)
quinine	quinine
primaquin	primaquine
trimethoprim + sulfa (Septrin)	trimethoprim + sulfa (Bactrim)
(Anthelmintics)	(Anthelmentiques)
piperazine (Antepar)	pipérazine (Nématorazine)
bephenium (Alcopar)	béphenium (Alcopar)
niclosamide (Yomesan)	niclosamide (Trédémine)
quinacrine (Atabrine)	mépacrine (Quinacrine-)
thiabendazole (Mintezole)	
niridazole (Ambilhar)	niridazole (Ambilhar)
diethylcarbamazine (Hetrazan)	diéthylcarbamazine (Notézine)
suramin (Antrypol)	suramine (Moranyl)
(Antiseptics)	(Antiseptiques)
tincture of iodine 2%	teinture d'iode 5%
benzalkonium (Zephiran)	
	cétriminium (Cétavlon)

Table I concluded

ENGLISH	FRENCH
cresol (Lysol) sodium hypochlorite 2% thimerosal (Merthiolate)	crésol soluté de Dakin 1.5% thiomersal (Merseptyl)
(Antifungal Drugs) benzoic & salicylic acid (Whitfield) griseofulvin (Grifulvin) nystatin (Mycostatin) amphotericine B (Fungizone)	(Antimycoses) griséofulvine (Griséfulvine) nystatine (Mycostatine) amphotéricine B (Fungizone)
(Antitumour Agents) bisulfan (Myleran) cyclophosphamide (Cytoxan) methotrexate mercaptopurine (Purinethol) azathiopurine (Imuran) melphalan (Alkeran)	(Drogues Anticancereux) bisulfan (Misulban) cyclophosphamide (Endoxan) améthopterine purinéthol azathioprine (Imural) melphalan (Sarcolysine)
(Insecticides) chlorophenothane benzene hexachloride (Lorexane) benzyl benzoate pralidoxine (Protopam)	(Insecticides) chlorophenothane hexachlorcyclohexane (Aptiria) benzoate de benzyl pralidoxime (Contrathion)

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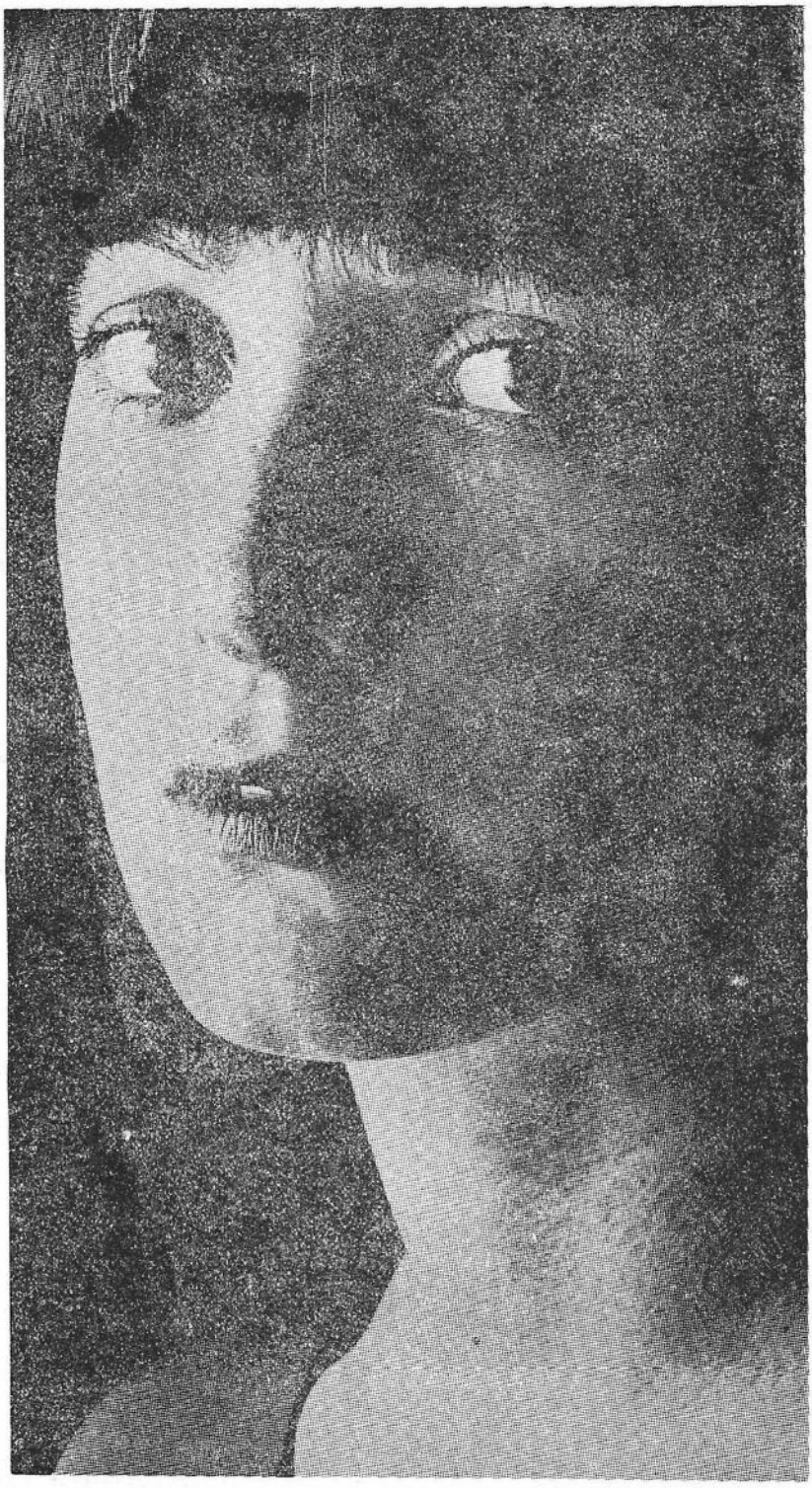

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CANNABIS SATIVA L.—I

SOME PROPERTIES OF CANNABIS SATIVA L. (INDIAN HEMP) USEFUL IN FORENSIC SCIENCE:

By J. Y. Binka, B. Pharm., M.Sc. MPSG and
S. Y. Bediako-Donkor, B. Pharm., MPSG

SUMMARY

The smoking of *Cannabis Sativa L.* is now a world-wide problem and Ghana is no exception. This requires the law enforcing bodies to have detailed knowledge about the botanical and physico-chemical properties of the plant. The general characteristics, microscopic features and the chemistry of the *Cannabis sativa L.* are discussed. Identification methods used currently by law enforcing laboratories are mentioned and their limitations discussed.

INTRODUCTION

Cannabis sativa (Indian Hemp) is now found to be smuggled for smoking in many countries. Law enforcing bodies and scientists have been occupied in studying the problem being posed by the use of *Cannabis sativa. L*

Figures on Police seizure of Indian Hemp (*Cannabis sativa L.*) in Ghana are rising in recent years as indicated in Table I. This rise might be due to increase in efficiency of the police operations and more likely to increase in illegal cultivation of the plant. Observations made in Ghana revealed that about "25 per cent of 100 consecutive male admissions to Accra Mental Hospital were either active smokers of Indian hemp or had at one time or other smoked it" (1).

In Ghana, the resin, "Hashish", of Cannabis is not known to be used. Samples analysed comprise mostly of the flowering tops of the plant and occasionally, the police send whole plants uprooted from farms for identification.

The Cannabis plant is normally found cultivated in many parts of the country, especially in and around cities and towns with few incidences in Northern and Upper Regions. They are normally found grown among food crops. In remote areas (from the cities and towns) cannabis is cultivated as small farms.

Cannabis is known by various names in Ghana: Sodom, Tampi, Gum, Guage, Stuff, Kinshasha, Swala and Whisky-in-papers (2). These names normally refer to the flowering tops and leaves of the plant in paper wrappers.

For Forensic purposes, the various characteristics of *Cannabis sativa L.* plant are used in the identification tests. When the plant is cultivated in a farm, the law enforcing officer need be acquainted with the general characteristic features of the *Cannabis sativa L.* in order to recognise it. Knowledge of the microscopic features and the chemistry of the plant constituent is essential for the identification of the plant materials, especially when seized as powders in paper wrappers.

General Characteristics

Samples of *Cannabis sativa L.* usually consist of green leaves and flowering parts. The leaves are digitate with serrated margins, and the fruits are of achene type. Uprooted whole plants are 2ft - 5ft high and mostly branched. The plant is dioecious and the male plant has a loosely branched many flowered inflorescence which stands out from the leaves. The female inflorescences are compact, short and few-flowered and and do not project beyond the leaves

(See fig. 1).

Microscopic Features

Microscopic features of *Cannabis sativa L.* of diagnostic importance are the trichomes. The trichomes are of two main types :- cystolithic unicellular trichomes and the glandular trichomes with multicellular heads. The glandular trichomes may have a multicellular, multiseriate stalks. These trichomes may sometimes be sessile. The glandular trichomes secrete the Cannabis resin, although other parts of the plant, stem and roots are known to contain resin (3-7).

The stomata of *Cannabis sativa L.* are of the anomocytic type and they occur on the lower epidermis of the leaf.

Chemistry

The main components of the Cannabis resin are the Cannabinoids —Cannabidiolic Acid, Cannabidiol, Cannabinol and Tetrahydrocannabinol. Other constituents isolated from Cannabis resin include Cannabichromene, Cannabinilic acid and Cannabigerolic acid (3-6).

The tetrahydrocannabinol (THC) is known to be physiologically active and the activity is attributed to the 9—THC isomer (7-9).

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The phytochemical interconversion of Cannabinols are as shown in figure 2. From the phytochemical changes, the predominant cannabinol content in Cannabis and its resin can be used to classify the plant as Unripe, Intermediate, Ripe and Over Ripe as shown below:-

The cannabinoids exist in the fresh plant as the carboxylic acids but slowly decarboxylate on harvesting and storing. The acid forms of THC are not physiologically very active. On smoking, the acid forms of THC decarboxylate into active THC.

IDENTIFICATION TESTS

Botanical & Colour Tests

Microscopic examination and chemical tests (10, 11, 12) are mainly used in routine identification of Cannabis. The microscopic examination is useful in the identification of the flowering tops of the plant for forensic purposes The colour tests indicate the presence of the Cannabis resin in a given cannabis sample. None of these methods, are however, considered specific enough for unequivocal identification of cannabis. Nakamura (10) found that 64 out of 82 plant species examined had cystolithic trichomes resembling that of Cannabis.

The chemical tests commonly used for the routine analysis of Indian Hemp are the Beam, Duquenois and Ghamrawy tests. The reactions of these tests and other reagents for cannabinoids are as shown in Table II. False positive reactions could be obtained when the reagents are applied to certain plant extracts (11-16). It is reported in a United Nations Document (1960) (15), that application of Beam's tests to extracts of 120 non-cannabis plant species, belonging to 28 different families gave faint positive tests on 2 plants. One plant gave a false negative response to Beam's test because of the absence of CBD in the sample.

Similar false positive responses to other plant species were also observed with Duquenois and Ghamrawy *tests. In 1966, Butler (17) reported that the modified Duquenois test, (Colour formed with the reagent is extracted into a chloroform layer), enhanced the discriminating value of the test.

Chromatography

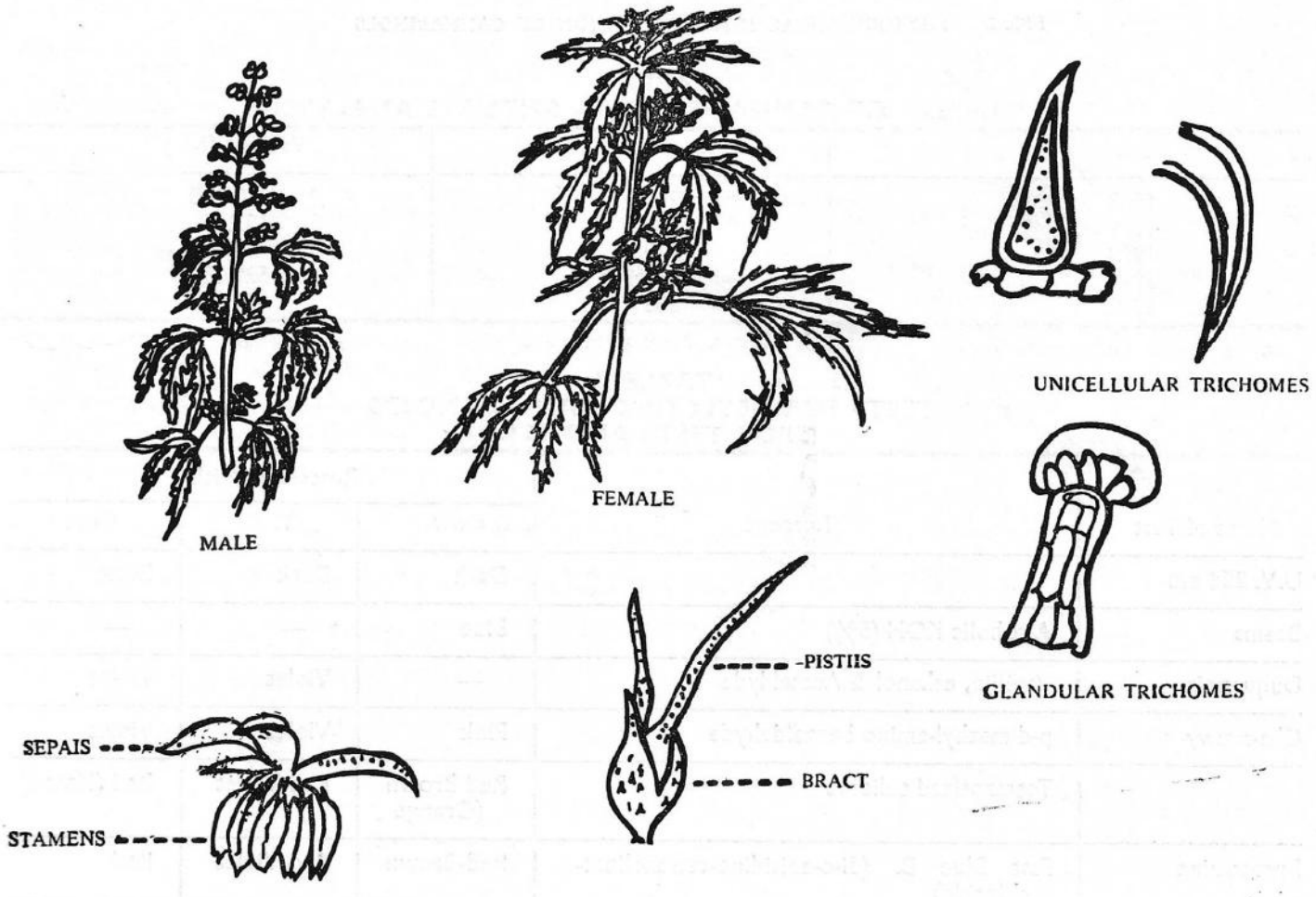
Considerable number of reports on the use of chromatography for the identification of cannabis and its resin have appeared in literature (18, 19). Column chromatography has been used for purification of the crude resin (Davis, et al, 1963) (20).

The use of paper chromatography is now rare, however, recently, Pettersen and Stevens reported a 10-minute technique for the separation of CBD, THC, and CBN on Silver Nitrate—impregnated Whatman SG 81 paper (21).

Thin layer chromatography (TLC) is extensively used now for the isolation and identification of cannabinoids (Korte and Sieper, 1964, (22) (12, 23, 24. 25). The technique is simple, relatively inexpensive and specific.

Gas chromatography is very useful for the identification and quantitative evaluation of Cannabis and its resin. Columns currently in use are SE-30

FIG 1 MACROSCOPIC AND MICROSCOPIC FEATURES OF CANNABIS SATIVA (L)



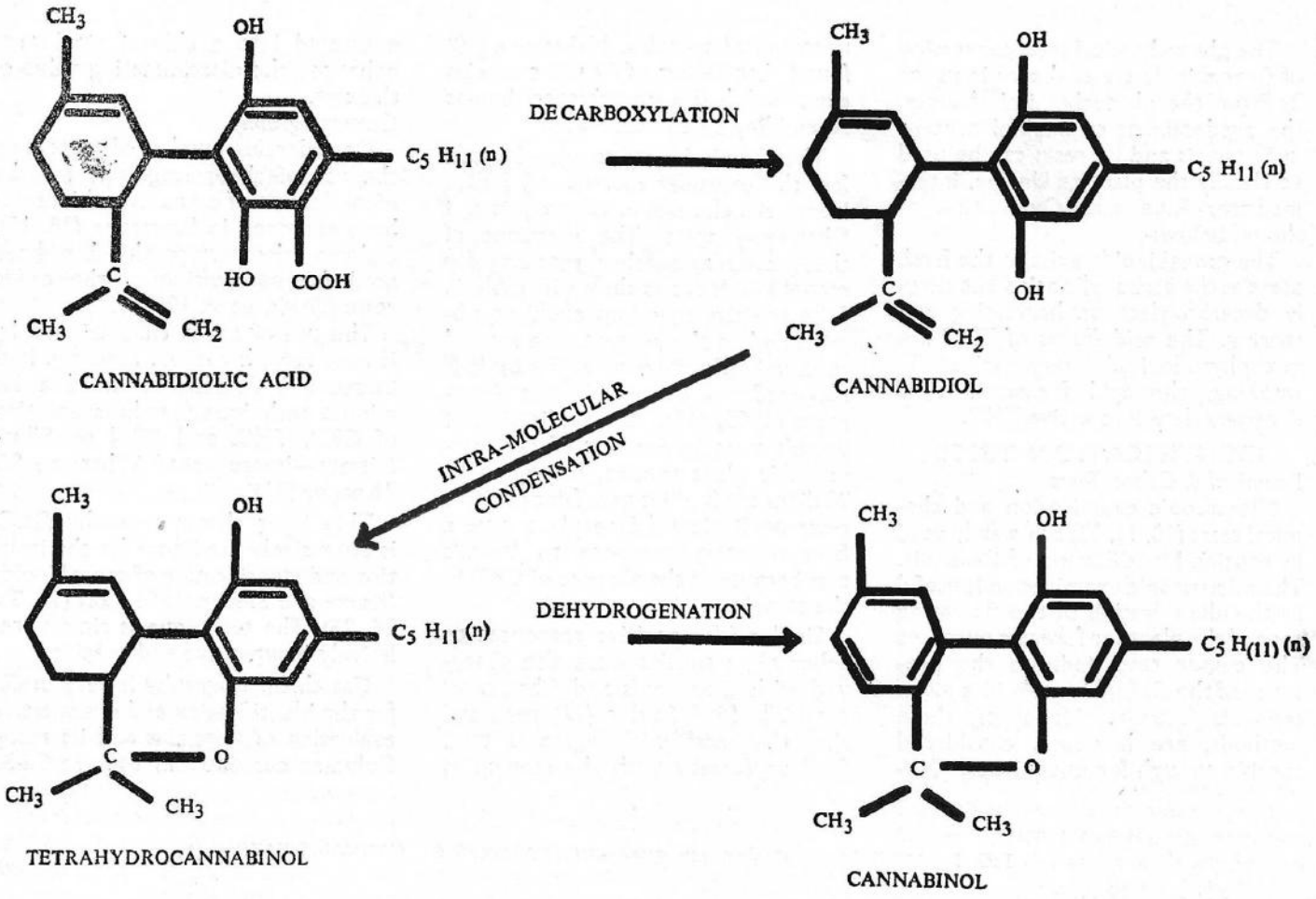


FIG. 2 PHYTOCHEMICAL INTERCONVERSION OF CANNABINOLS

TABLE I
SAMPLES OF CANNABIS SATIVA SEIZURES ANALYSED

Year	No. of Samples	Weight (KG)
1968	207	–29.00
1969	169	193.00
1970	229	— *
1971	544	529.39
1972	505	428.93

* **Figure Not available**

TABLE II
TESTS FOR DETECTING CANNABINOIDS
(SPOT TESTS AND TLC)

Name of Test	Reagent	Reactions With		
		CBD	THC	CBN
U.V. 254 mu		Dark	Dark	Dark
Beams	Alcoholic KOH (5%)	Blue	—	—
Duquenois	Vanillin, ethanol & Aceteldyde	—	Violet	Violet
Ghamrawy	p-dimethyl-amino benzaldehyde	Pink	Violet	Violet
	Tetrazotized tolidine	Red Brown (Orange	Red-Violet	Red (Mauve)
Brentamine	Fast Blue B. (di-o-anisidine-tetrazolium-chloride)	Red-Brown	Red Violet	Red

(26, 27), XE 60, (27) Carbowax 20M (29) OV-17 (20), and 2 per cent Ov-17 on chromosorb Q at 235°C (31-33). Gas Chromatography is a powerful tool in the study of the various constituents of *Cannabis sativa. L*

Spectrophotometry:

(a) *Ultra-violet spectra*
Attempts have been made to use ultra-violet spectra of cannabis extracts to differentiate between cannabinoids but with little success (17.)

(*b*) *Infra-Red Spectra*
Infra-red spectra of cannabis extracts have also been used to differentiate between cannabis samples of various ages and origins (de Ropp, 1960 Grlic, 1965 (22) and Mechoulam Gaoni (1967) (34).

(*c*) Mass and N.M.R. Spectroscopy have been used to elucidate the structures of various cannabinoids Claussen, 1966 (35) Schultz et al, 1958 (36), and Mechoulan and Gaoni 1964 (4).*

Ultra-violet and Infra-red spectroscopy are not normally required in the day to day analysis of Indian Hemp samples for forensic work. They serve however, as good research tools especially when used in conjunction with Mass and N.M.R. spectroscopy. Mass spectroscopy coupled with Gas Chromatography serves as powerful tool in detecting cannabinoids in body fluids.

Conclusion:

Knowledge of botanical and chemical properties of *Cannabis sativa L.* is reasonably adequate for the identification of Cannabis samples for most forensic cases. It is clear from the above discussion that more than one test need be applied to provide unequivocal proof of the identity of the plant material. Interference from plant materials other than *Cannabis sativa L.* need be evaluated so that false positive results will not be obtained for non-Cannabinoid plants.

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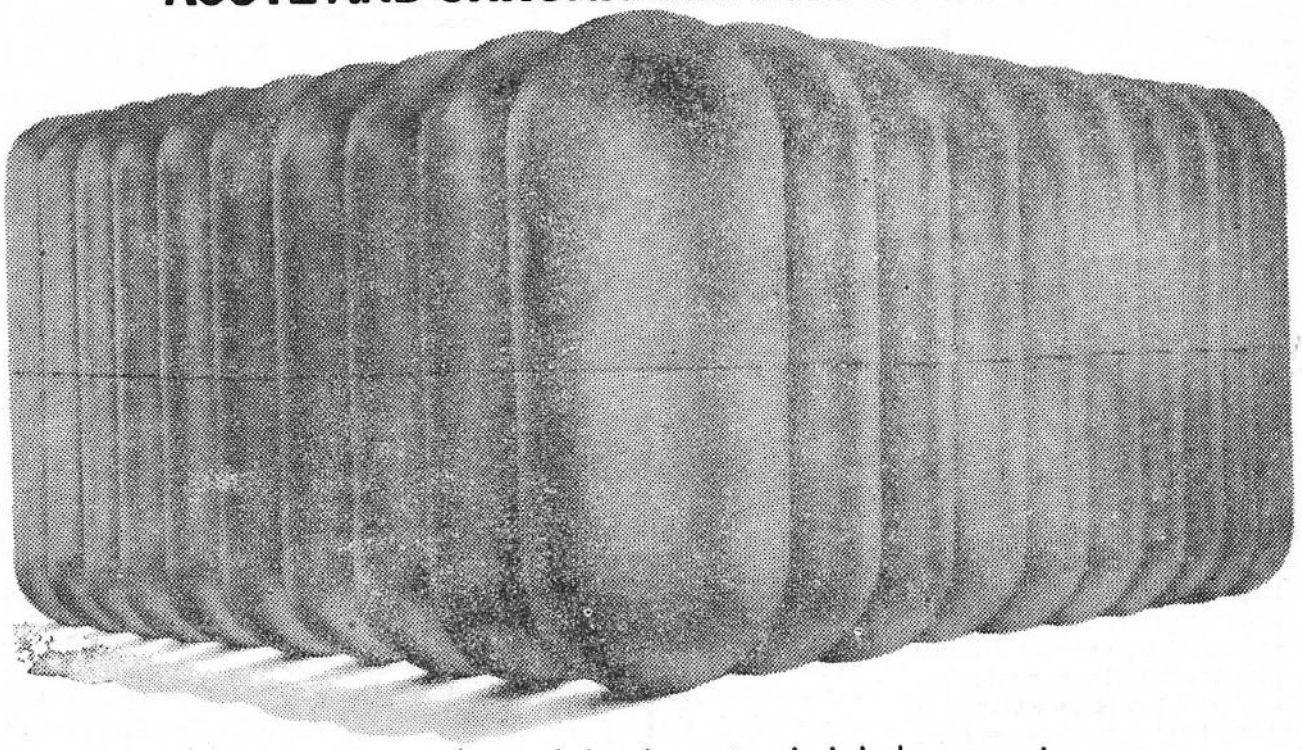

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PROBLEMS ASSOCIATED WITH THE PREPARATION AND USE OF INTRAVENOUS FLUIDS

By John Ocran, B Pharm., Ph.D., M.P.S.G.
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Some pharmaceutical products are so simple in composition that it appears anybody can make them. One such group of preparations are the intravenous fluids. After being told that normal saline contains 0.9 per cent w/v Sodium chloride there is the temptation for the nurse, the assistant in the dispensary or the medical practitioner to think that he can make normal saline injection himself and therefore does not see the need for or importance of the pharmacist. It may be relatively easy for anybody to prepare say 100 ml of normal saline injection but when it comes to preparing fairly large quantities e.g. 100 L of the same solution, as one may well do in a busy hospital dispensary, the associated problems become so complex that only a well trained pharmacist can handle them.

In this case it would be necessary to evolve a procedure which ensures effective dissolution and mixing making use of the apparatus and facilities available. It would also involve testing the solution for homogeneity. Various methods of distributing the solution into the final containers and handling the containers will have to be examined and assessed to determine which is most efficient in use of equipment, space, manpower and time bearing in mind the accuracy and/or quality required in the preparation.

Having established a routine effort should be made to ensure its continuing efficiency and the faithfulness with which it is followed by the operators.

PYROGENS

The first problem that should be tackled concerns water. The need for pyrogen-free water cannot be overemphasized so it is essential to find out if the still being used produces apyrogenic water. Since most dispensaries will not have the facilities for carrying out the test for pyrogens, this will mean getting a reputable laboratory to perform the test. The next problem which arises is how to transport the water from the still to the point of use without the possibility of the production of pyrogens or microbial contamination before the water is used. It is not only the water which should be apyrogenic but also the solid, that is sodium chloride. Even if the source of supply of sodium chloride does not change one cannot guarantee that after one batch has passed the pyrogen test subsequent batches will be apyrogenic.

When dealing with such large quantities it is difficult to ensure effective dissolution and mixing of the solutions, neither is it easy to distribute the solution into the final containers in a manner which excludes particulate and/or microbial contamination of the contents. How does one convince himself that the sterilization process to which the product is subjected guarantees the sterility of every individual container? Finally is the problem of subjecting the product to an examination which guarantees its suitability for use with regard to particulate content.

It should be realized that an unsatisfactory solution to any of the problems which come up during the production means increased probability of the preparation becoming pharmaceutically unacceptable.

With all the limitations of the official sterility test one can still make a reasonable decision as to whether a batch of preparation is sterile or not. The same can be said of the other desirable characteristics—homogeneity, limits of content of active or dissolved substance and apyrogenic nature.

PARTICULATE MATTER

However, there is no guide whatsoever, official or otherwise, as to what constitutes an acceptable preparation as far as the particulate content is concerned and one is left to use his common sense which makes the decision rather controversial. The rest of the paper will therefore be devoted to a discussion of this problem which was neglected until quite recently when the detection of solid particles was made relatively easy by the introduction of suitable instruments. It should be realised that irrespective of the undesirable nature of the particles and the process through which the solution is passed some particles will inevitably be present in the final product. The problem therefore is "how many particles of what size and nature (chemical) make a product unacceptable?" In the absence of any guidance in either the pharmaceutical or medical literature the only course left for the pharmacist is to rely on his conscience and knowledge of what is Practicable perhaps by reference to material produced by reputable manufacturers. As suggested by Goddard (1966) it may be possible sometime to come to use instrumental counts to determine the acceptability or otherwise of a solution. Before this becomes generally accepted the pharmacist must have an idea about the sources of particulate contamination so that special effort can be made to reduce the number in the final solution to the barest minimum. Armed with a good knowledge of the chemical nature of the particles the number and size

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likely to cause trouble and the possible dangers to the patient he will be in a position to make reasonable decisions concerning his preparations.

Sources and Chemical Nature

Particulate matter present in parental solutions may originate from:- (a) Materials present in the final container which have not been removed during washing prior to filling; (b) Materials present in the solution and not removed during clarifications; (c)Particles falling by chance from the atmosphere into the final container during the filling operation; (d) Particles shed by glass surfaces in contact with the saline solution for prolonged periods of time; (e) Rubber or plastic closures in contact with the solution, especially, if the solution has been heat sterilized; (f) particles shed from the filter medium itself. Garvon and Gunner (1963, 1964, 1971) have reported that they identified some of the solids present in commercial injection solutions as carbon black, whiting, zinc oxide and clay. These workers concluded that the particles originated from the rubber-closures since the particles were representative of materials commonly used as fillers in rubber. They also showed that blisters on the surface of a rubber closure could rapture during heat sterilization, and blamed rubber closures for the majority of cellulose fibres found in the solution. However, rubber closures cannot be the usual source of fibres since solutions packed in all glass or all plastics containers also contain fibres. It has been suggested by Fowler (1959) and by Endicott **et al** (1966) that chance contamination from the environment during the filling operation is the main source of this type of material.

If it is accepted that rubber closures are a possible source of contamination it follows that contamination will be greatly reduced if this type of closure is avoided or if it is improved by coating the surface with a suitable inert lacquer. The improvement by coating may not however eliminate the possibility of particles being pushed into the solution by the syringe during use. However, where the same solution has been packed in an all-plastics container and a rubber closed bottle the former has been found to give a lower particle count; Groves. (1966).

Since a large particle will almost certainly block the needle used to administer the infusion it is fairly easy to state the upper limit of size of particles to be found in intravenous solution. Particles of diameter around 300um are likely to block a No. 18 guage hypodermic needle but no standard can be set regarding the smallest particles that should be tolerated. Again it is extremely difficult to prescribe a limit for the number of particles since each individual particulate contaminant is potentially capable of causing a reaction in the body. Perhaps the only way of preventing particles from entering the patients blood stream is by inserting a membrane filter at the end of the giving set.

Dangers to Patient

The probable consequence of administering large quantities of pyrogenic solutions heavily contaminated with micro-organisms are too well known to be discussed here. Non-homogeneity in the batch may mean giving hypotonic solutions to some patients whilst others receive hypertonic solutions both of which may produce disastrous results. Thus one does not have any problem in deciding whether to reject or accept a batch of intravenous fluids when it does not meet the standards for homogeneity, absence of pyrogens and sterility, knowing very well the dangers involved in using such solution. In the case of particulate contamination the pharmacist is in a dilemma because added to the problem of deciding what size, number or type of particle he should permit in the solution he can only speculate on the possible dangers to the patient after deciding to accept a given batch.

The chemical nature of the particle may be crucial in determining the effect a particle may produce. In some cases the particle may not produce any biological effect at all but the possibility of inciting an inflammatory, neoplastic or antigenic response cannot be ruled out. The particle which does not produce any of the above responses is still dangerous potentially since it may block the lumen of a blood vessel. The question which arises is "where is the particle likely to lodge?" A particle injected into a radial vein of the arm is not likely to come to rest in a vein as it travels along the veins of increasing diameter towards the heart. After passing through the heart and pulmonary artery the chances of the particle blocking an artery increase as the diameter of the branching arteries decrease away from the heart. The diameter of the finest capillaries being about 5.1um it is perhaps reasonable to say that as far as possible, particles above this size should not be permitted in intravenous fluids so as to reduce the risk of occlusion of the arteries. The effect of occlusion will be determined by the availability or otherwise of alternative circulation to the tissue. If the occluded vessel happens to supply an organ which does not have many alternative pathways for the blood e.g. kidneys or brain, then the result may be permanent damage. It may be argued that the pulmonary venous circulation, where occlusion will be less dangerous, can act as an effective filter unit and prevent large particles from reaching the systemic circulation. Prinzmetal and coworkers (1948) have shown that glass beads as big as 390um could pass through the lungs and reach the systemic circulation. The above discussion shows that the pharmacist cannot take any chance over particulate contamination in intravenous fluids since it is his primary responsibility to help save life and not endanger it. At the moment there is no way of ensuring that the solution is completely free from particles of any size but if the pharmacist will personally take charge of or supervise the preparation of such solutions and select the right packaging materials, he can satisfy himself that he has done everything within his ability to produce the best possible solution.

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CANNABIS SATIVAL L.—II

STUDIES OF SAMPLES OF CANNABIS SATIVA L. (INDIAN HEMP) IN GHANA

By J. Y. Binka B. Pharm; M.Sc., MPSG. and S. Y. Bediako-Donkor, B. Pharm; MPSG.

SUMMARY

Specificity of the chemical test—Ghamrawy and Duquenois—was evaluated with respect to eleven different local plant species. Some plants responded to colour spot tests similar to the response given by Cannabis sativa L. Thin Layer and Gas Chromatographic methods were found to be specific for the identification of Cannabinoids in *Cannabis sativa L.* extracts.

A local *Cannabis resin* and that from United Nations Narcotic Laboratory were examined qualitatively with the U.V. and I.R. Spectrophotometry. The I.R. spectra of the resins were used to evaluate the maturity of the samples.

INTRODUCTION:

Seized samples of *Cannabis sativa L.* (Indian Hemp) sent for analysis by law enforcing bodies in Ghana comprise mainly of the flowering tops of the plant, and sometimes, the whole uprooted plant. These samples are seized under various conditions.

The Police may uncover a Cannabis farm which may be concealed amongst other crops like cassava, tomatoes and pepper. If the undergrowth of a farm is overgrown, other plant species might make it difficult for the law enforcing officer to recognise the Cannabis. The illegal dealer in Cannabis may adulterate wrappers of Cannabis with some other plant materials. Cases have been known of suspected Cannabis smokers chewing up partly smoked Cannabis wrappers, when apprehended by the Police. Bits and pieces of the chewed up plant materials may be sent to a laboratory for analysis by the Police.

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It is apparent that analytical methods used for the identification of seized *Cannabis sativa L.* should be selective and specific. It has been reported that some plant materials other than *Cannabis sativa L.* respond positively to some of the chemical tests for the *Cannabis sativa L.* notably Beams, Ghamrawy and Duquenois tests (1,2,3).

The present studies seek to evaluate the specificity of the normal laboratory identification tests for *Cannabis sativa L.* vis à vis other local plant materials likely to be found with seized Cannabis samples. Spectrophotometry and Chromatography are also used to evaluate qualitatively seized samples of *Cannabis sativa L.* and compared with authentic samples.

EXPERIMENTAL

MATERIALS

(A) Apparatus:

(i) Microscope (ERNST-LEITZ)

(ii) Thin layer Chromatography equipment (DESAGA) with plates 20" x 20"

(iii) U.V. Spectrophotometer-Beckman Model DK 2A with recorder.

(iv) I. R. Spectrophotometer-Beckman Model IR 33.

(v) Gas Chromatography—Varian Model 1700 with Flame Ionization Detector. Stainless steel column ($5' \times \frac{1}{8}''$) Stationary Phase: 3 per cent SE. 30.

(B) Reagents:

(*i*) *Acid Chloral Reagent*
Dissolve 10G, Chloral hydrate in 100ml. of 20 per cent v/v aqueous hydrochloric acid.

(*ii*) *Ghamrawy*
Dissolve 0.5 G of p-dimethylamino benzaldehyde in 50ml. 95 per cent Ethanol
Add 2.8ml. conc. H_2SO_4.

(*iii*) *Duquenois*
Dissolve 2G vanillin in 100 ml of 95 per cent ethanol. The stock solution may be kept indefinitely in a refrigerator. For immediate use, 1 ml of the vanillin solution is mixed with 3 drops of acetal dehyde.

(iv) *Beam*
Dissolve approximately 5G, KOH in 100 ml of ethanol (95%).

(*v*) *Brentamine*
(a) Fast Blue Salt (B) (Echtblausalz in water (1% w/v).

(vi) (b) Aqueous KOH (2N)
Spray first with (a) followed by (b)

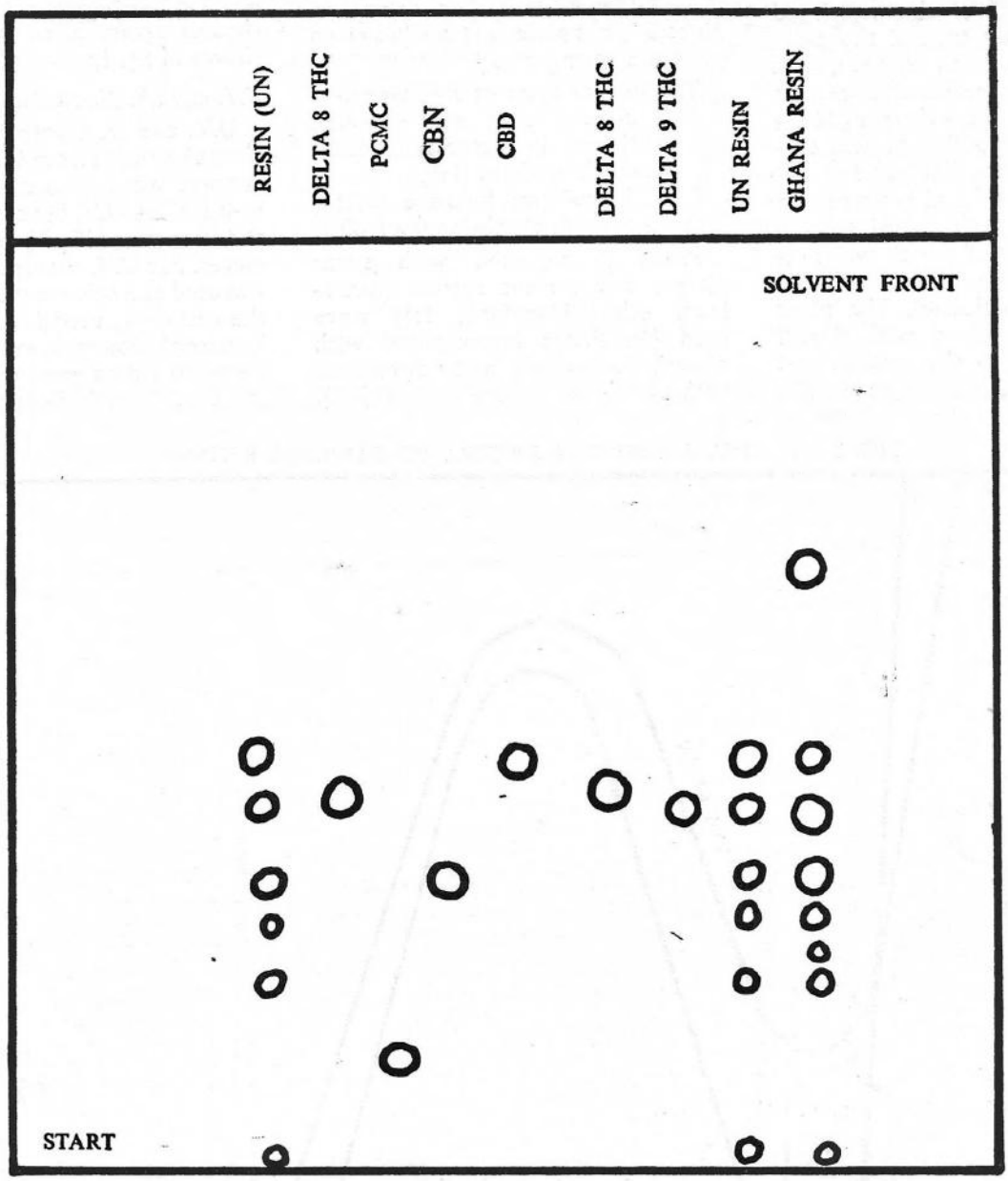
(vii) *Tetrazotised benzidine or tolidine*
(a) 1ml. or 1g. of amine 3ml. conc. HCL made up to 200 ml. with water.

(b) 10 per cent Sodium nitrite.
Mix equal volumes of (1) and (2) and stand for 1-2 minutes before spraying.

(C) PLANT MATERIALS:

The *Cannabis sativa L.* samples used in the investigation were taken from Police seizures from suspects.

FIG. 1 THIN LAYER CHROMATOGRAM OF CANNABIS RESIN



The other plant materials were sampled from small farms around Accra, Aburi and Kumasi. The plants were identified by the Botany Department, University of Ghana, Legon. The selection of the non-Cannabis plants was based on their morphological resemblance to *Cannabis sativa L.* and their likelihood to be used to adulterate genuine *Cannabis sativa L.*

(D) REFERENCE CANNABINOIDS

(i) Authentic resin (UN).
(ii) Cannabinol (CBN) (UN)
(iii) Cannabidiol (CBD) (UN).
(iv) ● 8 - THC) (UN)
● 9 - THC) (UN)

PROCEDURE

Macroscopy and Microscopy

The main morphorlogical features of the leaf structure and inflorescence of eleven non-Cannabis plants were examined. Powdered plant materials were cleared with chloral hydrate solution and the presence of cystolithic trichomes were checked with acid chloral solution. The details of examination are as indicated in Table I.

Colour Spot Tests

50 mg of the powdered plant materials (leaves and flowering tops) were extracted with 20 ml. petroleum ether (40-60°) and filtered. The filtrate was evaporated to dryness and the reagent was applied to the residue.

The non-Cannabis plants were tested with Ghamrawy and Duquenois tests (1, 2, 3). Extended Duque-

nois test which involved extraction of the colour formed with the plant residue was also applied to each plant sample. The various colour reactions of the reagent with the plant extracts are as also shown in Table I.

Thin Layer Chromatography (T.L.C.)

About 0.5 - 1G of the powdered leaf and flowering tops of the plant were extracted with 3x20ml, hot methanol. The methanolic extract was filtered through Whatman No. 4 filterpaper and the filtrate was evaporated to dryness. The residue was then wetted with 0.5ml benzene and taken up with 0.5G florisil (60-100 mesh). 2G slurry of florisil was prepared with benzene and transferred to a column (12x1.2cm). The plant extract residue mixed with florisil was transferred to the column and eluted with 3x25ml. benzene. The benzene extract was evaporated to dryness and the residue was taken up in n-hexane or cyclohexane into 5ml. volumetric flask and made up to volume.

The final solution was then spotted (5ml) on 250mu layer of Silica gel (GF254-Merck-Stahl) (air dried) on 20"x20" glass plates and run in a given solvent system.

The solvent systems used were:-

(a) 1.5 per cent v/v Absolute ethanol in petroleum ether and chloroform (1:1)
(b) Chloroform: benzene (50:50)
(c) Benzene: Diethylamine (100:1)

Plates impregnated with silver nitrate and solvent system (petroleum ether/chloroform 1:1) were used (4). Plates impregnated with dimethylformamide and developed with cyclohexane were also used (5).

The Benzene: Diethylamine (100:1) system and silica gel (GF254) were selected for the screening of cannabis and non-cannabis plant materials. Para-chlorometacresol was used as reference substance. Rf. values and Relative Rf values (Rx) of Cannabinoids are as shown in Table II, T.L.C. chromatogram of cannabinoids is as shown in fig. 1.

U.V. and I.R. Absorption

U.V. and IR absorption spectra of Cannabis resins from U.N. and Ghana samples were recorded using Beckman DK 2A U.V. Spectrophotometer and Beckman IR 33 Spectrophotometer. For U.V. absorption, n-hexane was used as a solvent and a thin film of the resin was used for the Infra Red Spectrophotometric examination. The Cannabis resins were extracted from plant materials as described under the

FIG. 2 U.V. ABSORPTION SPECTRA OF CANNABIS RESINS

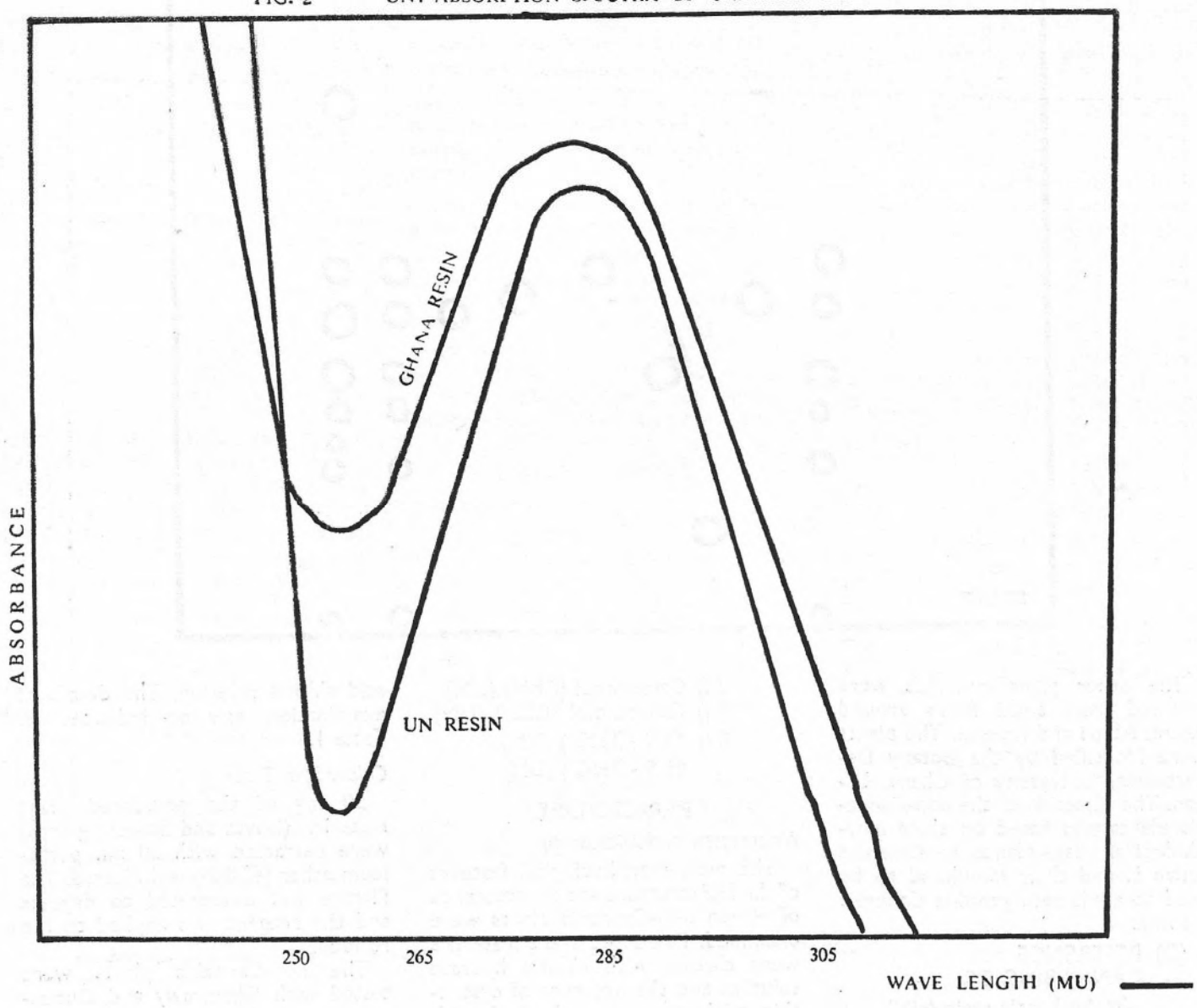


FIG. 3 INFRA RED ABSORPTION SPECTRA OF CANNABIS RESINS

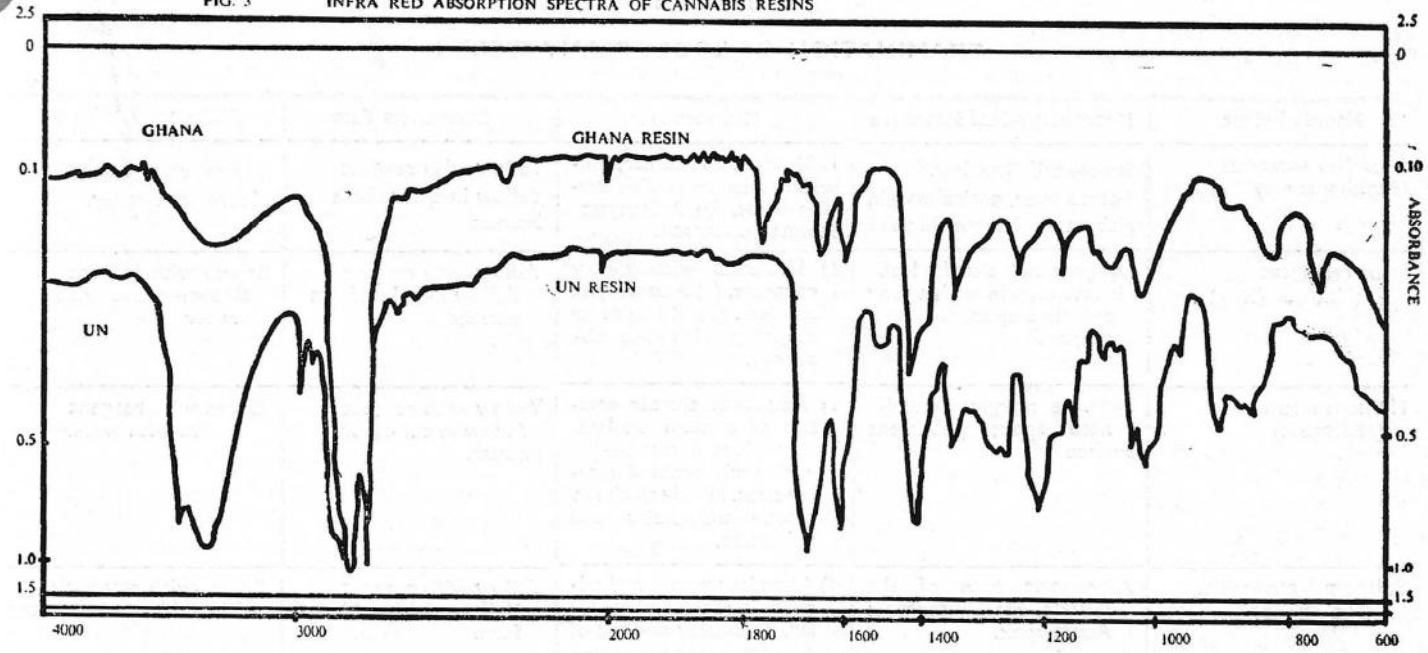


FIG. 4 GAS CHROMATOGRAM OF CANNABIS RESIN

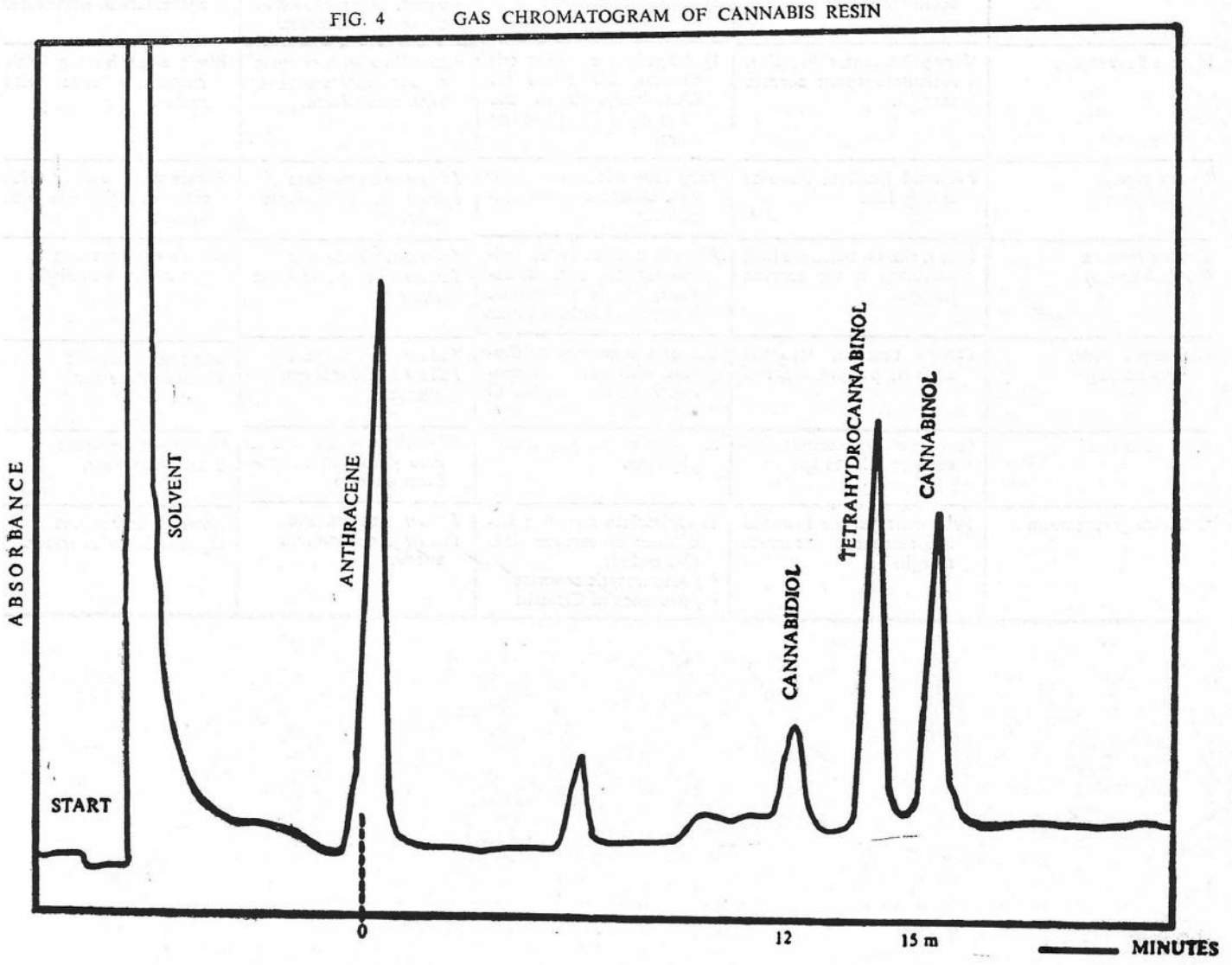


TABLE I

EXAMINATION OF LOCAL PLANT SPECIES

Name of Plant	Macroscopy-Leaf Structure	Microscopy	Duquenois Test	Ghamrawy's Test
Crotalari goreansis (Papillionaceae)	Simple trifoliate leaf. Retuse apex, entire margin glabrous and ovate-shapped	1) Slender, unicellular, uniseriate trichomes with burging bases. (2) Anisocytic Stomata observed.	Yellow with reagent Yellow in chloroform extract	Brown with reagent Mauve with water.
Ficus religiosus (Moraceae)	Long-stalked simple leaf. Sinuate margin with a long apiculate apex, Cordate-shapped.	1) Idioblasts with yellow contents. (2) Anomocytic stomata. (3) No hairs or covering trichomes observed.	Yellow with reagent Yellow in chloroform extract	Brown with reagent Brown-mauve with water
Hibiscus micranthus (Malvaceae)	Separate margin; Acuminate apex; pubescent surface	1) Abundant cluster crystals of calcium oxalate. 2) Abundant horny covering trichomes of varying sizes. Highly thickened Mostly unicellular and uniseriate.	Yellow with reagent Yellow in chloroform extract.	Green with reagent Mauve with water
Solanum lycopersium (Solanaceae)	Assymetric base of the leaflets. Fleshly-texture; Acute apex.	1) Abundant compound trichomes mostly unicellular. 2) Cluster crystals of calcium oxalate. 3) Glandular Hairs not observed	Yellow with reagent Yellow with chloroform	Brown with reagent Dirty blue with water
Spigalia anthelmia	Lanceolate Leaflet; acuminate apex	1)Paracytic Stomata 2) No hairs observed	Deep yellow with reagent. Light yellow in chloroform extract.	Brownish-red with reagent. Green with water
Hyphis Suaveolens	Very pubescent, thin stalks, Apiculate apex; serrate margin.	1) Abundant covering trichomes, 3-5 celled (2) Cluster crystals in the Mesophyll. (3) glandular hairs.	Pale yellow with reagent colourless aftershaking with chloroform.	Black after boiling with reagent. Mauve with water.
Carica papaya (Caricacea)	Palmatid incision, Palmate simple leaf.	Very few trichomes observed. Uniseriate and unicellular	Yellow with reagent Yellow in chloroform extract	Purple after boiling with reagent. Light blue with water.
Croton lobatus (Fuphobiaceae)	Hairy, simple trifoliate leaf; apiculate apex; serrate margin	Abundant trichomes, unicellular slender, uniseriate, highly thickened. Few compound trichomes	Yellow with reagent Yellow in chloroform extract	Mauve with reagent Light violet with H_2O.
Clausena anisate (Rutaceae)	Papary texture, glabrous surface, paripinnate leaf	Uniseriate covering trichomes with little thickening. 2) Idioblasts with oil contents	Yellow with reagent Yellow in chloroform extract	Black with reagent Violet with water
Splendens Red	Serrate Margin, brittle texture acuminate apex	Idioblast containing brown pigments	Pale yellow with reagent. Pale yellow in chloroform extract	Violet with reagent Blue with water.
Ocimum gratissimum	Pubescent, yellow flowered inflorescence, serrate margin	1) Uniseriate covering trichomes of various sizes (3-6 celled) (2) Anomocytic stomata (3) Presence of Cicatrix	Yellow with reagent Yellow in chloroform extract	Mauve with reagent Light violet with water.

method for thin layer chromatography. The U.V. and IR spectra are as shown in figs 2 and 3 respectively.

GAS CHROMATOGRAPHY

Gas chromatography was used to evaluate qualitatively the contents of samples of *Cannabis sativa L.* extract as obtained and compared with that from U.N. The final residues from 2.0G samples were dissolved in n-hexane as described under T.L.C. procedure. Stainless teel column (5'x$\frac{1}{8}$") with stationary phase 3 per SE 30 on Porapak Q (80 - 100 mesh) was used. The following conditions were used:

(i) Temperature: programmed temperature from 170°-230°C at the rate of 6°C/min. Detector temperature:- 250°C. Injection temperature:- 270°C.

(ii) Carrier gas:—Nitrogen-flow-rate: 30ml/min.

(iii) Detector: Flame Ionization Detector: Hydrogen (30 ml/min): Air - 300ml/min.

(iv) Attention 8×10^{-10}.

Anthracene (0.2% w/v in n-hexane) was used as internal standard.

RESULTS AND DISCUSSION

Macroscopic and microscopic examination of the non-Cannabis plant species revealed that none of the plants examined resembled *Cannabis sativa L.* However, some of the plants had limited resemblance to Cannabis when specific features like trichomes and stomata were considered. As shown in Table I, covering trichomes from *Crotalaria gereansis*, *Hibiscus micranthus* and *Clausena* anisate might confuse inexperienced worker especially when the materials are powdered. Anomocytic stomata of *Ficus religiosus* and *Ocimum gratissimum* could also be wrongly taken as those from *Cannabis sativa L.*

Application of colour spot tests to the non-cannabis plants revealed that some of them could give false weak positive tests to Ghamrawy test—*Croton lobatus*, *Ocimum gratissimum* and *Carica papaya*. None of the plants examined responded positively to Duquenois and extended Duquenois tests, although certain plants are known to give positive reactions (2, 6). Report in U.N. Document 1969 (2) indicated that mace oil and nutmeg oil could give false positive reactions to the extended Duquenois test. These plant materials are not likely to be found in Cannabis wrappers but could probably interfere with Duquenois test when applied to a mouth wash from a suspected Cannabis smoker.

None of the non-cannabis plant species examined with thin layer chromatography gave Rf values and colour reactions of spots to spray reagents like those given by *Cannabis sativa L.* extract. Thus, the combination of colour spot tests, microscopic and the thin layer chromatographic techniques offers useful means for the identification of Cannabis samples. The benzene: diethylamine (100:1) solvent system gave the best separation of the cannabinoids. (fig 1) (Table 1).

The U.V. and I.R. spectra of U.N sample and Ghana sample are as shown in Figs. 2 and 3 respectively. There was no significant difference between the two U.V. spectra. However, the I.R. spectra of the two samples showed some differences especially around 1500 cm^{-1}, 1760cm $^{-1}$, 900 cm^{-1} and 3080 cm^{-1}. It has been established by other workers (7, 8) that only CBN exhibits a band at 815cm^{-1}. This is attributed to the 1, 2, 4—trisubstituted benzene ring. Thus, intensity of I.R. band at 815cm^{-1} could be an indication that the cannabis extract is from 'Overipe' sample. Hence, the cannabis extract from Ghana examined could be said to be from an 'Unripe' sample since the band at 815 cm-1 is weak. The relatively weak bands at 1130 and 1160 cm^{-1} of the resin from Ghana as compared with the UN sample confirms the earlier observation that the resin from Ghana was relatively unripe plant. The bands at 1130 and 1160cm^{-1} are attributed to the skeletal frequencies for $(CH_3)_2C$— group present in THC and CBN which replaces the CH_3 CH—CH_2 group for CBDA and CBD. The absorption band at 1265 cm^{-1} is found mostly in "unripe" Cannabis (9). This is present in the I.R. spectrum of the resin from Ghana whilst absent from the U.N. sample, thus confirming the "unripe" stage of the Ghana resin.

A typical Gas Chromatogram of Cannabis resin is shown in fig. 4 Retention times relative to Anthracene were; CBD:- 12min; THC:- 14 min. and CBN:- 15 min. The G.L.C. provides a specific method for the identification of Cannabis samples for forensic purposes. It has been found in our laboratory routine work to be particularly useful when a suspected hemp smoker chews up his wrapper when apprehended by the police.

Acknowledgement

Our sincere thanks go to Miss G. Acquah (Government Chemical Laboratory) and Mr P. D. Owusu (Vacation Student from Faculty of Pharmacy, Kumasi University) for their technical assistance to the running of the programme. We are also grateful to Dr Olav. J. Braerden, Chief of the United Nations Narcotics Laboratory, Geneva, for providing the reference substances.

TABLE II

THIN LAYER CHROMATOGRAPHY OF EXTRACTS OF CANNABIS SATIVA LEAVES

CONSTITUENT	Rf Value		Rx Value	
	Mean	Range	Mean	Range
CBN	0.42	0.39-0.43	2.51	2.42-2.70
~~CBN~~ CBD	0.53	0.50-056	3.31	3.0-3.63
Delta 8THC	0.53	0.51-055.	3.25	3.2-3.48
Delta 9THC	0.45	0.43-0.47	2.88	2.48-3.32

N.B.—*Internal Standard for Rx values; p-chlorometacresol.*

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HERBAL MEDICINE RESEARCH CENTRE

*Another view — by *Phillip Dixon Owusu B. Pharm. (Hons)*

The recent pronouncements by the Head of State at the inauguration of the 32nd Conference of the Pharmaceutical Society of Ghana and similar statements by the Commissioner for Health at the meeting of the Planning Committee for the Five-year National Health Development Programme clearly indicate the Government's avowed interest and policy to make increasing use of our indigenous natural resources and our native medicine.

In accordance with the policy of self-reliance and resurgence of our cultural heritage, of which our native system of medicine forms an integral part, the Government has taken a very important step forward by proposing to establish a central research organisation with the objective assessment of the merits of herbal medicine and its development and modernisation, as some of the laudable goals.

Today, China and India are forging ahead in their faith in indigenous systems of medicine by giving material and moral support to Scientific investigation and development. Acupuncture, a traditional anaesthetic practice in China is now being revived and raised to such a state of refinement that it has caught the imagination of researchers in the United States, Canada and most European countries. Some anaesthetic experts have learned the technique and are using it as a part of their anaesthetic know-how.

India has moved ahead in the direction of using its indigenous system of medicine (the "AYURVEDIC" SYSTEM) to bring inexpensive health service to the common man. Among the measures that the Indian Government has taken, three are highly significant and of great relevance to the Ghanaian situation. These are: (a) Formulation of an Ayurvedic Pharmacopoeia. Botanical indentity of the medicinal plant, morphological description of the organ actually used as the crude drug; the method and season of collection; the subsequent processes to preserve the plant product; tests of identity—chemical or organoleptic; detection of common adulterants and substitutes, all these are set out in clear terms in the Ayurvedic Pharmacopoeia.

By properly compensating native practitioners who held part of this information secret, much hidden knowledge about indigenous drugs had been brought to light for the benefit of a larger number of people.

(b) Qualified and recognised Ayurvedic medical practitioners have been organised into a cadre of health service personnel to man clinics and hospitals in which treatment is given strictly according to the Ayurvedic Pharmacopoeia. Besides, by bringing the indigenous medical practitioner into an organised system of public service, what the Government of India has achieved is elevation of the herbal system of medicine to a position of respectability. Moreover, the facilities provided at the clinics and hospitals especially established for carrying out treatment by the indigenous methods, have opened up a way for objective clinical evaluation of drugs and medicaments hitherto used in an environment of magic and superstition not conducive to research and development.

(c) Establishment of a research centre to carry out objective investigation and assessment of the therapeutic claims of indigenous drugs by modern scientific methods of enquiry. Finally, by establishing research centres in various parts of the country, the Indian Council for Medical Research have sought to make a concerted effort to discover new drugs, rediscover old ones through modern scientific method of investigation of all these plants mentioned in Ayurvedic Literature.

That natural products which our motherland is richly blessed with are assuming increasing importance in the total armamentarium of medical treatment can hardly be over-emphasized. For example, over 96 per cent of research work carried on annually at the National Cancer Research Institute (U.S.A. and Canada) has been on the evaluation of natural products. It is also encouraging that drugs that are undergoing Clinical Screening and tests in most research centres around the world are increasingly found to be natural products. Through such research programmes *Vincaleukoblastine*, a potent anti-mitotic (anti-neoplastic) substance obtained from *Catharanthus rosea* commonly called *periwingle* and other important natural products are being used in clinical therapeutics.

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Cardiac glycosides obtained from plant sources including some species of the genera *Strophanthus, Urginea, Digitalis* and *Convallaria* have been used principally in the treatment of *heart failure* and in *atrial arrhythmias.*

In fact, there have been no synthetic analogues of the cardiac glycosides.

"*Senokot*" granules—strong laxative, have been obtained directly from the leaves or pods of *senna* species.

Most or at least some synthetic drugs that have been of clinical use have been withdrawn from the market because they have been found to exhibit serious or sometimes lethal side effects. The *Thalidomide* Episode (teratogenicity) in Europe and recently the Hexachlorophene and Boric acid/Borax cases that have caught the eyes of the World Health Organisation (W.H.O.) are very simple examples of note. The problem with the synthetic drugs is being attributed to the chemistry (stereochemical, purity, etc.) of the synthetic product or to the inadvertent inclusion of some of the poisonous reagents that were used to synthesise the drugs. Recent research has shown that the average survival of a newly introduced synthetic drug is only about five years. As many as fifteen synthetic drugs accepted by the British Pharmacopoeia (B.P.) 1948 were summarily excluded from the 1953 Edition. As many as twenty (20) synthetic drugs and their preparations which found a respectable place in the 1963 edition of the B.P. were thrown out of the 1968 edition. Another important fact that goes to augment the need to look back to natural products and for that matter our herbs is that no synthetic drug has been manufactured nor synthesised without a precursor or an analogue of it being known to be contained in a plant species. That is to say, there have been analogues of chemical compounds of therapeutic efficacy that were found to be the active constituent of a plant extract. The immediate examples that come into mind are the important *Alkaloids* from the *Solanaceous* plants and the *Steroidal sapogenins* from the *Solanum* and other plant species.

Atropa belladonna is a plant that produces *hyoscine*. An extract of the plant is a strong *anti-spasmodic*. The pure alcoholic extract (tincture) of it is used in such preparations as *Magnesium trisilicate* with *Belladonna*, a common preparation administered to treat gastrointestinal disorders. A synthetic analogue trade-named '*Buscopan*' is chemically, *hyoscine N-butylbromide* and it is an effective clinical product in cases such as *Spastic* disorders of the alimentary, biliary and urino-genital tracts.

The essential point about this is that if hyoscine from *Atropa belladonna* extract had not been known and used it would have required miracles from heaven for modern science and medicine to synthetise and specifically use *hyoscine N-butyl*-bromide (Buscopan).

Local anaesthetics such as cocaine—the primary constituent—and its synthetic analogues (lignocaine, Amethocaine etc.) have been obtained as a result of the study of the plant, *Erythroxylon coca* used by the natives of Peru, Chile and Bolivia. From the traditional uses of Opium, researchers have been able to produce very potent analgesics/Narcotics which are either synthetic morphine derivatives (e.g. Codeine, Dihydro-codeine, Levorphanol) or chemically related or morphine-like types such as pethidine and methadone.

Similarly synthetic adrenocortical hormones, progestational agents, androgenic and anabolic agents have all been produced using natural steroidal compounds as precursors or starting materials.

Volumes would be required to cite examples of the other classes of drugs and pharmaceutical compounds/products, all from natural sources. But it will suffice to say that invaluable service has thus been rendered by our forefathers, "primitive" as they were — the traditional "medicine men" and the apothecaries—without whose ingenuity modern medicine and pharmaceutical sciences would have suffered a great set-back. Summarily, therefore, our known drugs of choice have been obtained in one way or the other from herbs, shrubs, trees or animals—basically, they have been obtained from natural sources.

However, in Ghana, most educated people particularly medical doctors, para-medical specialists and other people of high academic standing despise or feel contempt for our *traditional medical practice* ("Herbalism").

I have reason to believe that the contention of most critics of this system is that either the procedures or methodology of the medicament formulation are unscientific and unhygienic, or they do not believe in the psychical aspects associated with the methods adopted by most native/traditional healers or herbalists in this country. On the latter rationale for which people have prejudices against herbalism, I should say that if people understood the role psychotherapists and psychiatrists play in medical treatment they would have found out that the psychic aspects are propitious to our traditional methods of herbal treatment. Ghanaians, like all other black Africans, must have reasons to believe in telepathy and spiritualism.

It is on the aspect of the unscientific procedures practised by herbalists in this country that the *Medical Centre for Herbal Research* will have a lot to contribute. Even though the exact instrument purported to establish this Centre has not been published, I can foresee the centre being required to improve upon the herbal preparations (i.e. develop standards for such preparations; establish methodology for preparation and thus improve the elegance and hygiene of the final products) that may be of therapeutic importance. The centre may also be required to research into all plants and for that matter all available natural products of known and unknown medicinal properties with the view to preparing a compendium or Pharmacopoeia of such medicinal plants of this country.

On the basis of the foregoing, I propose to discuss the type of personnel that would be required to organise and establish the proposed centre for Herbal Medicine. A beginning has been made by the Government in setting up a Board for which Dr Oku-Ampofo is the first Director. I would wish to draw the latter's attention to what to my mind, is relevant for consideration by this Board. I shall endeavour to expatiate on the various duties that would be expected of each scientist appointed to be with this very important research centre. I shall do so by categorising the disciplines under which such experts shall function:

(a) Medicine and Therapeutics

—Two professors or specialists in the application of drugs to the treatment of diseases. These two experts would assist the chairman or director of the

centre in supervising the clinical trials of standardised and/or formulated herbal preparations.

(b) Pharmacology—(i) A professor of pharmacology with specialisation in pharmacodynamics and toxicology. He must be an expert on the actions of drugs and dose—response relationship.

(ii) An experimental pharmacologist- He will be responsible (with the assistance of (i) above for the determination of the pharmacological activity of crude extracts and of isolated compounds and their modified forms (possibly) on laboratory test animals. This important study will precede any clinical trials. In fact, the (laboratory) pharmacological studies will be very vital for any assessment of the activity in humans.

(c) Physiology and Biochemistry—Experts in *clinical biochemistry*, *Molecular biochemistry* and other highly qualified personnel in biochemical/clinical techniques would augment the research activities of the *Pathologist*.

(d) Biological Sciences

(i) A specialist/technician in zoology will take charge of the laboratory animals. He would assist the experimental pharmacologists and the biochemical cytologist, and the pathologist in their research programmes.

(ii) A professor in Botany with specialisation in Taxonomy. Other renowed Ghanaian taxonomists in the persons of Messrs. Obeng Darko (formerly of U.S.T.) Akpabla and Nti (formerly of Legon) may be co-opted.

Dr Nartey of the Traditional Healers Association, Nsawam, who is an expert on the taxonomy and traditional uses of most Ghanaian medicinal plants would also be an asset.

Regional representatives of Traditional Healers or herbalists Associations would have to be involved. They will communicate with the research centre on the traditional uses of the medicinal plants occurring in their respective regions. This, no doubt, will facilitate the work of the taxonomists and pharmacognosists since the herbalists can locate and collect the plants in their various localities.

(e) Pharmacognosy and Pharmaceutical Chemistry

With the assistance of the taxonomists the pharmacognosists would collect, classify, preserve and prepare the plant products of medicinal interest for further investigations. They would isolate and characterise the isolable active components of the crude extracts. The pharmacognosists may also control and give expert advice and guidance on the cultivation of the useful medicinal plants to ensure a constant supply of standard drugs.

An extensive study of the chemistry of the extracts and/or the isolated compounds in relation to their physicochemical properties—stability, solubility and such other parameters that influence the activity and bioavailability of drugs would be pursued by the pharmaceutical chemists.

(f) Pharmaceutics and Microbiology

Experts would be required to formulate into suitable and ethical forms isolated compounds or in cases where single compounds could not be isolated infusions, decoctions or generally the crude extracts would be processed and standardised biologically under strict microbiological conditions to safeguard against microbial infestation of such preparations during storage.

(g) Miscellaneous

Any other experts on drug research may be appointed to work at the centre.

From what has been said so far, it is imperative that the Centre should be set up in such a manner as to make it possible to screen clinically herbal preparations selected to be of therapeutic promise at a special Herbal Health Clinic. In this regard, the Tetteh Quarshie Memorial Hospital where Dr Oku Ampofo's successful trials have been recorded or the Korle-Bu Teaching Hospital may be chosen to house the clinic. Clinical supervision at this clinic shall be such that herbal preparations would be given side by side with conventional drugs to patients suffering from diseases of which the herbal preparation is indicated or supposed to treat, so that evaluations could be extrapolated to assess the efficacy of the herbal preparations.

Secondly, the non-clinical aspects of the research should be undertaken at the Faculty of Pharmacy, University of Science and Technology, Kumasi. The reason for this is obvious and quite simple, because apart from the clinical trials aspect, the whole research programme shall be purely pharmaceutical. The manpower potential of the Faculty would be at the disposal of the Research Centre and with improvement in the existing facilities (scientific equipment, etc.) the Faculty could conveniently carry on the pharmaceutical aspects of the whole research programme the Centre would be embarking upon.

It is also hoped that the proposed Plant Medicine Research Centre would co-operate with such relevant institutions as the Council for Scientific and Industrial Research (C.S.I.R.) and such other departments engaged on Natural Products research especially from the Universities. Such co-ordination of research findings can enhance the successes expected of such institutions.

With time, financial and material support and encouraging results from the research activities, regional clinics could be established. The whole programme could become nation-wide when standardised preparations could be dispensed from the pharmacists' counter or hospital dispensaries.

We shall by this be struggling to finding answers to curing some intractable diseases with our own herbs, not mentioning the foreign exchange we might save by stopping the importation of most materials (Pharmaceutical and drug items) that can be obtained here at home and naturally too.

The Plant Medicine Research Centre would have also evolved an important development in our health services. It would have been an answer in this country to the need of re-defining the inter-relationship of the other health professions with Medicine. Fundamentally, it implies old barriers to communication will be vanishing and new boundaries of inter-professional relations will be opened within the same health services.

Gradually, new areas of clinical activity would have been structured.

We should be able to do this though gigantic. WITH PROPER PLANNING WE CAN SUCCEED. WE HAVE THE MATERIAL AND HUMAN RESOURCES. OURS IS TO TAP WHAT ARE OURS.

WITH GOD ON OUR SIDE WE SHOULD OVERCOME.

ACKNOWLEDGEMENT

The author is very grateful to Professor D. K. Santra of the Faculty of Pharmacy, U.S.T., Kumasi, for information about the 'AYURVEDIC' system as practised in India.

SOCIETY NEWS

PHARMACY BOARD:

The Pharmacy Board has moved from its offices at the Ministry of Health into new offices at ADJABENG LODGE, Liberty Avenue. This was the first attempt towards the Board operating as a statutory Board independent of the Ministry. This was followed by the formal inauguration of the 5th Session of the reconstituted Board by the Principal Secretary of the Ministry of Health (on behalf of the Commissioner for Health) at Adjabeng on 16th January. In his inaugural address the Commissioner reiterated that the Board should operate as an autonomous body and should be guided by the Ministry of Health only on matters of Government policies.

MEMBERSHIP:

Since the last Conference, five members have died and eight new members have been admitted. Membership of the Society now stands at **446.**

The Ashanti/Brong Ahafo Regional Branch has elected new officers for 1974. The officers are:
Dr J. Ocran (Chairman), Mr E. K. Bortey (Vice Chairman), Mr I. K. Ampah, Jr. (Secretary), Mr F. G. Akubia (Asst. Secretary) Mr I. Otieku-Boadu (Treasurer), and Mr S. K. Asiedu (Financial Secretary). Dr G. H. Konning, Mr E. B. K. Mensah and Sister Angelina are also members of the Executive Committee while Dr D. O. Gyane was elected Auditor (Non-Executive member).

The Eastern Regional Branch has also elected the following officers for 1974:
Mr F. K. Bruce (Chairman), Mr E. E. Akuetteh (vice Chairman), Mr E. A. Osekre (Secretary), and Mr S. T. Dankyi (Treasurer). Messrs E. Afreh-Asamoah, E. A. A. Amah, F. A. M. A. Asamoah, D. B. Opoku-Agyemang and M. E. A. Armah are members of the Executive.

Industrial Pharmacists Association under the auspices of the Society has been formed by members in industry. The following have been elected officers of the Association:
Mr F. M. Dickson (Chairman), Mr J. Atta-Nyamekye (Vice Chairman), Mr D. Akoto (Secretary), Mr Kwesi Aggrey (Treasurer) and Mr T. Annancy (Executive Member).

MINISTRY OF HEALTH COMMITTEES:

At the invitation of the Commissioner for Health the following members representing the Society served on Committees appointed by the Ministry:
Mrs Eniton R. Gavu, Committee on Re-grading of Pharmaceutical Importers, Mrs Agnes Brookman-Amissah, Committee on Award of Contracts for Supplies to the Ministry of Health.

The Pharmaceutical Society of Nigeria held its 46th Annual Conference last December and although the Society did not send an official delegation to the Conference, Mr V. K. Aidoo, the President, happened to be in Lagos on a private visit at the time of the Conference. Mr Aidoo therefore read to the Conference a Fraternal message from the Pharmaceutical Society of Ghana which Council earlier decided to despatch to the Conference. Among other things the Fraternal message said:

"we still value our ties with your Society since we believe that in black Africa our two Societies have to pull our human and material resources together to help raise the standard and status of pharmacy. It was no accident, Mr President, that for our 32nd Conference held at the State House, Accra, early August, the Council of the Pharmaceutical Society of Ghana invited Prof. Gabriel Osuide of the Ahmadu Bello University, Zaria and one of your own members as our Guest Speaker. We wish to record the invaluable contribution Prof. Osuide made at the Conference which was officially opened by our Head of State Col. I. K. Acheampong. It is our fervent hope and prayer Mr President, that in the years that lie ahead, our Societies will work increasingly towards the improvement and consolidation of gains in the practice of pharmacy in our two countries so that very soon we would be able to turn our attention to help improve pharmacy in the other sister African Countries where the development of the profession is still in its early stages. It is our hope that during your deliberations at this Conference, you will spare some thoughts on the development of Pharmacy on the African Continent as a

whole. We have heard your efforts to obtain a charter which will grant your Society the legal right to control every aspect of the profession in your country. You will be happy to know that we have also been fighting for the same thing in Ghana, and that last July we were one of the first three professional bodies to be fully registered under a Professional Bodies Registration Decree promulgated by our Government in January 1973.

This is similar to a charter since the provisions of the decree vest the absolute control of each profession in the respective professional body registered under it. We are in the stage now of working out the details of the implementation of the responsibilities and powers that we have ourselves sought and we believe your problems are similar to ours and we can therefore, share our experiences together for the betterment of the profession of Pharmacy." Mr Aidoo who has since returned home reports that the Conference was a big success and the Nigerian Society greatly appreciated the message sent them.

BPC TO CHANGE:

The Pharmaceutical Journal of 10th November, 1973 reports that the British Pharmaceutical Codex, published by the Pharmaceutical Society of Great Britain, is to cease to set standards for drugs as a result of a decision taken by the Medicines Commission. The publishers have decided however that future editions of the Codex will probably concentrate on Pharmaceutical and Clinical aspects of drugs and medicines. These decisions mean that in future only the British Pharmacopoeia shall be the official compendium of standards for all medicines in the U.K.

Letter to the Editor

Dear Sir,

Appearance of Particles in Chloroquine Phosphate Ampoules — advance publication.

Chloroquine Phosphate injection manufactured in the pharmaceutical factory of Ghana Industrial Holding Corporation from chloroquine phosphate powder imported from a reputable pharmaceutical company in the United Kingdom was found to contain particulate matter within six months of production. It was the first time that chloroquine phosphate powder from that source was used for producing the injection. Injections manufactured from chloroquine phosphate powder obtained from other suppliers did not show this phenomenon.

Microbial contamination was suspected, but microbiological examination carried out concurrently in our own laboratory and in the Ghana Medical School, showed that no micro-organisms were present. The particulate matter which was white, light and amorphous was pooled and isolated. The precipitate did not dissolve in water. The U.V. spectrum of the precipitate in eight per cent W/V HCl. showed absorption maxima and minima in the same region as authentic chloroquine phosphate. The investigation is still continuing in our laboratory.

D. AKOTO, B. Pharm., Senior Quality Control Analyst, Pharmaceutical Division, Ghana Industrial Holding Corporation, Accra.

A SYMPOSIUM: "PHARMACEUTICAL INDUSTRY IN GHANA"

The symposium was organised by the Ashanti and Brong Ahafo Branch of the Fharmaceutical Society in collaboration with the Ghana Pharmacuetical Students' Association at the Conference Room of the Great Hall, University of Science and Technology, Kumasi, on 7th November, 1973. Dr J. Ocran, Chairman of the Ashanti-Brong Ahafo Branch, introduced Mr F. A. Jantuah as the Chairman. The panel for the symposium was composed of Messrs T. K. Manu, J. Y. Binka, Ago Simmonds, J. Mensah and Dr D. O. Gyane.

Technology — Dr D. O. Gyane, Lecturer, Faculty of Pharmacy, U.S.T. Kumasi.

The speaker discussed the present demand for galenicals and ethical products. He cited the antibiotics as an example of drugs which could not be prepared in the ordinary Pharmacy shops. He pointed out that economy, accuracy and greater scope for research required a change from small scale dispensing to industrial production.

The technological problem, he suggested, required large number of experienced pharmacists, skilled technicians to man the equipment and raw and packaging materials. Dr Gyane stressed that laboratories for chemical, pharmacological and microbiological analysis of both raw materials and finished products were essential for the viability of the pharmaceutical industry. However as the small manufacturing houses would find it difficult to establish their own quality control units, the Consulting Services available in the Faculty of Pharmacy could be utilized.

The Consultancy Services

could also tackle problems involved in formulation and development.

In conclusion Dr Gyane advised manufacturing firms to limit themselves to a few lines so that they could solve specific problems posed by those products before moving to new fields.

He further maintained that an intensive research into the case of local materials for a variety of formulations was also a prerequisite for the development of Pharmaceutical industry in Ghana.

Finance—Mr T. K. Manu, Project Officer, Ashanti Regional Development Corporation.

Mr Manu stressed that the need for finance not only in the pharmaceutical industry in Ghana but also in any business, could not be overemphasised. Besides proper planning as to the viability of the industry, he said, "money is the major problem that has to be considered by the management body. Financing a business should therefore be considered in the terms of cost and revenue."

On *cost*, Mr Manu said that the cost involved in establishing an economically viable industry could be classified as:-

(*a*) the personnel for an industry—this should not only be qualified but must also be experienced and efficient. To acquire and maintain such personnel, the establishment would face the problem of paying huge salaries, allowances, insurances, bonuses, etc;

(*b*) the cost of the factory—this involved the construction of a suitable building with an adequate plant and machinery; stationery and office equipment; and electricity and water;

(*c*) raw materials—when obtained locally, were of a considerable advantage to the economic success of a pharmaceutical industry in Ghana. Importation of raw materials would deplete reserves of foreign exchange, and in Ghana, for instance, where there is restriction of imports, an industry that depended heavily on imported raw materials would eventually face an economic crisis;

(*d*) research—must be carried out into improving the quality of the products; minimising the undesirable side-effects; marketing survey; formulating cheap but efficacious medicaments to meet the pocket of the consumer. Failure to do this resulted in prejudice against the products made locally, and hence, a heavy loss;

(*e*) marketing of ethical pharmaceutical products—unlike the marketing of food items, drinkables and other merchandise, this must be undertaken by Pharmacists who by their training know the uses and side-effects of drugs. In the exercise of introducing such products to the retail pharmacists, physicians, midwives and the general public, the company spent a lot on advertisements in the form of films, posters and free medical samples of drugs;

(*f*) the establishment may also face the problem of paying suitable compensation to individuals or companies who suffered due to the side-effects in the use of the drugs. The best examples in this regard were the thalidomide disaster and the recent

* Report was compiled by Mr I. Otieku Boadu, M. Pharm., MPSG and Mr G. Agbokpor-Mensah, M Pharm., MPSG, both of the Faculty of Pharmacy, University of Science and Technology, Kumasi.

hexachlorophane episode. In the course of transportation of medicaments from the factory to the consumer, the establishment had to render the necessary compensation in event of any spoilage.

Speaking on *revenue*, Mr Manu grouped the sources of revenue to start and maintain an industry into the following categories:-

(*a*) money invested by the individual(s)—which may be acquired by savings;

(*b*) the above initial capital could be supplemented with loans from any financial institution or bank, and

(*c*) investments from shareholders. With the success of the operation, yielding a wide profit margin, he said, the initial capital would then be raised by re-investing the profit and inviting more shareholders.

Quality Control—Mr J. Y. Binka, Pharmaceutical Chemist, Government Chemical Laboratories, Accra.

The speaker, referring to a recent W.H.O. report on Pharmaceutical Preparations, said, "a good manufacturing practice is necessary and to ensure that a drug intended for use is safe and efficacious, quality control must be built in the industry. That is, right from the onset, the raw material should remain as safe and potent as the finished product or the dosage form."

The above objective, Mr Binka maintained, could be achieved in two ways, namely, by controlling the environmental conditions and by controlling the manufacturing and storage processes. The environmental factors included light, temperature, humidity and microbial organisms. Citing an example, he said that aspirin powder intended to be used in the preparation of aspirin tablets must be kept at the lowest humidity in order to avoid hydrolysis prior to the manufacture of the tablets. Similarly, photosensitive materials like powdered ergot must be stored in the dark prior to extraction to prevent the inactive lumi-alkaloids from being formed. Maintaining the fact that no environment was absolutely aseptic, he however, stressed that a lot would be achieved if the personnel who handled the starting materials could change into sterile uniforms before entering the aseptic laboratories. The Pharmacia laboratories of Sweden, Mr Binka pointed out, had achieved the highest standard in this environmental practice.

On manufacturing control, the speaker stated that the factors lied in the accuracy of weighing or measuring the ingredients, packaging and storage of the finished product. He maintained that the raw materials must be authentic and of the highest quality, these requirements being assessible on the basis of microchemical tests—for authenticity—melting and mixed melting points, U.V., I.R., T.L.C. and G.L.C. characteristics. He added that the potency must be assessed on the basis of B.P. assay methods. He further stressed that process control was also important since faulty balances, thermometers, pressure gauges and other indicating devices, could record inaccurate readdings. For this reason, it was important that samples of a batch were taken during the processing and assayed for their quality.

He stressed the need for packaging materials to be good enough to ensure and maintain the potency once the drug had been manufactured. This took the form of appropriate glass, plastic or tin containers. He further stated that there should be a check on labelling to ensure that each batch of drugs carried the correct label of the main constituents, together with the date of expiry, storage conditions and a physician's pamphlet describing the indications dosage and side-effects wherever appropriate. He finally stressed that it was vitally important that the products on the market should be intermittently recalled and tested for potency.

Marketing—Mr J. Mensah, Marketing Officer, May & Baker (Ghana) Ltd., Kumasi.

The speaker classified marketing in a pharmaceutical industry into two, namely, purchasing and selling or medical representation. The purchasing officers, he stressed, must not only be qualified pharmacists who could assess the authenticity and quality of the raw materials used and check for adulterations, but also have a good background of economics and accountancy, since their work entailed trading with home and foreign agencies for the procurement of the raw materials. The work of the salesman or medical representative, said Mr Mensah, was however, to sell the finished product and make profits for the organisation.

Indicating that drugs and other pharmaceuticals were commodities which cost as much to sell as to manufacture, Mr Mensah added that the salesman's aim would therefore be geared towards maximising profit over a long period so that the company could repay its loans, expand and pay its employers more. Pharmaceutical industries, he pointed out, did not usually sell their products direct to the consumer, but through dealers or other agencies. There was, therefore, he went on, a natural result of the development of specialisation, both functional and geographical. "Thus," said the speaker, "it is necessary to establish connecting links between the manufacturer and the consumer who are scattered all over the country and abroad. This is the primary function of the salesman. But how does the salesman perform this function?"

Mr Mensah pointed out that the salesman had primarily to make constant marketing research to estimate consumer's demand for the numerous specialities that could be produced at varying prices. This would then enable him to ensure that productive resources went into those channels where they were likely to be used to make commodities the public needed and were prepared to buy in the proportions they wanted.

Secondly, the salesman had to study the existing prices of the same commodity from different companies on the market in order to price his items at any material moment.

Mr Mensah added thirdly that the salesman had to get as many agents as possible who would buy the drugs in bulk, pay them discounts and help them to sell the products to the consumer. In order to create a channel whereby the products would move as fast as possible from the agents' counter, the salesman, Mr Mensah added, had to advertise his products. He said, "advertising in pharmaceutical business is necessary because hundreds of different kinds of items are produced by the company and it is the company's duty to make the consumer aware of their existence and uses. This is especially so when the item produced was not in response to the demand of the consumer." He stressed further that drug advertising

would stimulate a continuous demand and create a stable market, thus reducing waste. Advertising in the marketing aspect of pharmaceutical business, he continued, also served as a form of guarantee for quality since the company thereby established a reputation and therefore would not offer shoddy goods to risk the high standard it had set. Mr Mensah said, "the confidence felt by the consumer in the 'sameness' of the advertised product simplifies distribution. It also stimulates the total demand for the items, thus encouraging investment, production and employment."

Enumerating forms in which drugs could be advertised effectively, namely, on the T.V., radio, cinema halls, posters and handbills, in the newspapers, in medical and pharmaceutical journals and in public exhibitions, Mr Mensah added that these sources must however, be backed by advertising for acceptability. "To make drug advertisement more effective,", he said, "special and attractive brand names and brand signs must be encouraged. Drug excipients like colour and flavour also make the products acceptable. Free medical samples and gift items carrying brand names and signs and the manufacturer's name are all helpful in promoting the marketing of pharmaceuticals "Finally, Mr. Mensah pointed out that courtesy and good human relationship in the establishment itself, ranging from the office messenger, receptionist, cashier, to the general salesmanager, were also important in promoting marketing.

Practical Problems—Mr Ago Simmonds, Managing Director, Pharco Laboratories Ltd., Accra.

Mr Ago Simmonds stated that the most outstanding problems besetting the pharmaceutical industry today are the high cost of finance, the Import Licensing system and the lack of technical personnel.

On financing the industry, Mr Ago Simmonds said that generally one had to depend on the financial institutions like the banks, for loans, overdraft, letters of credit and such like facilities to finance the day to day running of the industry. The high cost of these facilities, about fourteen and a half per cent at the time was both discouraging and prohibitive and did not promote expansion. This also invariably tended to increase the price of drugs.

On the Import Licensing system, Mr Ago Simmonds said that because of the country's inadequate foreign exchange earnings, the Government had to impose import controls. In the attempt to watch the inflow of foreign currency and relate it to our imports some hardships to industry sometimes, cannot be avoided. Consequently, the allocation and issue of licences becomes inevitably slow and irregular, production schedules cannot be met, annual planning had to be made on short term basis, sometimes haphazardly. The time an import licence was issued and letters of credit facilities obtained took anything between two weeks to a month. When an order is placed for raw materials supplies it took about two months at best for the consignment to arrive in Ghana.

On staffing, the speaker said, the problem of obtaining technical personnel sufficiently experienced into the industry was going to be with us for quite a long time because this is tied up with the universal shortage of pharmaceutical manpower. Unfortunately, the present was not necessarily one was looking for. Sometimes a Pharmacist walked into an industrial establishment without the slightest idea of what he was coming to do. And when he was faced with having to work with his hands, he felt disappointed.

Even if one hits on the right type of graduate Pharmacist for the industry it would take several years to train him to become an industrial Pharmacist. The next problem he said was the supporting staff such as pharmaceutical and laboratory technicians. This type of personnel was not available at our present stage of development and one had to depend on expatriate personnel to provide the necessary know-how. Processes like granulation and pill-coating requires long periods of training and continuous practical work to attain proficiency. In the department of laboratory practice, about 80 per cent of the pharmaceutical factories depend on the Government Chemical Laboratory for their quality control. Most of the Companies import ready-made granulates to get around the problem of local granulation and quality control procedures. This is un-economical and also deprives us of un-economical and also deprives us of the necessary manufacturing expertise.

Mr Ago Simmonds suggested the establishment of a liaison between the University and the pharmaceutical industry so that student undertook, during studentship attachment courses in industry. He also suggested that the course structure and scope of the Faculty's syllabus should be looked into with a view to providing an orientation in industrial pharmacy.

To the question, "in the absence of import licence and hence, short supply of raw materials, what are the industrialists doing at the moment to substitute for those items? Have they given thought to providing funds for research into making plantations in Ghana from where things such as tinctures that still being imported for use in cough mixtures can be obtained?" Mr Ago Simmonds again replied that during the primary stages of the pharmacy industry as we are at present it is well-nigh impossible to undertake research projects.

In the first place no firm in the industry can provide the necessary financial outlay for research. The technical personnel for such projects are also not available, and as such one has to depend one hundred per cent on imported drugs and chemicals, including know-how. Perhaps a state subsidized institution like the University might initiate such a project for the time being. Industry would certainly undertake fundamental research but at this stage the idea is far fetched. Mr Ago Simmonds added.

In his remarks, the Chairman, Mr Jantuah, categorised the difficulties facing industrialists in setting up a viable pharmaceutical establishment as elaborated by the members of the panel, into three:—distribution, manufacturing and the student pharmacists.

He revealed that the distribution of ethical products appeared to be easy in Ghana because the seller needed not be a pharmacist. "Ethical products now float in the hands of the hawker, chemical seller, the supermarkets, etc. The chemical sellers are therefore engaged in competing with the retail pharmacists", Mr Jantuah said.

The Chairman attributed the wrong application of industrialisation in pharmaceutical business in Ghana, to the fact that all the manufacturing firms were importing all the raw

materials and in some cases, the finished products, and only labelling them, 'made in Ghana'. "Such 'imported' pharmaceutical industries being joint foreign enterprises suffer political infiltration and consequently economic crises", the Chairman added.

He pointed out that an economically viable pharmaceutical industry could be set up in Ghana only if "we can achieve self reliance on agriculture electricity, chemicals, iron and steel industries."

Mr Jantuah finally said, "the problem facing the student pharmacist is the utilisation of his knowledge after leaving the university. Is he going to dispense, retail, serve in the hospital or work in the industry? Is his training being orientated to meet problems facing the members of the panel?"

NEW PRODUCTS ON THE MARKET

This column is based entirely on information supplied by the manufacturers or their accredited Agents/Distributors and it is intended to provide pharmacists and other readers with details of new products as and when they appear on the market.

ALPHACILLIN

Manufacturer: MERCK SHARP & DOHME

Active Ingredient: Pivampicillin Hydrocloride, an oral broad-spectrum bactericidal antibiotic.

Indications: Pivampicillin HCl has all the advantages of ampicillin but has in addition, the advantage of quicker and near complete absorption from the upper gastro-intestinal tract and provides peak plasma levels 3 to 5 times those attainable by equivalent doses of oral ampicillin. Pivampicillin HCl is useful in respiratory tract, genito-urinary tract and gastro-intestinal tract infections. Its absorption rate is not decreased by food or milk.

Dosage: *Adults*—For most respiratory tract and gastro-intestinal tract infections, 175 mg three times daily given with food is adequate. In U-G tract infections, 350 mg three or four times daily with food or milk.

Presentation: Alphacillin is available as Capsules containing either 175mg or 350mg Pivampicillin Hydrochloride in packs of 16's and 100's.

Side Effects: The drug shares the side effects of oral ampicillin like skin rash, puritus, urticaria etc. but cause less gastro-intestinal disturbances.

Contra-indications: It should not be given to people who are sensitive to penicillins.

Special precautions: Its safety in pregnancy has not been established, and it should not be given with antacids.

Availability: ALPHACILLIN is available from:

DANAFCO LIMITED, ACCRA, KUMASI, TAKORADI, KOFORIDUA AND HOHOE.

BECOTIDE INHALER

Manufacturer: ALLEN & HANBURYS LTD.

Active Ingredient:

Beclomethasone Dipropionate BP as a suspension of finely divided drug in liquefied propellent.

Indications:

Therapeutic doses of beclomethasone dipropionate Inhaler are active locally in the lung without producing the side effects associated with systemically administered corticosteroids or cortico—trophins in the management of **bronchial asthma.**

Useful especially in the following cases: asthma patients not controlled or inadequately controlled by Sodium Cromoglycate in addition to bronchodilators; asthma patients who are dependent on systemic steroids or ACTH.

DOSAGE—Adults

Two inhalations (100meg) three or four times a day is the usual maintenance dose but in severe cases, it is advisable to start with 600mcg-800mcg per day and adjust the dose according to the response.

(Children)

One or two inhalations (50-100mcg) should be given two, three, or four times daily according to the response.

Maximum daily dosage should not exceed 20 inhalations (1mg) in adults or 10 inhalations (0.5mg) in children below 12 years of age.

Presentation:

A metered aerosol Inhaler delivering 50mcg Beclomethasone Dipropionate per inhalation

with a specially designed actuator. Each canister contains 200 inhalations.

Side Effects:

No major side effects attributable to the use of the recommended doses have been reported but some patients have become hoarse. Localised infection with Candida albicans has occured in the mouth and throat of a few patients but the condition cleared rapidly after appropriate topical antifungal therapy without discontinuing the treatment with Becotide Inhaler.

Contra-indications:

No specific contra-indications are known but special care is necessary in active or quiescent pulmonary tuberculosis.

Special Precaution:

Unnecessary administration of drugs during the first trimester of pregnancy is undesirable.

Availability:

BECOTIDE INHALER is avilable from:

Allied Medical Products Limited,
Jones Nelson Road,
P. O. Box 469,
Accra.

CANESTEN

Manufacturer: BAYER AG.

Active ingredient: Clotrimazole as cream, solution or pessary.

Indications: It is active against dermatophytes, candida, and other fungi. Major indications being: Vaginal mycoses, dermatomycoses due to Trichophyton sp., Microsporum sp., Epidermophyton floccosum, Candida sp., Nocardia sp., and Malassezia furfur, etc. It is also useful in skin diseases which are superinfected by these fungi.

Dosage: *Vaginal Tablets:* normally one tablet inserted every night for 6 days. In severe cases, one tablet in the morning and one in the night may be inserted daily for 6 days or longer.

CREAM AND SOLUTION: apply sparingly to the affected parts two or three times daily.

Presentation: *Canesten Vaginal* tablets (each containing 0.1gm of Clotrimazole) are packed in 6's.
Canesten Cream contains 1 per cent Clotrimazole in a cream base and is available in 20gm tubes.
Canesten Solution is available in 20ml bottles each 1 ml containing 0.01 gm of Clotrimazole.

Side effects: (Not stated)

Contra-indications: Apart from possible hypersensitivity to Canesten, there are no known contra-indications.

Special Precaution: It is not advisable to use the Vaginal tablets during menstruation.

Availability: CANESTEN SOLUTION, CREAM and VAGINAL TABLETS are available from:

Major & Co. (Ghana) Limited,
Accra, Kumasi and Takoradi.

MODURETIC

Manufacturer: MERCK, SHARP & DOHME

Active Ingredients:

Amiloride hydrochloride 5mg and Hydrochlorothiazide 50mg.

Indications: Moduretic is a multi-purpose diuretic with antihypertensive properties combining the potent natriuretic action of hydrochloro-thiazide with the potassium-conserving property of amiloride hydrochloride; and it is useful in treatment of patients with congestive heart failure, hepatic cirrhosis with ascitis, oedema and hypertension.

Dosage: In oedema, hypertension and congestive heart failure, initially, one or two tablets daily and adjusted gradually but not exceeding four tablets a day. In hepatic cirrhosis with ascitis, initially one tablet a day and increased gradually up to four tablets a day if necessary.

Presentation: Peach coloured diamond shaped tablets (marked MSD917) in packs of 30s and 100s

Side Effects: Gastrointestinal complaints such as nausea, vomitting, dryness of the mouth and thirst may occur.

Contra-indications Hyperkalemia, potassium sparing diuretics or potassium salts, impaired renal function, anuria, and known sensitivity to the drug.

Special precautions: It may not be given during pregnancy since its safety in pregnancy has not been established. It should not be used by nursing mothers since thiazides appear in breast milk.

Availability: Moduretic Tablets are available from:

DANAFCO LIMITED, ACCRA, KUMASI TAKORADI, KOFORIDUA, AND HOHOE.

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- a lower incidence of diarrhea than with oral ampicillin (due to almost complete absorption from the upper intestine, and therefore less disturbance of the intestinal flora)

Note: Detailed information is available to physicians on request.

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