THE GHANA PHARMACEUTICAL JOURNAL

Incorporating the programme for the

GOLDEN JUBILEE CELEBRATIONS

and

PROFILE OF THE PROFESSION IN GHANA

OFFICIAL ORGAN OF THE PHARMACEUTICAL SOCIETY OF GHANA

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Editorial

TOWARDS A MORE SATISFACTORY PHARMACEUTICAL SERVICE

The Journal has not been out for over four years. The web of socio-economic problems that frustrated its publication is disentangling. It is strongly hoped that subsequent issues would follow quarterly as expected.

This particular issue has come out at a time when efforts are being made to revamp many services in the country. Preservation of the peoples health remains a prime objective of the Society. To achieve this an ever satisfactory pharmaceutical service is needed in the country.

Is the current practice of pharmacy in the country satisfactory? It is patently obvious, it is lacking in quality and effectiveness. Quite recently, there have been several calls from official circles to the profession to meet the challenges of the time. The use of drugs by the public at large cannot be adequately described as decent. The outcry against the personal financial interests of some pharmacists at the expense of the public is not dead. Public debates over prices of drugs continue. Simply, the nation is craving for satisfactory discharge of pharmaceutical services. The nation looks up to pharmacists for the performance of this duty. The profession should prove itself competent now and at all times.

The Council of the Society, realising the low grade of practice, devoted 1984 to discussion with groups of members ways of improving Pharmaceutical Services in the country. At the 1984, Annual General Meeting of the Society at Sekondi, members finally had a vivid appraisal of the practice. The glaring inefficiency of the present practice was the centre of the discussions. The following arguments were put. The state's economy in the doldrums. Non-availability of aids for pharmaceutical services, Commercial pressures on community pharmacists. Ownership intrusions. Financial constraints on members. Poor remuneration of government pharmacists, Poor communications, Obsolete pharmaceutical legislation.

Good reasons for the poor performance. But, who takes care of the detriments to patients or the public? The stars do not have the solution. The remedy is greatly with the profession. The pharmacist stands in the position to influence matters. The pharmacists failure dignigrates the profession and fakes the interests of the public the profession serves.

Unpleasant duties! But duties are said to be such and must be done and satisfactorily too. Also, it goes without saying, that rendering of pharmaceutical services constitute a high responsibility beyond reproach. This is a requisite in all spheres of the practice of pharmacy to generate and maintain an harmonious and constructive relation between the makers and custodians of drugs and the users and thus promotion of health care.

Pharmacists must take up the courage and zeal to build up satisfactory pharmaceutical service for the country. Pharmacists should be more selective in choosing their employers. Pharmacists should always be guided by the Society's code of ethics. Pharmacists should ensure that in whatever sphere or conditions of the practice, the service to the public is supreme. It is well within the capability of pharmacists and the Society to achieve this. It is time we acquired the necessary determination.

Only we must not forget, continuing education in pharmacy is requisite to achieve and maintain satisfactory standards. We must not fail to keep up with new developments in the practice and neither be found wanting in our basic knowledge in pharmacy. The service we render are based on knowledge which is continually expanding and changing. This fact should make us welcome continuing education as part of the practice. We must ensure that we obtain and use our journals and books, organise and attend meetings, lectures, symposia, courses and conferences to acquire and share ideas and experiences.

We must also eschew any convictions that put our own personal financial interests over the public interest. At the end of the day it should NOT be pharmacists failing the nation in terms of health and patient care.

IMPROVING PHARMACY'S IMAGE AND USEFULNESS THROUGH CONTINUING EDUCATION

John Oeron, Faculty of Pharmacy, U. S. T., Kumasi, Ghana.

Abstract

In the eyes of the general public, pharmacists appear more as businessmen than professionals with scientific or academic background. This image is due to the activities of general practice pharmacists who form the highest percentage of the pharmacist population in most countries. To make the pharmacist more useful and respectable, a programme designed to keep him abreast with recent scientific and professional developments in pharmacy for up to ten years after he has qualified is being proposed for pharmacy graduates in hospital and general practice.

Essentially the programme consists of compulsory courses in Biopharmaceutics, Pharmacokinetics and Social and Administrative pharmacy, with options for specialization in various fields such as clinical pharmacy, information, etc. later. A pharmacist will be required to complete the programme within ten years after qualifying. The programme is spread over eight years so that graduates will acquire the habit of constant study throughout their working life; this will also reduce the pressure to the minimum. The award of a Masters degree after successful completion is provided as an additional incentive.

The question of making all pharmacists go through a similar Programme of continuing education as a condition for retaining their names on the register of pharmacists is discussed.

Innovations which have taken place in the pharmaceutical sciences and pharmacy practice within the last 15 years have necessitated the broadening of the curriculum for the first degree courses in pharmacy. One effect of this is that much detail has to be sacrificed if we are to stick to the present duration of the programmes, usually 3—4 years after college or 'A' level in most countries. Two solutions are open to educators; either increase the time taken for the first degree which may mean turning prospective pharmacists into perpetual students. The other solution is to continue with the broad but shallow education and make it obligatory for the graduate to study for a higher qualification, diploma or degree, while practising his profession. This second solution seems more reasonable even though, like the first, it may turn pharmacists into permanent students. The difference here is that pharmacists will all become permanent graduate students thus helping to wipe off that 'illiterate' image from the profession. In the past most people thought that once a person was registered as a pharmacist he did not need to study again but could go on working as a pharmacist all his life. Thus employers could not see why they should grant the pharmacist paid leave to study for a higher or specialist qualification, whereas they felt this was a necessity for other categories of employees in the same establishment. Unfortunately, this bad image was created and accepted by some pharmacists, particularly those at the top in general practice and hospital pharmacy who did very little apart from ordering supplies and dispensing what was prescribed.

With the majority of pharmacists in every country in general and hospital practice, it is important

to examine further education for these two groups, because the image created by these categories determines the total image of the profession in a country.

There is no doubt that as authorities become more concerned about the toxic side effects of drugs and pharmaceuticals, the number of new drugs coming onto the market in any given period will continue to decrease.

However, what pharmaceutical scientists are trying to do is to make use of technology to make the present drugs more effective and useful. Thus, it is now accepted more than ever before that the effectiveness of a pharmaceutical product is not determined merely by the quantity of active ingredient present. This has made the twin subjects of biopharmaceutics and pharmacokinetics so important for every pharmacists in hospital and general practice to continuously update his knowledge in these disciplines. This will enable the pharmacist to make better choice of products, offer more useful advice to physicians and patients and make a more meaningful evaluation of the effect of a drug.

Another recent development of major significance is the greater realisation that pharmacy is a social profession and therefore needs an injection of social and administrative sciences if it is to achieve its aim. Many schools of pharmacy have introduced some social and administrative pharmacy into the first degree curriculum but, here again, time only allows very superficial and elementary treatment. It is essential for pharmacists in general and hospital practice to have deeper knowledge of these disciplines because no pharmacy business or department can be run successfully if the key figures in control cannot sound administrative principles. In fact, at the very top, the administrative skill of the pharmacist is just as important as his knowledge of pharmacy for the success of his department or company. The need to promote closer links between pharmacists and patients and physicians cannot be overemphasized and this should be the primary objective in designing any course in social pharmacy for graduate students.

With this strong background in biopharmaceutics, pharmacokinetics, and social and administrative pharmacy, graduates can go on to specialise in any particular fields, e.g. information, clinical pharmacology, patient education and counselling, clinical research (investigating problems involving patients and drugs).

The course discussed in this paper is similar to what is being planned for pharmacists in Ghana. To make it more practical and emphasize the patient-oriented objective, only pharmacists working as community/general practice and hospital pharmacists will be admitted. Employers are being persuaded to accept the need for pharmacists to become specialists so that they will grant their employees permission to attend classes without loss of pay (one day a week). It is intended to collaborate with various experts at the University hospital, a teaching hospital and some local pharmacies.

There has been much discussion about ways of ensuring that pharmacists keep in touch with current developments in pharmacy practice and pharmaceutical and related sciences but it appears no solution has been found yet. In some countries one of the suggestions made is for pharmacists to pass an examination every so often, say three years, in order to maintain their name on the register. There has also been a proposal to make it obligatory for pharmacists to attend short courses, conferences and symposia. Both suggestions have their associated problems and drawbacks. From my personal experience, most people who attend courses, etc. regard them more as holiday than anything else. What is being proposed in Ghana is that in order to retain his name on the register, every pharmacist will have to study for a higher qualification within ten years after being registered. This may not be the most satisfactory solution to the problem but it is hoped that if accepted, this will make it possible to broaden the first degree curriculum to cover new developments in professional practice and the pharmaceutical sciences while at the same time laying a solid foundation for specialisation later. The days when the first degree was considered as enough for whatever the pharmacy graduate wanted to do in life are certainly over. It should now be accepted that there is absolute need for formal post graduate education if the pharmacist is to perform new roles expected of him. Apart from making him feel more confident it is hoped that the higher training will enable him to win greater respect among the other members of the health care team, and more important, improve the benefits derived by the patient from his service.

The intention behind the long duration proposed for the course, 3 years, is to make pharmacist cultivate the habit of studying to keep up-to-date without subjecting them to the harsh pace demanded by most full-time formal courses. In this way it is hoped that even after obtaining his qualification he would have accepted the fact a pharmacist never stops studying. There will also be opportunity to discuss new developments over a reasonably long period so that up to 10 years after qualifying, he will still be up-to-date. The award of a degree is to be used only as an incentive and should not be regarded as the primary objective; people work harder when they can see some reward in physical terms.

The tendency for the majority of pharmacists in general practice to portray themselves as businessmen rather than science-based professionals is not doing pharmacy any good and has to be reversed. In deed, in my opinion this is the main reason why pharmacists are finding it so difficult to climb up the social ladder in many countries and to be treated with the respect accorded other professionals with similar training. A programme of further education designed to make the pharmacist more useful by applying his scientific knowledge more during his practice is necessary for the continued survival of pharmacy as an important science-based social profession. *(Paper accepted for presentation at the Academic Section meeting, 40th International Congress of Pharmaceutical Sciences of FIP, Madrid, Spain 1 - 5 September, 1980).

GOLDEN JUBILEE CELEBRATION AND 38TH CONFERENCE OF THE PHARMACEUTICAL SOCIETY OF GHANA, 26TH NOVEMBER TO 1ST DECEMBER, 1985

PROGRAMME OF SOCIAL ACTIVITIES

WEDNESDAY, 27TH NOVEMBER, 1985

6.30 p.m. — Cocktails
Pharmaceutical Society of Ghana
Venue: Forecourt, Kwame Nkrumah Conference Centre
Cultural Show: SANKOFA Cultural Group

THURSDAY, 28TH NOVEMBER, 1985

10.30 a.m. — Coffee Break
Courtesy of: Food Specialities Limited
Venue: Kwame Nkrumah Conference Hall

1.00 p.m. — Lunch
Courtesy of: PHEMECO Limited and PHARCO Group of Companies
Venue: Banquet Hall, Kwame Nkrumah Conference Centre

6.30 p.m. — Cocktails
By Courtesy of: MAJOR & Company Limited
Venue: Forecourt, Kwame Nkrumah Conference Centre
Cultural Show: National Dance Company

FRIDAY, 29TH NOVEMBER, 1985

10.30 a.m. — Coffee Break
Courtesy of: Food Specialities Limited
Venue: Kwame Nkrumah Conference Centre

1.00 p.m. — Lunch
Courtesy of: LETAP Limited
Venue: Banquet Hall, Kwame Nkrumah Conference Centre

6.30 p.m. — Cocktails
Courtesy of: OVERHEAD Trading Store and PHARMACY Limited
Venue: Forecourt, Kwame Nkrumah Conference Centre

SATURDAY, 30TH NOVEMBER, 1985

12.00 p.m. — Snacks
Courtesy of: Food Specialities Limited
Venue: Kwame Nkrumah Conference Centre

7.30 p.m. — Golden Jubilee Dinner
Courtesy of: GIHOC Pharmaceutical Company Limited, J. L. Morison Son & Jones (Ghana) Limited, Netherlands African Manufacturing Company Limited
Music: Ghana Police Band

SATURDAY, 30TH NOVEMBER, 1985 — Sightseeing — Foreign Guests

SUNDAY, 1ST DECEMBER, 1985

9.30 a.m. — Devotional Service at the Ridge Church, Accra

THE GOLDEN JUBILEE OF THE SOCIETY

PROGRAMME OF ACTIVITIES

2.1 REGIONAL CELEBRATIONS

REGION	*DATE*				*VENUE*
Volta Region	From Thursday	3rd	—	9th October, 1985	Ho
Brong-Ahafo Region	,, ,,	10th	—	16th October, 1985	Sunyani
Greater-Accra Region	,, ,,	17th	—	23rd October, 1985	Accra
Western Region	,, ,,	21st	—	26th October, 1985	Takoradi
Ashanti Region	,, ,,	31st	—	6th November, 1985	Kumasi
Central Region	,, ,,	7th	—	13th November, 1985	Cape Coast
Eastern Region	,, ,,	14th	—	20th November, 1985	Koforidua
Northern/Upper East/ Upper West Region	,, ,,	21st	—	24th November, 1985	Bolga/Wa

2.2 NATIONAL CELEBRATIONS

Venue: ... ... Kwame Nkrumah Conference Centre, Accra — Tuesday, 26th November, 1985

5.00 p.m. ... ... Public Lecture

Topic: ... ... "Pharmacy and Primary Health Care."

Speaker: ... ... PROF. M. DARWISH SAYED OF EGYPT—
Vice-President, International Pharmaceutical Federation (FIP)

Chairperson: ... ... DR BENEDICTA ABABIO
Deputy Director of Medical Services, Greater-Accra Region, Ministry of Health

WEDNESDAY, 27TH NOVEMBER, 1985

4.00 p.m. ... ... Public Lecture

Topic: ... ... "The Role of Pharmacy" in National Development.

By: ... ... PROF. A. H. BECKETT
Head of School of Pharmacy, Chelsea College, University of London

Chairman: ... ... DR J. N. BANERJEE
President, Commonwealth Pharmaceutical Association

THURSDAY, 28TH NOVEMBER, 1985

Inauguration of Golden Jubilee Celebrations

9.00 a.m. ... ... Welcome address by President of Pharmaceutical Society of Ghana

Chairman:	**The PNDC Secretary for Health**
	Opening of Golden Jubilee Pharmaceutical Exhibition **By: The PNDC Secretary for Industries, Science and Technology**
3.00 p.m.	**Anniversary Lectures**
Topic:	**"Pharmacy practice in the Third World"** **Official opening of the Golden Jubilee** **By: The Head of State and Chairman of the PNDC**
Speaker:	PROF. ALBERT WERTHEIMER *Professor and Director, Department of Graduate Studies in Social and Administrative Pharmacy, College of Pharmacy, University of Minnesota*
Chairman:	MR J. PEARCE-BINEY *Immediate Past President,* *West African Pharmaceutical Federation (WAPF)*
FRIDAY, 29TH NOVEMBER, 1985 ...	**Scientific Session**
9.00 a.m. — 12.30 p.m.	**Speakers:**
	PROF. B. A. OBIORAH *Faculty of Pharmacy, University of Benin, Benin City, Nigeria*
	PROF. D. DWUMA-BADU *Faculty of Pharmacy, University of Science and Technology, Kumasi*
Chairman:	DR R. ANSAH-ASAMOAH *Department of Pharmacology, Faculty of Pharmacy, University of Science and Technology*
3.00 p.m.	**Symposium**
	Topic: "Traditional and Orthodox Medicine—Marriage for the future"
	Speakers:
	PROF. C. C. ADOMAKOH *Chairman of the Medical and Dental Council, Vice-President, West African College of Physicians*
	DR K. SARPONG *Faculty of Pharmacy, University of Science and Technology, Kumasi*
	DR J. A. NARTEY *Institute of Herbal and Tropical Medicine, Nsawam*
	REV. DR QUARCOO
Chairman:	PROF. A. H. BECKETT *Head, School of Pharmacy, Chelsea College, University of London*

Saturday, 30th November, 1985 — 38th Conference of Pharmaceutical Society of Ghana

Sunday, 1st December, 1985 10.00 a.m. — Devotional Service at the Ridge Church — Accra

3. **The following is the curriculum vitae of the Chief Guest Speakers**

3.1 **Prof. A. H. Beckett** was a former head of the Pharmacy Department of Chelsea College, University of Lon He has been a past President of the Pharmaceutical Society of Great Britain and Former Chairman of the B of Pharmaceutical Sciences of the International Pharmaceutical Federation. He has also been Consultant to International Olympic Committee.

3.2 **Prof. Albert Wertheimer** is Chairman of the Academic Section of the International Pharmaceutical Federa (FIP) and Head of the Department of Graduate Studies in Social and Administrative Pharmacy, College of P macy, University of Minnesota.

4. **Members of the National Council of the Pharmaceutical Society of Ghana, 1984 - 1985**

*	Mr K. A. Ohene-Mana	— President
*	Mr E. O. Gyamfi	— Vice-President
*	Mr Moses Appiah	— Hon. General Secretary
*	Mr Charles Dontoh	— Assistant Hon. General Secretary
*	Mrs Agnes Brookman-Amissah	— Hon. Treasurer
*	Mr Joshua N. N. Addo	— Editor
*	Mr T. C. Corquaye	— Council Member
*	Mrs E. R. Gavu	— Council Member
	Mr J. Pearce-Biney	— Immediate Past President
	Mr F. K. Bruce	— Acting Director of Pharmaceutical Services, M. O. H.
	Prof. K. Boakye-Yiadom	— Dean of the Faculty of Pharmacy, U. S. T., Kumasi.
	Mr Ampadu-Boateng	— Greater Accra Regional Branch Representative
	Mr G K. Acheampong	— Greater Accra Regional Branch Representative
	Mr P. E. A. Okwabi	— Eastern Regional Branch Representative
	Mr Michael Addo	— Ashanti Regional Branch Representative
	Sister Angelina	— Brong-Ahafo Regional Branch Representative
	Mr D. A. Obuobie	— Volta Regional Branch Representative
	Mr M. K. Amoa-Ampah	— Central Regional Branch Representative
	Mr S. A. Bentum	— Western Regional Branch Representative
	Mr A. Dan-Braimah	— Northern/Upper E/Upper W Regional Branch Representative

* Standing Executive Committee Members

5. **The Secretariat of the Pharmaceutical Society of Ghana**

Mr Moses Appiah	— Hon. General Secretary
Mr Charles Dontoh	— Asst. Hon. General Secretary
Mr E. T. B. Lomotey	— Administrative Secretary
Mr S. L. Owusu	— Administrative Assistant
Mr John A. Abugah	— Accounts Secretary
Miss Rose Akushie	— Typist

ANALGESIC AND ANTI-INFLAMMATORY COMPOUNDS FROM SOME GHANAIAN MEDICINAL PLANTS

R. Ansa-Asamoah Department of Pharmacology Faculty of Pharmacy University of Science and Technology, Kumasi, Ghana

Summary

The Faculty of Pharmacy at the University of Science and Technology, Kumasi, has for the past twenty years collaborated with Ghanaian herbalists in an attempt to elucidate the medicinal properties of the most commonly used medicinal plants in Ghana.

Alkaloids have been isolated from three of these plants, namely O-methylflavinantine from *Rhigiocarya racemifera*, *Conopharyngine* from *Tabernaemontana* (*Conopharyngia*) *pachysiphon* var *Cuminsii* and Cryptolepine from *Cryptolepsis sanguinolenta*, and their pharmacological activity examined in mice and rats.

Even though these alkaloids are chemically unrelated, pharmacological evidence exists which shows that whereas O-methylflavinantine and conopharyngine possess analgesic activity in mice, cryptolepine is predominantly anti-inflammatory in the rat.

Introduction

Before the advent of the industrial revolution, when synthetic drugs were almost not available, plant products were the mainstay of the pharmaceutical industry as well as that of the general medical practice. The British Pharmacopoeia (1973) contains a list of some 60 plant materials or substances derived from them and out of the 76 substances of plant origin listed in the United States Pharmacopoeia (1970), only seven are now synthesised.

The Ghanaian flora is an untapped source of medicinal plants (Irvine, 1961) and a large majority of Ghanaians in the rural and even urban areas still depend on herbal remedies for many of their ailments despite the availability of synthetic drugs and an almost free medical service in the country. The Government has therefore supported the Ghana Traditional and Psychic Healers Association through various means and has set up since 1973, a National Centre for Scientific Research into Plant Medicine.

In addition to the above, the Faculty of Pharmacy at the University of Science and Technology, Kumasi in Ghana in collaboration with other research institutions have carried out phytochemical and pharmacological investigations into some Ghanaian medicinal plants. Several alkaloids have been isolated and characterised but very few have been examined for pharmacological activity. Those that have so far been tested (Fig. 1) include O-methylflavinantine (OMF) from *Rhigiocarya racemifera* (Tackie et al., 1974), Conopharyngine from *Tabernaemontana pachysiphon* var cuminsii (Thomas & Starmer, 1963) and Cryptolepine from *Cryptolepis* sanguinolenta (Dwuma-Badu et al., 1977). These alkaloids possess analgesic and anti-inflammatory activities in mice and rats; the results are discussed.

Methods

1. *Analgesic Activity*

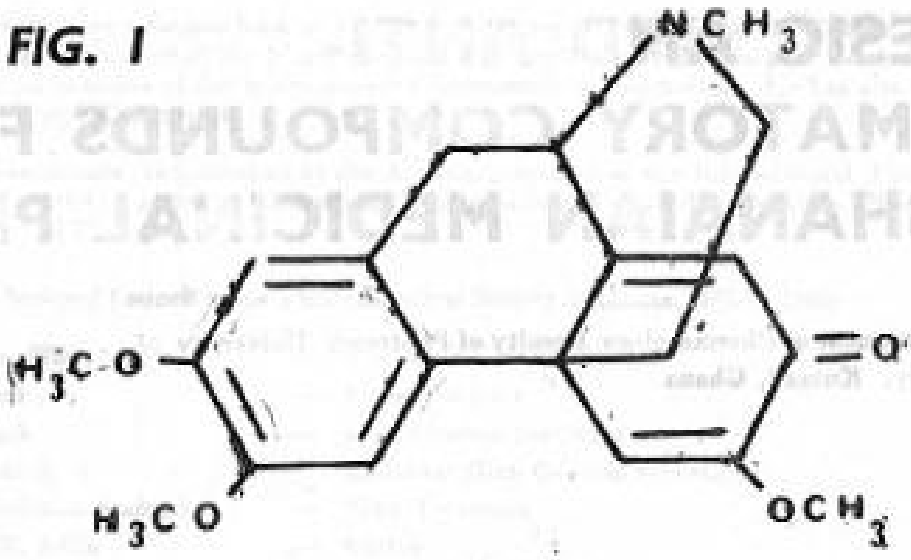
(i) Hot Plate Test

A modification of the method of Eddy and Leimbach (1953) was used. QS strain male mice (18 - 22 g) were used. The hot plate was maintained at 55 + 1 °C and the time taken for each animal to flick or lick its hind paws was noted. Mice which failed to react within 15 s were rejected. Groups of mice were injected (i.p) with increasing amounts of morphine, O-methylflavinantine or conopharyngine and their reaction times were determined every 30 min. for 3 h. Animals were removed from the hot plate after 30 s. The number of mice reacting outside the critical reaction time (mean predrug reaction time plus 2 standard deviations) was expressed as a percentage and the analgesic RD^{50} values (+s.e.m) were calculated by probit analysis (Finney, 1971).

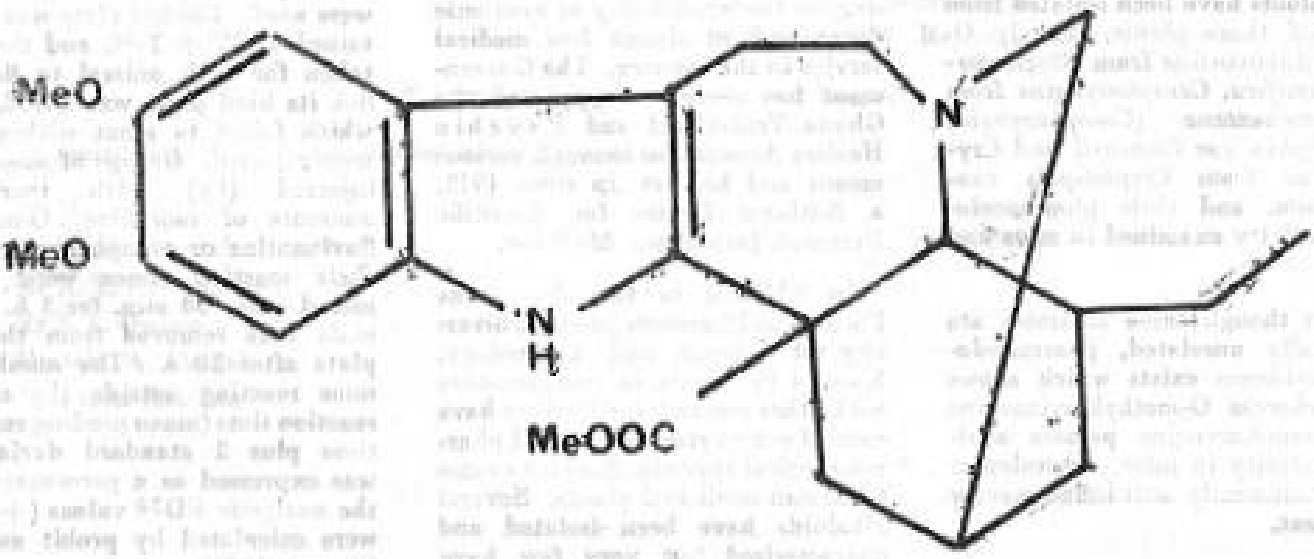
(ii) *Writhing Test*

The method used was based on that of Parkes and Pickens (1965). Mice were injected (s.c) with morphine, O-methylflavinantine, conopharyngine or saline 30 min. prior to an injection (i.p) of formic acid (25 mg.kg — 1 as 0.1 ml of 0.25% solution per 10 g mouse) (Starmer, Mclean and Thomas, 1971). They

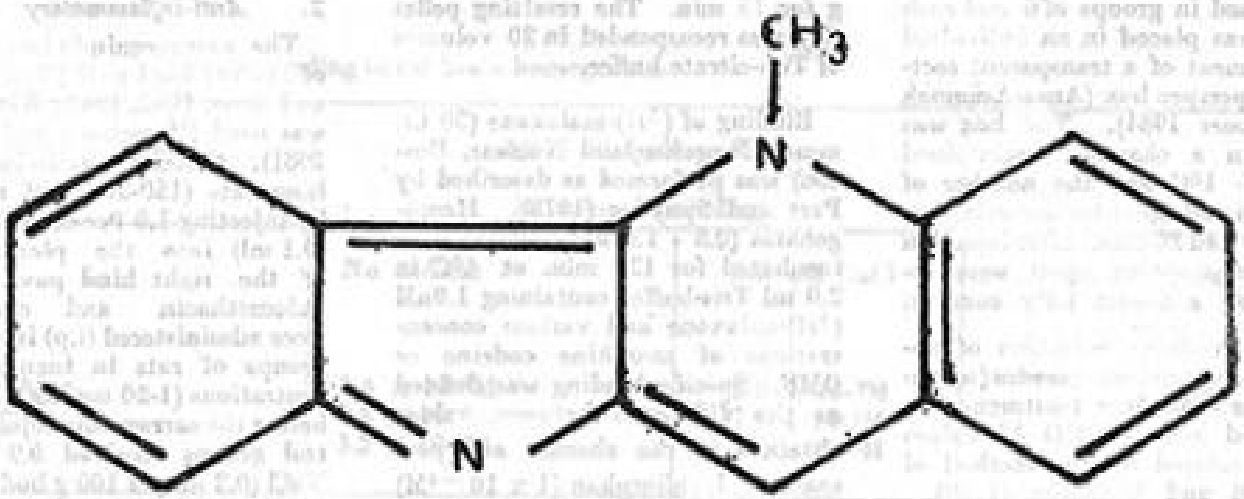
FIG. I



O-METHYLFLAVINANTINE



CONOPHARYNGINE



CRYPTOLEPINE

were dosed in groups of 6 and each mouse was placed in an individual compartment of a transparent rectangular perspex box (Anna-Asamoah and Starmer 1984). The box was placed in a chamber maintained at 31 + 1°C and the number of constrictional episodes occurring between 10 and 20 min. after injection of the nociceptive agent were recorded on a 6-unit tally counter.

The percentage reduction of abdominal constriction episodes (writhing) after each drug treatment was calculated and the ED_{50} values were calculated by the method of Litchfield and Wilcoxon (1949).

(iii) (^3H)-Naloxone Binding Studies

The ability of OMF to bind to central opiate receptors has been compared with morphine and codeine (Anna-Asamoah, 1981). Rat brains (minus cerebellum) were homogenised in 10 volumes of 0.32M sucrose at 4 °C (Potter Elvejham, 6-8 strokes) and centrifuged for 10 min. at 1,000 x g (4 °C). The supernatant was centrifuged at 17,500 x g for 15 min. The resulting pellet (P_0) was resuspended in 20 volumes of Tris-citrate buffer.

Binding of (^3H)-naloxone (50 Ci/mmol, New England Nuclear, Boston) was performed as described by Port and Synyder (1973). Homogenates (0.8 - 1.0 mg protein) were incubated for 120 min. at 4°C in 2.0 ml Tris-buffer containing 1.0nM (^3H)-naloxone and various concentrations of morphine codeine or OMF. Specific binding was defined as the difference between values obtained in the absence and presence of levallorphan (1×10^{-4}M) Incubation was terminated by rapid filtration under vacuum (Whatman GF/B Filters). Filters were rinsed three times with 5ml of ice-cold buffer and radio-activity was assayed by liquid scintillation spectroscopy. All samples were assayed in triplicate. The concentration of drug that produced 50 per cent inhibition of control stereo-specific naloxone binding was determined by log-probit analysis.

2. *Anti-inflammatory Activity*

The carrageenin-induced oedema of the rat hind paw (Winter, Risley and Nuss, 1962, 1963; Winter, 1968) was used (Bamgbose and Noamesi, 1981). Oedema was induced in albino rats (150-200g) of mixed sex by injecting 1.0 Per cent carrageenin (0.1 ml) into the plantar tissue of the right hind paw. Aspirin, indomethacin and cryptolepine were administered (i.p) into separate groups of rats in increasing concentrations (1-20 mg. kg^{-1}) 30 min. before the carrageenin injection. Control groups received 0.9 per cent NaCl (0.2 ml per 100 g body weight). The linear diameter of the paw was measured immediately after the carrageenin injection and at hourly intervals for 5 hours. The percentage increase in paw volume was expressed as $(V_t/V_0 - V_0/V_0 \times 100$, where V_0 = Volume of hind paw at time injection of carrageenin, and V_t = Volume after injection. The LD_{70} (concentration of drug that reduced oedema volume by 70 per cent) values were estimated from log-probit plots 3 hours after treatment.

Table 1

Analgesic ED_{50} values for morphine, OMF and conopharyngine in the mouse hot-plate and formic acid-induced writhing tests.

ED_{50} mg.kg—(95% Confidence Limits)

Drug	Hot plate (i.p)	Writhing (s.c)
* Morphine	7.5 (5.3 - 9.0)	1.1 (0.8 - 1.5)
* OMF	75.0 (65.3 - 86.2)	86 (61.4 - 120.0)
* Conopharyngine	26 (17.0 - 41.0)	6 (4.9 - 6.7)

* Anna-Asamoah and Starmer (1984)

▲ Carroll and Starmer (1967)

Table 2

Inhibition of ^{3}H-nalozone binding in rat brain homogenates

Non-radioactive drug	ED^{50} of stereospecific ^{3}H-naloxone binding		
	No sodium	100 uM NaCl	ED_{50} Ratio 100 uM NaCl/No NaCl
Morphine	1.4×10^{-8}M	5.0×10^{-7}M	35
Codeine	2.2×10^{-4}M	7.9×10^{-4}M	3.6
OMF	3.2×10^{-4}M	1×10^{-3}M	32

Table 3

Relative Anti-inflammatory potency of cryptolepine compared with aspirin and indomethacin.

Drug	ID_{70}	± s.e.m	n
Cryptolepine	20 mg.kg $^{-1}$	+ 1.47	(4)
Aspirin	8 mg.kg	+ 1.88	(4)
Indomethacin	2 mg.kg^{-1}	+ 1.29	(4)

Indomethacin aspirin cryptolepine

n = number of times the experiment was repeated.

(Bamgbose and Noamesi (1981).

Results

The analgesic effects of O-methylflavinantine (Ansa-Asamoah and Starmer, 1979) and conopharyngine (Carrol and Starmer, 1967) have been compared with that of morphine in the mouse. Table 1 shows the analgesic ED50 values (95 per cent confidence limits) of the three drugs. The order of petencies in both tests were morphine conopharyngine O-methylflavinantine. The analgesic effect of OMF was naloxone (0.5 — 1.0 mg $^{-1}$, iv) reversible which suggests an opiate receptor interaction, but that of conopharyngine was not reversed by nalorphine (Carroll and Starmer, 1967).

Both OMF (Ansa-Asamoah, 1981) and conopharyngine (Christie, 1981) have been shown to inhibit stereospecific ^{3}H-naloxone binding in rat brain homogenates. The ED 50 for morphine, codeine and OMF have been compared both in the absence and in the presence of 100uM sodium chloride (Table 2). The large sodium effect produced by OMF (32-fold shift) which was of the same order as that of morphine further suggests that OMF possesses a pure narcotic agonist activity as proposed by Pert and Snyder (1974).

The anti-inflammatory effect of cryptolepine reported by Bamgbose and Noamesi (1978; 1981) has been compared with two commonly used anti-inflammatory drugs aspirin and indomethacin (Table 3). The order of potency was found to be indomethacin > aspirin > cryptolepine.

Discussion

Available experimental evidence indicates that O-methylflavinantine possesses narcotic analgesic activity since its analgesic effect was naloxone reversible. (Ansa-Asamoah and Starmer, 1984). This is further supported by results from stereospecific ^{3}H-naloxone binding studies where a large sodium effect was observed. Even though conopharyngine was more potent than OMF, its analgesic effect in the mouse hot-plate test was not reversed by nalorphine (Carroll and Starmer, 1967). However, it did cause an inhibition of stereo-specific ^{3}H-naloxone binding to rat brain

homogenates (Christie, 1981) in very low concentrations (10^{-7}M). It is not known why these workers did not use naloxone (a pure narcotic antagonist) to attempt a reversal of the analgesic effects of conopharyngine since nalcophine is a partial narcotic agonist. Since narcotic analgesia is exerted at a central site in the CNS, results from binding studies suggest that both OMF and conopharyngine activities may be centrally mediated. This proposal is further strengthened by the observation that both sleeping times induced in mice by either pentobarbitone sodium (Ansa-Asamoah, 1981) or hexobarbitone sodium (Carroll and Starmer, 1967) were significantly potentiated by OMF and conopharyngine respectively. This inter-action between narcotic analgesics including the opioid peptides and the barbiturates which is naloxone reversible, has been reported by other workers (Willow, Carmondy and Carroll 1980) and our results support their findings.

An interesting observation is the fact that crude extracts of various parts of the three plants are used in Ghana and other West African Countries in the treatment of various forms of fever including that of malaria. The leaves of *Rhigiocarya racemifera* is used to treat common cold symptoms and the stem bark is an aphrodisiac (Irvine 1961). The roots of *Cryptolepsis sanguinolenta* is used to treat malarial and other infections (Oku Ampofo) and the roots of *Tabernaemontana* (*Conopharyngia*) *species* are used to treat fever including that of malaria (Kennedy, 1936; Watt and Breyer-Brandwijk, 1962). Since pyrexia causes pain and discomfort, it would appear from our results that the use of these plants has some pharmacological basis and clinical studies of these compounds and their analogues should be undertaken to collaborate the analgesic and anti-inflammatory effects observed in rodents.

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IMMUNOPROPHYLAXIS OF MALARIA

F. N. Gyang, B. Sc. (Hons.), Ph. D., MPSG. Department of Biochemistry, University of Ghana, Legon.

Almost 25 years after the initiation of malaria eradication programme by the World Health Organization, malaria infection is still the major health problem in tropical countries contributing to mobidity of about 100 million per annum and motality of about 1 million every year mainly among young children. The eradication programme involved indoor spraying with insecticide and the use of antimalarial drugs. On the Indian subcontinent where this effort nearly achieved the interruption of malaria transmission, this interruption has, for one reason or another completely broken-down. Possible causes for this may be (a) overcomplacency of the initial success and so, laxity in adequate follow-up of insecticide spraying or (b) resistance of vector (mosquito) to insecticide used. Another possible cause is drug resistance of the malaria parasite. *Plasmodium falciparum*, by far the most lethal of the four species of malaria parasite that infect man and the most commones in our subregion, has developed resistance to so far the most effective antimalarial drug, chloroquine, in several geographical areas such as Vietnam, Brazil and India and this chloroquine resistance seems to be spreading (1).

As is the case with other compounds the mechanism underlying chloroquine resistance is inherent in a genetic mutation that is expressed when drug pressure is exerted. Because of natural selection the continuing use of chloroquine for therapy in an area where chloroquine-resistant malaria has just started may indeed facilitate the spread of resistance to this drug. For effective treatment therefore, Pharmacists and Chemists would have to resort to the development of new antimalarial compounds or formulation of drug combination after every couple of years. As Pharmacists we are all aware that new drug development is a very expensive and time consuming proposition. Under these circumstances, vaccination against malaria, a possible alternative method of malaria control has engaged the attention of scientists over the past few years and this effort has led to a good understanding of the immunology of malaria.

Unlike other parasites that infect man, malaria parasites go through a series of stages in both the mosquito and in man. Sporozoites that are injected by a mosquito circulate in the blood for about half an hour before enterng the liver where they undergo the first stage of multiplication leading to the formation of merozoites. The merozoites from the liver invade red blood cells in which further multiplication occurs resulting in more merozoites and eventually sexual stages or gametocytes. These are taken up by the mosquito in which the life cycle is completed (See diagram).

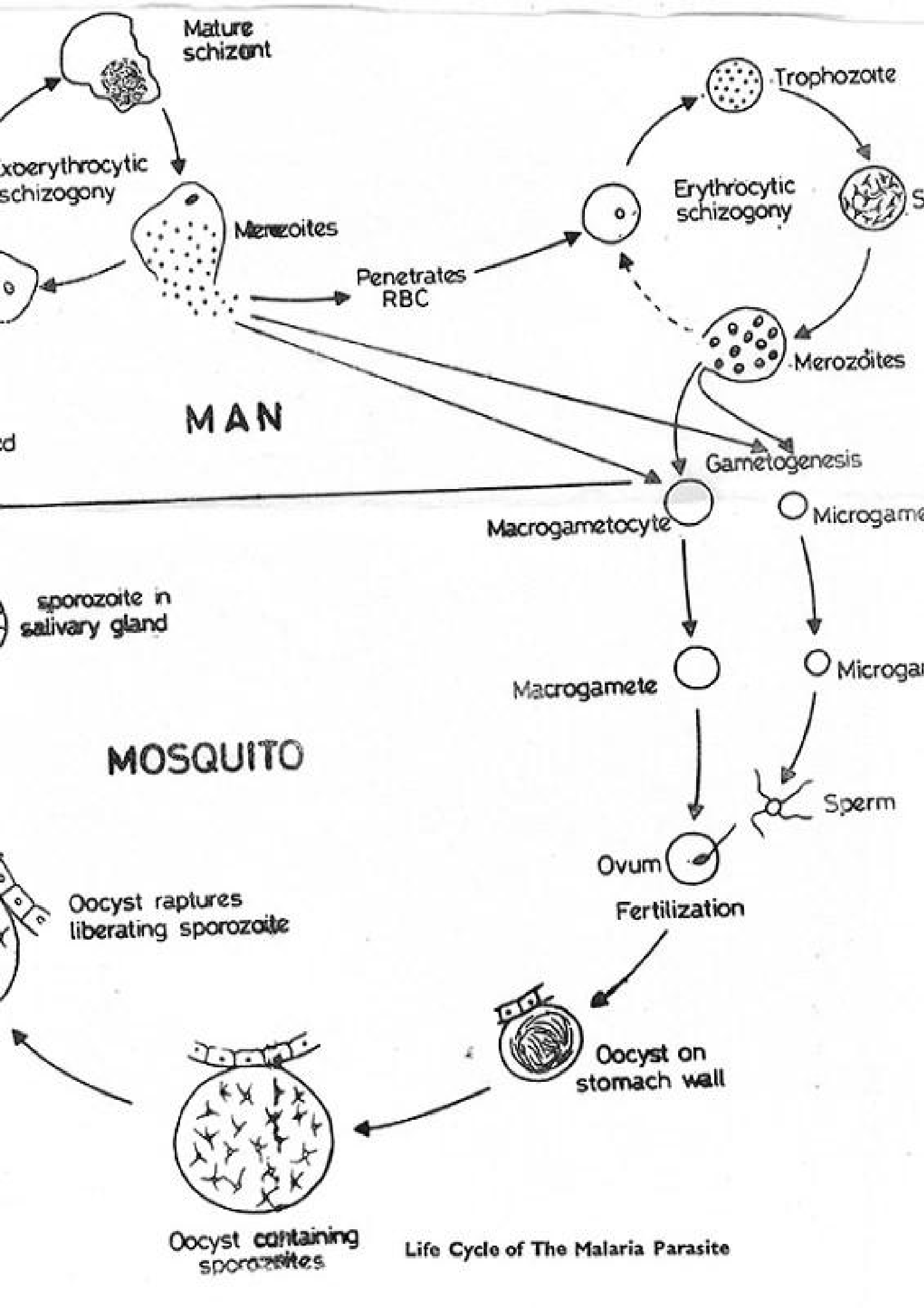
Plasmodial antigens, that is the compounds in the parasite that elicit the formation of antibodies by the host and which will react with the parasite to neutralise its infectivity, seem to be stage specific. Infection with one stage leaves the host relatively immune to reinoculation with the same stage, but totally vulnerable to subsequent inoculation of other stages of the homologous parasite in experimental animals (2). Two forms of malaria vaccine, based on sporozoites (3) and merozoites (4) respectively are currently engaging the attention of researchers, although other approaches including the use of gametes are being encouraged by the World Health Organization under its Special Programme for Research and Training in Tropical Diseases.

In order to be effective sporozoite vaccination must result in complete elimination of all viable pre-erythrocytic stages of the parasite since any that mature will induce blood infection in the host with the attendant malarial symptoms. A major constraint is the production of enough sporozoite material suitable for large scale vaccination. Merozoite vaccination on the other hand eliminates all the viable erythrocytic stages of the parasite in experimental animals (5). Following the successful *in vitro* continuous cultivation of a strain of *P. falciparum* in 1976, the chances of producing merozoite vaccine are brighter (6).

Plasmodia seem to consist of an array of heterogenous antigenic components. With the availability of research material the stage is now set for the purification and characterization of the antigens. A good knowledge of the nature of the antigens from different species of malaria parasites from different geographical regions will indicate whether a single vaccine or a mixed vaccine will protect man against malaria infection.

Most of the knowledge that have accumulated on induced protective immunity has been derived from studies of avaian (7), rodent (8) and simian (3) malaria with only a limited number of studies in man (9). However, with the introduction of infections of human Plasmodia in the owl monkey (Aotus trivirgatus) much attention is now being focused on the study of the immunology of human malaria (10).

Malaria is a race between the development of Plasmodia through the different stages and the immunoprophylactic machinary of the host. Enough protective antibody should therefore be produced by the host before it can effectively control the parasite. A few years ago vaccination against malaria was considered unrealistic. However with the current World Health



Life Cycle of The Malaria Parasite

Organization support for the intensive investigation into the eventual development of malaria vaccine there is the optimism that in the not too distant future, an effective vaccine will be developed against malaria.

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CONTAINERS FOR PHARMACEUTICAL PREPARATIONS

J. K. Kwakye, B. Pharm., M.Sc., Ph. D., MPSG, Department of Pharmaceutical Chemistry
Faculty of Pharmacy, U.S.T., Kumasi.

Summary

The maintenance of the efficacy of pharmaceutical product throughout its shelf life depends among other factors, upon the container in which it is stored. The containers for pharmaceutical products are derived from a variety of materials among which are plastics, glass and metals, some of which is without hazard. The hazards arise mostly through drug - container interactions which may give rise to toxicity or loss of activity. However proper selection depending upon a knowledge on the constituents of the container, drug composition and the storage requirements will eliminate or at least minimise the hazards. Methods are to be sought which would insure the suitability of a particular container for the intended use.

Introduction

Containers are integral part of pharmaceutical preparations and therefore need attention in their selection. Many manufacturers particularly in Ghana do not take pains to select the right containers for their preparations and this has resulted in proliferation of shoddy products onto the market. Recently two deteriorated products from different sources were picked from the market. Upon analysis the deterioration was found to be container/drug interaction. If pains had been taken to select the right container material, this sort of thing would not have arisen.

In effect with many products which are contained in wrong containers the patients do not know what they are taking in. Serious consequencies can arise out of this negligence.

Again many products are on the market with leakages particularly at the clossure (the lid). Apart from the fact that such products are subject to contamination they are really an eye-sore.

The arbitrary selection of containers for dispensing is also dangerous, and retail and—hospital—pharmacists are to be cautious about this. In view of the above it has become necessary to throw some light onto the subject - containers for pharmaceutical preparations.

Selection of Materials for Pharmaceutical Containers

The primary function of a container may be summarised as, provision of a convenient means for the presentation and continuing efficacy of a compound or preparation. The choice of containers and clossures can have a profound effect on the stability of many pharmaceuticals since the possibilities for interaction between the packaging components and formulation ingredients are immense and some of the packaging elements themselves are subject to physical and chemical changes which may be time - temperature dependent. Therefore, many factors must be considered in assessing the value of a particular container for a particular use in the pharmaceutical industry. The more important of these, not necessarily in order of priority are:

1. Provision of continuous protection for the contents during storage;
2. Cost of material to manufacture the container;
3. Strength of the container to withstand shocks during handling and transport;
4. Ease of filling the container;
5. Ease of further processing after filling (e.g. sterilisation of infection solutions);
6. Ease of labelling;
7. Weight of final package in relation to cost of transport;
8. Appearance of final package;
9. Acceptability for use by eventual consumer;
10. Compliance with statutory requirements.

In most instances the container finally selected is a compromise of the first nine points detailed above, the tenth requirement is mandatory.

From a knowledge of the properties of the product to be stored and of their properties of materials used for containers, a tentative selection of the most acceptable container may be made. Further tentative conclusions may be drawn from specially — designed storage trials under controlled conditions for a few weeks. There is, however, no real substitute for a prolonged trial of the formulated product in the proposed container under the most rigorous conditions likely to be encountered during subsequent shelf life.

The Container Materials

Materials used as containers for pharmaceutical preparations include glass, metals, plastics, paper and rubber. Of the raw materials available glass has traditionally been the most widely used container for pharmaceutical purpose to ensure chemical resistance, thermal resistance and mechanical strength. Plastic containers have become popular for a number of reasons including

the ease with which they can be formed, their high quality, freedom of design to which they lend themselves, and resistance to breakage. However, a lot of hazards are associated with their use.

Metals are also used for a number of pharmaceutical products in view of their high tensile strength. Paper and cardboard continue to be used for outer wrapping; more substantial thickness as primary package. Rubbers are mostly used for closures.

PLASTIC CONTAINERS

Plastics used in the pharmaceutical industry consists of one or more polymers together with certain additives. The polymers includs polyethylene, polystyrene, polypropylene, polyvinyl chloride and, to a lesser extent, polymethyl methacrylate, polyethylene terephathalate polytrifluoroethylene, the amino formaldehydes and polyamides (e.g. Nylon) [1].

The additives may consists of anti-oxidants, antistatic agents, colours, impact modifiers, lubricants, plasticizers, and stabilizers. It is the presence of these additives in the formulation of plastics that poses much problem to the use of plastic containers for pharmaceutical products.

The selection of a plastic container, should be based upon adequate and appropriate testing to establish its suitability. It is recommended that at the outset, the composition of the plastic material should be known. This will assist in the elaboration of any additional biological and physico-chemical tests that seem necessary.

Plastic containers for parenteral dosage forms should be sufficiently transparent so that the appearance and clarity the preparation can be examined at any time. The container should not impart an objectionable odour to the contents. Plastics are also used as containers (or components of containers) for dosage forms other than parenteral products. These include ointments, creams, lotions, gels, sprays, nasal drops, enemas, suppositories and inhalation aerosols for external applications and mixtures, syrups, etc. for oral administration. For these applications, it must be ascertained that nothing will be extracted from the plastic by the preparation that will give rise to adverse effects during use such as irritation or sensitisation of the skin, irritation of mucous membrane or unacceptable taste and/or odour on inhalation. For example, materials known to produce skin sensitisation (nickel, or chromium) or surface anesthesia should not be included unless evidence is available that they are not extractable into the product.

Ultimately, the acceptability of a plastic container for a particular dosage form can be assessed by carrying out animal toxicity irritation test on the preparation stored in the container for an appropriate period of time. In some cases (such as enemas and dialysis solutions) it will be necessary to carry out clinical acceptability trials in patients with the preparation stored as above. These storage tests should also be designed to ascertain whether loss of active ingredient, preservative, or other essential components of the product, where they occur, are attributable to the plastic.

Drug—Plastic Interactions

The use of plastics are not without hazards. These hazards can be grouped under permeation, leaching, sorption and chemical reactivity.

Permeation: is the transmission of gases, vapours, or liquids through plastic packing materials. This, in fact, is an active diffusion process whereby the permeating (diffusing) molecule first dissolves in the plastic film, then diffuses through it along a concentration gradient and finally emerges at the outer surfaces from where it evaporates off [2].

Some effects of permeation are [3]:

(i) Rapid degradation of substances particularly those which are prone to oxidation;

(ii) Alteration of pH of the solution through loss of carbon dioxide may catalyse the degradation by either an oxidative or hydrolytic mechanism.

(iii) Loss of water vapour leads to concentration of the solution.

(iv) Changes in the fragrance of perfumes.

(v) Bulging or collapsing of the plastic container with the passage of air into and out of the container.

Therefore an important factor to be considered in assessing the suitability of containers concerns possible changes in the composition of the vehicle and loss of active ingredients due to permeation.

Permeation is affected by quite a number of factors including cross-linking, crystallinity and polarity. Polymeric materials with a great deal of cross-linking decrease the rate of permeation. This is due to the fact that gas molecules require 'holes' to pass through to effect permeation. Cross-linking reduces or blocks the 'holes' and thus decrease the rate of permeation. For the same reason, a high degree of crystallinity reduces permeation.

Polarity plays an important role in permeation. Since like dissolves like non-polar drugs kept in non-polar plastic container such as polyethylene will increase the rate of permeation. Likewise polar drugs in polar plastic containers. For this reason certain water-in-oil emulsions cannot be stored in a hydrophobic plastic bottle, since there is a tendency for the oil phase to migrate and diffuse into the plastic.

Permeation could be mollified by several ways including lamination, use of branched chain molecules and lining.

Lamination reduces permeation especially in cases where the laminates are hydrophilic materials alternating with hydrophobic ones. When a plastic container is manufactured from such a laminated material, hydrophillic contents definately come to a stop when they reach hydrophobic laminates; permeation is thus checked.

Containers manufactured from plastics with branched chain molecules sufficiently lower the rates of permeation relatively more than those manufactured from plastics with straight chain molecules.

Another effective way of reducing permeation is by lining the bottles with specific materials to prevent permeation.

Leaching: is the migration or the release of constituent from the container into the drug system. The rate of leaching has been found to be dependent upon such factors as the solvent system, solute, pH, time of contact and temperature [4]. The major cause of leaching is attributed to additives used in plastics. This can lead to a number of untoward effects. For example, it has been shown that patients have suffered thromboses as a result of constituents of a plastic hubbed needle having been injected together with medicament[5].

Sorption: is the binding of a constituent at either the surface (adsorption) or in the bulk (absorption) of the plastic [2]. In otherwords it involves the removal of constituents from the drug product by the packaging material. This could lead to either a reduction of the potency of the drug or deterioration. Since drug substances of high potency are administered in small doses, losses due to sorption may significantly affect the therapeutic efficacy of the preparation. A problem commonly encountered in practice is the loss of preservative which may be great enough to leave the product unprotected against microbial growth. The following results show the extent of sorption by nylon container for the named chemicals in aqueous solution at 50°C[7].

Agent	Sorbed after one week of contact
t'Chlorocresol	85.5
t'Propylhydroxybenzoate	85.1
t'Salicyclic acid	80.1
t'p-hydroxy benzoic acid	78.7
t'Methylhydroxybenzoate	75.5
t'Benzoic acid	67.1
t'Phenol	60.5
t'p-aminobenzoic acid	51.0
t'Sorbic acid	47.0
m-hydroxy benzoic acid	39.5

Permeation, sorption and leaching may play a role in altering or modifying the physical and chemical properties of a plastic container and may lead to its degradation. Deformation of polyethylene containers is often caused by permeation of gases and vapours from the environment or Loss of content through the walls of the container. Some solvent systems have been found to be responsible for considerable changes in the mechanical properties of plastics. Oils, for example, have a softening effect on polyethylene; fluorinated hydrocarbons attack polyethylene and polyvinyl chloride.

Changes in polyethylene caused by some surface — active agents have been noted. In other cases the content may extract the plasticizer, antioxidant or stabilizer, thus changing the flexibility of the package. Polyvinyl chloride is an excellent barrier for petroleum solvents, but the plasticizer in polyvinyl chloride will be extracted by such solvents. This action usually leaves the plastic hard and stiff. Sometimes this effect is not immediately perceptible because the solvent either softens the plastic or replaces the plasticizer; later, when the solvent evaporates off, the full stiffening effect becomes apparent.

Certain ingredients that are used in plastic formulations may react chemically with one or more components of a drug formulation. At times, ingredients in the formulation may react with the plastic. Even micro-quantities of chemically incompartible substances can alter the appearance of the plastic or the drug product.

Other interactions between drugs and plastics include those which are brought about as a result of the effect of ultraviolet radiation. Brown [8] found that plastic containers when left standing for long periods in daylight may undergo undesirable changes due to oxidation which may be initiated by ultraviolet light or heat resulting in changes in permeation, sorption and leaching occurring between drug system and the plastic container.

Autoclaving of medicaments in plastics should be approached with care since it is likely to affect the physical properties of the plastic and thereby affect the permeation,

leaching and sorption properties of the container.

GLASS CONTAINERS

Glass is commonly used in pharmaceutical packaging because it possesses superior protective qualities, it is economical and containers are readily available in a variety of sizes and shapes [9]. It is chemically inert, rigid impermeable to water vapour and gases, and stable at sterilisation temperature. It does not deteriorate with age and, with a proper closure system, provides an excellent barrier against practically everything except light. But even then coloured glass, especially amber can give protection against light when required.

Glass provides the nearest approach to universal container medium. It can be employed for virtually every pharmaceutical product and is therefore the best choice for a "standard" container. The major disadvantage of glass are its fragility and weight. Fragments of glass are potentially dangerous.

The major components of glass are sand (silica), soda-ash (sodium carbonate) and limestone (calcium carbonate). Many useful properties of glass are affected by the kind of elements it contains. Reduction in the proportion of sodium ions makes glass chemically resistant; however without sodium or other alkalis, glass is difficult and expensive to melt and mould [10]. Boron oxide is incorporated mainly to aid in the melting process [11]. Lead in small traces gives clarity and brilliance, but produces a relatively soft grade of glass. Alumina (aluminium oxide) is often used to increase the hardness and durability and to increase resistance to chemical action.

Problems associated with glass containers

Leaching of alkali ions into drug formulations particularly injections is the major problem. This may lead to precipitation of alkaloidal salts, loss of activity of some vitamins and instability of many products. The source of this is the alkali oxides included in the composition of glass. The British Pharmacopia requires the containers used for alkali—sensitive substances to comply with a limit test for alkalinity because many injections are stored for long periods during which alkali extraction could be considerable and more over a number of their medicaments are unstable at high pHs.

Loss of brilliance is another problem with glass containers. In a damp atmosphere moisture condenses on the surface of glass containers and extracts some of the weakly bonded alkali ions from the network When the surface becomes dry a white deposit is left which consists mainly of alkali carbonate produced by interaction of the alkali with carbon dioxides from the atmosphere. If this film is washed off with water or weak acid the exposed glass surface will contain considerably less alkali and, therefore, subsequent extraction will be at a slower rate. However, if the film is allowed to remain, when further condensation occurs an alkaline solution is produced at once and this dissolves away some of the silica (because of the ease with which alkalis can disrupt the network) with a resulting loss of surface brilliance referred to as "weathering."

Loss of brilliance can be caused in ways other than weathering. When water is kept in high alkali containers the extracted alkali is replaced by hydrogen ions to maintain the electrical balance. These are accompanied by some water molecules which cause the network near the surface to swell slightly. When the container is emptied and dried the loss of this water leads to cracks in the surface.

Apart from the aesthetic objection to containers that have lost their brilliance, they are quite unsuitable for injections because it is essential to see easily the earliest signs of decomposition such as precipitates and slight colour changes. The problem is most acute for the hospital pharmacist who has to re-use most of his containers. In this case glass containers of low alkalinity should be used. However, if it is necessary to use some containers of quite high alkalinity they should be thoroughly and quickly dried after cleaning and stored in a dry, well-ventilated place.

Flaking is another hazard associated with the use of glass containers. This is the falling away of some silica-rich laminae (flakes) or needle-like fragments (spicules) from the surface of glass and is seen in the contents of the container as glistering particles. Flakes are produced most readily by alkaline solutions because these roughen the surface by eating part of the silica. Thus flakes appear quite quickly when injections containing sodium-citrate, phosphate, or - lactate are packed in certain types of glass. Occasionally, they develop in injections that contain sodium, Potassium and calcium chlorides, and because solutions of these salts are often given intravenously in large volumes the presence of insoluble matter particularly glass is most undesirable.

Ideally, there should be no interaction between drug and container. Nevertheless, even the silicate glasses which are probably the most inert glass containers are attacked at all pH levels by aqueous liquids and it is necessary to apply realistic tests to ensure that the amount of contamination is within acceptable limits. Attack by alkaline solutions leads to the steady dissolution of glass without apparent change in appearance. The only visual evidence of such attack may be the formation of insoluble silicates in the product. Hydrofluoric acid and a few related fluorine containing substances also dissolve glass.

TYPE OF GLASS

Glass containers for pharmaceutical products are classified into four types:

Type I: Borosilicate Glass: It is a highly resistant glass which contains boron and/ or aluminium or zinc in place of a substantial quantity of alkali and earth cations. Leaching and chemical reactions is very much reduced.

Type II: Treated Soda-Lime Glass These are made of commercial soda-lime glass that has been dealkalized or treated to remove surface alkali. The dealkalizing process which is known as "sulphur-treatment" virtually prevents "weathering" of empty bottles. Sulphur treatment neutralizes the alkaline oxides on the surface, thereby rendering the glass more chemically resistant.

Type III: Regular Soda-Lime Glass: These containers are untreated and made of commercial

soda-lime glass of average chemical resistance.

Type IV: General purpose Soda Lime Glass: These containers are inexpensive, easy to process and can be manufactured at convenient temperature. It is unsuitable as a container material for many injections because it causes leaching of alkali ions, flaking, weathering and because of its liability to fracture with sudden changes of temperature due to its relatively high co-efficient of expansion. It is employed for preparations intended for oral and topical use.

METAL CONTAINERS

Aluminium, tin, lead and iron are the metals commonly employed. By virtue of its tensile strength and adequate elasticity, the metal container may be the choicest of all available containers for pharmaceutical purposes. However, metal containers are bulky and thus result in increased transportation costs. There is a high tendency to contain metallic particles especially near screw threads of collapsible tubes; this makes the metal container highly unsuitable for parenterals and ophtalmic preparations. Their opacity is also a serious disadvantage likewise the chemical and electrochemical activities.

Of all the metals used in pharmaceutical packaging, aluminium appears to be the most suitable. This is because it is light, non-toxic, relatively resistant to oxidation and generally more inert. It is tasteless and colourless. It is capable of lacquer protection and it could be anodised. Coating enhances the chemical resistance.

Tin is invariably used to protect other vulnerable metals. Metal containers such as lead and steel are almost always plated with tin.

Certain products may decompose when in contact with particular metals. A typical example is the decomposition of propazine HCl when stored in contact with copper, brass or galvanised material.

PAPER CONTAINERS

Due to its low strength, lack of rigidity and high permeability to water vapour and poor barrier properties, paper is not very much used as a material for the manufacture of pharmaceutical containers. Nevertheless, it is suitable for secondary packaging to effect additional protection as in the case of solid dosage forms enclosed in strip or blister packs and packaging of certain powders dispensed in individual dosages.

RUBBER CONTAINERS (CLOSURES)

Rubber is an elastic polymer, and may be obtained from natural sources or by synthetic methods. In the pharmaceutical industry rubber is mainly used for closures. The types of ingredients commonly found in rubber closures are: Rubber, vulcanizing agent, activator, fillers, plasticiser, antioxidant, pigment and lubricants.

Since the composition of rubber stoppers is complex and the manufacturing process complicated, it is common to encounter problems with certain rubber composition. These problems are similar to those of plastics. Hence as for plastics the choice of rubbers for closures should be made with care

CONCLUSION

Containers are important aspect of pharmaceutical products. Their function is primarily to contain and protect the drug against physical hazard and adverse environmental conditions and to present the product in a convenient quantity and satisfactory fupctional form. No container is hundred per cent safe for use, therefore, adequate tests must be performed to evaluate the suitability of a particular container for its intended use. Standards must include biological, physical and chemical methods.

Although packaging of drugs in plastic containers have become more prevalent these days, plastics present the most diversified hazards. Besides direct toxicities of plastics, it should be considered that plastic containers may change the efficacy of drugs or discharge toxic harmful substances. Even though plastics have made a great impact in the various facets for pharmacy and medicine, some problems have occurred which should indicate that perhaps there should be a slower pace of introduction of these items to the health profesion.

To the industrial and hospital pharmacist, an appreciation and understanding of medicament - containers interactions would help minimise costly errors and at the same time provide the many advantages to be gained by the use of plastics, glass, metals and rubber as materials for pharmaceutical containers.

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A COMMEMORATIVE PROFILE OF THE PROFESSION OF PHARMACY IN GHANA

Compiled By J.N.N. Addo

Introduction

On the 19th December 1985, the Golden Bells shall be ringing for the Pharmaceutical Society of Ghana. The Society is already gripped in preparative activities for the celebration of this 50th anniversary.

At this time then, it would be very appropriate to gracefully recall the inception and progress of the profession of pharmacy in the country.

The Begining

Statutory practice of Pharmacy was introduced into the country, by the Druggists Ordinance, Gold Coast, 1892. This brought a limited control over the sale of drugs and poisons and vested authority in the Medical Department to license suitable persons as 'druggists'.

Little is known about the requisite qualifications for registration. No organised training or curriculum was instituted along this legislation.

Various Pharmaceutical Legislations

Since the Druggist Ordinance of 1892, four other pharmaceutical legislations have been enacted. The earliest was the Drugs Ordinance, Gold Coast, 1936. This was followed by the Dangerous Drugs Ordinance, Gold Coast (cap 73), 1st July, 1935; revised in 1954. These two ordinances made provisions for the regulation of the importation, exportation, manufacture, sale and use of opium and certain other dangerous drugs and substances and for purposes connected therewith.

Another pre-independence ligislation was the Pharmacy and Poisons Ordinance, Gold Coast (cap 70), 1st Nov. 1946; revised 1954, 1956, 1957. This made povision for the Regulation of the profession of Pharmacy and the control of the Trade in Drugs and Poisons.

There is just one post-independence legislation. The Pharmacy and Drugs Act, Ghana 1961 (Act 63), 13th June 1961; Amended 1963,1965, 1966, 1968, 1973, 1974. This is an act of parliament which,

(1) regualates the profession of Pharmacy.

(2) Controls the supply, manufacture, storage and transportation of drugs.

It is the current pharmaceutical legislation. Meanwhile draft legislations are under study for enactment.

Training of Pharmacists

No local training institution had been found existing before 1920. Organised training of Pharmacists locally started with the establishment by the Government of a small 'Dispensary School' at Korle Bu Hospital, Accra, in 1921.

The school trained only persons desiring to enter Government service. The students were described as Dispensers - in-trainig. The staff included no pharmacists with qualifications equivalent to that of the United Kingdom, the then colonial masters.

It consisted of:

(1) ex - RAMC Sergeant-compounders whose course of training was far below that for the statutory qualifications of the U.K. Notable among these was Sergeant Hart.

(2) Nurses.

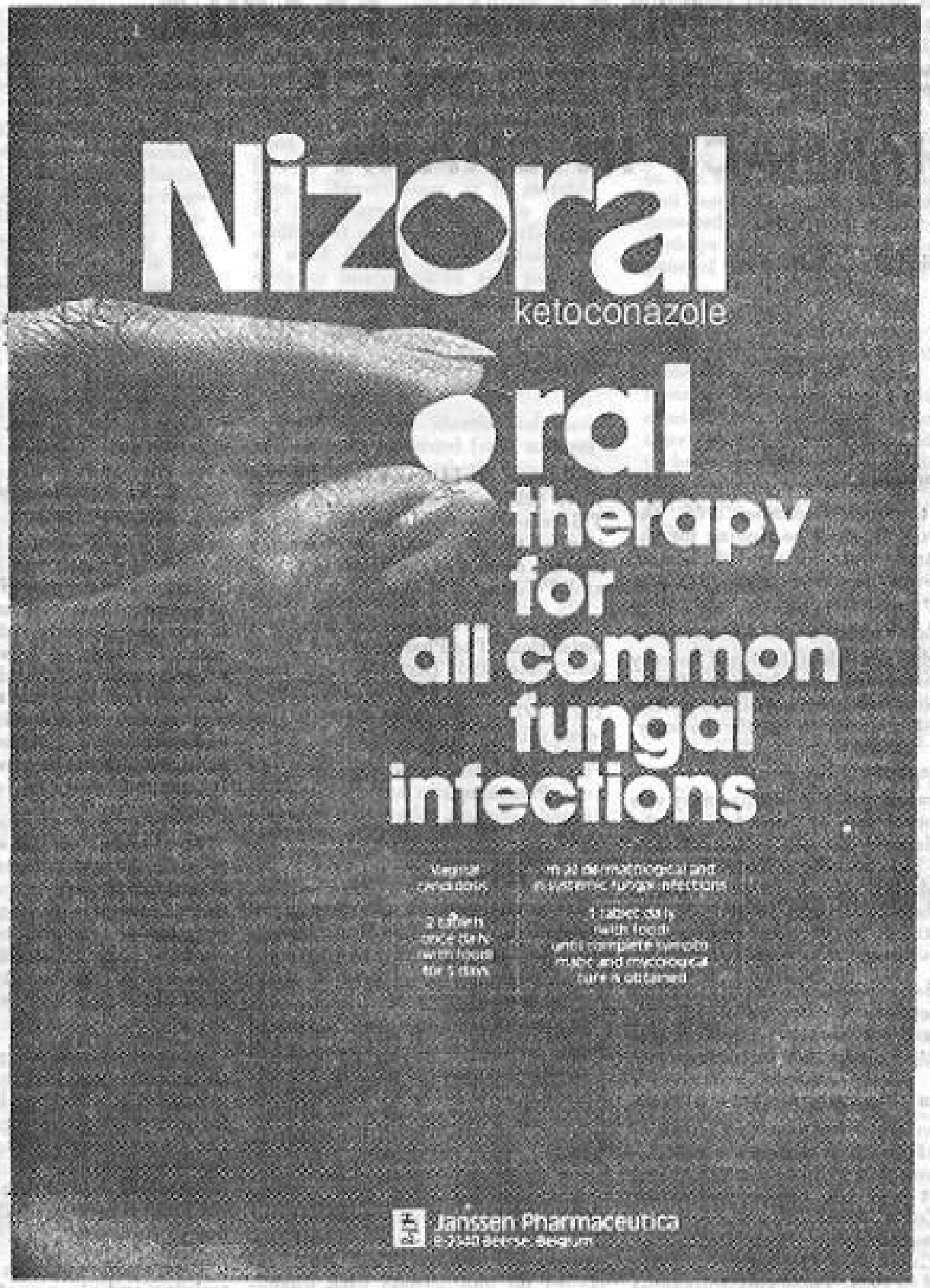
There was no prescribed standard of entering the school until 1940 when it was the Cambridge School certificate. The training followed the UK army practice of training compounders. Before 1940, the course content was nursing, compounding, dispensing and store-keeping. After 1940, therapeutics and anesthesia were included. It took 3 years to complete the course.

At the end of the course pupils took the Druggists Qualifying Examination. Successful pupils received their certificates as Registered Druggists and were appointed as civil servants. The Examination Board consisted of the Deputy Director of Medical Services and two other medical officers.

A non-government pupil wishing to be a druggist had to serve an apprenticeship with a qualified druggist for five years and present himself for the Government's Druggist Qualifying Examination. A few private institutions existed to help. One such was the Hansdrug College of Pharmacy, Hansdrug Hall, Accra.

Poor equipment, lack of systematic training and absence of rules or syllabus made the examinations difficult for the non-government pupils. Only few pupils managed to scrap through.

The 1940-43 batch of students called for a more appropriate curriculum for the school in a memorandum to the Ministry of Health in 1943. In 1944 the Government employed Mr



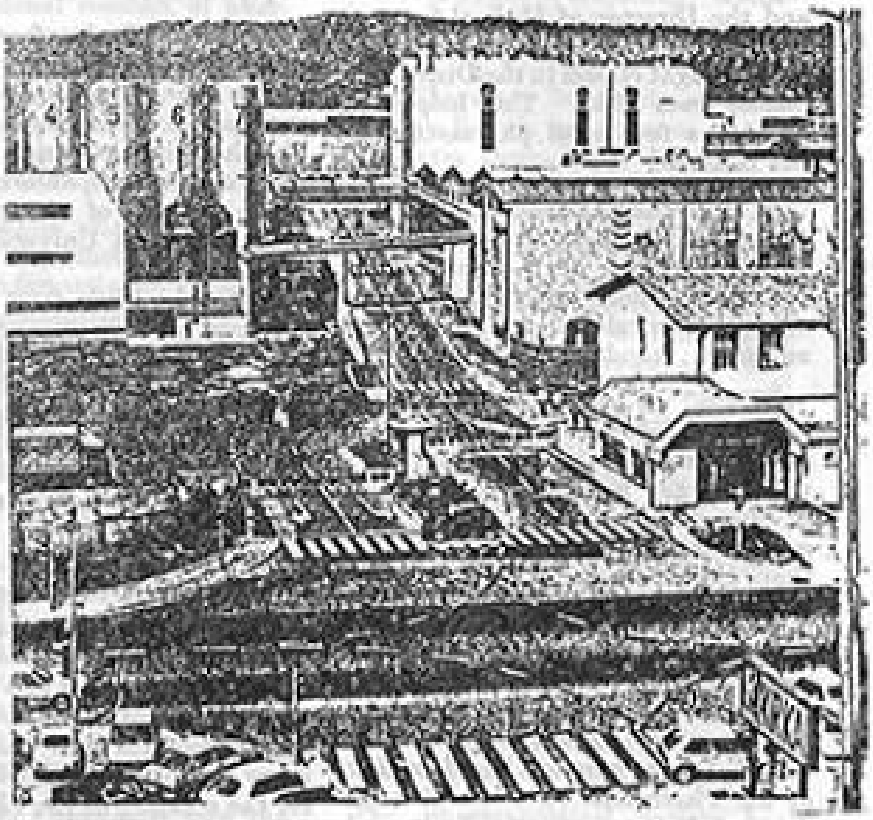
For Further Information Contact

City Chemicals & Pharmaceuticals Ltd.

A 599/4 Link Rd. Laterbiokorshie, P.O. Box 1183, Mamprobi, Accra-Ghana

Krka Pharmaceuticals

Novo mesto, C. herojev 45
Telephone: (068) 22-441
Cable: Krka
Tele. KRKA YU



Krka is one of the leading Yugoslav pharmaceutical companies employing 3850 workers. Its range of activities includes pharmaceutical and chemical raw materials, pharmaceuticals, veterinary and cosmetic products, medical herbs, health resorts and tourism, as well as glass fibres for heat and sound insulation.

Krka produces about 146 different products for human and over 30 for veterinary use. The production is partly based on Krka's technology and partly on technological co-operation with different foreign companies.

Krka produces drugs for the following indications; infectious diseases, cardiovascular and lung diseases, gastrointestinal disorders, urinary tract diseases, disorders of the locomotor apparatus, psychiatric diseases and cancer. Krka is the only producer for radiological diagnostics.

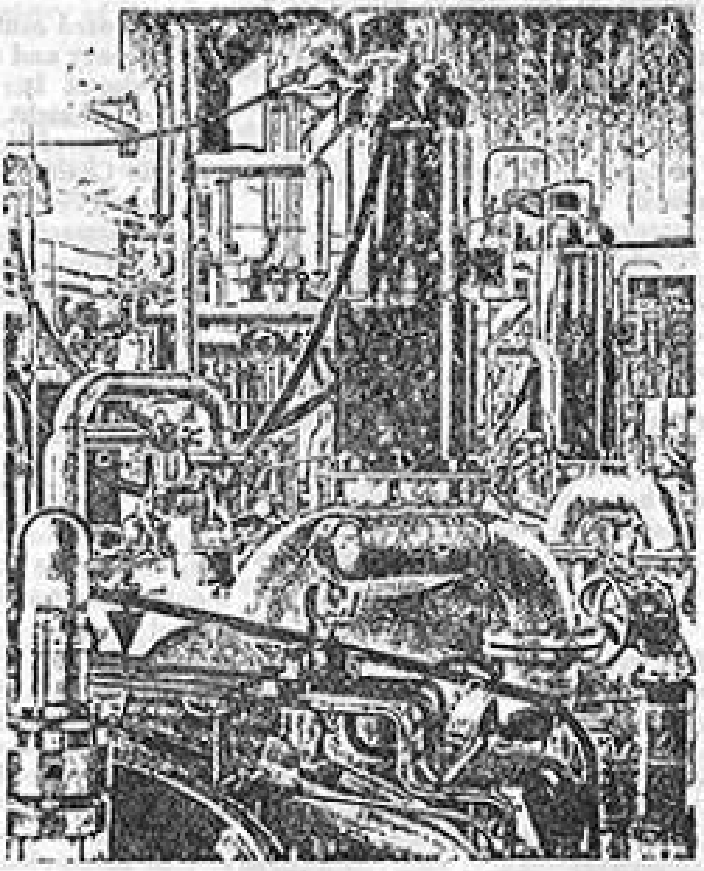
The production range includes also dietetic products, natural stimulants, vitamin beverages, products for diabetics, fruit and vitamin sweets and a series of other products like insecticides, thermometers for different purposes, solutions for cleansing and storage of contact lenses, etc.

Krka's research is focused on development and improvement of production technologies for extraction of antibiotics, enzymes and vitamins as well as new biosynthetic technologies and procedures.

Krka was granted FDA registration for bacitracin-Zn and oxytetracycline.

Krka exports to all continents, mainly antibiotics, various pharmaceuticals and medicinal herb products. The value of exports in 1983 amounted to $55 million.

Krka has a joint venture, DAWA Pharmaceuticals, in Nairobi, Kenya.



Eric Allman, a British Druggist to start running a proper dispensing school. The pupils became known as pupil-pharmacists. At the end of a three-year course, they took the Certificate of Competency to Practice as Pharmacist. After considerable negotiations between Mr Eric Allman and the Director of Medical Services opportunity was given to outsiders to have night classes in the Dispensing School from 1955. This helped to provide a few retail pharmacists in the country.

In 1949, the Pharmacy and Poisons Board Examination Rules were introduced. They were based on the type of questions asked by the examiners, the rules also insisted on a minimum standard of entry.

In 1957 it was realised that the educational standard of Pharmacists were low and that there was an ever-widening gap between the standards of those trained by the Government and those trained outside, particularly those trained in the U.K.

As a result the Dispensing School was replaced by the Pharmacy Department of the new Kumasi College of Technology. At the request of the newly created Ministry of Health, the training was based on that of the Pharmacist in Great Britain. A new department was built and equipped at the cost of £100,000.00 to accommodate 24 students a year on a four-year course. This department became the Faculty of Pharmacy in 1963 after the Kumasi College of Technology became the University of Science and Technology (UST), Kumasi.

There is now no other way of becoming a pharmacist by training in this country other than going through the UST.

The faculty offered:

(a) a three-year Bachelor of Pharmacy degree course, and

(b.) a two-year Pharmacy Diploma course. These had been replaced since 1976 by a four-year Bachelor of Pharmacy (Hons) degree course.

Post-graduate courses leading to a Master of Pharmacy degree is also given by the Faculty. Initially the Faculty was manned by expatriates. Howevet since the 1970s the bulk of its staff consist mostly of Ghanaian Pharmacists with post-graduate qualifications. They received their undergraduate training in Ghana and post-graduate training from mainly British and American Universities which continue to have academic and research links with the Faculty. The Faculty also continues to enjoy the service of visiting professors in pharmacy.

Training of the faculty staff is usually by government sponsorship under the University staff training programme. Non-government bodies, like the British Council for instance, have also been sponsoring post-graduate training of Ghanaian Pharmacists in British Universities or elsewhere.

Since the 1960s most Pharmacists working with Pharmaceutical Manufacturers or Distributors receive some sort of post-graduate studies sponsored by their employers. Refresher courses have also been organised a few times before by the Faculty of Pharmacy on behalf of the Pharmaceutical Society.

Organisation of the Pharmacy Service

This has been governmental up-to-date. The Druggist Ordinance 1892 vested authority for this in the Medical Department. There was very little organisation till 1946 when the Pharmacy and Poisons Ordinance called for the creation of the Pharmacy and Poison Board.

This Board controlled the practice of Pharmacy and the Trade in Drugs and Poisons. It consisted of not more than eight persons including the Director of Medical Services who was the Chairman and Registrar of the Board, two medical practitioners, three pharmacists and other persons appointed by the Minister. The Chairman and three other members formed a quorum.

There was little progress with this set-up. Rather, a very strong pharmaceutical opposition to this arrangement and its proposed revision in 1955, developed. The Government had to act to revamp the system.

In April 1956, the Government requested help from the U.K. The U.K agreed and released its chief Pharmacist, Dr. Harold Davis, for a period of two months. Dr Davis was given the following terms of reference: To review the measures taken and projected in the Gold Coast for the development of Pharmacy and the control of poisons and dangerous drugs, and to make recommendations with particular reference of the following matters:—

(1) The training of Pharmacists for the Government service and for non-Government Institutions.

(2) The organisation of the Government Pharmacy Service, including the Professional/technical qualifications and mutual relationship of each post in the structure.

(3) The organisation of the Pharmacy and Poison Board including the powers and duties of the Board and the composition of its membership.

(4) The control of Poison and Dangerous Drugs including a review of the adequacy or otherwise of the Ordinance and its subsidiary legislation.

Dr Davis arrived in the country on 2nd August and left on 29th Sept. 1956 having traversed the country, visiting and hearing concerns and the concerned of the profession, including the Legislative Assembly.

He submitted his reports in two parts. Part I, dated 9th Nov. 1956 dealt with 1 & 2 of the terms of reference above. Part II dated 17th Jan. 1957 dealt with 3 & 4 of the terms of reference above. The report was not published until after March 1958.

The Government was deeply appreciative of the report and took measures to implement the recommendations. 'It is desired to placed upon record that Dr Davis' Report is a most valuable document. It endorses Government view regarding the necessity to raise the standard of Pharmacy and the standing of Pharmacists in Ghana and is of special value as having emphasised the standard of the training given at the Kumasi College of Technology,' read the Government statement on the report.

Pharmacy Division, Ministry of Health

In 1959, the Pharmacy Division of the Ministry of Health was set up. The post of Chief Pharmacist was created. The Chief Pharmacist now the Director of Pharmaceutical Services became the head of the pharmacy service, responsible respectively to the permanent secretary and chief medical officer of the Ministry of Health for administrative and professional matters. The late Mr S.B.

Adjepong was appointed the first chief Pharmacist.

Since its inception the Pharmacy Division of the Ministry of Health has been rendering an assortment of services including,

(1) advising the Government on Pharmaceutical affairs;

(2) implementing Government decisions on pharmaceutical matters;

(3) controlling and regulating the profession through the Pharmacy Board;

(4) issuing of Import Permits for Dangerous Drugs to importers;

(5) grading of Pharmaceutical Houses and allocation of Specific Import Licences to them;

(6) operation of a chain of Hospital Pharmacies in Government Hospitals and Clinics;

(7) responsibility for Government drugs procurement and supplies;

(8) monitoring and quality control of drugs, and

(9) organisation of training for professional and sub-professional staff.

The Pharmacy Board

A persistent Pharmaceutical opposition caused the proposed Pharmacy and Poisons Ordinance, 1955 to be withdrawn. Dr Davis' Report called on the Government to seek the views of the Pharmaceutical Society in the redrafting of a new ordinance. Three years after the report, on 13th June 1961, a new law was enacted. As has been observed already, the profession of Pharmacy is regulated by this Act. Among other things it called for the creation of a Pharmacy Board.

This Board is the body 'charged' with the general responsibility of pharmaceutical affairs in Ghana. It is to ensure that 'the highest practicable standards in the practice of the profession are attained and maintained.

The Board used to prescribe courses of instruction and practical training for students of Pharmacy. However, since 1963 it has relinquished this responsibility to the Faculty of Pharmacy at the UST, Kumasi. The Board approves the registration as Pharmacists all persons with the requisite knowledge and skill, who are competent to practise pharmacy in Ghana.

It has a Disciplinary Committee which advises it on matters relating to the professional conduct of pharmacists. It has power of cancellation and suspension of registration. The Board also approves the registration of Licensed Companies and premises suitable for the practice of pharmacy. It issues licences to chemical sellers.

The Board is also charged with the responsibility for encouraging and facilitating the formation of co-operative societies embracing persons carrying on pharmacy business. The Board classifies and registers specialities through its Drugs Committee for purposes of controlling the manufacture, possession and supply of drugs.

It is also to advise the Minister of Health, on consultation, on Price Control of drugs. The Board appoints a Registrar who acts as secretary to the Board and its committees. The Registrar must be a pharmacist and his appointment has to be approved by the Minister. The Pharmacy Board consist of the following:—

(a) The Chief Pharmacist now the Director of Pharmaceutical Services of the Ministry of Health as Chairman.

(b) The Dean of the Faculty of Pharmacy UST, Kumasi.

(c) A lawyer appointed by the Minister of Health.

(d) A medical practitioner appointed by the Minister of Health on the nomination of the Chief Medical Officer or Director of Medical Services.

(e) A medical practitioner appointed by the Minister of Health on the nomination of the Ghana Medical Association.

(f) A medical practitioner, specialising in internal medicine, appointed by the Minister of Health

(g) Three Pharmacists appointed by the Minister of Health on the nomination of the Pharmaceutical Society of Ghana.

The term of office of appointed members of the Board is three years and the powers of the Board may be exercised not withstanding a vacancy in its membership. Since its establishment in 1961 the Board has had five Chairmen, the first being the late Mr S. B. Adjepong. It has appointed three (3) Registrars so far, Mr Halm, Mr Nettey and Mr T.C. Corquaye, the incumbent registrar. The Board currently has its offices at Adjabeng, Accra. It is sandwiched by Kingsway Stores and Ghana Cocoa Board buildings.

The Pharmacy Board like all other statutory Boards is not autonomous. It operates through the Ministry of Health and is funded and equipped by the latter. It has been bogged down by registration formalities of private pharmaceutical and chemical warehouses and of pharmaceutical specialities. Government Medical Stores and Hospital Pharmacies have virtually escaped registration by the Board. The most nagging problem of the Board is that of sustained inspections of the very many premises, registered and non-registered, where Pharmacy is practised all over the country. So far it has not been adequately staffed nor equipped to implement many sections of Act 64. Also, it has not enjoyed the persistent support of the law enforcement agencies and therefore has not been able to take sufficient measures that could serve as deterrent to flouting of Act 64.

The Pharmaceutical Society has suggested a re-organisation of the Board into a Pharmacy Council and a Drugs and Cosmetics Board. This measure, it is hoped, when taken, would improve the situation tremendously.

The Pharmaceutical Society of Ghana

Section 9 of Act 64 gives statutory recognition to the Pharmaceutical Society of Ghana.

Founding

The Society started as the Pharmaceutical Society of the Gold Coast. It was founded on the 19th Dec. 1935 out of the former Gold Coast Pharmacists and Druggists Union and the Chemists Defence Association which had existed before 1929. It was incorporated on the 2nd Sept. 1936 with its headquarters at Selwyn Market Street, Accra.

The Society was founded by a group of Pharmacists led by the late Mr William Ayiah Hansen, Hansdrug College of Pharmacy, Hansdrug Hall, Accra. He did so with the moral and personal support of the Honourable Dr D. Duff, then Director of Medical Services. William Ayiah Hansen was

then the Organising Secretary and Registrar of the Society.

Before 1935 the predominant pharmacists grouping in the contry were the two associations mentioned above. Pharmacists affiliated themselves to these groups according to their bonding or non-bonding to government service. The private pharmacists groups was led by Mr William Ayia Hansen.

The groups had been pestering the colonial government for better development of the profession in the country. In April 1935, the government set up a committee headed by Dr D. Duff to update the existing pharmaceutical ordinances. The committee received memoranda with virtually identical ideas from the fragmented groups.

Ayiah Hansen successfully managed to bring these groups together to back up their suggestions to the committee. They held many fruitful discussions with the committee. Impressed by the unity achieved, Dr. D. Duff encouraged the united group to organise themselves on the lines of the Pharmaceutical Society of Great Britain. He used his offices to acquire copies of the constitution and bye-laws of the latter for the group.

The group soon became the Pharmaceutical Society of the Gold Coast. It had to be registered with the Registrar-General's Department. To fufil this, the Society appealed to the Governor to authorise the registration of the Society as a company without the word 'Limited' after its name.

The Governor issued the necessary licence on the 19th Dec. 1935, accepting the formation of the Society and recommending its registration. Dr D. Duff was elected the honourary and first chairman of the society. The objectives at its formation were:

(1) To advance Chemistry and Pharmacy and to assist the Government in promoting a uniform system of education of those who should practice the same; also for the protection of those who carry on the business of Chemists and Druggists,

(2.) To provide a fund for the relief of the distressed members and assist associates of the Society and their widows and orphans.

It had a Central Executive Committee, with seven local associations in Accra, Cape Coast, Sekondi, Koforidua, Kumasi and Temale. There were twenty-six foundation members and five students associates.

The Society had its first Executive Council Meeting on 16th Sept. 1936, its first anniversary Dinner at the Grand Hotel, Accra, on Friday 18th Dec. 1936, and the first Annual General Meeting in the 4th week of May 1937. On the 19th Oct. 1957 it became the Pharmaceutical Society of Ghana.

Branch Societies and Wings

The Society has branches in all the Regions of the country except Northern and Upper Regions which form one Branch. It has Hospital, General Practice and Industrial, Pharmacists Associations. The Ghana Pharmaceutical Students Association is affiliated to the Society.

Aims

The Society labours to do the following:—

(a) To promote a corporate spirit among pharmacists in Ghana generally, and to secure the observance of such high standards of professional conduct as will uphold the dignity of the profession of pharmacy.

(b) To encourage and regulate the training of persons desirous of becoming pharmacists, and to encourage the persuit of research activities connected with the progress of pharmaceutical knowledge.

(c) To desseminate scientific and professional information by means of lectures, symposia, seminars, the publication of the Society's Journal, and by whatever means available to the Society within the laws of the nation.

(d) To encourage the interchange of ideas on and discussion of subjects of common interests to its members.

(e) To co-operate with other pharmaceutical bodies outside Ghana with the aim of upholding high standards and dignity of the profession of pharmacy worldwide.

(f) To organise meetings or such other functions that will promote a good social intercourse among its members.

(g) To place at the disposal of the Government and the general public the benefit of pharmaceutical experties in keeping with the society's motto:
"Amicus Humani Generis"

(h) To co-operate with the Government and all or any other agencies or bodies in Ghana to ensure that pharmaceutical services comparable to the be in the world is available to th people of Ghana.

(i) To perform all other such functions within the framework of the laws of the nation, as may be found necessary for the achievement or realization of the foregoing objects or part thereof.

Crest

The Society also has a crest. The idea of obtaining it was mooted in 1962. It was not until Feb. 1971 when a design was ordered. The crest as it is today was obtained and accepted as the symbol of the Society on the 5th Aug., 1972. The Crest has and indicates the following:—

(a) An outer ring, the Adinkra design: Obi nka obi (Peace and Harmony) which is in conformity with the Society's motto.

(b) Pestle and Mortar with the Recipe sign superimposed on the mortar representing the basic international designation of the Pharmacy Profession.

(c) Cluster of Green Leaves at the base of the mortar with a capsule superimposed on the leaves. The cluster of leaves represents the old and traditional concept of Pharmacy and denotes the numerous medicinal plants that abound in Ghana.

The superimposed capsule indicates the changing role of Pharmacy from plant source to synthetic products. It also shows that Pharmacists can extract the active principles from plants, formulate and present them in attractive dosage forms.

Membership

By virtue of Act 64 every person registered as a pharmacist in Ghana becomes a member of the society. Membership had until then been optional.

At its inception the membership was twenty six. In 1961, the effective year of Act 64, a new register was opened. The membership then was nearly four hundred and twenty. By Dec. 1984 the number of Pharmacists registered had reached eight hundred and five. The actual number of registered pharmacists at the same time however was five hundred and sixty. Death has taken its share of the membership.

A few pharmacists have also not renewed their registration voluntarily. A good number of pharmacists are seeking better laurels, or persuing further studies outside the country. Membership certificates have been available since 1972. The designation of membership is MPSG. Associate membership is open to persons who have obtained their registrable academic qualifications and are undergoing their registration training programme or pursuing postgraduate studies.

The National Council of the Society

This is the body responsible for the management of the affairs of the Society. It is constituted as follows:—

(a) Standing Executive Committee which consists of members elected by the Society at a biennial conference, Viz — The President, Vice-President, the National Treasurer, the Hon. General Secretary, the Asst. Gen. Secretary, the Editor of the Journal and two others.

(b) Two members nominated by the Minister of Health under Section 9 (5) of Act 64. The Director of Pharmaceutical Services and the Dean of the Faculty of Pharmacy, the UST, Kumasi.

(c) Elected Society Branch representatives. Two from Greater Accra Region, one each from Eastern, Central, Western, Ashanti, Brong-Ahafo, Volta Regions and one for Northern and Upper East/Upper West Regions which form one Branch.

(d) The immediate past President.

The Ghana Pharmaceutical Journal

This is an official organ of the Society. Before the country gained independence there was the West African Pharmaceutical Journal. This was being run on the endeavours of Mr Allman who was then the Editor. Mr Allman was succeeded by Prof. A.N. Tackie. Due to financial constraints publication of the Journal ceased. The Council of the Society made an unsuccessful attempt to revive it in 1958. In October 1971 Council formed an Editorial Committee with the purpose of publishing a Journal. In August 1972 Mr Ago Simmonds was elected the Editor of the Ghana Pharmaceutical Journal. The maiden issue of the Journal came out in March 1973. The Journal is supposed to be a quarterly publication. Only seven volumes have been published so far. The last one in December 1980. The Journal is facing problems of cost and availability of newsprint in the Country.

National Secretariat

This is the head-office of the Society. Initially it was on the Selwyn Market Street, Accra. In 1956 a new office with its own letter box was inaugurated at Knutsford Avenue, near the Timber Market, Accra. Since 1972 the Secretariat has been moved four times. Now it is within the Social Advance Institute Building near the Greater Accra Regional Administration.

On 17th July 1966 a decision was made to build a National Headquarters. A Building Fund was launched by the late Gen. E. K. Kotoka. A Building committee was set-up by Council. Unfortunately up to date the building has not taken off.

The Secretariat is currently being run by the Hon. Gen. Secretary and his Assistant. They are aided by four employees led by an administrative secretary.

Fellowship of the Society

At its 32nd Conference twelve years ago, the society for the first time made five members fellows. The investiture was performed by the then President Mr. V. K. Aidoo, at the end-of-conference Dinner and Dance held at the Banqueting Hall of the State House, Accra. Present were commissioners of state, members of the Diplomatic-Corps, Senior Civil Servants and representatives of other professional associations.

These members had distinguished themselves either in the service of the Society or of the profession as a whole. The five members were:-

1. Samuel Benson Adjepong, 1914-84, a product of Chelsea College, first Chief Pharmacist of the Ministry of Health.

2. Samuel Addotey Allotey, 1913-84, became a member in 1941, was Hon Treasurer, 1954 - 63, Hon. Gen. Secretary, 1963 - 71 of the Society, and served on the Pharmacy Board for 12 years.

3. James Ebenezer Kwasi Djan, 1918-82, became a member in 1952, and soon the Vice-Chairman, Accra Branch and Hon. Treasurer of the Society from 1968 - 71.

4. Bernard Eugene Dua Ofori-Atta, 1919 - 76, became a member in 1940, the Vice-President, 1952-66, and the President 1966 - 71.

5. Albert Nii Tackie, then 49, a product of Korle-Bu and Chelsea College, appointed Professor and head of Department of Chemistry, Faculty of Pharmacy, UST, Kumasi, 1964 and later the Dean of the Faculty, a post he held until 1975 when he became the Executive Chairman, Council for Scientific and Industrial Research (CSIR). He is a fellow of the Pharmaceutical Society of Great Britain and a Chartered Chemist. He was a member of Council from 1957 to 1973.

Professor Tackie is a Fellow of the Ghana Academy of Arts and Sciences and the first Ghanaian Fulbright Professor to teach and carry out research in medicinal chemistry at the school of Pharmacy, Duquesne University, Pittsbury, USA, and a member of the Pharmacognostical Society of the USA. He is still actively in the forefront of the profession and is currently in Liberia to set up a new Pharmacy School in Monrovia at the instance of the WAPF.

The Society now has eighteen Fellows including two members of

the Pharmaceutical Society of Great Britain. These are:-

Eric Allman (British)	1979
Ago Simamonds	,,
T. Ofosu Eck	,,
H. K. Wellington	,,
S. K. Adjei	,,
E. W. L. Addy (Posthumous)	,,
J. K. Amuquandoh	,,
Mrs. Pat Carless (British) (Hon.)	1981
V. K. Aidoo	1983
T. E. C. Sagoe	,,
N. O. M. Tagoe	,,
R. C. A. Nettey	,,
Dr K. Sarpong	,,

The designation of Fellowship is FPSG.

Presidential Chain of Office:-

In its 50 years history the society has had twelve presidents. The chain of office is as follows:-

William Ayiah Hansen (Founder)	1935
J. E. Brown	1935 - 42
Johnny Amarteifio	1942 - 44
Johnny Hanson	1944 - 48
G. O. Jones-Quartey	1948 - 56
J. A. K. Quarshie	1956 - 61
E. K. Bensah	1961 - 65
B. E. D. Ofosi-Attah	1965 - 71
Victor Aidoo	1971 - 74
Dr. K. Sarpong	1974 - 75
Ago Simmonds	1975 - 81
James Pearce-Biney	1981 - 83
K. A. Ohene-Manu	1983

Affiliations

The Society is a member of the following bodies:-

(a) West African Pharmaceutical Federation (WAPF) of which it is a Founding member.

(b) Federation International Pharmaceutique (FIP) since 1962.

(c) Commonwealth Pharmaceutical Federation Association of which it was a founding member from 1972.

(d) The Society was also a founding member of the Association of Recognised Professional Bodies and it is registered as a Professional Body under the Professional Bodies Registration Decree.

Representations

The Society is represented on several government committees concerned with Drugs and Health Administration in the country. It was also represented in the Constituent Assemblies of 1969 and 1979.

Code of Ethics

A statement upon matters of professional conduct was first produced by the Society in 1957. In Feb. 1973 a new one was approved and published by Council.

The Pharmaceutical Co-operative

The Council of the Society had been encouraging members to form a co-operative-practice. The idea came up in 1966. The Investment Bank was approached for a loan. By Oct. 1971 a Co-operative Pharmacy had been started in Kumasi under the chairmanship of Mr V. K. Aidoo with twenty members. Each member paid a membership fee of ₵100.00 and subscribed 20 shares of ₵5.00. Unfortunately this was closed down in August 1972 because of financial problems.

In August 1973 the co-operative was revived in Accra. It faced many problems, especially of membership. However today the Pharmaceutical Co-operative operates country-wide with a membership of nearly sixty. Share-holding is limited to pharmacists operating their own pharmacies. An Annual General Meeting elects a Management Committee of nine members which deals with the daily affairs of the Co-operative.

It runs an office headed by a Managing Director. The Office is currently in the Modern Ghana Builders Block at Osu, Accra. The Pharmaceutical Co-operatives is currently operating on importation and wholesaling to its membership. It has plans to set up a manufacturing unit. Land has already been acquired for this purpose. For four years now, the Co-operative has been farming on this land and around it pending the establishment of the factory.

A brief historic survey of the practice of the procession in the Country

Pharmacists have been rendering their services in the following branches:

1. General Practice Pharmacy
2. Government and Hospital Service
3. Manufacturing and Wholesale
4. Academic and Research Pharmacy.

General practice Pharmacy

Pharmacy shops had existed from the 1930s. Before 1957 there were many shops in Accra, Tamale, Swedru and elsewhere. There were the large European-owned shops and the smaller Ghanaian-owned ones. Their performance were hampered by low volumes of prescription and free sale of drugs and medicaments. Thus in his report in 1957, Dr. Hanol Davis recommended inter alia, that the Government, that licences to sell poisonous chemical should be granted less freely than then. They should be restricted to areas where there was a genuine public need.

In the early days only a few pharmacists were in this sector. Today over sixty per cent of pharmacists operate from pharmacy shops. Still there are more shops than pharmacists available to supervise. Most of the shops are cited in the cities and towns. They are clustered in commercial areas. About one-fifth of these shops are operated alongside wholesale units.

Until quite recently most pharmacists in this area had been employed by non-professional proprietors. Very often, questions over professional management of the shop and financial problems had led to the pharmacists quiting, leaving the shops unmanned or closed down. Snatching of non-proprietor pharmacists has also greatly increased recently.

On the contrary, pharmacist owned pharmacies are growing especially with the growth of the pharmaceutical co-operative. This is a pointer to the call to limit the business of pharmacy to pharmacists and corporate bodies with pharmaceutical directors. As at Dec. 1983 there were over 280 registered retail pharmacies in the country.

Government and Hospital Service

The bulk of the early pharmacists were bonded to government service. Apart from the few who joined the military, they worked mainly in the government hospitals, health posts and medical stores. The pr

blem of the government pharmacists at that time were as follows:

1. Grading in the service.
2. Bonding to the service
3. Status of the profession
4. Remuneration

There was a steady drain of pharmacists in Government service from 1953. This trend was reversed in the 1960s. The problem over status was solved with reestablishment of the Pharmacy Division of Ministry of Health with pharmacists as administrators. The industrial hospitals, especially those of the various mines and certain mission hospitals have also been taking on pharmacists.

The Standards Board had also been enjoying the services of pharmacists. Customs and Excise Department still needs pharmacists for professional handling of the many drugs that pass through their various check points. They lost their last pharmacist several years ago.

Today the Government still remains the biggest employer of pharmacists. Nevertheless, it has only 65 out of about 250 pharmacists it requires. The unsolved problem of poor conditions of service remains the prime course of the loss of Government pharmacists.

Drugs take a large chunk of the national budget. Large amounts of it could be saved from going to waste through proper and responsible custody. It is time the Govetnment registered its Hospitals Pharmacies and Medical Stores with the Pharmacy Board. The iden is to have superintendent pharmacists who will be professionally accountable for stock at these places.

Manufacturing and Wholesale

Manufacturing of Pharmaceuticals in the country is a post-independence affair. There are twenty-four companies including Ghana Industrial Holding Corporation (GIHOC) Pharmaceutical Co. Ltd. The latter is the largest manufacturer, producing a large assortment of generic drugs — tablets, capsules, suspensions, syrups and injections. The company, cited in Accra, started operating in 1969 and has been the main supplier of generic drugs in the country.

There are seventeen other companies in Accra, three in Kumasi, Ashanti Region. One in Cape Coast, Central Region. All these companies produce patent drugs mainly tablets and liquid preparations. Over ten per cent of pharmacists in the country are employed by these manufacturing firms, mainly in their production departments.

The Pharmacy departments of certain government hospitals are also equiped for small-scale manufacturing.

The firms had been producing far below capacity. They are dependent on foreign raw materials, the importation of which the nation's economy had not been able to support optimally.

All the manufacturing firms operate wholesales from where their products are distributed. Most of them are local agents for various foreign manufacturers whose specialities they distribute.

Also there are non-manufacturing pharmaceutical wholesalers who operate as representatives of foreign manufacturers. Pharmacists in this sector render consulting service on the specialities of their various companies, detailing, promoting and selling them.

Academic and Research Pharmacy

Services in this sector came up with the establishment of the Faculty of Pharmacy at the UST, Kumasi, Ghana Medical School and the Centre for Scientific Reserach into Plant Medicine, Mampong-Akuapem.

Conclusion

Pharmacy was introduced into the country by legislation rather than by training. Training was from inception and for several years a problem. The course content, training staff, facilities, and in fact the policy of the colonial government with respect to pharmacy development were deplorable. The government little realised the importance of the practice of pharmacy.

In the early days, the scope of pharmaceutical service was limited to the government and to post-nursing store-keeping and dispensing. The society was in fragments and without official recognition. Private practice was virtually by foreigners only. There was no pharmaceutical manufacturing firms.

The administration of pharmaceutical affairs was rather undefined and haphazard. Administrative authority was vested in just one office—i.e. that of the Director of Medical Services. Pharmaceutical legislation was woeful and often the cause for agitation of pharmacists.

Progress has been very, very slow. Nevertheless, though there are still difficulties, today, there is a lot of true professionalism in the practice of pharmacy in the country.

There is only one Pharmaceutical Society in the country and it is officially recognised. The government has a Pharmacy Department which formulates pharmaceutical policies. There is the Pharmacy Board which regulates the practice of the profession and the Faculty of Pharmacy, University of Science and Technology, Kumasi, that trains world-class pharmacists.

In fact, the skills of pharmacists in the country today are not adequately tapped. the number of hospital pharmacies has increased tremendously and so is the number of pharmacy shops. These are backed by a good number of pharmaceutical manufacturing firms. Pharmaceutical research is carried out predominantly by the Faculty of Pharmacy, UST, Kumasi and the Centre for Scientific Research into Plant Medicine, Mampong-Akuapem. Today, there is a Pharmaceutical Co-operative which used to be a dream in the early days. With this the number of pharmacist—entrepreneurs is increasing—a good sign for better drugs control. So it has been a slow but commendable progress so far.

The current problems are with legislation, financing of pharmaceutical inputs and maintenance including remuneration for services. The existing pharmaceutical legislation is obsolete, ineffective and difficult to implement.

Expectations of the immediate future are as follows:

Current efforts to update the pharmaceutical legislation would be crowned by the enactment of the Pharmacy Council and the Drugs and Cosmetics Bills.

The on-going economic resuscitation programme in the country will succeed and thus solve the financial and imputs problems of pharmaceutical services and also the remuneration of pharmacists.

The Pharmaceutical Co-operative would successfully venture into manufacturing and embrace more pharmacists.

Hospital pharmacies would regularly manufacture or prepare all the basic pharmaceutical needs of the hospitals.

The output of local manufacturing firms would at least meet the country's demand for basic drugs at tolerable prices and terminate the import of finished pharmaceutical goods.

The pharmaceutical services in the country would regularly finance fruitful research into our medical plants for use in our hospitals.

In summary, initially, it was a task of carving an appropriate model of the profession, then, the problem of professionals coming together to share ideas and experiences. Along, was the fight for statutory recognition.

Today, the struggle for more effective and fair legislative control and administration of the profession continues.

Today, the labour is on to achieve optimal pharmaceutical services to all communities, in the context of a successful Primary Health Care Programme for the country.

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