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THE PHARMACIST

(The Journal of The Pharmaceutical Society of India)

A Quarterly Journal devoted to
the interests of Pharmacy in India.

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THE PHARMACEUTICAL SOCIETY OF INDIA

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The chief aim of the Society is to advance the interests of Pharmaceutical Chemists in India.

Membership is open to all persons with recognised qualification in Pharmacy. Qualified compounders are eligible for admission as Associate Members. Students undergoing training in Pharmacy are eligible for admission as Student Members.

Monthly meetings are held at which papers on Pharmaceutical subjects are read and demonstrations given.

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PHARMACY IN INDIA.

BY

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Surgeon-General with the Government of Madras.

PHARMACY may be defined as a branch of the art of Medicine which deals with the collection, preparation, preservation and dispensing of drugs and medicines.

India has made great advances in other branches of Medicine but has made very little progress in this particular branch of the subject. The result has been that, though there is a large number of well-qualified doctors who can correctly diagnose diseases and prescribe for their treatment, there are few well-trained pharmacists in this country who can be depended on to collect, prepare, preserve or dispense medicines in a thoroughly reliable manner. The position is akin to a thoroughly efficient general staff without a properly equipped army.

The following causes would appear to be responsible for this unsatisfactory state of affairs :—

1. Practically any one without restriction may sell or dispense drugs including poisons. No special training or qualification is considered necessary for those who follow the profession of Pharmacy in this country. All that is necessary is a big board and a special licence to sell poisons which is easily obtained on payment of money. Thus anything, from mineral acids to vegetable oils and strychnine to sugar, can be bought from the bazaar.

2. Practically anything may be sold in the bazaar as anything else. Calcium sulphate has been sold as quinine. Water (not even pure water at that) has been sold as hydrogen peroxide. The prices charged are no doubt cheap for what the articles purport to be, and the buying public read the labels and are satisfied.

3. No serious attempt has been made till now to train a sufficiently large number of persons with adequate knowledge of the profession of Pharmacy. The country has produced a large number of compounders, but it must be noted that their general educational training is not adequate. The Madras Medical College has been giving a course of adequate training in Pharmacy in the Chemist and Druggist course ; but the course of training has not been very popular owing to the fact that those who have thus qualified are unable to cope with the over-whelming competition by the large number of untrained or inadequately trained persons who are prepared to accept any remuneration, however low.

4. There is complete absence of unanimous public opinion that those who practise the profession of Pharmacy should be adequately trained to practise this art. The country is, however, made to pay a heavy price as it has to pay annually about fifty lakhs of rupees for the importation of patent and proprietary medicines. Whatever the disadvantages of such medicines, they are ready-made for consumption and in most cases reliable in quality and method of preparation. The Pharmacist is thus eliminated, no doubt at heavy cost, but the prescriber and the patient are satisfied.

To remedy the state of affairs, the following steps would be necessary :—

1. Regulation of the profession of Pharmacy by the State, by the provision of the necessary facilities for adequate training of Pharmacist in large numbers and by the restriction of the practice of Pharmacy to such qualified persons.

2. Prevention by suitable legislation of the sale of inferior, adulterated or spurious drugs and medicines.

3. The levying of a suitable duty on patent and proprietary medicines.

SOME ASPECTS OF PHARMACY.

BY

A. N. LAZARUS, M.P.S. (India),

AND

K. VENKATAPATHI NAIDU, M.P.S. (India).

Some General Principles of Dispensing.

DISPENSING is a specialised art and requires not only special knowledge and skill but also a high sense of responsibility and honesty on the part of the dispenser. As in every other profession, good personal habits such as orderliness and cleanliness are invaluable. The motto "A place for everything and everything in its place" is one well worth adhering to. The first thing every morning for the pharmacist to do would be to see that the dispensary is clean and tidy and to see that the stock is replenished. Drugs and preparations which are likely to lose their potency by long keeping, *e.g.*, Tr. Digitalis, etc., should be stored in small quantities and should be replenished by fresh supplies at short intervals. If any such drug or preparation has been left unused for a long time and is likely to have lost its potency, it should not be used in making up a prescription, but a fresh supply should be obtained. Drugs which are likely to undergo chemical change like Adrenalin, Paraldehyde, etc., have also to be similarly dealt with.

The dispensing scales should be checked for accuracy before the regular work for the day is commenced. The bottles and other receptacles required for dispensing should be previously well cleaned and dried. Accuracy, rapidity and cleanliness are the qualities which have to be cultivated by every pharmacist.

When the prescription is presented to him the dispenser should make it a habit to read the prescription first and see if the doses prescribed therein are correct and if the ingredients in the prescription are compatible with one another. He must make a mental note whether all the ingredients in the prescription are available in his dispensary. If any one of them is not in stock with him, he should obtain the required ingredients and then make

up the prescription. If any particular ingredient is not available anywhere, he should get into touch with the prescriber for the necessary alteration in the prescription.

The prescription should always be copied in a regular register kept specially for the purpose and a serial number given to the prescription. At the same time the label should be written out giving the directions as to the administration of the prescribed medicine as given in the prescription. The label should also bear the serial number, the date and the patient's name. These should be written clearly and legibly and in simple language.

While dispensing, all solids should be weighed accurately and all liquids should be measured exactly according to the quantities prescribed in the prescription. Accuracy is a relative term and strict accuracy is only obtainable with accurate standard weights and precision on the part of the dispenser. Slight errors in weighing are however possible, and it is for this reason amongst others that the *British Pharmacopœia* permits certain limits of error in the official preparations. A slight error in weigning large quantities would be negligible, but the same error in weighing small quantities would be likely to prove serious. An error of one or two grains in weighing one ounce would not be appreciable but an error of even a tenth of a grain in weighing one or two grains would be a serious mistake, particularly with highly active drugs. It is, therefore, advisable to exercise the greatest amount of care in weighing small quantities of drugs, especially of poisons. In such instances it would be advisable to use a specially sensitive balance. In measuring liquids, the meniscus should be carefully observed by holding the measure glasses against a good light and avoiding error due to parallax. Bad habits such as over-reaching the mark and pouring out the excess into the sink or back into the original bottles should be avoided. In pouring liquids from the dispensing bottles into the measure glasses, the bottles should be held with the labels against the palm so that the labels may not be soiled by drops of the liquids trickling every time from the mouth to the sides of the bottle. The dispenser should use in making up of the prescriptions all the skill and the care that he would use if the prescription was being

made for his own use. " Do unto others as you would be done by " is a good rule.

It is always essential, after the prescription is made, to have a second check of the label, the prescription and the entry in the register by a senior pharmacist, if available.

The cost charged for the prescription should be reasonable and should be neither too high nor too low. To avoid misunderstanding and possible trouble with the customer it is best to intimate to him beforehand the exact cost as well as the approximate time it would take to dispense the prescription, before commencing to dispense it. In several cases, owing to such misunderstanding, the dispenser has been left with the dispensed prescription on his own shelf.

If there is any doubt as to the correctness of the doses, etc., in the prescription, the dispenser should get into touch with the physician as otherwise he would have to face very unpleasant situations. The errors pointed out to the prescriber should be confidential and the pharmacist should not betray the interests of the prescriber by revealing such errors to the patient or others interested in him.

When a number of prescriptions are being dispensed, care should be taken to deliver them to the proper persons so that the medicine intended for one should not go to another. Ordinary prescriptions may be repeated if required but prescriptions containing drugs of high physiological activity, poisons, narcotics, or habit-forming drugs should not be repeated without a fresh signature by the prescriber every time.

Dispensing or compounding of doctor's prescriptions are thus the concern of three parties, *viz.*, the Doctor, the Pharmacist and the Patient. The doctor has no time at his disposal to dispense his own prescriptions, hence he depends to a very great extent on the expert knowledge and efficiency of the pharmacist and is fully confident that his prescription will be dispensed correctly. Further, the doctor knows that the pharmacist will play his part as a final and counter check in matters of over-dosage or incompatibilities.

In every community the pharmacist occupies a unique and commanding position. He has been aptly described as "the chemist to the common people", possessing cultural attainments and specialised scientific training fitting him to be the guardian of the general well-being and even the lives of his patrons. The confidence and trust of the people placed upon him makes his profession one of high and responsible status. In worthiness and trained efficiency, the pharmacist has no superior.

SOME THOUGHTS ON PHARMACY—ANCIENT AND MODERN.

By

J. C. David, M.B.B.S., Ph.D.

THE history of pharmacy is part of the history of medicine, the development of which is intimately associated with the progress of the human race in letters, science, religion and the arts. The term *Pharmacist* is from a Greek word meaning a drug and is probably of Egyptian origin, being derived from *ph-ar-maki*, which signifies the preparation of medicine from drugs. The Egyptian *pharmaki* who were engaged in that occupation belonged to the priestly class or to the social ranks of academically trained persons comprising priests, physicians, etc.

In ancient Egypt, Assyria and Babylonia, the pharmacists had an identity separate from physicians. ***In Sippara on the Euphrates*** *(1900 B.C.)* the druggists lived in a separate street.

In ancient Egypt as early as 3000 to 1400 B.C. a complete *materia medica* existed. While this contained a number of fanciful or repulsive things like animal excrements, etc., Dr. Singer estimates that *quite 80 per cent of the drugs known to-day were known to antiquity.* The art of Pharmacy was also highly developed. Many of the drugs used later by the Greek and other physicians were clearly borrowed from Egyptian sources. The Ebers' *papyri*, dated 1500 B.C. and discovered in a tomb in 1862, contains a codified list of formulæ and prescriptions. While we may at this time laugh at the inclusion of abnoxious substances

like excrements or menstrual blood, it must also be remembered that the first *Pharmacopœia*, published in London in 1618, contained equally abnoxious substances like the stone removed from a man's bladder, etc.

Some authorities say that, in Egypt, medicine was confined to the temples and that the compounding of medicine was carried out *in a room set apart for the purpose* known as *ASIT* in which the drugs were stored in boxes and in glass and earthenware vessels; further, pharmaceutical operations were entrusted to special assistants, the *Urma*, who received a regular training in the mysteries of the art. Directions for the preparation of unguents have been found on the walls of such a laboratory or *asit*. The physician was also a compounder of medicine, and there were druggists' shops for the compounding and sale of medicinal preparations as well as the perfumed oils, salves, pomades and cosmetics required by the public.

In ancient Assyria, medicinal lore was consigned to writings on clay tablets. About 700 B.C., *Ashurbanipal*, the Assyrian king, caused scores of thousands of such clay tablets to be stored in his palace library. In Babylon, about 2000 B.C., *Hammurabi*, King of Babylon, codified the ancient laws dealing with medical practice. In Assyria, herbarium with medicinal plants and other herb gardens was encouraged; and some of the drugs used by us now are mentioned in a list of 73 garden plants. Various methods of preparing drugs were given such as drying, powdering, stamping in a mortar, pressing out juices, filtering, decanting, digesting, boiling, roasting and heating in a furnace, but not distillation. Babylonians were also adepts in astrology and other occult sciences. The word *Chaldi* came to mean magician, from the word *Magi* meaning revered or learned. The Hebrews probably derived much of their knowledge of medicinal plants from the Egyptians. *Myrrh, frankincense, saffron, the balsam tree*, from which is derived the *balm of Gilead*—were all imported and grown.

Solomon had a great knowledge of natural history and botany. He is also credited with having written a book of prescriptions. In Jewish medicine, the apothecary was more a perfumer than a pharmacist.

In early Greek literature, Pharmacy was in a bad plight along with medicine. The word *pharmakon* (900 B.C.) came to mean either a medicine or a poison. In the classical period from 500 B.C. onwards it had become associated with the *idea of poison*, because the vendors of drugs and the compounders of medicines, poisons, philters and cosmetics, called *Pharmacopoloi*, had acquired a sinister reputation through being associated with poisoners and sorcerers. The business of Pharmacy was neglected and therefore open to undesirable elements such as market stall vendors, hawkers of medicine, travelling quacks, etc., who could be bribed to sell poisons for improper uses. *Aristotle* is said to have made a living in his early days by vending medicines in the market place and, if not the first, he certainly was not the last pharmacist to rise to eminence.

In the *New Testament* the word *Pharmakeia*, the original of the word *Pharmacy* is translated into 'witchcraft' or 'sorcery' and is associated with wickedness and depravity such as the preparation of philters to excite lust, or poisons for criminal purposes. So low had the practice of Pharmacy sunk that the word *pharmacopolos* or *druggist* was used to describe a poisoner, and *pharmakoi* became a name for condemned prisoners. The corresponding Roman words *medicamentus* and *medicamentarius* came to have similar sinister meanings, *viz.*, drug or poison, and druggist or poisoner respectively. From this low estate it was rescued by *Galen* who proclaimed the importance of the pharmacist as the physician's right hand. With the help of his assistants Galen prepared his own medicines—his name is perpetuated by the term *Galenical*—and stored them in wooden receptacles in his *apotheca*, which originally meant any shop or warehouse. Most of his prescriptions take the form of decoctions but he also favoured troches, pills and electuaries, while externally ointments and plasters predominate. His *Ceratum humidum* or *cold cream* still figures in the *Pharmacopœia*. The extensive use of perfumes, unguents and pomades by the peoples of the ancient world must have necessitated a certain skill in compounding, and the compounder *qua* perfumer may have been the forerunner of the compounder *qua* apothecary. The desire for the isolation of the fragrant essence free from fixed oil led to the invention of the *process of distillation*. A water

was distilled from roses (140 B.C., by *Nicander* who speaks of the apparatus as an *ambix* and the process was developed by the Alexandrians and the Arabians specially for the preparation of rose-water, etc.

It was in the early days of the Roman empire under the changed conditions of social life that Pharmacy became a practical art necessitated by the increased number of drugs used and the need for presenting them in suitable forms.

The Arab invasion of Alexandria, although it laid waste to a lot of valuable books, etc., gave a great impetus to the study of medicine, and we owe a great deal to Mahomedan physicians. The advent of Christianity set back the hands of the clock as the priests had a different outlook on disease and its treatment. From superstition, the Moors rescued medicine in Europe and the further advance of medicine dates from this invasion of the West by the Moors. To the Arab physicians, *Rhazes*, *Mansur* and *Avicenna*—all about the *9th century A.D.*—we owe the enrichment of the *Pharmacopœia* with many drugs which we now use like *camphor*, *senna*, *rhubarb*, *musk*, *aconite*, *datura*, *Indian hemp*, etc. *Mansur* also introduced *many Indian drugs* and thought very highly of Indian Pharmacology. It must be remembered that as early as 1500 B.C., Ayurveda possessed a *materia medica*. More than a thousand plants were botanically classified and detailed directions were given for the preparations of *arishtas* and *asavas* which are the precursers of the tinctures of to-day.

Many new words and terms were derived from Arabic and Persian as, *alcohol*, *alkali*, *alembic*, *arrack*, *naphtha*, *borax*, *tartar*, *otto or atthar*, *jujube*, etc. Even the word *drug* is said to be derived from Arabic *Dowa*, a remedy, by way of *doga* and *droga*. Chaucer (1387) has *dragges*, *drogges* and *drugges*. The Arabian physicians not only added largely to the list of medicines used, especially those of a chemical nature, but they also devoted much attention to the preparation and combination of medicaments and in their *formulæ favoured polypharmacy*. Their medicines were made as palatable as possible, and it is to the Arabs that we owe the *delicious syrups*, *sherbets* and *juleps* and the *fragrant waters* and *conserves*. Avicenna also introduced the *gilding* and *silvering of pills*.

The preparation of chemical and pharmaceutical products as well as the compounding of prescriptions necessitated the assistance of competent persons with skill and knowledge, and in this way *Pharmacy was constituted as a special work*, and the true apothecary appeared.

The Mediœval Period.—Although the whole of Europe after the fall of the Roman empire was in a state of barbarism, in a few isolated centres—chiefly in monasteries, possibly with hospital and garden attached—the doctrines of Hippocrates and Galen were still cultivated. This was notably at *Salerno* near Naples where there had been a medical school since early in the ninth century. *About the middle of the eleventh century* it received an influx of eastern Arabic medical lore by the visit of *Constantine*, an African Christian, who after an absence of nearly 40 years returned from Bagdad bringing with him medical works in Arabic. It is in his works that the name of *antimony* first appears.

The edict of the *Emperor Frederick* was of the utmost importance to Pharmacy as it made regulations ensuring the competence of the *confectionarii* who acted as pharmacists at Salerno. The association of drugs was now with *spices*, *syrups* and *conserves* and it is as *aromatarii* and *confectionarii* that the compounders of medicine were known. This edict may be regarded as the charter of Pharmacy inasmuch as it effected the definite separation of Medicine from Pharmacy and it served as the basis of later enactments of this kind. Its main provisions were: state licence to practise with limitation of pharmacies and of profits, the control being vested in the medical faculty, physicians forbidden to own or carry on a pharmacy or to make arrangements with pharmacists for personal profit; lastly, the adoption of an official standard for medicines with regulations for ensuring compliance with the standards set up in this work and the provision of penalties in case of fraud or adulteration. Certainly in the 13th century we find the apothecary preparing the medicines ordered by the physician. In 1350 a Nurenberg ordinance forbade physicians to be interested in the business of an apothecary and required apothecaries to be satisfied with moderate profits. The title of apothecary had different meanings in different countries. In England as

there was no restriction on medical practice, apothecaries became medical practitioners also.

The *separation of Medicine from Pharmacy* effected by the edict mentioned above made the enforcement of official standards ensuring uniformity in the compounding of prescriptions an imperative necessity, and we now come to the period which witnessed the gradual introduction of *Pharmacopœias* compiled by officially recognised bodies. Such authorised guides were published from time to time in the important medical centres of Europe. The first of its kind prepared by a specially appointed commission appeared in Florence in 1498. The first official *Pharmacopœia* to be published north of the Alps appeared in Nurenberg in 1546 and was the work of *Valerius Cordus*. The mention of *Pharmacopœias* brings us to the *British Pharmacopœia* and to the history of Pharmacy in England.

In the year 1511, an act of Parliament was promulgated. Under this Act there was instituted one body of practitioners comprising Medicine, Surgery and Pharmacy. The physicians' assistants were called apothecaries. In 1518 the College of Physicians was established, and in 1540 the physicians were empowered to enter the establishments of the apothecaries and inspect their drugs and destroy such as were found unfit. Also in this year the barbers and surgeons were united into one company, but the barbers were prevented from carrying out any surgery except the extraction of teeth while the surgeons were prohibited from shaving. The physicians, however, were allowed to practise surgery. The apothecaries mainly dispensed the medicines ordered by the physicians and the crude drugs were obtained from grocers. In 1606 the grocers and apothecaries formed into one company, but the apothecaries formed a separate society and got a charter in 1617. Under this charter the practice of Pharmacy was taken out of the hands of the grocers or druggists and out of the hands of the surgeons. By practising Medicine as well as Pharmacy the apothecaries began to encroach on the work of the physicians to such an extent that attempts were made to reduce the position of the apothecaries to that of grocers or druggists.

To compete with the apothecaries the physicians opened dispensaries where both the rich and the poor might obtain advice

and medicines. In effect, at an apothecary's shop persons obtained free advice but paid high prices for their drugs; whereas in the physicians' dispensaries drugs were cheap but a charge was made for advice.

The persons employed in the physicians' dispensaries obtained a working knowledge of Pharmacy, and with this aspired for independence. They soon opened shops of their own, and constituted the *first* Chemists and Druggists. The apothecaries now attempted to get powers to inspect the shops of the chemists and druggists, in the same way as physicians were permitted to inspect the shops of apothecaries, but failed. In 1795 the apothecaries presented a petition to Parliament claiming that the liberty to vend pharmaceutical preparations and compound prescriptions, physicians should appertain to the apothecaries alone and that a system of educated apprenticeship and examination should be established. The petition was unsuccessful but it resulted in the *chemist and druggist* banding themselves into a society. At this point a cessation of hostilities was called and the two classes united in a protest against the Medicine Stamp Act of 1802. Later the apothecaries definitely quitted Pharmacy under the Apothecaries Act of 1815. The chemists and druggists were ever watchful on their interests and in 1829 a society was formed, and after several vicissitudes in 1841 a new society was formed which was the *beginning* of the Pharmaceutical Society of England, and a Pharmaceutical journal was established. From such small beginnings the Society has developed from strength to strength until now it owns a magnificent set of laboratories, and is the final authority on the standardisation of drugs. Its College is now affiliated to the University of London for the *B.Pharm.* course. Its pharmacological laboratories have attained a fame which is daily increasing its usefulness and the respect with which all work emanating from this source is regarded. Having had the privilege of working there for a short time, I can testify to the greatness of its Director and the other workers in the Institution. The great value attached to the 1932 edition of the *British Pharmacopœia* is not a little due to the amount of laboratory work done in this place and the advice given by the Directors of the Institution. I was in London at the time the revision was progressing, and know the amount of Committee work put in by members working in the laboratory. In addition, the Society publishes the *British Pharmaceutical Catalogue* and the *Pharmaceutical Journal* and the *Quarterly Journal of Pharmacy and Pharmacology.*

DRUG LEGISLATION IN INDIA.

BY

A. SELVANAYAGAM, M.P.S. (India).

IN every civilized country, the manufacture and sale of food and drugs are controlled by law, to protect the people from the evils of impure food and adulterated drugs.

In England, previous to 1875, many statutes were passed against adulteration of tea and coffee, but they were meant more to protect loss of revenue than to protect the public from bad food.

The first Act in England, which attempted to protect the health of the community, was Sale of Food and Drugs Act, 1875. In 1928, a consolidating Act, *viz.*, Food and Drugs (Adulteration) Act, was passed. This dealt with the manufacture, importation, distribution and sale of food and drugs and certain special kinds of food such as butter and margarine. It penalized the adulteration of drugs either by admixture with other ingredients, or by abstraction of parts which affected the drug injuriously in quality or potency. It also made it an offence to sell any drug not of the nature, substance, and quality demanded by the purchaser. This restriction did not apply to proprietary medicines or patent drugs supplied according to specifications of patents in force. This Act did not set up any standards for drugs.

In India, no legislative enactment was made which could directly control the sale of drugs, or prevent adulteration, or ensure their conformity to proper standards. The Indian Merchandise Marks Act, 1889, and the Sea Customs Act contain some provisions, but they are only applicable to imported drugs by punishing misbranding of receptacles containing goods in a manner calculated to deceive any person as to the nature and

quality of goods, while the Sea Customs Act prohibits bringing into India goods with false trade descriptions. The only provision for preventing adulteration is the provision in the Indian Penal Code, Sections 274, 275 and 276, which penalize intentional adulteration and sale of any drugs so as to diminish their efficacy.

During the years 1912 to 1922, a number of Acts were passed in the provinces to protect the public from adulterated articles, but unfortunately these were mainly concerned only with foods, and not with drugs.

In Madras, the Prevention of Adulteration Act, 1918, the City Municipal Act, 1919, and District Municipalities Act, 1920, contained only provisions for inspection of food and not of drugs. The Opium Act, 1878, Poisons Act, 1919, and the Dangerous Drugs Act, 1930, control the manufacture, importation and sale of certain specified drugs only.

The Poisons Act, 1919, merely regulated the importation, possession and sale of poisons by the issue of licenses. The Commissioner of Police in the Presidency towns, and the District Magistrate in the mofussil were empowered by the Government to grant licenses. Why the Police and Magistrates were chosen for this work instead of the Medical profession is not clear. Probably the idea is that, as poisons are used for poisoning, the proper persons to control its sale are the Police and Magistrates. There was no provision in the Act as to who should be supplied poisons and for what purposes. The only restriction is that the licensee should take down the name of the buyer. Up to 1937, the following drugs were treated as Poisons under the Act:—

Aconite, Nux Vomica, Perchloride of Mercury, Potassium Cyanide, Stramonium, White Arsenic, Red and Yellow Sulphide of Arsenic and Phosphorus.

The alkaloids of these vegetable poisons and preparations of the other drugs did not come under restrictions. In fact the Government of Madras in their G. O., Mis. No. 1907, P. H., dated 26th May 1930, replied to a reference from the Pharmaceutical Society of India that the 'Poisons Act' intended to control the sale

not of poisons as such, but ouly of those poisons, which are found to be employed to any appreciable extent for criminal purposes. The Pharmaceutical Society of India has been bringing to the notice of the Government since 1931 of the necessity of replacing this obsolete Poisons Act, 1919, by a more comprehensive legislation on the lines of the Poisons and Pharmacy Act of Great Britain. The Government in 1930 passed amended rules. The new rules brought under restrictions a greater number of poisons, but the main provisions of the Act were not altered, with the result that the Act is meant to control bazaar trade, rather than to protect the public.

The Opium Act, 1878, dealt with the cultivation of poppy, and the manufacture, possession, importation and sale of opium. The Madras Government published in 1918, the Opium rules under Sections 5 and 13 of the Opium Act. Under these rules, two sets of licenses were issued—one to cover wholesale sale of quantities exceeding one tola, and the other to cover the retail sale of drugs of quantities below one tola. Under the Opium Act, anybody could have in his possession one tola of opium. The Excise Department found great difficulty in restricting the use of opium for *bona fide* medical purposes. They were also not aware of the strength of opium in the various preparations of opium with the result that they restricted the sale of the various preparations of opium also to one tola, irrespective of the strength of the opium in it. Thus a person could not purchase more than 180 minims (1 tola) of Tinct. Camphor Co., which contained only 1/13 grain of opium (in 180 minims). It was only after several representations that the rule was amended, so that possession and sale to private persons was limited to a quantity containing not more than one tola of raw opium.

Morphia Rules.—The Madras Morphia Rules, 1918, came into force on the 9th July 1918. These regulations were made to bring the restrictions in India in conformity with the rules enforced in England. This enactment restricted the possession and sale of morphia to licensees. As the Act was administered by the Excise Department, licenses were not restricted to qualified Chemists but granted at the discretion of the Department to one and all who applied.

When the rules first came into force, all prescriptions had to be written on an official form, copies of which were sold at the Taluk Treasury. As these forms were not always available and not convenient to write prescriptions upon, much confusion and delay occurred in dispensing medicines containing morphia. In the Indian States the restrictions were very severe. Even for a tube of Hypodermic Morphia Tablets an import permit had to be obtained from the Excise Commissioner of the State, and another from the Dewan or the Resident who were generally not at Headquarters with the result that it often took some months to get all the necessary permits.

The Council of State passed a resolution in 1929 recommending to the Governor General-in-Council to urge all Provincial Governments to take such steps as may be necessary to control the indiscriminate use of medicinal drugs and to legislate for the standardisation of the preparations and for the sale of such drugs. The Government of India, in 1929, addressed a letter to the Provincial Governments explaining the nature of the problem of drug control and inviting their views on the suggestion of appointing a small *ad hoc* Committee to explore and define the scope of the problem with reference to actualities and to make recommendations as to the measures necessary to arrive at a satisfactory solution.

The Local Governments having agreed to it, the Government of India issued a resolution on 11th August 1930 appointing the Drug Enquiry Committee to explore and define the scope of the problem and to make representations as to the measures necessary.

The terms of reference to the Committee consisted of three distinct heads:

(1) Control over drugs and chemicals recognised by the *British Pharmacopœia*.

(2) Control over known and approved drugs other than those recognised by the *British Pharmacopœia* and medicines made from indigenous drugs and chemicals.

(3) Control over the profession of Pharmacy.

The Drug Enquiry Committee began its enquiry in October 1930 and submitted its report by the end of 1931. Its recommendations may be summariesd as follows:—

1. There should be legislation to control drugs and Pharmacy. The control in respect of drugs should be for those included in the *British Pharmacopœia* and other known or approved medicinal preparations, whether indigenous or not.

2. Legislation should be central with a view to securing effectiveness and uniformity in control throughout India.

3. Legislation for drugs should not be combined with that for foods as the control for the latter should be provincial in view of the varying needs of the Provinces.

4. Legislation may consist of either a combined Drugs and Pharmacy Act or separate Drugs and Pharmacy Acts.

5. A Central Laboratory should be maintained by the Government of India, its main functions being—

(*a*) to prepare and maintain stable standards of strength, purity and quality for drugs;

(*b*) to standardise methods of analysis and tests with due regard to the climatic and other conditions in different parts of India;

(*c*) to do research work on the pharmacological testing of drugs; and

(*d*) to guide, co-ordinate and correlate the work of provincial laboratories.

6. An Advisory Board may be established to assist the Governor-General-in-Council in framing rules under the Act.

7. The sale, manufacture and storage of adulterated, misbranded and unwholesome drugs may be penalised.

8. All offences should be punished under the Act.

9. All manufacture, import and sale of drugs and medicine may be licensed.

10. A Pharmacy Act may be legislated and a General Council of Pharmacy be established.

11. Unqualified persons should be prevented from running Pharmacies.

12. The course of study may be prescribed for a qualification in Pharmacy.

13. The names and titles of Pharmaceutical Chemists, Chemists, Pharmaceutical Chemist and Druggist, Registered Chemist, may be restricted only to qualified persons registered under the Act.

14. Any unqualified person should be prevented from exhibiting a title or sign implying that he is a Pharmacist, unless he is qualified or registered under the Act.

15. The registration of patent and proprietary medicines may be brought about on payment of a fee on the lines of Patent and Proprietary Medicine Act of Canada.

16. A 20-per-cent special duty should be levied on all imported patent and proprietary medicines in addition to the Customs duties.

17. A duty should be levied on medicines with secret formulæ, manufactured in India.

18. Medicines made from indigenous drugs should be brought under control.

19. An *Indian Pharmacopœia* may be compiled.

These recommendations gave universal satisfaction to all classes and commercial bodies in India who did not fail to impress on the Government of India the importance of an early legislation to put a stop to the growing evil of adulteration and sale of drugs of different strengths.

Though the Drugs Enquiry Committee submitted its report on 29th March 1931, the Government of India did not take any action to implement its recommendations until August 1937, when they published a Draft Bill to regulate the import into British India of drugs and medicines. The Draft Bill only regulated the import of

drugs and medicines from outside British India, while the control of manufacture, sale and possession of drugs manufactured or compounded in British India was left to the various provinces who at that time did not contemplate or frame any legislation to supplement the Central Government's Bill. Importers from outside of British India would have been at a disadvantage inasmuch as while all the imported drugs had to conform to standards, drugs of Indian manufacture would be without control. Therefore the importers of drugs raised such a storm of protest through the various Chambers of Commerce that they virtually killed the Bill. The Government of India then requested the various Provincial Governments to draft out suitable legislation based on the recommendations of the Drugs Enquiry Committee, 1931. Some of the Provincial Governments drafted out Bills for introducing same in the Legislative Assemblies.

At this stage the Government of India were advised that there should be uniform legislation in all the Provinces, and this would not be possible if each Province drafted its own measure. The Government of India then requested the various Provincial Governments whether they were agreeable to uniform legislation being passed by the Central Government for the whole of India. Most of the Provincial Governments have agreed to this measure. The Government of India are presumably waiting for the remaining Provincial Governments also to agree to this measure.

THE CHEMIST IN THE SERVICE OF MEDICINE.

BY

C. A. SUBRAHMANYAM, B.A. (Hons.) (Oxon.).

CHEMISTRY, Physics and the Natural Sciences generally have always been the very foundations of medicine from the earliest times, but at no time perhaps has the chemist been such an important contributor to the progress of medicine as at the present moment. It is interesting, therefore, to survey briefly the contribution of the chemist to medicine, but no attempt is made in the paper to deal with the subject in anything but a superficial and

generalised manner. A detailed study would require whole volumes on each aspect.

Perhaps the main theme at any combined discussion of chemists and clinicians, at any common conference or in the intimate collaboration in laboratory and clinic, has been the study, isolation, synthesis and therapeutic applications of hormones and vitamins. And in this particular field the "team work" principle has resulted in the elucidation of most valuable problems and wrought perhaps the most spectacular results.

For a long time past the study of raw and metabolic products of physiological importance has occupied the attention of pure organic chemists, and the work of Emil Fischer on sugars and proteins, Willstatter on enzymes and alkaloids, Wieland on bile acids, Windaus on sterols and related vitamins, Hans Fischer on blood pigments, Ehrlich on the chemotherapy of arsenicals and more recently Butenandt and Doisy on sex hormones, Robinson and co-workers on synthetic œstrogens, Domagk on the chemotherapy of streptococcal infections, represents but a fraction of the results in this field. Particularly in the field of chemotherapy, I think, I can say without fear of contradiction that this co-operation has been most fruitful. The most successful clinicians were those who were assisted by the best chemists and the most successful chemists have been those whose collaborators were the best physicians. The importance of the chemists' work in elucidation of the structure of natural products in the development of therapeutics is apt at the moment to be obscured by the later results of synthetic medicaments. It is wise, therefore, to stress at the present juncture that, except in the case of metal-organic compounds, the direct impetus to synthetic chemotherapy was derived from this work of elucidation of natural products.

The classic example of this effect is given by the case of thyroxin and adrenalin. The effect of iodine on the thyroid was observed by the clinician's experiments but it was the work of the pure chemist, Kendal, in preparing crystalline thyroxin from the thyroid and of another pure chemist, Harington, in synthesising the same, that produced the impetus to research which is not yet finished with the preparation of various thyroglobulins in which

the thyroxin (di-iodo hydroquinine ester of di-iodo thyrotoxin) grouping forms the so-called "prosthetic" or anchoring group. Similarly the preparation of crystalline insulin from animal pancreas gave rise to the orgy of research into improved derivatives culminating in the present popularity of zinc protamine insulin.

Investigation of the circulatory hormone of the pancreas was from the first a joint effort of the clinician, Frey, and the pure chemist, Kraut. And the nucleosides which were originally isolated by Fischer and his school as products of metabolism, have now achieved an undoubted place in the therapeutics of certain types of anæmia. In this case physiological chemistry, as soon as pharmacolcgical methods replaced physilogical experiments, became pharmacology and finally, therapy.

A similar evolution is to be traced in the history of vitamins. It was in 1897 that Eijkman, a Dutch Prison Medical Officer in Java, noticed the presence of a disease remarkably like beri-beri in the hospital fowls which had been changed over (as a measure of economy) from a diet of raw grain to the leavings of cooked polished rice, left over from the prisoners' feeds. Further observation convinced him that the bran of rice contained something which prevented the production of this peculiarly afflicting form of paralysis and even cured it when it had once become established. But Eijkman's medical education had biassed him favour of the accepted theories of nutrition and he jumped to the conclusion that it was in some way concerned with the mineral constituents of rice husk. The more chemically-minded Holkins, starting from the opposite end, so to speak, conducted feeding experiments with synthetic food-stuffs prepared according to formula, containing the requisite amount of proteins, carbohydrates, minerals, etc., to show that there still existed a gap for efficient nutrition and thus proved the necessity for those infinitesimal components so essential for proper nutrition which he called "accessory food factors" and which, he showed, was supplied by rice bran. But it was left to the pure chemist, Funk, to track down the beri-beri preventive factor in rice cortex, which he described as a nitrogenous base and so called it a "*vitamine*" (*i.e.*, "life-amine" from Latin *vita* = life). Thus was born the expression which, owing to its

comparative catchiness as against the more accurate "accessory food factors", came wrongly to be ascribed to the whole lot of essential but infinitesimal components of our food. It took twenty years of further work before this first discovered vitamin was obtained in pure crystalline form from yeast by a team of medicos and chemists working in co-operation at the University of Gottingen and was shown to be a sulphur containing basic amine, thiamine.

With this, the first step in the elucidation of the vitamin complex of yeast was taken. Work then followed on vitamin B_1, the pellagra preventive factor and the growth promoting principle, named "bios" (by an optimistic medico) in anticipation of its discovery and all the rest of it. The pellagra preventive factor has now been shown to be nicotinic acid or its amide, and both these compounds have been prepared in the laboratory by organic chemists.

The same developments have also been taking place in the story of other vitamins. Vitamin A has been prepared pure and identified as a carotene by the work of the famous chemists, von Euler, Karrer and Kuhn.

Vitamin C, the anti-scorbatic principle, which is found in fruits of the citrus family, was at one time hastily identified as a derivative of narcotine, but the brilliant researches of the Hungarian Chemist, Szent Gyorgyi, and his school have shown it to be ketonic polybasic acid allied to glycuronic acid. This substance, named 'ascorbic acid' because of its anti-scorbatic action, has been prepared in pure crystalline form and is now available on the market for therapeutic use, thanks again to the Chemist.

With regard to the anti-rachitic vitamin D, we have to thank the English Physician, Mellanby, for the fundamental discovery that rickets was a deficiency disease, and a Berlin specialist in children's disease who first dircovered that ultra violet light exerts a curative effect. The New York Chemist, Steenbock (you can see, for instance, references to the "Steenbock Patent Process" on any tin of glucose D or other synthetic anti-rachitic vitamin preparation), made the next greatest discovery that certain types

of fatty foods and fodder could be activated by irradiation with ultra violet light. The chemists all the world over then took up the thread and tracked down the pro-vitamin (*i.e.*, the substance which becomes the vitamin under the influence of ultra violet light) to the unsaponifiable fraction in fats and oils. It has now become established that this pro-vitamin is ergosterol.

By fractionation of the mixture of products of irradiated ergosterol, finally the anti-rachitic factor was prepared in crystalline form by the labours of Windaus and co-workers in Germany, and Heilbron and the chemists of the National Institute for Medical Research in London—independently. The coping stone of this structure of co-operative research has not yet been laid, *viz.*, the positive identification of the synthetic calciferol with the vitamin D from codliver oil, but the production of a crystalline substance with the identical qualities of codliver oil vitamin D has, once and for all, solved the problem of dosage and set up a standard for the evaluation of activity. Just as in the partial solution of any problem another set of new questions crop up, so it is here. Why, for example, should an isomer of ergosterol, merely structurally altered by the energy of light, exercise such an enormously powerful effect on calcium metabolism which the original ergosterol did not possess, nor the intermediate forms produced during irradiation which have been named lumisterol and tachysterol? What is the point of attack? What is the mechanism of the change? What is the correlation between the structural change and its therapeutic activity? This opens up a wide field of speculation as to the exact relationship between chemical structure and physiological activity. with which I do not propose to deal in this paper.

We find, therefore, a whole scheme of work which keeps both the medical men and the chemists engaged together. For the sake of brevity I have treated the subject schematically and very roughly. In fact, these paths of research have been very much more interwoven.

The old synthetic pharmaceutical chemistry, of course, retains its position unassailed by the recent work on substance of thera-

peutic value formed in the organism itself and the latter often suggests and stimulates, as I have mentioned earlier, further research in the former field. The discovery of the constitution of adrenaline and its similarity to that of ephedrine (from the Chinese shrub, *Ma-haung*) has provoked the synthesis of various derivatives of hydroxy-phenyl-ethanolamine (such as veritol, etc.) which have marked physiological effects on the vaso-motor system. Here chemistry attempts to unravel the secrets of Nature, improve upon her and might one day surpass her in the production of such substances. Perhaps one day the synthetic products of chemical laboratories will outclass the natural hormones and oust them from the field of medicine as completely as the coal-tar dyes have ousted the ancient natural dyes, indigo and Tyrian purple, from the field of tinctorial chemistry.

Such an effect seems already in evidence in the case of synthetic œstrogenic (female sex hormone-like) substances. The female sex hormone, the principle produced in the ovaries of female animals, is responsible for the growth and function of these characteristically "female" organisation and function in them. The first of these œstrone was isolated by Allen and Doisy (medico and pure chemist respectively) from the ovaries in an active form. Later the closely related derivatives—œstriol and œstradiol—were also prepared. About the same time Aschheim and Zondek (the discoverers of the pregnancy test of that name) demonstrated their abundance in the urine of pregnant women and mares and, from this source, Butenandt, Doisy and Marrian isolated the substance in crystalline form. Butenandt and his co-workers proceeded to establish the constitution of this hormone and proved it to be closely related to the male hormones, both being derived from the steroids characterised by the presence of a fused phenanthrene-chrysene nucleus. Synthetic experiments were tried to produce analogous compounds by chemists, and the products were handed over to doctors for trial. Then it was found that the steroid nucleus was not essential for œstrogenic action and that quite simple benzenoid bodies exerted a very weak but essentially similar action. A number of compounds were tried and, finally, diethyl stilbene (stilboestrol, of commerce) was evolved, which is even more powerful than the naturally occurring hormone and is quite easily prepared.

Similar work was done on many other hormones. The male hormone was isolated by Butenandt and co-workers in crystalline form, and its constitution determined and a derivative—methyl androsterone—has very recently been prepared which exerts a "male-producing" action when administered by mouth.

The hormones of the pituitary glands have similarly been attacked by the combined labours of chemists and medical men. The sex gland stimulating fraction, now called gonadotrophin, the oxytocic fraction (pitocin. orasthin), the blood pressure increasing fraction (pitressin, tonephin), and the growth-promoting and the thyroid-stimulating fractions have all been produced in pure form.

Further work is progressing on the various fractions of liver, the anti-anæmic and the anti-coagulant (heparin) functions of which have been well known. The hormone of the adrenal cortex (cortin) has been recently prepared in active form and has been shown among other things to exert a powerful influence on carbohydrate metabolism. The minor secretions—'tissue hormones' as they are sometimes called—such as choline, histamine, neucleotides, etc., have also occupied the attentions of chemists. Muscle adenylic acid, a compound, a sugar ribose, phosphoric acid and adenine—according to present information—has been prepared and used in the treatment of circulatory disorders.

All these efforts have been successful because of the simultaneous developments in pure chemistry. The evolution of micro and semi-micro processes for the preparation, crystallisation and analysis of milligram quantities of substances have stimulated and been stimulated by the necessities in this field of work.

It has not been possible in this paper, on account of lack of space, to treat of the more purely chemotherapeutic aspects of the subject. Bare mention must be made of the research on quinine bases to find and improve the secret of their anti-pyretic, analgesic and anti-malarial action. Plasmoquin and atebrin have solved some of the anti-malarial problems and a curious but, in the event, fortunate mistake in following up the quinoline structure in

quinine led to the discovery of pyrazolone derivatives, anti-pyrin, pyramidone, melubrin and novalgin in which we have analgesics and anti-pyretics which are better than anything provided by nature.

A similar effort directed to the unravelling of the structure and physiological action of the coca alkaloids have produced the numerous local and infiltration anæsthetics—eucaine, pantocaine, procaine and all the rest of them. Here again the anæsthetic action was not correlated with the complexity of the molecular structure but more upon the effect of the molecular structure on physico-chemical properties and the surface phenomena of their solutions.

The work of chemists in the chemotherapy of protozoal diseases started with the Ehrlich school which prepared the first organic arsenical to be widely used against syphilis. Numerous improvements have occurred on these early compounds and the work has been extended to antimonials. In this field we may congratulate ourselves on having contributed at least one chemist from our country, the one who prepared urea stibamine for the treatment of Kala-azar.

There is yet another field where medicine owes a great debt to chemistry. I refer to the synthetic chemicals which have been evolved as disinfectants. From simple hypo-chlorites through various phenol derivatives, acridine derivatives (like proflavine and acri-flavine) and the organo metallic compounds like mercurochrome, the chemist has contributed a legion of powerful weapons against sepsis, and this work is still continuing.

In this connection, the work of Domagk on the chemotherapy of streptococcal infections must be mentioned. The first preparation to be effective was an azo-dye, prontosil rubrum which had an astonishingly specific anti-streptococcal effect but was suspected to be somewhat too toxic for long continued administration. Chemical investigation of its action in the blood showed that its effectiveness was due to the formation of para-amino-benzene-sulphonamide from it in the tissues. So this latter compound, sulphanilamide as it is now called, was prepared and

has attained wide popularity. More effective and less toxic derivatives of this body (proseptasine, etc.) were then made and the latest of them (M. & B. 693) has extended its application to the treatment of gonococcal and pneumococcal infections.

The exact mode of these drugs is still a matter of debate but it appears more or less certain that they act by making the invading organisms more vulnerable to the phagocytes and the natural protective mechanisms of the body; and very successful results have followed the combined use of these drugs and specific immunotherepy in the case of these infections.

The latest field of invasion by chemistry in what was once strictly the concern of the bacteriologist has been the study of the chemical relationships of toxins, anti-toxins and complements, and it has been used in the manufacture of sera and vaccines of a potency and specificity hitherto unknown. The so-called "protein-free" preparations owe their existence almost entirely to the activities of a band of chemists who have exclusively devoted themselves to this study. It is not my purpose, however, to enter here into a discussion of the chemistry of immunity and immune therapy.

It has not, of course, been possible within the scope of this article to do more than just indicate the debt modern medicine owes to chemistry. Valuable results have been arrived at in the last quarter of a century but a wide horizon of future work extends before us. "Every modest result from individual researches produces in its turn new questions, but much must be accomplished in each single field, until all can be fitted into a single harmonic whole and we can gain a deeper insight into the happenings of nature. To co-operate in this, is in the first place the common task of medicine and of chemistry between which Pharmacy stands as the border land and connecting line of communication." Thus an eminent pharmaceutical chemist has expressed what I have taken as the somewhat ambitious theme of a short article.

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ANTISEPTIC AND MEDICATED SOAPS.

By

H. J. BROUGHTON, M.P.S. (India).

THE manufacture of soap is a speciality, and is not recommended as a whole-time job for the pharmacist. But he can use his scientific knowledge and make the manufacture of medicated soaps a side line of his business. Such a side line will be profitable and help to supplement his income when business on the pharmaceutical side is dull. The pharmacist could specially use his knowledge in the manufacture of medicated soaps for which there would appear to be a constant demand from the public. The following observations, which are based to some extent on personal experience, may, therefore, be found to be of practical utility.

Soaps are generally made by (1) the "Boiling" or "Hot" process, and (2) the "Cold" process—the oil being treated with the required amount of alkali in each case.

The pharmacist has neither the time nor the facilities for the first process. The "cold" process, however, is simple and does not require the use of special apparatus. It lends itself to easy manipulation as a cottage industry, but requires very careful adjustment of the oils and alkali, with which the pharmacist, with his technical knowledge and ability, would be well able to cope.

The oils which lend themselves to the "cold" process are nut oils, especially cocoanut oil, which are cheap and abundant in this country. Cocoanut oil may be incorporated with other oils such as groundnut oil and/or rosin. The incorporation of rosin leads to a product with profuse lathering properties, and makes the soap soft in texture.

The alkali used is either sodium hydroxide or potassium hydroxide, depending on whether a hard soap or a soft soap is required. In the Indian climate hard soaps are more desirable, and therefore sodium hydroxide would be preferable.

During the preparation of the soap, the required medicament is incorporated in the mixture of oil and alkali at the close of emulsification, and the soap is then allowed to set. After setting, it is cut to the required size, stamped and packed. A brief description is given below of the various stages of manufacture.

Choice of Oils.

The choice of oils would depend on the consistency and quality of the soap required. Cocoanut oil, alone, gives a hard product with profuse lathering properties, but wasteful in use. Groundnut oil gives rise to a soap with a softer consistency. Gingelly oil (sesame oil) is not very suitable because of its high fatty acid content, and eventually gives rise to too soft a consistency. Margosa oil is not added as such, but small quantities may be added to other oils. Its so-called medicinal value would appear to be more psychological than real.

A satisfactory mixture of oils is two parts by weight of cocoanut oil to one part by weight of groundnut oil, and such a mixture is cheap, as both the oils are available abundantly.

Modus Operandi.

The requisite amount of NaOH as calculated is dissolved in twice its weight of water. This solution, known as "lye," is cooled to blood heat and then added to the mixture of oils, with constant stirring. When emulsification is complete, the mixture is set aside till it reaches the consistency of butter. The required medicament is then added and thoroughly stirred in. The partially saponified mass, after being perfumed, is run into suitable frames and is set aside for a day, when it will be found to have completely solidified. The mass is cut to size, stamped and packed. For the completion of saponification the cakes are stowed away for a week. Any colouring matter, if intended to be incorporated with the soap, should be oil-soluble, and may be dissolved in the oils before saponification. Alternatively, the medicament may be incorporated during milling, but it is not possible to mill soaps effectively without costly machinery.

Chemistry of the Process.

The chemical actions involved are shown in the following equation:—

$$\begin{array}{l} CH_2OR^1 \\ | \\ CHOR^2 \\ | \\ CH_2OR^3 \end{array} + 3NaOH = \begin{array}{l} CH_2OH \\ | \\ CHOH \\ | \\ CH_2OH \\ \text{(Glycerol)} \end{array} + \underset{\text{(Soaps)}}{NaOR^1 + NaOR^2 + NaOR^3}$$

where R^1, R^2 and R^3 are fatty acid radicals.

The products are glycerol and a mixture of sodium salts of the fatty acids constituting the soap. In the "cold" process the glycerol formed is left with the soap, so that the product obtained is what is known technically as a glycerine soap.

The weight of the alkali required for the saponification is calculated as follows:—

The saponification value of the oil is determined by the method well known to all pharmacists. Details of this will not therefore be given here. The saponification value represents the number of milligrams of KOH required to completely saponify one gramme of the fat or oil. The number of grammes or ounces of KOH required to saponify the weights of each of the oils in the mixture, is then calculated.

The molecular weight of KOH being 56, and the molecular weight of NaOH being 40, the weight of KOH required, multiplied by 5/7, gives the weight of NaOH necessary in cases where NaOH is used in soap making. A concrete example is given below:

Suppose two viss of cocoanut oil and one viss of groundnut oil are taken. One viss = 50 ounces. Taking the saponification value of cocoanut oil as 258, this number of milligrams of KOH would be required for 1 gramme or 1,000 milligrams of cocoanut oil for complete saponification. 100 ounces of cocoanut oil would therefore require 25·8 ounces of KOH or 5/7×25·8 (=18·4 ozs.) of NaOH. Taking the saponification value of groundnut oil as 195, 50 ounces of groundnut oil would require 9·75 ounces of KOH or 6·96 ounces of NaOH.

So a mixture of two viss of coconut oil and one viss of groundnut oil would require 25·4 ounces of NaOH. This weight of NaOH is dissolved in 50·8 ounces of water, and the procedure for the manufacture of the soap, outlined above, followed.

Soap in itself is a mild antiseptic, but in practice an antiseptic soap is understood to be one which incorporates an extraneous substance which has such a property.

Phenol (Carbolic Acid) is the commonest antiseptic used for this purpose. It may be added to the 'lye' before the latter is mixed with the oils, or as an alcoholic solution just before the mass of partially saponified oils is transferred to frames. Phenol soaps are tinted red, and usually contain about 5 per cent of the medicament. But products containing a higher percentage of carbolic acid are also manufactured for specific purposes.

A product of doubtful antiseptic value is the so-called iodine soap. The average proportion of iodine used in products of this description is 0·5 per cent, but most of it usually combines with the alkali to form iodide and iodate, as is illustrated by the following equation:—

$$6\ NaOH + 3\ I_2 = 5\ NaI + NaIO_3 + 3\ H_2O.$$

Even if, in an absolutely neutral soap, traces of free iodine do occur, such traces are converted into iodide and iodate immediately the soap is used, owing to its hydrolysis in aqueous solution, with the consequent liberation of alkali. In view of the above, it is very doubtful whether iodine soap bears out the claims made for it by manufacturers. Many an iodine soap seems to smell of iodine, but as this odour is comparatively easily suggested by the judicious use of cresylic acid and iodoform, this attribute is no criterion.

Biniodide of mercury (0·5 per cent) soaps are used extensively for such skin disorders as pimples, prickly heat, etc., and seem to be favoured by professional people like doctors and nurses, who find the need for an effective antiseptic soap in the course of hospital and private practice. Soaps containing mercurials are usually tinted green.

Beta-naphthol soap is an effective adjunct in the treatment of scabies.

When manufacturing a sulphur soap, care must be taken to see that a sufficiency of water is added to ensure that the finished product is of a proper consistency. As sulphur soaps contain 25 per cent of the medicament on the average, the necessity for the above adjustment will be appreciated. Elsewhere in this

article the 'lye' was recommended to be made up with one part by weight of NaOH and two parts by weight of water. A sulphur soap would probably require the water to be increased to 2½ parts by weight.

In addition to the above, very many other substances are incorporated in antiseptic and medicated soaps.

The perfuming of such soaps provides the manufacturer with scope for augmenting their antiseptic value. It has been found that volatile oils such as thyme, organium, rose, clove, etc., possess highly antiseptic properties. Cavel determined that organium oil, for instance, at a dilution of 0·1 per cent no longer showed antiseptic value, whereas for phenol this stage was reached at a dilution of 0·56 per cent. The antiseptic value of organium oil is, therefore, 5·6 times as great as that of phenol. Similarly, the antiseptic values of thyme oil and bitter almond oil are eight times and twice, respectively, as great as that of phenol. A perfume which incorporates such oils as the above will, therefore, be by itself of some antiseptic value, and tend to increase the efficacy of the main medicament.

INCOMPATIBILITIES AND THE METHODS OF AVOIDING THEM.

(*Continued from Vol. I, No. 1, p, 27.*)

BY

J. S. GANDHEKER, B.A., M.P.S. (India).

Chemical Incompatibility.

THIS type of incompatibility is mainly due to changes in composition on account of chemical dissociation or decomposition, and such changes may or may not produce any altered appearance in the preparations. It also may or may not have any effect upon its therapeutic value. An intelligent study of chemical incompatibility demands of the student a comprehensive knowledge of the physical and chemical properties of a wide range of substances. This will never become such an old subject as to be relegated to a corner, for

as has been rightly pointed out by Cook and Lawall, new remedies are continually coming into the market and unusual combinations will result as long as some few medical practitioners learn much of their prescription writing by the trial and error method. The medical curriculum, too, is to an extent responsible for it as it provides little training in prescription writing and much of what little is taught is almost forgotten by the medical graduate by the time he enters the profession. In medical journals and books a mysterious silence hangs over the subject. No one is better fitted to make a comprehensive survey of the subject than an intelligent pharmacist, who is aware of the fundamental laws of physics and chemistry, has a comprehensive knowledge of the physical and chemical properties of a wide range of substances and, last but not least, has a large clientele.

To-day there is many a pharmacist who advertises himself as one that compounds prescriptions "exactly as written" and one ought to beware of him for he is either a fool who does not know the A, B, C of the duties of a pharmacist, or a knave that wants to dupe the public, or presumably both. A pharmacist should exercise his skill in the interests of the physician as well as of the patient and must be intelligent enough not only to recognise an incompatibility but also to overcome it in such a manner as to satisfy the intentions of the prescriber. Failure on the part of the pharmacist to do so often lands him in difficult situations, as in a historic case[1] in Philadelphia where a pharmacist dispensed the prescription,

℞

Phenolis	1 fl. dr.
Aquam q.s. to produce	1 fl. oz.,

as it was written, with consequential harm to the patient who used it. The pharmacist who dispensed the prescription *as written* was evidently not aware of the danger attending on his negligence to dispense it properly. If he had only used a drachm of glycerin in dispensing the prescription, he could have saved the patient, satisfied the intention of the prescriber and avoided himself the most unpleasant task of being hauled up in a court of law. But then he was one who compounded prescription "exactly as written"!

1. Remington's *Practice of Pharmacy*, p. 1772.

Here is another example of a prescription where the professional skill of the pharmacist could be excercised in compounding in such a manner as would conform to the intention of the prescriber:—

℞

Pot. bromide	ʒ iss
Soda salicylas	ʒ ii
Caffeine citras	ʒ i
Tinc. colchici	ʒ iii
Sodii sulphas	℥ i
Syrup	ʒ vi
Aquam ad	℥ vi

$\frac{1}{12}$ *part t. d.*

If the above prescription is dispensed "exactly as written" the resulting mixture will not be homogeneous, but one containing a bulky precipitate of salicylic acid. Though theoretically caffeine citrate is a neutral salt of caffeine and citric acid, yet in solution there is always hydrolysis, free citric acid being present, for the reason that caffeine is a weak base and citric acid is a strong acid. When it is mixed with sodium salicylate, salicylic acid is thrown down as a bulky precipitate. The intention of the prescriber is quite obvious, *viz.*, to have caffeine in the mixture. So a skilful pharmacist would make a slight alteration in substituting an equivalent amount of caffeine instead of caffeine citrate and thereby make the mixture presentable in form, which would not mar the intention of the prescriber. With sodium salicylate, just as in the case of sodium benzoate, caffeine forms a soluble compound.

As I write this I am reminded of a humorous anecdote once told by my present Professor, while attending a demonstration class on hydrogen sulphide, of how in the good old days when pearl-white (bismuth oxychloride) was a favorite toilet powder, a fair young lady who used this powder, was transformed into a Negress (of course quite charming from a Negro's point of view). To us who know the reason for such a change it is quite clear that it was not the intention of the manufacturer of this toilet powder

to transform fair beauties into Negresses. And such an incompatibility as the above one is quite unintentional and only accidental. At the same time mention may be made, where an incompatibility is quite intentional, such as the use of hydrogen peroxide in the manufacture of blondes which is achieved by applying a weakly alkaline solution of hydrogen peroxide to the hair, the alkali used being dilute ammonia.

One often comes across prescriptions that are chemically incompatible but quite intentional on the part of the prescriber. When some of the prescriptions are dispensed, a precipitate is produced either immediately or gradually in course of time. We have a classic example of intentional incompatibility in the prescription:

℞

Plumbi acetatis	ʒ ss
Zinci sulphatis	gr. xv
Aquæ rosæ	fl. ℥ iv

Sig.: Use as an injection.

In the above prescription the production of a precipitate of lead sulphate is due to the chemical reaction of lead acetate and zinc sulphate in solution, resulting in the formation of the insoluble lead sulphate, that is thrown down as a precipitate. Separately lead acetate and zinc sulphate are often used externally for their astringent effect, and it is found in practice that if the precipitated lead sulphate is finely subdivided and incorporated uniformly at the time of injection, the coating of lead sulphate on the mucous surfaces exercises a soothing and protective effect, which is very advantageous to the patient, and such an injection could be made by a skilled pharmacist by dissolving them separately in equal portions of rose water and then mixing the two solutions by pouring the lead acetate solution gradually into zinc sulphate solution with constant stirring. It is, however, to be noted that prescriptions containing lead in any form should be tabooed owing to the risk of lead poisoning.

Here is another instance which, if not dispensed properly, would produce a precipitate of calcium sulphate:—

℞

Calcium hypophosphite	ʒ i
Pot. sulphoguocolate	gr. 30
Magnesium sulphate	ʒ iii
Syrup lemonis	ʒ iii
Aquam ad	℥ vi

Sig.: ℥ i *t. d.*

In this particular case the physician himself had given instructions to the pharmacist—a very rare instance—as to how to dispense the prescription. If the magnesium sulphate is dissolved separately in hot water and cooled and then added to the main bulk of the mixture with constant stirring no precipitate will be formed. If dispensed otherwise, *i.e.*, in the order of the medicaments in the prescription, a white and heavy precipitate of calcium sulphate will be the net result.

In prescriptions containing alkaloidal salts, if the prescriber is a little negligent, the base is often thrown down in some form or other. As, for instance, in

℞

Quinine sulphate	gr. x
Potassium acetate	gr. xv
Acid sulphuric dil	m. xv
Aqua cinnamon to	fl. oz. 1,

the trouble is mainly due to the formation of quinine acetate which could be overcome by using aromatic elixir, instead of cinnamon water as a vehicle, which of course should be done with the permission of the physician. There is also another method of avoiding the trouble by completely omitting the sulphuric acid and suspending the quinine sulphate in cinnamon water with suitable proportion of gum acacia, then adding potassium acetate and finally affixing a "Shake the bottle" label to the bottle.

In the following prescription:

℞

Ext. Ergot liquid	m. xx
Quinine sulphate	gr. 3
Acid sulphuric dil	q. s.
Hexamine	gr. v
Rect. Iodine	m. v
Tarc. Card. Co.	m. xv
Aqua menth-pip ad	℥ i

Ft. mist. Send 6 oz.

the incompatibility is due to hexamine and rectified iodine. The one due to hexamine can be overcome by dissolving it separately in water and then adding it to the main bulk. But the incompatibility due to rectified iodine (Liquor iodi simplex, *B. P.* 1932) cannot be overcome as it is, for quinine forms a precipitate with iodine in acid solution. It can be overcome by omitting the acid and suspending the alkaloidal salt in gum.

Some fatal cases have been known due to the precipitation of the alkaloidal compound on account of insufficient quantity of vehicle to keep the precipitated alkaloidal salt in solution as in

℞

Strychnine sulphate	gr. i
Potassium bromide	ʒ vii
Aqua distillata ad	℥ viii.

Here, due to potassium bromide, after a few hours strychnine begins to separate as a bromide, a microcrystalline precipitate, which on account of its inconspicuous character and smallness in amount, might be entirely overlooked by the patient and allowed to settle at the bottom of the bottle, with the consequential dangerous result of most of the strychnine being taken with the last dose.[2] The precipitate is highly insoluble in water (about 1 in 7,000). So in the above prescription nearly 12 ounces of water are required to keep the precipitate in solution.

2. The fatal case of a lady in England to whom the above prescription was dispensed is mentioned in *The Art of Dispensing*, p. 451.

In the prescription—

℞

Cocaine hydrochloride	gr. v
Sodium borate	gr. x
Aquæ distillatæ ad	℥ i

M. gt. soln.

Sig.: Two drops in each eye at night—

sodium borate, a salt of a weak acid and a strong base, undergoes hydrolysis in solution and is alkaline in reaction. This alkalinity causes the precipitation of cocaine with the production of a turbid mixture. This can be remedied by omitting sodium borate and using an equivalent amount of boric acid which would give a clear solution that would conform to the expectation and desire of the physician.

An incompatibility in a prescription may also be due to the evolution of gas when an acid is added to a solution of a carbonate or bicarbonate, but in many a case such an incompatibility as this is quite intentional. It is the underlying principle in effervescent mixtures. The carbon dioxide that is evolved is designed to act as a gastric sedative. In such prescriptions as that of effervescent mixtures, the two solutions containing the acid and the alkali carbonate or bicarbonate are dispensed separately in two bottles and a dose from each is mixed just before taking the mixture. That is the same principle in powders like Seidlitz powder. Sodium potassium tartrate and sodium bicarbonate kept in separate wrappers, are dissolved separately in water; both solutions are mixed and taken while effervescing.

In the formula for Liquor calcii lactatis of the *B. P. C.*, we find another instance of intentional incompatibility. Since the calcium lactate that is formed is the desired result, no harm is done till the evolution of all the gas ceases and then bottling.

But the real trouble arises in cases of prescriptions that contain bismuth subnitrate or salicylate with sodium bicarbonate. The bismuth salts are acid in reaction on account of the hydrolysis they undergo in solution, and the effervescence takes place slowly and the bottle should not be corked till effervescence stops, lest it should burst.

Of the prescriptions that cause some trouble to the dispenser, is the one that contains oxidising agents. Spiritus ætheris nitrosi often gives trouble to a dispenser, especially in prescriptions having potassium iodide as an ingredient. The spirit contains ethyl nitrite which in aqueous medium undergoes hydrolysis according to

$$C_2H_5NO_2 + H_2O \rightarrow 2\ HNO_2 + C_2H_5OH$$

with the production of nitrous acid. Nitrous acid thus produced reacts with potassium iodide, liberating free iodine. Though free iodine is used medicinally, yet iodine liberated in a mixture as above is an undesirable thing. So a prescription as

℞

Potassium iodide	grs. xx
Spritus ætheris nitrosi	℥ i
Aquam ad	℥ ii,

if dispensed as such, will be contaminated with free iodine. This could be avoided if the nitrous acid, that is formed due to hydrolysis of ethyl nitrite in the sweet spirit of nitre, is in some way removed from the sphere of action without altering medicinal value of the mixture. This could be accomplished by neutralising it with sodium bicarbonate and the resultiug sodium nitrite having the same medicinal value as that of ethyl nitrite. So, for every drachm of the spirit 1½ grains of sodium bicarbonate is added after neutralising the spirit with half the quantity of water to provide for hydrolysis, and if potassium iodide is added afterwards finally making up the mixture with the remaining water there would not be the liberation of iodine.

Of all the oxidising agents commonly used in prescriptions, potassium chlorate is the most dangerous one, for by nature it is quite provocative to rough handing. A slight rubbing of it with some organic agent such as sugar, carbon, will cause explosion. Vigorous rubbing of potassium Chlorate alone may cause explosion, due to the decomposition that is brought about. Instances of fatal accidents are on record due to negligent handling of potassium chlorate. So a dispenser ought to take the utmost care in compounding a prescription that contains potassium chlorate, and if organic matter is co-prescribed he should draw the attention of the

prescriber to the danger of such combinations. Potassium permanganate, another oxidising agent, is occasionally prescribed in pills. The exipient that is used should be a non-oxidising agent such as kaolin.

Often the ferric compounds are a source of trouble in a prescription. The iodides are oxidised by ferric salts. As for instance ferric chloride reacts with potassium iodide according to

$$FeCl_3 + KI \rightleftharpoons FeCl_2 + KCl + I.$$

As it is, there is no satisfactory method of correcting a prescription that contains a ferric salt and an iodide. It could in a way be done by precipitating all the iron as hydroxide by adding ammonium hydroxide, but then it will not conform to the æsthetic appearance of the mixture, as it will be quite unsightly to look at. Or the ferric salt could be converted into an organic compound by the addition of an alkali citrate or tartrate, but this will alter the composition. So, such a prescription should be referred back to the physician for the substitution of the ferric salt by Ferri et ammonium citrate.

An account of chemical incompatibility will not be complete without reference to the anæsthetic explosions though this is a province concerned with an anæsthetist than a pharmacist. It should be noted that ether mixed with air or oxygen forms an explosive mixture. While a patient is under such anæsthesia, if a naked light is brought near the patient, the patient may explode. Such explosions have been stated to have occurred by static electricity which may be developed by the friction of the clothes against the metallic frame of the operation table. Such explosions are however fortunately very rare and as stated already do not come under the province of a pharmacist. Certain impurities which may be found in anæsthetics, which are poisonous and are therefore incompatible with human life, however, come under the perview of the pharmacists. Examples are traces of carbonyl chloride in chloroform and traces of aldehydes in peroxides and ether. Getting rid of the anæsthetics from these impurities is the province of the manufacturing chemist and not of the dispensing pharmacist. But the pharmacist who dispenses such anæsthetic agents should

however satisfy himself that such impurities are absent either by testing a portion of a batch himself or by getting it tested and certified by a competent person.

The subject of chemical incompatibility is vast and as such only a few examples have been given above.

STERILIZED PREPARATIONS.

BY

S. SHAW, B.Sc., M.P.S. (India).

THE name of Pasteur has become a household word throughout the world. It is fitting, for he worked to bestow some of the greatest benefits that science has produced upon mankind. He discovered the existence of bacteria in fermentation and put medical science on the track of the cause of many diseases. He showed that these micro-organisms, belonging to the lowest form of vegetable life, were concerned in putrefaction, diseases of wines and beers, and of men and animals—each due to a specific type of organism.

Sterilization consists in the destruction of these minute organisms. At the outset, we must remember that some bacteria are able, in a certain stage, to resist treatment which in ordinary circumstances would effectively kill bacteria. This is the spore stage.

The points of interest to the pharmacist are the effects of different degrees of heat on bacteria and what processes can be relied upon to effect sterility; whether these processes are rendered more effective or less, by the addition of certain medicaments or antiseptics.

An important feature of sterilization is the aseptic precautions to be taken, meaning that the process is to be carried out under conditions which are intended to prevent as far as possible the access of bacteria. The hands should be washed thoroughly, soap and warm water being used freely. All benches and apparatus should be scrupulously cleaned before commencing work on any preparation.

It has been found that exposure to direct sunlight, in the presence of air, is fatal to many bacteria, and in all cases prevents growth. The resistance to drying varies, but all bacteria and spores are destroyed by heat, provided the temperature is sufficiently high and maintained for the required period. The temperature at which an organism is killed is higher when moisture is absent than when present, particularly with spores. For instance dry heat at 150°C. for one hour is required to destroy all spores and bacteria, whereas with moist heat a temperature of 115°C. for 30 minutes is found to be enough.

With regard to chemical agencies, the destructive power of germicides or disinfectants depends upon numerous factors. For instance in a given concentration a substance may be a germicide, but in a poorer concentration it may be no more than an antiseptic, which only prevents their growth, but does not kill them. The *Pharmacopœia* prescribes 0·5 per cent of phenol as a valuable antiseptic, but it has only a limited use, as it attacks the body tissues as well as bacteria, and is prohibited in intravenous injections, because the volume injected may be large. Another important germicide is alcohol, the most effective strength being 70 per cent, the activity diminishing considerably when below 50 per cent or above 83 per cent. It is widely used as a skin disinfectant, because it acts rapidly and thoroughly penetrates the skin.

The use of different preparations which are introduced into the body through different channels and of other preparations like the different ointments for the eye, demands that these should be sterile. The methods generally adopted for the purpose involve either application of heat (moist or dry), filtration, use of certain chemicals, or a combination of these. Whatever method may be adopted it must be such as will not inactivate the medicament, or render the preparation subjected to the process unsuitable for the purpose for which it is specially intended.

The *Pharmacopœia* sanctions the following methods for sterilization:—

Method 1—Sterilization by dry heat at 150 per cent for one hour.

The apparatus required for this method is a hot-air-oven one, and may be used to sterilize mortars, porcelain pestles, dishes, jars,

collapsible tubes, flasks and glassware generally. To minimize the risk of breakage, the articles should be quite dry. This method may also be used to sterilize substances which do not vaporize or decompose at 150°C. and which, if sterilized by moist heat, would undergo decomposition. Apparatus to undergo sterilization should be wrapped beforehand in clean cloth or filter-paper and containers must be plugged with non-absorbent cotton wool, for during cooling, the air within the oven would contract and non-sterile air would be drawn in.

Method 2—Sterilization by moist heat at 115°C.

The apparatus required here is an autoclave, which consists of an upright or horizontal thick-walled metal cylinder, which can be securely closed by clamping. A valve is fitted to regulate escape of steam during heating, also either a thermometer or a gauge or both to give temperature or pressure per square inch. In using an autoclave, care should be taken to have a sufficient amount of water in the autoclave and to expel all air before closing the steam valve. After the stated period, normally 30 minutes, the apparatus is allowed to cool to 100°C. or below, and then the tap opened. Autoclaving for 30 minutes at 115° to 116°C. is the most effective method of sterilization, and a similar effect can be obtained; when an autoclave is not available, by heating in a liquid at 115°C. Non-volatile liquids like fixed oils, liquids with a boiling point considerably above 115°C. (*e.g.*, glycerine and liquid paraffin) will serve but careful regulation is necessary to maintain the required temperature. Another alternative is a salt-bath consisting of a saturated solution of ammonium chloride which boils at 114°C. (sufficiently near for practical purposes), hence regulation of heating is controlled. Furthermore the commercial variety of the salt is inexpensive and a saturated solution (1 in 4) provides autoclaving within the reach of all.

Method 3—Sterilization by Tyndallization.

In this process the solutions are heated at 80°C. for one hour on three successive days. This method may be used for materials which are not immediately wanted, for use, and which are not injured by a temperature of 80°C. The principle underlying this method is that most bacteria are killed during the first heating

but not the spores. So they are exposed for to moisture for twenty-four hours on each of three successive days to allow the spores to germinate thus making them susceptible to the action of heat. Tyndallization is officially prescribed for solutions of most alkaloidal salts.

Method 4—Emergency Method.

In this method, the solution is prepared with aseptic precautions, filled into sterilized containers and subsequently heated. In the case of solutions not for intravenous use an antiseptic equal to 0·5 per cent phenol is included and the solution heated to 80°C. for 30 minutes. This treatment kills the vegetative bacteria present but will not kill spores unless they are of low resistance. The antiseptic, however, prevents the germination and multification. In solutions intended for intravenous injection the addition of the antiseptic is omitted and the solution is prepared by aseptic methods and then boiled for fifteen minutes. In either case the solutions prepared in this manner should be stored in a cool place and must bear the date of preparation and must be rejected if not used within four days.

This emergency method provides a means of sterilization for use in pharmacies not fully equipped for the normal processes.

Method 5—Filtration through Bacteria-proof Filters.

This consists in passing the material to be sterilized through sterile bacteria-proof filter (Berkefeld or Chamberhand). The filter should be first sterilized by heating in an autoclave at 115° to 116°C. for 30 minutes. This method is applied to those substances which would be inactivated by heat.

THE PHARMACIST

(The Journal of The Pharmaceutical Society of India)

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Editorial.

THE PHARMACEUTICAL PROFESSION AT THE PRESENT JUNCTURE.

The outbreak of the present war demands of every Pharmacist in this country every service which he can render in the cause of the king and country at any emergency that may arise. Practically every member of our profession has had a training in first-aid work and is in a unique position to afford first-aid to casualties even in remote and distant places. The Pharmaceutical profession may also serve our country at this juncture by making a serious attempt to make up the deficiencies in the production of such drugs and medicines as had to be imported and are now available with great difficulty.

A survey of the medicines and drugs in use in our country shows, as the Hon. Minister for Public Health, Madras, has pointed out in the first issue of this Journal, that practically every one of them is imported and practically none is produced here. Even many of the bigger Indian Pharmaceutical Works have been in many cases in the habit of importing drugs from foreign countries and bottling them and issuing them under their own labels. Even in the case of most of the finished products that happen to be produced in this country, the manufacturers depend on importation from foreign countries for the initial constituents.

India is not in a position to supply even the containers such as bottles, tins, capsules, ampoules and even card-board for boxes.

In some cases even the printed labels are imported from abroad. It is obvious that big Pharmaceutical Industries cannot be built up in a day. This should not prevent at least a few of us from thinking seriously of starting some small industries which would be practicable and which would not depend on foreign resources for their existence. Proprietary and patent medicines are popular among the medical profession in this country as shown by the large amount of money spent on these imports. If the drugs of British Pharmacopœia are not going to do good, one cannot see how a patent medicine containing mostly the same drugs is going to be any better. In the interests of the profession and of the community, the use of these patent medicines is a collosal waste of money. In addition to this, most of the money paid for these patent medicines is not paid only for the value of the medicines it contains but for the advertisements also.

Most of the British Pharmacopœia drugs could be manufactured in India. The main difficulty has been the lack of interest of the capitalist in the utilisation of his capital. The present day capitalist would invest his money on Rice Mills and Cinemas; the tendency is to go on a beaten track rather than on a new enterprise which would be highly remunerative in addition to being a service to the country. With regard to the machinery required for these industries the country is not lacking in metals, engineers, and skilled craftsman, but organised co-operation and investment of capital by descerning capitalists is lacking.

The resources of our country are enormous not only in raw products but also in the machinery which it can produce for the manufacture of these raw products. The only thing that is essential is the co-ordination of effort by the State, the capitalists and the general public.

Postponement of Conference and Exhibition.—Owing to the war, the Society has had to postpone with regret the holding of the First All-India Pharmaceutical Conference and Exhibition which had been proposed to be held at Madras in January 1940. The work in this connection was well advanced and it is indeed very much to be regretted that the function had to be

postponed. Many of the business firms that had signified their intention to participate in the Exhibition and the Conference have now withdrawn from it owing to the uncertainty of the present situation. The Society fully appreciates their difficulties and thanks them for the co-operation which they would have otherwise given but for the present situation. It is hoped that when the present difficulties are over, full co-operation would be forthcoming from them at a future auspicious occasion when the conference and exhibition will be held.

NOTES ON SOME INDIGENOUS DRUGS

(*Continued*)

By

A. S. Nathan,

Associate Member of the Pharmaceutical Society of India.

5. *Chandanam.*

Latin	Santalum Album.
Tamil	Chandanam.
Telugu	Chandanamu.
Canarese	Srigandha.
Malayalam	Chandanam.
Urdu	Sandal.

Small evergreen tree, indigenous to Mysore. This is also grown in Coimbatore and some southern parts of Madras. The wood is bitter. Its efficacy is due to the volatile oil, sandalwood oil, it contains. The oil contains not less than 2 per cent W/W of esters calculated as santalyl acetate, and not less than 90 per cent of free alcohols calculated as santalol. The sandalwood oil is used in perfumery, and sometimes applied to scabies with good effects. By a majority of people, especially in the South, sandalwood is used in the form of a paste, for its cooling effect. The oil has a sedative effect on the urinary tract. In Ayurveda, Chandanam enters into the composition of many compound powders and oils, such as "Asvam," "Chandanadi thailam," etc. Its use in Gonorrhœa—both in allopathic and Ayurvedic systems—is well known.

ABSTRACTS.

Evaluation of Hydrogen Peroxide: S. M. TRITTON (*Analyst*, LXIV, 1939, 469).

"Hydrogen peroxide owes its efficacy as an antiseptic for the readiness with which it liberates oxygen in the presence of living or dead tissue or bacteria" (*B.P.C.*). Since catalase is a factor in organic matter that decomposes H_2O_2, the preparation and use of a catalase solution to estimate the ease of decomposition of preparations of H_2O_2, chemically of full strength but pharmaceutically of varying effectiveness, was studied.

Many substances, notably H_2SO_4, persulphate and pyrogallol inhibit catalase. A very strong solution of catalase would liberate oxygen even in the presence of acid which explains why a stabilised preparation of H_2O_2 might be effective in the presence of pus but useless as a mouth wash or on dentures. If neutralised before the addition of a weak catalase solution oxygen is liberated, but if alkali is added after the catalase the inactivation is found to be irreversible.

A solution of catalase was prepared by leaving overnight in a refrigerator ½ lb. of fresh calf liver in 500 ml. of chloroform water straining, filtering and diluting ten times. 0.1 ml. of this solution decomposed 0.03g. of buffered H_2O_2 in one hour at room temperature.

Method: A narrow bore tube of 8 ml. capacity with a three way cock and funnel at one end and an ordinary stop cock at the other was used. The tube was evacuated by the use of a Lunge nitrometer containing mercury and 1 ml. of undiluted peroxide drawn in followed by 3 ml. of water and 1 ml. of above catalase solution, connection to the nitrometer made, levelling tube lowered and the volume of oxygen liberated measured at 3 minutes and 6 minutes thereafter.

Preparations of H_2O_2, stabilised or not, were found to vary widely in their ability to react with organic matter. The most suitably stabilised preparations, though of good keeping qualities, liberated oxygen almost explosively (20 ml. in 2 sec.). It should be

the aim of stabilisation to obtain maximum keeping quality without inhibiting catalase. This method is recommended for testing both the suitability of stabilisers and of stabilised preparations of H_2O_2.

C. A. S.

The Glycosides of the Oleanders.—(*Annual Reports of the Chemical Examiner to the Government of Madras for 1937 and 1938.*)

Red Oleander (*Nerium Odorum*).—The poisonous glycoside "Nerin," $C_{35}H_{50}O_{10}$, was isolated from the leaves of this plant. It is soluble in ether. It is about six times as poisonous as strychnine. It gives an immediate purple colour with concentrated sulphuric acid.

Yellow Oleander (*Cerbera Thevetia*).—The defatted kernals of the fruit of this plant yeilded two glycosides:

(*i*) "Thevetin," $C_{27}H_{42}O_{12}$, which is soluble in ether. It is of about the same toxicity as "Nerin". It gives with concentrated sulphuric acid a yellowish colour slowly changing to purple.

(*ii*) "Cerberin," $C_{30}H_{38}O_{14}$. This glycoside is insoluble in ether, but soluble in alcohol and water. It has nearly the same toxicity as the other two glycosides mentioned above. It is easily detoxicated by the enzyme emulsin and also by mineral acids. With dilute hydrochloric acid it gives a blue colour.

Cerbera Odallum.—Only one glycoside was obtained from the defatted kernals of the fruit of this plant. This corresponds in its properties and molecular formula to "cerberin" mentioned above.

On the Efficacy of the Gonadotropic Hormones in the Treatment of Whooping Cough.—(VENKATACHALAM and A. N. RATNAGIRISWARAN—*The Indian Medical Gazette*, Vol. LXXIV, No. 5, May 1939).

Cases of whooping cough were treated by administration of charcoal adsorbates prepared in the laboratory of the authors, from urine of pregnant animals by a modification of the method

of Davy (Davy, L., 1934, *Endocrinology*, Vol. XVIII, p. 1). In a few cases treatment was given by injections of Antuitrin S.

The results were dramatic relief resulting in a few days. It is explained that adults are immune to whooping cough, whereas children are not, the deciding factor being probably the sex hormone.

COMPOUNDER ?

BY

M. Y. CHOWHAN,

Haft Kel, Iran

References.	Compounder.
1. Gould's Medical Dictionary.	No such word.
2. Dorland's Medical Dictionary.	No such word.
3. Black's Law Dictionary.	One who compounds or compromises with a felon, *etc.*
4. Oxford Concise Dictionary.	No such word.
5. Chambers English Dictionary.	No such word.
6. Funk and Wagnall's Standard Dictionary.	No such word.
7. Nuttalls' Standard Dictionary.	One who effects compromise; one who compounds with a debtor or felon.
8. Blackie's Standard Dictionary.	One who compounds with a felon, etc.

It is evident from the above table of references that the offensive word 'Compounder' *per se* is irrelevant to Pharmacy and therefore ambiguous. It was in 1925-26, that the Punjab Government realized this ambiguity and decided to change the term (Compounder) to that of 'Dispenser' which is now in official use throughout the Provincial Medical Department. In 1933, a class for training Dispensers and Dressers, was started in Amritsar Medical School, with a two years' curriculum—Pre-requisite; Matriculation Pass.

Persons, who practise the art of Pharmacy, are known by the term 'pharmacist' all over the world, with the exception of India where this stigma on Indian Pharmacy still exists.

In England and America one finds 'Assistants' or 'Assistant Pharmacists'. These people are not University Degree men, but men merely with a couple of years' training in practical Pharmacy. If, however, such people wish to earn the Ph.C. or B.Sc. degree in Pharmaceutical Science, they simply have to do part-time or evening College studies and sit for the examination.

For ambitious persons there are many ways to enter the profession of Pharmacy in these civilized countries, whereas India is just awakening from a long slumber of negligence.

Anyway, it is better to be late than never. I hope that our several Provincial Pharmaceutical Associations will be wise to formulate a united front for the cause and uplift of Pharmacy in India.
