

883

SURGICAL & MEDICAL NEWS

FOR THE USE OF REGISTERED MEDICAL PRACTITIONERS, HOSPITALS AND LABORATORIES ONLY.

NEW



ISOLEVIN
(1-ISOPRENALINE BITARTRATE)

NEW

FOR EFFECTIVE TREATMENT OF ASTHMA

Available: Inhalation solution in packings of 10 cc. & 100 cc. (0.75%)
Sublingual tablets in packings of 20 & 100 tabs. (15 mg.)

CILAG-HIND PRIVATE LIMITED

15, CAWASJI PATEL STREET,
BOMBAY-1.



"For Young and Old"

Eledon is the answer. It's a wonderful buttermilk diet with the same caloric value of whole milk, while its milk fat content is less than half.

Eledon has been proved very successful in the case of stomach disorders, and is the ideal food for typhoid patients in the convalescent stage.

Eledon is specially recommended for premature babies who naturally require more protein and whose flow of gastric juice is restricted.



YOU
CAN
DEPEND
ON

Eledon
ACID BUTTERMILK IN POWDER FORM



Please write for literature to: NESTLÉ'S PRODUCTS (INDIA) LTD.

P.O. BOX 396, CALCUTTA. P.O. BOX 315, BOMBAY. P.O. BOX 180, MADRAS

SL.
- m 2, NS4 SM
NS7
192931

EDITORIAL NOTICE

Articles in original are invited for publication in this Journal on all subjects of interest to the medical profession. Accepted articles when published become the property of the Journal and should not be published in other Journals without our previous permission.

The Publishers will supply to authors twenty reprints free of cost, if so desired, but previous intimation should be given in all cases where reprints are required.

Manuscripts should be submitted to us duly typed in double space with wide margin on one side of the paper in duplicate. Footnotes and bibliographic references should be on the lines of the Quarterly Cumulative Index Medicus of the American Medical Association, in the following order :—

Author's Name

Title of the article,

Name of the periodical with volume number,
page, month, etc.

Used manuscripts and illustrations will not be returned and unused manuscripts will be returned only if postage stamps are enclosed.

Photographic prints should be large, clear, on glossy paper. Charts and drawings should be drawn in India ink on white paper or drawing cloth without pencil shading etc. X-ray photo prints should be sent and *not* X-ray films for preparation of blocks.

The views expressed in the articles do not necessarily reflect the editorial policy of the Journal nor can any inference be deduced that the Editor is necessarily in agreement with those views published, and consequently no responsibility shall devolve either on the Editorial Board or on the Publishers.

Printed by T. S. Gopal Row at M. K. Press, Tanjore and Published by B. S. Amruta, B. A.
for "SURGICAL & MEDICAL NEWS" "Yamuna Bhuvan" Jayprakashnagar, Goregaon, BOMBAY
Managing Editor : Dr. S. N. Dhananjay, M.B., B.S., C. I. H.

SURGICAL & MEDICAL NEWS

Telephone : 84311

Telegrams : "Pulsewave"—"Goregaon"

Volume 3 No. 4 Price Re. 1/- (India) Rs. 2/- (Foreign) July 1957

CONTENTS

	PAGE		PAGE
Integration in Medicine	4	"Weingarten's Syndrome" or "Tropical Eosinophilia"—	
		Dr. T. V. VENKATESAN, Madurai (S.I.)	24
The Present State of Knowledge Regarding Sewage Purification—		Soviet Physicians Concentrate on the Heart—	
Dr. S. C. PILLAI and C. ANANDESWARA SASTRY, Bangalore	7	A. DEMBO, Leningrad	28

MULTIMIX
(Oral & Injectable)
A DEPENDABLE ANTI-ASTHMATIC

For
**SYNERGETIC THERAPY
OF
BRONCHIAL ASTHMA &
SPASMODIC COUGHS**

Ephedrine, Lobelia, Hyoscyamus, Grindelia, Belladonna, Sodium Iodide, Sodium Benzoate, Vasaka, Senega, Glycerriza, Potassium Arsenate, Caffeine and Aminophylline.

Phone: 4930
Cables: MULTAMINE

INDO-FRENCH PHARMACEUTICAL CO., CATHOLIC CENTRE, MADRAS-1

	PAGE		PAGE
Dyes and Detergents as Antiseptics—		Advances in the Indications for	
SURESH CHANDRA BANERJEE	30	Tracheostomy—	
		Dr. P. NARASIMHA RAO, M.S., F.I.C.S.,	48
		Visakhapatnam	
Mucoviscidosis—		Management of Faucial Diphtheria—	
Dr. STUART S. STEVENSON, Pittsburg. Pa.	34	L. K. GANGULI, B.SC., M.D., M.R.C.P.,	49
		Calcutta	
Malariology (The Past and the Present)—		Shock in Gynæcology—	
Dr. P. N. GUPTA	38	Dr. VISHNU SARMA, M.A. (Cantab), M.B., B. chir.,	
		M.R.C.S. (Eng.), L.R.C.P. (Lond.), Madras	53
Hypothermy—		Painless Child-Birth—	
Professor V. KOVANOV, Moscow	43	I. KOSOI, M. SC. (Medicine) Moscow—USSR	59
Infantile Beri-Beri—		Book Reviews—	63
Dr. Ch. KRISHNAMURTY, Visakhapatnam-2	45		

THE ORAL treatment of Diabetes.....

Now recommended by the leading Physicians of the World

DIAMELIN

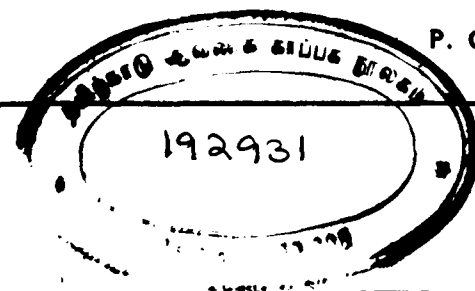
India's oldest and most Efficacious Oral treatment aims at not only correcting the defects of pancreas but also of the liver, nervous system, kidneys and ductless glands, which of late are also considered to be causative factors of diabetes. Diamelin does not suppress symptoms. It is easily assimilated and gives thorough and lasting results.

Available in packing of 50 tablets at all leading Chemists
@ Rs. 5—75 nP. per phial.

Detailed literature and samples on request from :

DIAMELIN RESEARCH LABORATORY,

P. O. Box 107, CALCUTTA.



EDITORIAL BOARD



Chairman of the Editorial Board : Dr. G. S. Melkote

HONORARY MEMBERS:

- Dr. **P. K. Ghosh**, M.B., D.T.M. (Cal.) T.D.D. (Wales), M.R.C.P. (London), F.R.C.P. (Edin.), F.C.C.P. (U.S.A.), Visiting Physician R.G. Kar Medical College & Mayo Hospitals, Calcutta, Chief Medical Officer, Associated Battery Makers (Eastern) Ltd., Calcutta.
- Colonel **T. C. Ramchandani**, F.R.C.S. (Eng.), Chief Surgeon & Medical Officer, The Singareni Collieries Co., Limited, Hyderabad-Deccan.
- Dr. **B. N. Balakrishna Rao**, B.Sc., M.B., B.S., F.A.S.C., F.I.C.S., F.R.C.S., (Eng.), Professor of Surgery, G.R. Medical College, Gwalior.
- Major **A. H. Vatsyayan**, M.B., B.S., B.Sc., L.O. (London), Senior Medical Officer, Tata Locomotive & Engineering Company Ltd., Jamshedpur.
- Dr. **Birendra Chandra Dutta**, M.B., B.S., Medical Officer, Jenson & Nicholson Ltd., Calcutta.
- Dr. **C. A. Agashe**, M.B., B.S., Medical Officer, Ogale Glass Works, Ogalewadi, Bombay State.
- Dr. **A. Basu**, B.Sc. (Hons.), M.B., Chief Medical Officer, Martin Burn & Associated Companies, Calcutta.
- Dr. **Vishnu Sarma**, M.A. (Cantab), M.B., B.chir., M.R.C.S., (Eng.), L.R.C.P. (Lond.) Fellow, Royal Society of Medicine, London; Civil Asst. Surgeon.
- Managing Editor : Dr. **S. N. Dhananjay**, M.B., B.S., C.I.H., Medical Officer, Mysore Kirloskar Limited, Harihar.
- Advertisement Manager : **Padma Vyas**, B.A.
- All communications regarding advertisements, editorial business, subscriptions etc., should be addressed to :
"SURGICAL & MEDICAL NEWS", 'Yamunabhuva' Jayprakashnagar, Goregaon, Bombay.

INTEGRATION IN MEDICINE

"IF you want an X-ray film of a right-sided pleural effusion I might be able to find you one. But, I can't tell you whether it comes from a patient who had, in addition, a fibroma of the ovary with ascites". This radiologist was a helpful man, but he reflected in his remark the isolation in which a specialist in one of the ancillary branches of medicine (radiology) has to work. The trouble was, he couldn't get a detailed clinical history and other records of the patient who came to be X-rayed in his department. It was not his fault. He had no time himself to go round gathering the clinical history or find out the exact diagnosis which had been made. Patients came to be X-rayed. The X-rays were sent to the surgeon for perusal. A provisional diagnosis may have been made. The patient may have been operated. But there was no reference back to the X-ray when the correct diagnosis was made. These X-rays in the usual course, were returned to the department. The radiologist had no time to follow up each patient and the surgeon had no time to review each X-ray in the light of his findings at operation and record them.

What can be done to overcome this lack of integration? I think there is only one way. There should be an efficient medical record section closely associated with a department of medical illustration and photography in all teaching hospitals. To this department should be submitted for review detailed case records of all patients including information about special methods of investigation which might have been employed. Such information should be assembled, analysed, classified and recorded. If this is done it should be possible for any one to go to the records department for information. For instance if one wished to make a study of cases of Meig's syndrome (a benign fibroma of the ovary associated with ascites and pleural effusion) it would be possible for the staff to refer to their index of records of all fibromas of the ovary and to discover which of the cases presented with ascites and pleural effusion. That is not all. They would be able to say for instance, "We have had in this hospital eight proved cases of Meig's syndrome. We can furnish you with the complete details of these cases which have been diagnosed in this hospital during the last five years."

A complete record means a thorough clinical history, the result of various investigations, radiographs, photograph of the tumour preferably taken at the time of operation, detailed account of the tumour, histophotographs as well as follow-up records. To be able to maintain such careful and detailed records involves a lot of labour as well as expense. It requires the employment of well qualified staff. The dividends that may be derived by such an elaborate organisation may not appear at first sight to be great. Yet, in the course of time, say, in ten years, the material that would have been gathered and correlated in this fashion would be a great treasure house of knowledge.

Such a collection will serve a three-fold function. The analysis of case sheets and a subsequent discussion on how a case might have been managed in a better way will help to improve the standard of medical practice. Much of the material will be of great use for

teaching both under-graduates and post-graduates. Material gathered and correlated in this way can help a lot to advance research. In order that case records should be complete, it is important that the history of a patient's ailment should be taken in great detail. Even the best physicians are apt to be incomplete in their anamnesis. Accuracy and precision in diagnosis is based on two things. A good history should be taken. The physical signs which are elicited should be made by one whose findings are moderately accurate. The first part is easy to fulfil with the aid of a printed questionnaire. Any doctor should be able with the aid of a printed form to take a detailed history, and not omit anything. The second part is not so easy to fulfil because people vary in the degree of accuracy of their physical findings. However in many cases in which a provisional diagnosis is made, it may be corrected in the course of the patient's stay in the hospital. Most probably she may have been operated. The findings during operation should be recorded precisely. Even here a printed form for record is useful so that the information is complete. It is invaluable to have the services of a medical artist to depict the findings during operation. In order to be able accurately to show the physical signs and the nature of the lesion within the pelvis it is important to know the exact location of the lesion and the manner in which it had produced structural alterations. It is not possible to determine this merely by viewing the excised tumour without any context to how it lay in the pelvic cavity.

For instance take a case in which a particular radio-opaque shadow was seen in the hystero-salpingogram. There might have been displacement of the uterine cavity. This displacement may have been either in the vertical or horizontal plane. In addition there may have been some rotation of the structure. It is important to review this hystero-salpingogram after operation. It is not enough merely to determine that a fibroid produced this defect. One must establish where the fibroid was and whether the appearance in the hystero-salpingogram would be compatible with the exact location of the fibroid in relation to the uterus and pelvic adnexæ. This is impossible to determine unless accurate records are maintained of findings at operation. Medical photography also plays a very notable part in recording conditions found at operation. In the treatment of disease photographs taken before and after treatment are visual records of great value. Once a tumour has been excised, it should be photographed. Histophotographs should be obtained of the tumour. The post-operative course should also be plotted out on special charts. The result of operation should be assessed. Unless a patient co-operates this part of the record is apt to be incomplete.

Yet, with the maintenance of such elaborate records, it will be possible in the course of ten years to build up an assembly of clinical information the value of which will be unimaginably great. The expense involved when compared to the money we are spending on so many other things will not be too prohibitive.

Apart from this aspect there is one factor which stands in the way. No material can be assembled without the co-operation of all. Each person in a hospital should feel responsible to contribute his share and the material which has been collected should be used in the name of the hospital.

Unfortunately there is a factor which one has to take into account. Selfishness and individualism very often stand in the way of progress. To begin with, I told you of the helpful radiologist who could not find a suitable film. He was helpful. He was kind, but his place was soon taken over by another, who said, "Don't bother me, I can't show you any films" and thought to himself, "If I gave on loan any of the old films that lie in this department there might be something interesting in it. If I myself do not know what is of interest in my films, why should anyone else find out?" There are striking exceptions to this attitude but it is not unknown for a person who has control over valuable clinical material not to use it himself, either because he does not know how to, or because he has too busy a practice that does not give him time to, but yet will do everything possible actively to prevent its use by anyone else who may be interested.

It is well worth asking oneself who may lay claim to the scientific property in a State Hospital. Is it the doctor who examines the patient and records his or her findings? Is it the biochemist who carries out certain complex tests? Is it the hæmatologist? Is it the radiologist? Is it the surgeon or his associates who remove a tumour from a patient's abdomen? Is it the pathologist? Or perhaps, even the statistician who pours over figures? It is a difficult matter to answer because there are no established rules but in co-operative state of society people should be willing for any person who is sufficiently interested and who is willing to take that extra trouble to use invaluable clinical material for the purposes of teaching and publication. There is an unfortunate trend today whereby in State Institutions, the control of scientific property is accepted as being vested in entirely the administrative head of the institute.

Usually there is no difficulty. If one should happen to be more interested and active, established authority sees in the work of those who serve under them a challenge to their own apathy and indifference and there is a real tendency for such superior people to use their influence to obstruct work that is done which will not directly enhance their own prestige and glory. This is a matter which is well worth considering. In a teaching institution there should be a place only for superiority of interest and learning and not for mere seniority and administrative authority.

A young woman who recently settled in a small village set out one morning to catch a bus bound for town. She reached the bus stop about the time it was due and joined several others, also waiting.

When after a few minutes the bus failed to make its appearance, she turned to a farmer leaning against a tree near by.

"Isn't the bus overdue?" she asked.

"Should be along in a half hour or so", was the answer.

"But" cried the woman in dismay, "what happened to the 9:15?"

"The 9:15?" drawled the native. "Oh, that's Joe Spivens' run. He always leaves ahead of time, madam. Can't STAND crowds."

The Present State of Knowledge Regarding Sewage Purification

BY DR. S. C. PILLAI AND C. ANANDESWARA SASTRY

Department of Biochemistry, Indian Institute of Science, Bangalore

INTRODUCTION

SEWAGE may briefly be described as water after it has been used by a population provided with underground water carriage system. It contains a variety of polluting materials in solution and suspension: it includes faecal matter, urine, wash water from kitchens, soil washings and other materials; and it contains numerous putrefactive and possibly pathogenic organisms. The clean, pure water before it is used by a population holds oxygen almost to the saturation point, and as the water becomes sewage the amount of oxygen is very considerably reduced or even completely depleted.

Sewage may be quickly removed from the residential area of the community by means of underground sewers, but its ultimate disposal in a hygienic way is one of the serious problems in the urban areas of the world. It is instructive to note the observations of a few American authorities on the problem quoted in a pamphlet recently prepared by General Electric Co. in the interest of public health.¹ Two of these observations are: (1) "The greatest investment in the national welfare which can be made in the next five years is the construction of the sewage treatment works required to eliminate the unsavory, uncivilized pollution of our water courses. This investment will pay a dividend of more than \$ 100,000,000 yearly in the elimination of pollution losses. Its value in terms of better health and preserved esthetic assets is inestimable" (M. M. Cohn); and (2) "It is a sad commentary on our vaunted civilization that water pollution seems to grow with it—the more civilized we become, the more rare is an unpolluted stream. The time is fast approaching when, as a nation, we must either conquer pollution or be conquered and destroyed by it" (*Field & Stream*). Not long ago the late Dr. G. J. Fowler,² an English authority on the subject, wrote: "Year by year at many points in New York Harbour, the dissolved oxygen approaches more nearly to a dangerously low limit. Along certain water fronts it is virtually absent, and the black stinking water, and its floating grease and debris, affords no cause for

civic pride to the city whose great bridges and railway terminals are the admiration of the traveller".

As indicated above, if crude sewage is discharged into a water course, it depletes the oxygen of a relatively very large volume of water and contaminates it in other ways; the extent of these adverse effects depends upon several factors. The material can be spread on land, but here again difficulties arise, depending upon local conditions. These and other difficulties in sewage disposal have been for about a hundred years studied and still are being studied at different centres. It would perhaps be interesting and valuable to examine broadly the evidence accumulating particularly on the principles of sewage purification. It is being increasingly realised that a deeper understanding of the mechanism of the purification process is essential for further advances in the field. A general review of the subject as given in the following pages may therefore prove useful in facilitating further progress.

RISE OF THE PROBLEM OF SEWAGE DISPOSAL

The problem arose quite naturally with the extraordinary increase of populations around the industrial cities. Kershaw,³ who was for twelve years Engineer to the Royal Commission on Sewage Disposal in England, observed in 1911 when considering the cause of progress in matters relating to sewage disposal: "It may be said without hesitation that England has been the pioneer in matters relating to sewage disposal. That is so is no doubt largely due to the fact that for some time past the tendency has been for a general exodus from the country to the town; new conditions have arisen which were not even contemplated thirty years ago, and new improved methods of dealing with the results accruing from these altered condition have become imperative. Authorities who in the past have been content to adopt an attitude of 'masterly inactivity' have in most cases been roused to action, sometimes by epidemics, frequently by wrathful land-owners who have the misfortune to possess property in the vicinity of inefficient sewage disposal works, and of late years by the Rivers Boards of Yorkshire and Lancashire".

The first Sewage Commission in England was appointed in 1857.

During the last hundred years work has been going on steadily at different centres and satisfactory methods have been developed for the purification of sewage and possible prevention of pollution of surface waters. In a subject of such urgent public importance practice must of necessity often precede theory, and only under actual working conditions in many cases the real problems emerge and the need for a better understanding of the principles becomes apparent. Thus certain aspects of pollution and purification are still not fully understood.

EARLY OBSERVATIONS ON THE DISPOSAL OF SEWAGE

In his evidence given before the Royal Commission then sitting (1898), Adrian⁴ traced the development of the ideas of sewage disposal during the previous half-century. He pointed out three periods, 1842—57, 1858—70 and 1870 onwards, and analysed the prevalent opinions of each period bearing on the proper method of sewage disposal. During the period 1842—57, it was of the first importance to secure the prompt removal of sewage from the neighbourhood of dwellings; that the use of a river outfall was preferable to retention of sewage near dwellings; and that, in consequence of doubt as to the effect upon the public health of the irrigation of large surfaces with sewage, the best system of disposal was by underground pipes, for subsequent distribution by hose or jets. During the period 1858—70, the notion of possible injury to health as a consequence of the irrigation of land with sewage was abandoned and it was believed that the ideal system of sewage disposal was that which aimed at its profitable utilisation by direct application to land and thus facilitated the protection of rivers from contamination. From 1870 onwards, a dominant idea which found expression in official and parliamentary publications and legislation was prevention of the pollution of streams. This was regarded as an indispensable requisite of every system of sewage disposal which could lay claim to efficiency.

Until a few years prior to 1870 the position was that, with the exception of a few towns which dealt with their sewage by land treatment, sewage purification, as understood at the present day, was practically non-existent. At the same time some very valuable information was gained during these early years of

study of the sewage problem, and it was found useful later in devising artificial methods.

When it was held that it was dangerous to spread sewage on land, attempts were made to "disinfect" or "deodorise" sewage by addition of chemicals such as carbolic acid, chloride of lime and chloride of iron, in order to delay the putrefactive changes in the sewage until it had been carried away by the stream receiving the sewage from the neighbouring town. The use of chemicals for such treatment eventually led to the development of the methods of chemical precipitation of sewage, which are employed even today particularly at those centres where the sewage contains a large proportion of trade effluents.

Close study of the earliest practice of discharging sewage into waterways also gave results of considerable interest and value. The observations showed that the sewage discharged into a flowing stream or river was gradually purified, and this behaviour of the water-course has come to be known as the "self-purification" process which forms the basis of the "dilution" method of sewage disposal. The principles and practice of the "dilution" method, including the permissible loading of a stream and related aspects, are still being studied in certain parts of the world.

Liebig (1844)⁵ in Germany called attention to the very considerable loss of the elements of plant nutrition in the continual discharge of sewage into rivers or sea and argued that the countries which allowed this to happen would finally become impoverished agriculturally. He wrote: "Our fields will become more and more deficient in these essential ingredients of food, in all localities where custom and habits do not admit the collection of the fluid and solid excrements of man, and their application to the purposes of agriculture" "If it were possible to restore to the soil of England and Scotland the phosphates which during the last fifty years have been carried to the sea by the Thames and the Clyde, it would be equivalent to manuring with millions of hundred-weights of bones, and the produce of the land would increase one-third, or perhaps double itself, in five to ten years".

Liebig's view seems to have prevailed, as the question of danger to health arising from land treatment of sewage was given up and sewage farms were started in Germany, England and other countries. Some of the experiences in the agricultural utilisation of town sewage during this period were published (Campbell,

Announcing



(Vitamins A, D, E with Calcium)

Each capsule contains:

Vitamin A, U.S.P.	6000 I.U.
Vitamin D, B.P.	1000 I.U.
Vitamin E	1.0 mg.
Calcium Lactophosphate	100 mg.

Excess vitamins have been added to compensate for any possible loss on storage.

Indications:

Avitaminosis due to poor absorption, infancy, pregnancy, lactation, rickets, tetany, osteomalacia, hypoparathyroidism, bone fractures, tuberculosis and cirrhosis of the liver.

Dosage:

One to four capsules daily or more as directed by the physician.

Packing:

Bottles of 30 and 100 capsules. Tins of 500 capsules.

A Product of
TEDDINGTON CHEMICAL FACTORY PRIVATE LTD., BOMBAY
 Sole Distributors: **W. T. SURÉN & CO. PRIVATE LTD.**
 P. O. Box 229, Bombay I

1858⁶; Mechi, 1860⁷; Lawes and Gilbert, 1866⁸). It may be remembered in this connection that, as recorded by Kershaw³, one of the oldest examples of land treatment of sewage is the Craigentenny Meadows near Edinburgh, which are supposed to have come into use for sewage treatment about the end of the 18th century.

In one of the papers just mentioned, bearing on the application of sewage to a large agricultural area,⁷ which was read before the Royal Society of Arts on 7 March, 1860, some interesting comments were made in the course of the discussion of the paper. One of the members of the audience, P. H. Holland, remarked: "He would in conclusion only allude to the fallacy which Mr. Sidney had put forth upon the authority of Mr. Hawksley. That gentleman, an engineer, had put forward a notion which must be astounding to every chemist. It was this, that if sewage ran away for a distance of about 10 miles, it was no longer sewage, but almost plain water. That was one of the most astounding assertions he had ever heard made".

Other accounts of early studies on the direct application of sewage to land also included observations of interest, the most significant of which relates perhaps to the behaviour of different soils. Soil, like water, was also found to purify sewage, but some soils were found more efficient than others in bringing about purification. Thus the Rivers Pollution Commission in England (1868),³ when examining the experimental evidence on the purifying powers of various soils, observed: "The cleansing power of soil seems to be more closely connected with physical condition as regards porosity and fineness of division than with its chemical composition. Thus the Beddington and Barking soils, whilst similar in chemical composition, are most widely dissimilar in their action upon sewage. Again, sand and Hambrook soil act very similarly upon sewage, whilst they differ considerably in chemical composition; and lastly, the Hambrook and Dursley soils do not differ very widely in their chemical compositions—nevertheless, the latter has more than twice the purifying power of the former".

LATER STUDIES ON THE SUBJECT

By 1876, about sixty towns in England had tried irrigation of land with sewage, and many schemes had proved failures both financially and otherwise, chiefly because there was a clashing of economic and sanitary

interests, which are often diametrically opposed. In many cases the land was quite unsuitable for the purpose and it rapidly clogged and became coated with a layer of putrefying filth; in some cases the sewage contained industrial wastes, which were harmful to crops, and generally the management of the farms was of a low standard. Thus "the opinions of Liebig and his exaggerated valuation of sewage, which was not realised in a single instance, were responsible for some of the difficulties of later years".⁹

In view of the above difficulties in farming with sewage, local authorities were again attracted towards chemical methods. These methods were put to the test, especially where it was claimed that their adoption would bring about purification and also remove the manurial constituents of sewage, which could then be worked up into a portable manure.

In 1868 a commission was appointed to obtain expert opinion upon the whole subject. This Commission again re-affirmed that only by land treatment could the dissolved organic matter be removed from sewage, but realised that there were difficulties inherent in that method, and carried out experiments to overcome them.

Frankland, as a member of the 1868 Commission, conducted experiments which were devised with a view to increasing the volume of sewage which could be treated upon a definite area; for, the early irrigation schemes had necessitated large areas of land. He used glass cylinders 6 feet high by 10 inches diameter, filled with soils from several irrigation farms. These soils were dosed twice a day with London crude sewage at rates varying from three to fifteen gallons per day, according to the type of soil. The soils did not show signs of becoming clogged after working for four months; the effluents were clear, non-putrefactive and contained nitrates. Frankland assumed that the dissolved organic matter of the sewage was oxidised by the oxygen of the air as the sewage dripped through the filter. His assumption was perhaps based on the prevailing view (for which Liebig was mainly responsible) that the decomposition of organic matter was a process of slow direct combination with oxygen.

The conclusion was however reached that with the best land, underdrained at a depth of 6 feet and divided into plots, dosing each in turn for six hours and resting eighteen hours, one acre could purify 44,000

gallons of sewage daily without fear of choking up the pores of the soil. This system of periodical dosing and resting was designated by the Commission "intermittent downward filtration".

As given in a report in 1877, about forty towns had attempted to purify sewage by intermittent filtration, but the results were generally unsatisfactory.⁹ But it is known from later experience that where a sufficient area of suitable land is available at reasonable cost there is no doubt that "intermittent downward filtration" affords a satisfactory system of purification, provided steps are taken to minimise the difficulties which Frankland foresaw.

The observation made in this connection that where the soil was sandy less trouble was experienced and more satisfactory results were obtained than with heavy soil, suggested the construction of artificial sand filters. The possibilities in this direction were fully explored by the Massachusetts State Board of Health; their experiments, started about 1886, for the development of artificial filters upon scientific lines and the demonstration of their practicability, indeed require special mention.

At the same time, improvements were attempted in regard to land treatment of sewage when it was observed that removal of grosser solid matters from sewage led to increased volumes being treated upon a definite area. At first some form of screen was tried for removing the large floating solids. The screens which originally consisted of bars, sieves, or gratings, have in course of time developed into the various mechanical appliances now commonly employed.

As a preliminary to land irrigation or filtration it became a practice to dig trenches or pits through which the sewage flowed before passing on the land. These pits removed most of the silt, grit and larger particles of organic matter. When the pits were almost full with these materials through continued use, they were filled with soil and new pits were dug. This procedure indicates not only the first stage of tank treatment but also the disposal of sludge by trenching upon land.

Attention was then directed to the study of the putrefactive changes and decomposition of organic matter in sedimentation tanks and in tanks in which the sedimentation was prolonged. Scott-Moncrieff⁹ reported that sewage purification might take place in two

stages: in the first stage a partial liquefaction of the solid organic matter might occur, and in the second nitrification and other oxidative changes might proceed. He built plants to demonstrate this: the first portion of these consisted of a closed tank filled with stones, which he called the liquefying tank; the second part was made up of coke arranged in tiers well ventilated, and upon which the effluent from the closed tank was oxidised. It was thought that liquefaction would proceed better under anaerobic conditions. Attempts were therefore made to design a tank in which anaerobic decomposition might be facilitated; such a tank might differ from a sedimentation tank chiefly in being relatively larger and so time might be allowed for decomposition to take place under anaerobic conditions.

In 1895 Cameron developed the anaerobic process and designed a tank at Exeter which he patented as the "Septic Tank". Considerable modifications of the septic tank were made notably by Travis (1908) and Imhoff (1909). Travis stated that sewage purification was largely a physical phenomenon, due to surface contact and 'desolution' of organic matter.

The claims for complete liquefaction of sewage in the septic tank proved incorrect, and the system did not contribute much towards the solution of the sludge problem. Further, septic tank effluents were generally dark, offensive liquids, which when sprayed over land or on filters caused a nuisance. The effluents required further purification under aerobic conditions before they could be finally discharged.

INFLUENCE OF THE ADVANCES IN MICROBIOLOGY ON THE IDEAS OF SEWAGE PURIFICATION

During the latter part of the seventeenth century the existence of microscopic organisms was known, and their activity in putrefactive changes was also suspected. Following the work of Leeuwenhoek, Kircher and others, Baker, in his book on the microscope dated 1743,¹⁰ wrote about the rapid increase in the quantity of animalculæ contained in impure water. But it was not recognised until many years later that microbes were the chief cause of the slow decomposition of organic matter.

During the sixties and seventies of the last century rapid progress was being made in bacteriology, and it was established that bacteria bring about putrefaction,

decomposition and other changes. It was therefore conceivable that they were the active agents in soil, and that the process of decomposition taking place in it was not the purely chemical "eremacausis" Liebig had postulated.¹¹ Pasteur (1862) suggested that nitrification might be a bacterial process.

The new knowledge was first brought to bear on sanitary and agricultural problems by the French chemists, Schloesing and Muntz (1877, 1878)^{12,13} who were asked to study the purification of sewage by land filters. They constructed a filter of soil brought from the Paris Sewage Works, and found that the sewage poured upon it became purified. Experiments were carried out by allowing a continuous stream of sewage to trickle down a column of sand and limestone so slowly that it took eight days to pass. For the first twenty days the ammonia in the sewage was not affected, then it began to be converted into nitrate; finally all the ammonia was converted during its passage through the column, and nitrates alone were found in the issuing liquid. The investigators argued that if the process were simply chemical, oxidation should begin almost immediately. They therefore examined the possibility of microbial activity and observed that the process was completely stopped by a little chloroform vapour, but could be started again after the chloroform was removed by adding a little turbid extract of dry soil, as the conditions for biological activity were again promoted. Referring to this situation, Adams¹⁴ recorded: "This is the mystery of sewage disposal, and, in the words of another writer, 'the wizards were the small bacteria'".

Sewage purification and nitrification were thus shown to be due to micro-organisms or "organised ferments", as the French workers expressed, and that the presence of nitrate in an effluent could be taken as an unmistakable sign that purification was well advanced.

Warington (1878, 1897),^{14,15} who had been investigating the nitrates in the Rothamsted soils, confirmed the work of Schloesing and Muntz and applied the new discovery to soil processes. He showed that solutions of ammonium salts could be nitrified by adding soil extract and maintaining free access of air, and in 1882 described his idea of a filter bed "having a greater oxidising power than ordinary soil and subsoil. Such a bed could be made laying over a system of drain pipes a few feet of soil from the top 6 inches of a well cultivated field".⁹ These and related

observations considerably influenced the growing concept of soil phenomena and sewage purification. As worked out later by Adeney (1908)¹⁶ and Fowler (1911),¹⁷ many of the changes in soil closely resemble those occurring during sewage purification, one of the main differences being that they proceed more quickly in sewage than in soil. It was, however, possible in the eighties of the last century to ascribe decomposition of organic matter in all cases to the action of micro-organisms and to consider that "they are the important, almost the only, agents of universal hygiene" (Duclaux, 1884).⁹

The simple theory of direct oxidation of sewage matter as proposed by Frankland was no longer tenable. In the numerous later reports of the Lawrence Experiment Station (1887) may be seen the development of theories of direct biological oxidation of organic matter in the slow passage of sewage through a filter. Referring to these studies Dunbar (1908)¹⁸ commented: "If Frankland's experiments are to be regarded as the basis of modern biological methods of sewage treatment, they have really attained this position with the aid of the systematic and scientifically conducted experiments of the Massachusetts State Board of Health".

BIOLOGICAL FILTRATION OF SEWAGE

In the Massachusetts experiments, several grades of material were used for constructing filters, ranging from fine sand to coarse gravel. In the latter case it was soon found that intermittent filtration failed, as the liquid did not flow over the surface of the filter but rapidly passed through the large pores without being purified. A layer of soil or sand placed on the surface did not produce satisfactory results, although distribution was improved.

During 1886—1890, renewed attempts were made in England to filter sewage at a higher rate than was possible on land; stone, gravel, ballast, coke and clinker were employed, in addition to sand. In order to overcome the difficulties of distribution and too rapid a passage of the sewage through the filter, Dibdin modified the usual procedure of allowing the sewage to pass continuously through the filter, by placing the material in a water-tight tank, allowing the sewage to fill the tank, and afterwards holding it "in contact" with the filter for some time to allow the oxygen in the pores to oxidise the organic matter. The liquid was

Useful
adjunct
in

Diabetes

Bivinal Forte

With Vitamin C

(Vitamin B complex with Vitamin C)

Composition: Each capsule contains:—	
Vitamin B ₁ B.P.	10 mg.
Vitamin B ₂ (Riboflavin B.P.)	10 mg.
Vitamin B ₆ B.P.C.	5 mg.
Niacinamide B.P.	50 mg.
Calcium Pantothenate U.S.P.	25 mg.
Vitamin C B.P.	150 mg.

Alembic CHEMICAL WORKS CO. LTD., BARODA-3.

You can put your confidence in Alembic.

then drawn off from the bottom of the filter and the latter allowed to stand empty to be recharged with air. Dibdin's modification of the process of intermittent filtration thus gave rise to the "contact bed" system. The effluent from the preliminary process was passed on to such a bed, and allowed to remain in contact, generally for about two hours, and then run off and, if not sufficiently purified, submitted to a similar treatment on another bed at a lower level. The material in the second contact bed should be of smaller dimensions than that in the first bed for obtaining the best results. In special cases a third treatment on still more finely graded material, e. g. sand, might be necessary.

In regard to the changes in these "bacteria beds", Dibdin himself considered it the same as in land treatment, but he added, "land treatment, concentrated, accelerated, and controlled, and therefore economical; whilst land treatment as generally practised is haphazard, uncertain and expensive".⁹

Clogging of the beds accompanied by deficient aeration was the chief difficulty in connection with the contact system. Dibdin ultimately admitted these defects and tried to remedy them in his attempts to treat crude sewage aerobically by constructing primary contact beds of slates laid horizontally and spaced one or two inches between the layers.

Further investigations during 1831—1894 by Waring, Lowcock, Corbet, Ducat, Scott-Moncrieff, Whittaker and others led to the development of Trickling or Percolating filters which are widely used not only for the treatment of domestic sewage but industrial wastes after suitable pre-treatment. The operation of a trickling filter differs from that of a contact bed in that the liquid is applied almost continuously to it in such a way that it flows over the fragments of filtering medium in a thin film and the oxidative changes consequently continuously proceed.

The efficiency of a filter depends on the total effective surface area of the filtering material, together with a sufficient air supply. By effective surface area is here meant the sum of the surface areas of the fragments of the material. The surface area of the filter may be spoken of as the upper surface area; thus if large size material is used a greater depth is necessary in order to obtain the same total or effective surface area. In order to obtain the largest possible surface area material of an irregular character such as hard furnace

clinker may be used, but other available material can also be used so long as it is not so smooth as to exert little or no retaining power or retentivity upon the gelatinous matter deposited upon it. It will be found economical to use the smallest material which allows of free circulation of air.

It is obvious that if the filtering material is to be fully made use of, efficient and equable distribution of the liquid over every part of the filter is essential. The various methods of applying sewage effluent to the filter have been studied by a number of workers who have laboured to surmount the practical difficulties.

It is necessary in the case of trickling filters that means should be provided for arresting partially oxidised organic debris and "spent" organic matter resembling humus which pass away with the effluent. For this purpose either "humus tanks" or sand strainers may be employed.

The changes which take place in the trickling filter have been a subject of intensive study. In the first place, as in the contact bed, a purely mechanical action is exerted and the sewage matter deposits itself on the surface of the medium. For obvious reasons the trickling filter is better adapted to deal with large volume of dilute effluent rather than with more concentrated liquid the application of which results in a rapid accumulation of undigested organic matter in the upper layers of the filter. In addition to bacteria, a variety of living forms, e. g. protozoa, worms and larvæ, gradually establish themselves in the filter, and these organisms seem to maintain the cycle of changes. Albuminoid substances are broken down to amino compounds, and finally oxidised to nitrates. A greater proportion of the nitrogen is recovered as nitrate than in the contact bed, owing to the constant presence of oxygen in the interspaces; nevertheless some denitrification occurs in the interstices of the medium. A further great advantage possessed by the trickling filter is that the effluent passing away from it "is constantly saturated with dissolved oxygen", and consequently the effluent contains generally a greater reserve of oxygen available for purification in the stream into which the effluent may flow.²

THE ACTIVATED SLUDGE PROCESS

Inadequate air supply to the soil under sewage irrigation causes "sewage-sickness" of the soil. The

soil then has to be rested, ploughed up, and occasionally treated with lime. Similarly, choking of sewage filters presents difficulties; the sewage then is not purified. The filtering medium then has to be cleaned up or renewed.

Fears were always entertained in regard to the behaviour of the land under sewage and the sewage filters. Waring (1891), Lowcock (1892) and others attempted to improve the aeration of the filters. They constructed filters with false floors, below which pipes were laid and through which air could be forced. Economic considerations and the difficulty of uniform air circulation prevented further progress, but these experiments would indicate that the importance of air circulation through the filters was fully recognised.

Even from 1882 attempts were made to aerate sewage directly. The studies conducted by Dupre and Dibdin (1884) showed that aeration had comparatively little effect upon sewage and waters with which they experimented (Martin, 1927).¹⁰ The early ideas of aeration of sewage and the practical application of the principle were also discussed by Martin.¹⁰ It may perhaps be of some special interest to refer to the work of Fowler (1897)², Clark and Gage (1912),²⁰ and of Ardern and Lockett (1914—15).²¹⁻²³

The earlier experiments of Fowler (1897) carried out in the Laboratories of the Davyhulme Works of the Manchester Corporation showed that direct aeration of sewage effluents produced fairly easily a clear liquid and a rapidly settling deposit. But no attempt was made to investigate the liquid and the deposit separately. At that time he, like others, was obsessed with the belief that in order to purify sewage it was necessary completely to render soluble or gasify the whole of the sewage constituents.

Clark and Gage in 1912 reported that aeration of sewage perceptibly clarified it, and that when green growths occurred in the aerated sewage, it became saturated with oxygen. These observations led to a series of experiments begun in April 1912, to test the efficiency of aeration combined with these growths, in which three small sand filters were used; the first receiving raw sewage, the second aerated for 24 hours by drawing or blowing air through it, and the third containing aerated sewage with green growths. It was found, after the experiments had been underway for several months, that nitrification was taking place in the aerated sewage containing the growths, over 1.5 parts of nitrate per 100,000 being found. Later, an aërating

tank containing slabs of slate was put into operation, in which it was observed that the slate and sides of the tank became covered with a compact brown growth, and that this growth collected not only the suspended matter, but also a large portion of colloids, so that after a few hours treatment the sewage became free from both.

Early in 1914 Ardern and Lockett showed that purification of sewage could be effected without the aid of filters. They passed air through sewage for five weeks until complete nitrification took place. The clear settled liquid was then decanted, fresh sewage added, and aeration restarted. The process was repeated a number of times and it was observed that, as the deposit increased, the time for each succeeding nitrification decreased until, by the time the deposit occupied one quarter of the bottle, aeration for six hours with subsequent settlement yielded a supernatant quite equal to that from an efficient percolating filter. The investigators termed the deposit "activated sludge". This is also the name by which the process elaborated from their research is generally known.

The original process based on the work of Ardern and Lockett was modified to some extent. Haworth and Bolton succeeded in maintaining the conditions essential to the process by circulating the mixture of activated sludge and sewage in specially designed tanks by mechanical agitators, relying on the solution of free air instead of injecting compressed air. Watson and O'Shaughnessy at Birmingham applied process to the settled sewage as a preliminary aid to filtration upon percolating filters; by curtailing the period of aeration they aimed at "flocculating" and removing the fine and emulsified solids and producing a liquid which could be filtered at an intensive rate.

The modifications of the pioneer activated sludge process, while differing in points of detail, are indeed based upon the same fundamental principle, namely, the utilisation of the sludge under aerobic conditions as the main factor in the purification of sewage. By aeration alone, either by mechanical means or by passing a current of air through sewage, purification was, as found by the earlier investigators, too slow to be practicable; but in combination with the sludge it became evident that any quantity of sewage could be rapidly clotted out in a compact system. Indeed the sewages of the largest cities of the world are today purified by the activated sludge process. Referring to Milwaukee, Fowler wrote in 1934²: "...Milwaukee, whose

sewage at one time poured untreated into Lake Michigan, fouling the water supply of this city and its neighbours. Now an immense activated sludge plant converts all this impurity into clear effluent and into fertilizer, valued at £ 100,000 per annum. The sludge which used to defile the bright waters of the Lake now reappears as wheat on the wide acres of western prairies, or as smooth rich turf on countless golf greens".

AVAILABLE EVIDENCE ON THE MECHANISM OF SEWAGE PURIFICATION BY THE DIFFERENT METHODS

An attempt has been made in the preceding pages to indicate the more important developments in the practice of sewage disposal since the middle of the last century. Although the successive stages in the practice were arrived at largely by empirical methods, observations of scientific interest were indeed made. Thus, in the early days of the study of sewage disposal it was observed that a stream or a similar body of water could purify sewage if the mixture would contain sufficient oxygen. Recognition of the purifying power of water led to the practice of the "dilution" method.

Frankland's experiments on the "intermittent downward filtration" of sewage through soil, carried out in 1868, may perhaps be regarded as the first piece of experimental work in the field of sewage purification. Frankland also recognised the importance of oxygen of the air in the pores of the soil, and he assumed that the oxygen directly oxidised the organic matter in the sewage as it percolated through the soil. He "likened the action of the soil to that of the lungs in breathing".⁹

The air in soil to the depth penetrated by plant roots (6 or 9 inches) is almost identical with that of the atmosphere, the two important differences being in the carbon dioxide and moisture content. As recorded by Russell and Appleyard in 1915,²⁴ unmanured arable land usually contains 20.4% oxygen and 0.2% carbon dioxide; dunged arable land contains 20.3% oxygen and 0.4% carbon dioxide (composition of the air of the soils, per cent by volume). Atmospheric air contains 21% oxygen and 0.03% carbon dioxide.

Oxidation of sewage in soil is of course largely dependent on the air supply to the soil system. But, as was experimentally shown by Schloesing and Muntz in 1877,¹² the oxidation of organic matter is not by its direct combination with oxygen but through the

activity of the microorganisms in the soil. The work of Schloesing and Muntz not only influenced the progress in sewage purification but introduced a new outlook in regard to the oxidation of organic matter in nature.

Meanwhile, work proceeded in other directions of artificial treatment of sewage, as already indicated. The processes of simple sedimentation or of chemical precipitation are not really processes of purification, but only of disposal, since the offensive constituents removed from the liquid are merely collected in the sludge and have to be ultimately purified, that is reabsorbed without offence into the cycle of nature by further processes occurring either in soil or in other aerobic systems. The changes in the anaerobic tank are mainly the decomposition and gasification of cellulosic derivatives, the ammoniacal fermentation of urea, the breaking down to a greater or less extent of more complex nitrogenous substances and the splitting of fats. These changes are almost wholly due to bacteria and to enzymes possibly derived from faeces. These changes have been studied by a number of workers by analysing the sewage and the deposited sludge at various stages. In the liquid it will be found that the free ammonia increases at the expense of the albuminoid. The oxygen absorbed from permanganate while possibly not greatly differing at the beginning and end of the process in its total amount, will be found to be distributed in different proportion between the easily oxidised matter and the more difficultly oxidizable substances, or in other words, while the oxygen absorbed in 4 hours by the so-called "4 hours' test" may not greatly decrease, the oxygen absorbed in 3 minutes will probably increase.²

The studies on land treatment of sewage gave valuable results of practical application. Artificial sand filters, contact beds and trickling or percolating filters were successively developed; and finally purification of sewage without the aid of filters was achieved. The principle of sewage treatment in all these methods appears to be the same, but the available information on the exact biological mechanism is very limited. The principal views on the purification process in the filters and in activated sludge may now be briefly considered.

The experiments carried out by Dunbar⁹ at the Hamburg State Hygiene Institute during 1897-1900 led him to consider that the oxidation of sewage matter in its slow passage through a filter was a possible

explanation" ...so long as it could be maintained that sewage remained about 3 days in the filter; but when it was shown that the sewage left a 3-foot filter thoroughly purified within 10 minutes the above explanation fell to the ground. It cannot be assumed that micro-organisms decompose highly complex molecules of organic substances within a few minutes or seconds.... It can only be assumed that the dissolved organic matters are first separated from the sewage during its passage through the filter, and are retained in the filter to be decomposed and oxidized by the micro-organisms during the succeeding period of rest". After examining theories of mechanical retention and chemical combination, Dunbar concluded that "an explanation of the purification process must be sought in absorption phenomena".

The general theory of filter action proposed by Dunbar, and systematised by Ardern (1921),²⁶ was somewhat as follows:²⁶ (1) coarse particles are transferred to the filtering media by surface attraction; (2) dissolved matters are retained by absorption phenomena accelerated by the growth of a biological slime on the filter materials; (3) the absorbed materials are oxidised by biological action and also by oxygen "ozonized by the high pressures existing in the gelatinous film"; (4) the absorption process is prevented from ceasing by the action of micro-organisms under aerobic conditions; and (5) there is a residue of organic matter, highly resistant to bacterial action, which either accumulates in the filter or is discharged with the effluent.

Stoddart's²⁷ criticism of Dunbar's theory may serve as an illustration of objections brought to bear against absorption as a step preliminary to biological oxidation. "It has already been shown that the starting point is the assumption that micro-organisms cannot 'decompose highly complex molecular organic substances within a few minutes or seconds'....and with the exposure of the fallacious nature of this assumption, which may be characterised as an unwarrantable repression of scientific imagination, the theory itself falls to the ground". Dunbar's theory when first proposed was by no means free from objections, particularly in the matter of the removal from sewage of dialysable or non-colloidal matters such as ammonia.

Jones and Travis²⁸ in their paper on the clarification of sewage by filters at Hampton (England), offered an explanation for the "de-solution" of sewage colloids. They stated that the deposition of solids on the filter

materials "is dependent upon the action of surfaces, as such", and not on the colloidal properties of the biological slimes. Their observations would suggest that the efficiency of a filter could be increased by the use of finely divided material. According to them "...colloids in gell form encouraged further deposition, and to this extent the bacterial coating of the (filter) material undoubtedly played a part."

Activated sludge corresponds to and resembles the gelatinous film which coats the material of a percolating filter, but in the activated sludge process the film becomes a 'floc' which is maintained in circulation in the liquid in tanks instead of being supported upon a solid material over which the liquid trickles down. When the floc is driven about in the liquid it has a sweeping action by which the colloidal substances may be said to be swept out of the water, or as stated by Parker the 'process may be regarded as passing a filter through the water in place of passing the water through a filter'.¹⁰

As Baly²⁹ and others have pointed out there are several features characteristic of the activated sludge process which are particularly significant and which merit full consideration in any discussion of the mechanism. The rapidity of the process is most striking when it is remembered that the hydrolysis and oxidation of the harmful impurities by bacterial action are relatively slow, even under the optimum conditions of oxygen supply. The process not only purifies the sewage from all the harmful impurities but removes the bacteria, so that "a sterile or almost sterile effluent" is obtained. The successful operation of the process depends on the maximum "activity" of the sludge being maintained by the optimum conditions of aeration. There is the very considerable increase in the volume of the sludge during the purification process, and there is the readiness with which this highly activated sludge undergoes putrefactive changes in the absence of sufficient oxygen.

Bolton¹⁹ observed that the Activated Sludge Process was "extremely fickle and easily upset". The organisms had apparently to adapt themselves to the environment: by changing the method from air-blowing to mechanical agitation, or *vice versa*, there was a temporary falling off in the results; if the process was working satisfactorily on one sewage and a sewage from another district was put on, there was a temporary check, and it took time for the sludge to adjust itself to the new conditions. Garfield¹⁹ referred to some

experiments conducted by Barraclough at Bradford and mentioned some outstanding features of activated sludge. The first point was that the activated sludge, upon being mixed with the sewage, immediately effected a purification which might be compared with the action of a very heavy chemical precipitant, and the extent of purification thus effected appeared to be proportional to the amount of activated sludge used. Eddy¹⁹ also compared the sludge, or "floc" as he termed it, to the coagulum which was formed when sewage was treated with a precipitant such as sulphate of alumina. The floc was also considered as a sponge-like mass or an open-mesh network which in the process of formation might envelop, entrap or entrain colloidal matter and bacteria. The sponge-like structure of the floc was found to offer a very large surface area for contact, and this floc appeared to be able to absorb colloidal matter, gases and colouring compounds.

It was demonstrated that the process could not be carried on under sterile conditions. Fowler¹⁹ expressed the view that the process "can be referred entirely to bacterial activity". He described it as "a process of intensive bacterial oxidation", consisting broadly of three operations: "a clotting or clarifying action, a rapid carbon oxidation, and finally nitrification". Butterfield³⁰ emphasised the primary importance of *Zooglea ramigera* in the Activated Sludge Process. Recently McKinney and Weichlein³¹ isolated 72 floc-producing bacteria from 16 different samples of activated sludge from 4 sources. Of these, 14 were capable of floc formation in sterile synthetic sewage, and 12 in sterile sewage. All the cultures formed floc in these substrates when incubated, unagitated, for 17 days. Microscopic observations indicated that floc was the normal result of complete metabolism of the organic substrate and was not caused by special zoogloeal-producing bacteria.

Views regarding the importance of protozoa in the purification of sewage have ranged from definite statements of their usefulness expressed by Cramer³² and Pillai and Subrahmanyam³³⁻³⁶ to the suggestion by Fairbrother and Renshaw³⁷ that the protozoa in activated sludge might be eliminated through the use of certain dyes because of their interference with the process. Butterfield *et al.*³⁸ recorded that the primary function of the protozoa was to prevent the bacterial population from reaching a stalemate, thereby stimulating bacterial growth accompanying oxidation. Others^{39,40} considered the assistance of protozoa in the clarification

of sewage, in causing "a secondary clarifying effect",⁴¹ and as indicators in activated sludge treatment.⁴² In the more recent studies of McKinney and Gram⁴³ on protozoa and activated sludge the significance of the protozoa to the optimum operation of activated sludge was emphasised.

Buswell and Long⁴⁴ carried out microscopic studies on activated sludge and stated that the purification of sewage by microscopic communities was entirely similar to the disposal of garbage by feeding it to hogs. According to them, it was not probable that mechanical factors played any greater part in the metabolism of micro-organisms than in the digestive processes of the larger animals.

Theories of mutual precipitation of sewage colloids by the neutralisation of electrical charges have been frequently advanced. Buswell and Long⁴⁴ rejected the colloidal theory of coagulation as they found that the colloidal particles in sewage and the activated sludge particles were both negatively charged. Again, Baly²⁹ proposed a theory which was supported by Lumb,⁴⁵ assuming "that weakly charged colloidal particles will associate with strongly charged bacteria of the same sign, because the free energy of the whole system is thereby decreased". In the discussion of the paper by Lumb, Scouller (Huddersfield) said that the author of the paper "seemed to have gone out of his way to reconcile the two negatively-charged particles becoming attached to one another, . . . and though Mr. Lumb's results agreed with the theory of Professor Baly, if the process as a whole were considered, Mr. Scouller thought that the crucial point was getting the air into the liquid, and if sufficient could be got into it he saw no reason why the purification process could not be shortened considerably".

Recently Popel (1953)⁴⁶ observed that activated sludge required several times the amount of oxygen necessary for the bacterial metabolism, although the actual amount varied with the amount of suspended matter, aeration time, etc. In regard to the distribution of oxygen in the sludge floc, Pasveer (1954)⁴⁷ observed that the rate of each of four sub-processes was important: (1) diffusion of oxygen from air into the liquid; (2) diffusion from the water to the floc boundary; (3) diffusion in the floc; and (4) binding of oxygen in the floc. He concluded that high turbulence in the liquor might be the most influential factor in oxygen transfer. But there is no definite information on the nature of the floc.

Theriault and McNamee^{48,49} advanced a biozeolitic theory of sewage purification, according to which the clarification by activated sludge (complete in 30 minutes) was due to a base-exchange process with the aminosilicate complex or sludge zeolite surrounding the bacteria. Oxidation was explained partly as the result of primary decomposition by bacteria and partly by enzymic or purely chemical action. But a flocculating enzyme from sewage or sludge has not so far been isolated.

A detailed account of the activated sludge process with a full bibliography was given by Martin.¹⁹ The available evidence on the mechanism of the process was fairly comprehensively reviewed by a number of workers, e.g. Lumb,⁴⁵ Theriault,⁵⁰ and Williams.⁵⁰ In summarising the theories put forward by different investigators Hodgson⁵¹ stated that the process is probably the result of: (1) clarification effected by base exchange, and partly by bio-precipitation; (2) oxidation of the absorbed organic matter by the aid of bacteria, probably of the zoogloea group; and (3) oxidation of the nitrogenous matter by the aid of a different group of bacteria. A committee of the American Public Health Association,⁵² in a report presented on October 14, 1941, concluded its discussion of the various hypotheses with the statement: "The trend of opinion, however, is that the process is biochemical". According to Imhoff and Fair,⁵³ it is a biological-contact process similar to filtration, and that activated sludge is similar to the biological films or slimes covering the filtering material in trickling filters.

PRESENT POSITION AND FUTURE POSSIBILITIES

A century of study of sewage disposal has indeed given very valuable practical results. The course of progress is understandable in view of the very nature of the problems raised by sewage. In this, as in certain other fields of inquiry, practical solution of the problems has been of greater importance and urgency. Not that purely fundamental work has been considered to be unnecessary or to be of doubtful value. For many years, the main objective has been to bring under control, in a very practical way, the situation tending to become dangerous to public health in the most rapidly growing industrial cities of the world. The approach, under such circumstances, would not always be entirely scientific, because the attempts would be to obtain quick practical results, and a truly scientific

basis for the attack of the problems would have to be worked out more leisurely. Once, however, a reasonable measure of practical success has been achieved, it is advantageous and even essential for further steady progress and thoroughly dependable results to inquire into the principles that lie behind the measures adopted or the methods developed. This is broadly the present position of sewage purification.

A number of methods of sewage treatment have been devised. These include disposal by "dilution", land irrigation and filtration, chemical precipitation, settlement and sedimentation processes, septic tank, biological filters and the activated sludge process. The various methods have presumably shaped out under the stress of the surrounding circumstances, but they are today applicable under a fairly wide range of conditions, for the treatment of small volumes of domestic sewage from individual houses and colonies as well as vast quantities of industrial sewage from the most crowded cities.

The methods that have been developed may be viewed broadly from three angles: (1) those that may be considered largely as artificial treatment of the material, with or without the aid of suitable chemicals; (2) those that are mainly dependent upon mechanical forces, together with the organisms that can function under anaerobic conditions or under conditions of very poor air supply; and (3) those that operate under aerobic conditions promoting the growth and development of organisms commonly found in health soils and natural waters. The methods under (1) and (2) have been found to be of limited value and to be less efficient than the methods under (3).

The evolution of the aerobic methods, though it has taken place on rather empirical lines, is of great interest. When the purifying power of porous soil was linked up with its pore space (in the same way as the cleansing action of water was related to its dissolved oxygen), artificial sand filters were tried for sewage treatment. The sand filters were later replaced by contact beds which in turn gave rise to trickling filters. In the attempts to circulate air in the filters may perhaps be found the origin of the idea of direct aeration of sewage and its purification without the aid of filters.

Although the necessity for effective aeration of sewage was appreciated even as the early observations were made on the behaviour of the material in the natural media of sandy soil and clean water, the

significance of another important condition had to be realised before the aerobic process of purification could be appreciably facilitated. Thus, when sewage alone was intensively aerated and the deposit formed was thrown out with the clarified liquid, as was done by Fowler² in 1897, the process did not appear to be practicable. In another series of experiments no attempt was, however, made to aerate artificially the sewage treated with the purifying humus or slime from the oxidising filter; the slime by itself was found ineffective.² The defects of these experiments were more apparent in the light of the experiments carried out by Clark and Gage in 1912 at the Lawrence Experimental Station of the Massachusetts State Board of Health and their later trials with slate beds.²⁰ But further experimental work had to be done for actual application of the principle of aerobic purification of sewage.

Fowler and Mumford, in 1913, did away with the fixed surfaces as in a filter or slate bed and employed a specific bacterium (M7) in combination with a small dose of ferric salt for the purification of sewage. In the following year, Ardern and Lockett dispensed with any extraneous bacterium or chemical substance and relied solely on the organisms naturally present in sewage for the development of "activated sludge". The next step was the substitution by Jones and Attwood of diffusers for the perforated pipes which had previously been used. The introduction of diffusers proved very useful in the economic and efficient distribution of the air employed for sewage purification. Finally came the elimination by Haworth of compressed air in favour of mechanical agitation. It may thus be seen that while each successive improvement was an important step, leading up to a most efficient aerobic process of purification, every stage in the progress meant simplification, some adjunct which had previously been regarded as indispensable being discarded. But, irrespective of the mode of aeration of sewage, by compressed air or by mechanical agitation, and of other conditions, it has been found essential that a certain percentage of "active" sludge should always be maintained in the purification system, and it was this point that was missed in the early years of the study of aeration of sewage. It is, however, curious that even after so many years since the development of the activated sludge process, which is practised as a rapid and efficient aerobic method of sewage purification, the true principle of the process still remains obscure.

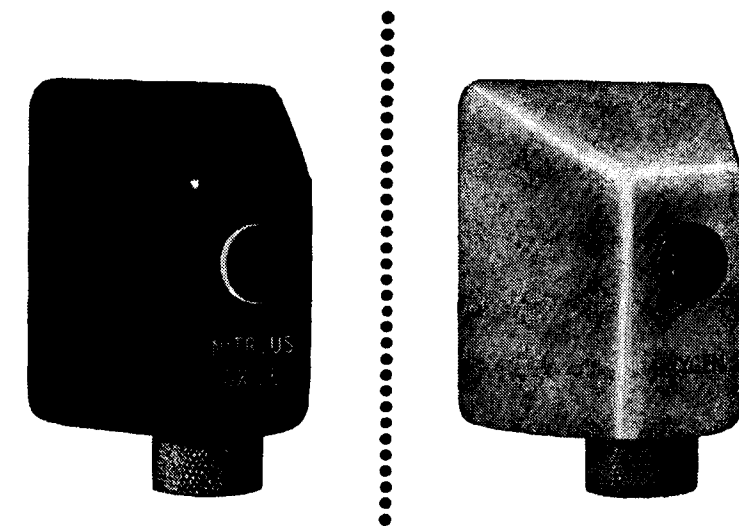
It is in this context that the more recent work at Bangalore on the natural purification of flowing sewage

is most interesting. The sewage of the whole town of Bangalore is disposed of by an unusual method. It is allowed to flow down in natural channels from three main outfalls on the outskirts of the town and it purifies itself without treatment of any kind. The quality of the purified effluents is comparable to that from the activated sludge process, and they have been used by the people in the neighbourhood for washing purposes. It is also important to note that the gradients of the sewage channels vary (1 in 50, 1 in 100 and 1 in 800) and that, depending upon the gradient, the distance covered by the sewage for purification varies. Thus, in the channel having a gradient of 1 in 50 the sewage is purified at a distance of about 1.29 miles from the outfall and in the case of the channel having a gradient of 1 in 100 the corresponding distance is about 4.75 miles. The most remarkable feature of the regions of purification in the sewage channels is the occurrence in amazingly large numbers of ciliate protozoa particularly the colonial Vorticellids of the species of *Carchesium* and *Epistylis*.⁵⁴ These and other species of Vorticellids have been found to be closely connected with the operation of the activated sludge process.^{33-38, 55} The active presence of these protozoa in the flowing sewage, as in activated sludge, has also been found to be very vital in the purification process.⁵⁴

The work at Bangalore brings out a few points of interest both in regard to the theory and practice of sewage purification. The observations on the natural purification of sewage indicate that what can be achieved by compressed air or mechanical agitation can also be achieved by mere rapid flow and that during vigorous flow of sewage, purification is attained without the aid of the so-called activated sludge which has been hitherto considered essential whether the aeration of sewage is effected by means of compressed air or by paddles. It is not suggested as a new method that sewage may be purified by allowing it to flow down over a shorter or longer distance as at Bangalore, but it is pointed out that the purifying action of activated sludge is derived from the activity particularly of colonial Vorticellids; that the object of artificially aerating sewage is precisely to supply oxygen to the organisms and to maintain their activity; and that these protozoa can develop and purify sewage even without artificial aeration of the medium. These organisms have been found to influence every facet of purification, including the oxygenation of the medium by controlling the deoxygenating agencies. Vorticellids are apparently the major living force in the purification of sewage.

modern hospital planning

MEDICAL GASES ON TAP...



Modern surgery demands ever-increasing quantities of medical gases, which has hitherto involved the constant movement of cylinders; bringing in their wake inevitable noise and distraction where quiet efficiency would otherwise prevail. A Pipe-Line system for the internal distribution of gases has now been

developed whereby the employment of cylinders and trolleys in the theatres and wards can be totally eliminated. These small, neat and compact units measuring only 4"x3" are all that need be seen or heard of oxygen and nitrous-oxide supply to the theatres and wards of any Hospital.



THE INDIAN OXYGEN & ACETYLENE CO., PRIVATE LTD.

IOAX 45

Sewage contains the necessary food for the organisms such as Vorticellids which exist mostly in the encysted condition as derived from soil, and if the medium could also contain at the same time the necessary amount of oxygen for their development and activity, purification would commence earlier, proceed faster and be complete in a shorter time than in the activated sludge plant. It was of particular interest to observe at Bangalore that in one of the natural sewage channels having a gradient of 1 in 50 the liquid was not appreciably purified up to the sampling point at 0.67 mile from the outfall, but at 0.92 mile it attained a very high degree of purification suggesting a sweeping action (similar to that of activated sludge floc when driven about in sewage) on the flowing liquid between these sampling points so close to each other. Experiments showed that it was the profuse growth of colonial Vorticellids in this region that was mainly responsible for the rapid process of purification and that up to this region the sewage by its turbulent flow was dissolving oxygen just enough to support these organisms. It would appear that this initial oxygenation and subsequent activity of Vorticellids are the essential principles of sewage purification and that a fuller understanding of these principles and their application in the design and operation of the activated sludge tank are likely to increase the efficiency and economy of the process.

The operation of activated sludge itself appears to be a natural phenomenon as suggested by the gradual evolution of the process and its simple but essential requirements. It just hastens an incipient or slow process that is taking place in natural waters, water-logged soils and even in ordinary arable soils in which aeration is known to be most important for the oxidative changes on the organic matter normally present or artificially introduced. The underlying principle of the activated sludge process and of the other biological methods, as also of the natural purification of flowing sewage, seems to be the same. This principle relates to the activity of Vorticellids, as the accumulating evidence at Bangalore shows. The future possibilities, therefore, lie in harnessing this biological force and intensifying it to the highest degree of efficiency for developments which would be no less significant in the practical fields of sewage purification and allied operations than in the sciences of microbiology and biochemistry.

REFERENCES

1. The Pamphlet prepared by General Electric Co., Schenectady, N. Y. (recently circulated by

- Dr. B. V. Bhoota of Dorr-Oliver (India) Ltd., Bombay, December, 1956).
2. Fowler, G. J., *An Introduction to the Biochemistry of Nitrogen Conservation*, 1934, Edward Arnold & Co.
3. Kershaw, G. B., *Modern Methods of Sewage Purification*, 1911, Charles Griffin & Co. Ltd., London.
4. Adrian, C. B., Evidence before the Royal Commission on Sewage Disposal, 1898 (cited by G. B. Kershaw, 1911).
5. Liebig, J., *Familiar Letters on Chemistry and its relation to Commerce, Physiology and Agriculture*, 1844, First series, Second Edition, Printed for Taylor and Walton, London.
6. Campbell, D., *J. Chem. Soc.*, 1858, 10, 272.
7. Mechi, A., *J. Soc. Arts.*, 1860, 8, 261.
8. Lawes, J. B. and Gilbert, J. H., *J. Chem. Soc.*, 1866, 19, 80.
9. Garner, J. H., Transactions of the International Conference of Sanitary Engineers, 1924, Institution of Sanitary Engineers, London, p. 204.
10. Adams, S. H., *Modern Sewage Disposal and Hygienics*, 1930, E. & F. N. Spon, Ltd., London.
11. Russell, E. J., *Soil conditions and plant growth*, 1937, Longmans, Green and Co. Ltd., London.
12. Schloesing, Th. and Muntz, A., *Compt. Rend.*, 1877, 84, 301; 85, 1018.
13. *Idem.*, *Ibid.*, 1878, 86, 892.
14. Warrington, R., *J. Chem. Soc.*, 1878, 33, 44.
15. *Idem.*, *J. Roy. Agric. Soc.*, 1897, 8, 577.
16. Adeney, W. E., *Appendix 6 to Fifth Report of Royal Commission on Sewage Disposal*, 1908, 13.
17. Fowler, G. J., *Bacteriological and Enzyme Chemistry*, 1911, London.

18. Dunbar, W. P., *Principles of Sewage Treatment*, 1907, (translated by H. T. Calvert, 1908), C. Griffin & Co. Ltd., London.
19. Martin, A. J., *The Activated Sludge Process*, 1927, Macdonal & Evans, London.
20. Clark, H. W. and Gage, S. DeM., *44th Annual Report of Massachusetts State Board of Health*, 1912, 290.
21. Ardern, E. and Lockett, W. T., *J. Soc. Chem. Ind.*, 1914, 33, 523.
22. *Idem.*, *Ibid.*, 1914, 33, 1122.
23. *Idem.*, *Ibid.*, 1915, 34, 937.
24. Russell, E. J. and Appleyard, A., *J. Agric. Sci.*, 1915, 7, 1.
25. Ardern, E., *Brit. Assoc. Advancement Sci.*, 2nd Rept. *Colloid Chem.*, 1921, 81.
26. Theriault, E. J., *Sewage Works J.*, 1935, 7, 377.
27. Stoddart, F. W., *Proc. 7th Int. Congr. App. Chem.*, Section, 1909, 8 (a), 183.
28. Jones, A. S. and Travis, W. O., *Proc. Inst. Civil Eng.*, London, 1906, 154, 68.
29. Baly, E. C. C., *J. Soc. Chem. Ind.*, 1931, 50, 22T.
30. Butterfield, C. T., *U. S. Public Health Rept.*, 1935, 50, 671.
31. McKinney, R. E. and Weichlein, R. G., *Appl. Microbiol.*, 1953, 1, 259.
32. Cramer, R., *Ind. Eng. Chem.*, 1931, 23, 309.
33. Pillai, S. C., *Curr. Sci.*, 1941, 10, 84.
34. Pillai, S. C., *Curr. Sci.*, 1942, 11, 437.
35. Pillai, S. C., and Subrahmanyam, V., *Nature*, Lond., 1942, 150, 525.
36. *Idem.*, *Ibid.*, 1944, 154, 179.
37. Fairbrother, T. H. and Renshaw, A., *J. Soc. Chem. Ind.*, 1922, 41, 134T.
38. Butterfield, C. T., Purdy, W. C. and Theriault, E. J., *U. S. Public Health Rept.*, 1931, 46, 393.
39. Wagner, G., *Anniversary Publication, 25th Year Danz Tech. School Reprint*; 1930; *Chem. Abstr.*, 1930, 24, 1917.
40. Heukelekian, H. and Gurbaxani, M. I., *Sewage Works J.*, 1949, 21, 811.
41. Theriault, E. J., *U. S. Public Health Rept.*, 1935, 50, 1581.
42. Bains, S., Hawkes, H. A., Hewitt, C. H. and Jenkins, S. H., *Sewage and Ind. Wastes*, 1953, 25, 1023.
43. McKinney, R. E. and Gram, A., *Sewage and Ind. Wastes*, 1956, 28, 1219.
44. Buswell, A. M. and Long, H. L., *J. Amer. Water Works Assoc.*, 1923, 10, 309.
45. Lumb, L., *J. Inst. Sewage Purif.*, 1933, Pt. I, 21.
46. Popel, F., *Gas-u. Wasserfach*, 1953, 94, 47.
47. Pasveer, A., *Sewage and Ind. Wastes*, 1954, 26, 28.
48. Theriault, E. J. and McNamee, P. D., *Ind. Eng. Chem.*, 1936, 28, 79.
49. Theriault, E. J., *Ibid.*, 1936, 28, 83.
50. Williams, E., *Sewage Purif.*, 1940, 2, 125.
51. Babbitt, H. E., *Sewerage and Sewage Treatment*, 1947, Sixth Edition, John Wiley & Sons Inc.
52. The Committee of the American Public Health Association, Report on the operation and control of activated-sludge treatment works, 1942, *S. W. J.*, pp. 3, 32.
53. Imhoff, K. and Fair, G. M., *Sewage Treatment*, 1940, John Wiley and Sons.
54. Pillai, S. C., Mohan Rao, G. J., Prabhakara Rao, A. V. S., Natarajan, C. V. and Madappa, I. B., *Indian Med. Gaz.*, 1953, 88, 507.
55. Pillai, S. C., *Curr. Sci.*, 1949, 18, 382.

"Weingarten's Syndrome" or "Tropical Eosinophilia"

By DR. T. V. VENKATESAN

Madurai (South India)

This condition is characterised by a tetrad of symptoms.

- Persistent or recurrent cough.
- High Eosinophilia.
- Radiological changes in lung fields.
- The beneficial effects with Mapharside or any other arsenic.

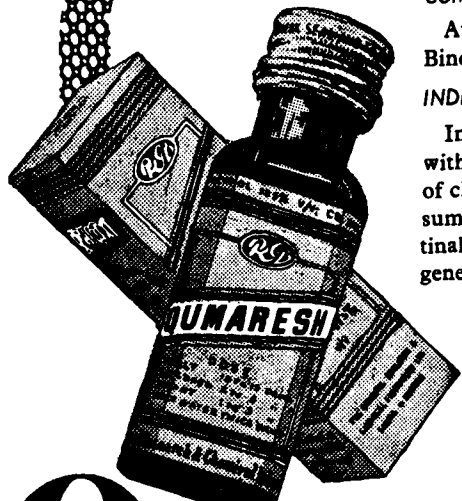
There are three conditions occurring with Eosinophilia and lung signs which must be grouped under the

category of "Eosinophilia Pneumonopathy". They are:

- Weingarten's Syndrome.
- Loeffler's Syndrome.
- Asthmatic Bronchitis.

The Loeffler's Syndrome is a condition of transient pulmonary infiltration and eosinophilia due to helminthiasis. The three conditions need to be differentiated and the following points will be useful though Loeffler's Syndrome and Tropical Eosinophilia may border on each other.

Tropical Eosinophilia.	Loeffler's Syndrome.	Asthmatoid Bronchitis.
Marked Leucocytosis.	Moderate Leucocytosis.	No or slight Leucocytosis.
Marked Eosinophilia.	Moderate Eosinophilia.	Slight Eosinophilia.
Disseminated mottlings in lungs.	Transient pulmonary infiltration.	No pulmonary infiltration.



COMPOSITION:
Audrographis Paniculata, Hygrophila Spinosa, Luffa Bindal, Ptychotis and other cholagogues and carminatives.

INDICATIONS:
Infantile liver with constipation; biliary obstruction with dropsy; tropical congestion of liver; early stages of cirrhosis of liver; intestinal troubles during dentition; summer diarrhoea; postnatal anorexia with gastro intestinal irritation and diarrhoea; anasarca; jaundice, and general atonic condition of the liver and stomach.

DOSES:

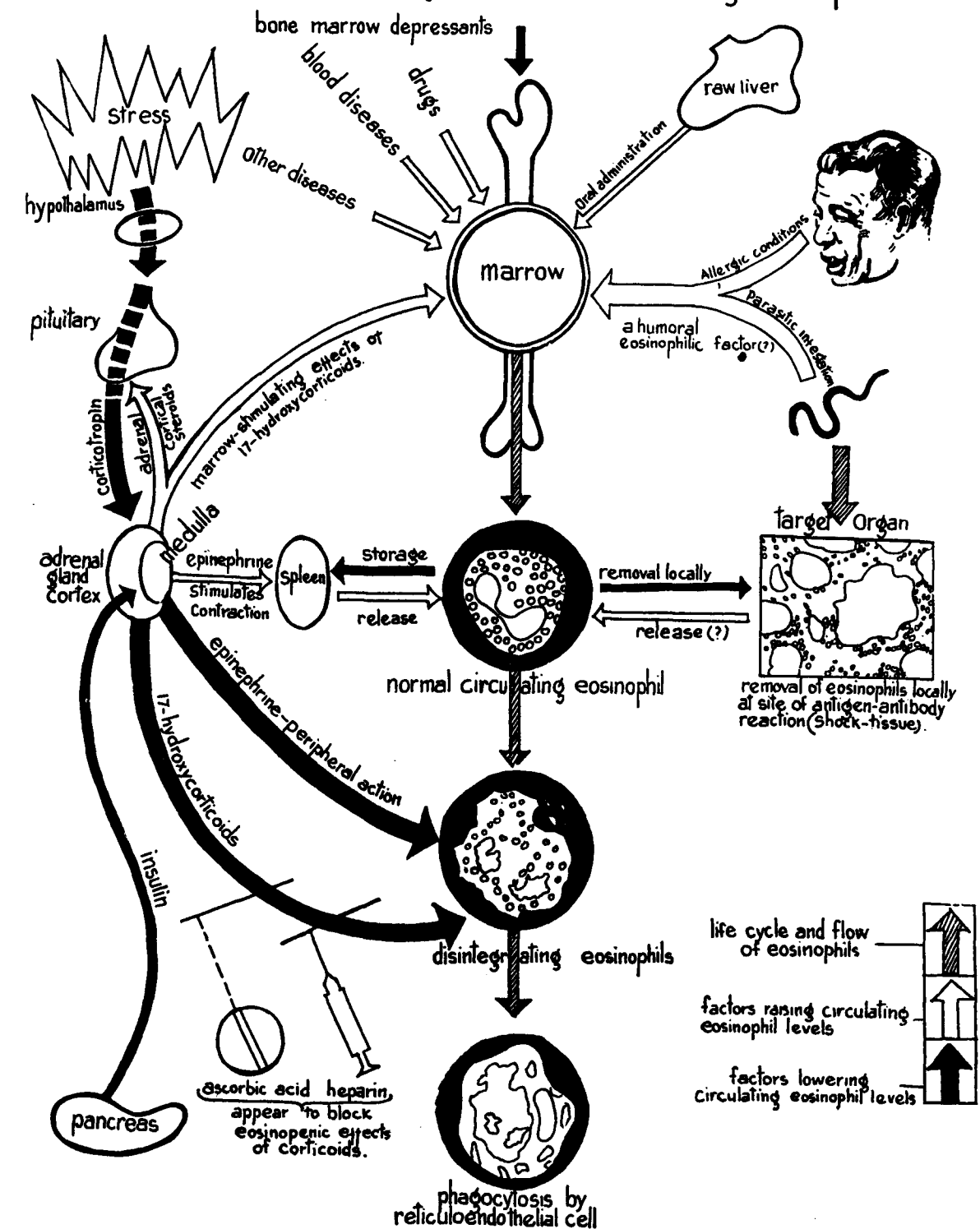
Adults	10 to 15 drops
Children	2 to 5 "
Infants	1 to 3 "

with water twice daily, before or after meals, or as directed by physician.

Qumareash

THE ORIENTAL RESEARCH & CHEMICAL LABORATORY LTD

Factors involved in Controlling the level of circulating Eosinophils



In tropical eosinophilia there is diffuse mottling and nodulation in the lungs. The histological picture is an unorganised pneumonia with many eosinophils. There is eosinophilic bronchitis or bronchiolitis. Dr. R. Viswanathan described scattered areas of interstitial fibroblastic proliferation and eosinophilic infiltration.

The symptoms produced are variable :

- (1) Fever may be the presenting symptom at the onset in many cases.
- (2) Intermittant attacks of cold and cough and bronchitis may occur.
- (3) Some cases may show evidence of bronchospasm.
- (4) The liver and spleen may be palpable.
- (5) A history of nasal allergy in a good number of cases is present.

Investigations :

- (1) Total leukocyte count is high and variable.
- (2) Differential count : There is marked, eosinophilia as much as 90% has been reported. The eosinophils are mature segmented forms.
- (3) Blood for Wassermann Reaction and Kahn Reaction show false positive reactions.
- (4) Blood culture during the febrile period is sterile.
- (5) Motion examination may reveal hookworm or roundworm ova in about one fourth of the cases.
- (6) Mites are not found in the sputum.
- (7) Spirochætes : Some cases showed spirochætes in sputum or sample of mucus. Short "S" shaped forms of spirochætes, longer and coarser forms and very fine closely allied spirochætes may be present in the sputum.
- (8) X-ray picture of the lung fields shows a snow storm appearance. Prominent bronchial markings occur with basal emphysema.
- (9) The liver biopsy shows cellular eosinophilic infiltration around the portal triad.

Treatment of Tropical Eosinophilia :

- (1) There has been recently a great amount of criticism levelled against the use of arsenic in this condition. It cannot be denied that the

use of Nearsphenamine or Mapharside produces good results. The use of the latter is less toxic due to the presence of ascorbic acid. The vast majority of cases responded to six injections. The response with oral arsenic preparations as Carbarsone or Fowler's solution is very slow. Relapses do occur in a small percentage of cases.

- (2) Chlortetracyclin has been found to be good in a few cases that do not tolerate arsenic. The dose is two capsules 0.5 gr., 6th hourly for 10 days.
- (3) With Di-ethyl-carbamazine (Hetrazan or Banocide) a number of cases has been reported with beneficial results by Dr. R. N. Choudhri. 10 out of 12 cases have been recorded to present clinical and hæmatological response after giving di-ethyl-carbamazine in doses of 12 tablets per day for 10 days.
- (4) Corticosteroids : The preparations that have produced beneficial results are :
 - (a) A. C. T. H. 20 units ; 6th hourly for 7 days.
 - (b) Cortisone 200 mgm. on the first day and 100 mgm. daily on the next 6 days.
 - (c) Prednisone : Dose :—10 mgm. thrice daily for 7 days. There is clinical, radiological and hæmatological response with these drugs.

It is justifiable to state that it is essential to find the *raison d'être* that produces the condition while there is such a wide galaxy of therapeutic agents available.

A brief survey about Eosinophilia is *sine qua non*. An extract from Pfizers Spectrum in the J. A. M. A., 1953, Vol. 151, No. 13, is enclosed. This gives a very vivid picturesque view of the condition.

The pathology of Eosinophilia : There is increased production of Eosinophil from the bone marrow. The bone marrow smears show increased eosinophil in all stages of development. The pulmonary infiltration is due to eosinophilic exudates producing stelectasis or pneumonitis.

Ætiology of Eosinophilia

- (1) Infections : (a) Viral. (b) Bacterial. (c) Spirochætal. (d) Helminthic infection as (i) Ascariasis,

(ii) Ankylostomiasis, (iii) Microfilaria bancrofti (Filariasis), (iv) Acanthocheilonema perstans.

The percentage of cases in which an ætiological agent has been identified is small as compared with those in which no cause is discovered.

It is probably an infection allergy type. The beneficial effects noted with corticosteroids may be due to either antiallergic or direct action.

The eosinophils are destroyed and phagocytosed by the reticulo-endothelial cells.

REFERENCES

1. Löffler's Syndrome by Louis Mare: Diseases of Chest Vol. XXV. No. 2.
2. J.A.M.A., Vol. 151, Pfizers Spectrum, 28th Mar. 1953.
3. Tropical Eosinophilia by Dr. R. N. Choudhri, J.A.M.A., Vol. 27, No. 6.

The seedy looking race track tout sat on a park bench, sadly fingering his last dollar, when suddenly his eyes lighted on a racing form. He picked it up excitedly and started doping out the day's races. Making a decision, he rushed to a bookie friend and bet the dollar on Speedy Stuff.

"Look, Joe" said the bookie sadly, "that horse hasn't a chance on earth, Save your dollar, pal".

But Joe was adamant.

"O. K." Shrugged the bookie. "I'll show you what I think of that nag. I'll personally give you a million-to-one on him".

Came the race and - wonder of wonders - Speedy Stuff came in first. Joe stuffed his pockets with \$. 1,000 bills and started walking away glumly.

"For the love of Pete" cried the bookie "I should be shooting myself. Why are you so unhappy?"

Joe shook his head bitterly. "All my life I've been betting on horses", he said. "Finally I win a million-to-one race. And what have I got on it? A measly \$. 1!"

To the physician requiring a dependable Liver Extract for stimulating intensive erythropoiesis in macrocytic anæmias, Befolex, containing all the constituents of anti-anæmic principle, offers an ideal choice.

Crude Liver Extract
with folic acid and vitamin B₁₂

BEFOLEX

FOR INTRAMUSCULAR INJECTION ONLY

Mode of Issue : Boxes of 2 c. c. x 6 ampoules • Rubber capped vials of 10 c. c.

BENGAL CHEMICAL CALCUTTA BOMBAY KANPUR

Soviet Physicians Concentrate on the Heart

BY A. DEMBO

Doctor of Medical Sciences (Leningrad)

THE attention of the modern therapy is attracted to diseases of the cardio-vascular system. This is quite natural since lately diseases of the organs of the circulatory system are the most wide-spread among the adult population in the USSR. The incidence of such cardio-vascular diseases, as rheumatism, hypertonia, sclerosis, myocardial infarction and stenocardia has greatly increased. These diseases are one of the fundamental causes of invalidity of factory and office workers.

The problem of atherosclerosis has long since drawn the attention of scientists, because it is one of the most wide-spread diseases of the cardio-vascular system. What is the nature and pathogenesis (i. e. origin) of atherosclerosis? As it was demonstrated for the first time by works of a Soviet scientist, Academician N. Anichkov and his collaborators, this disease is due to disturbed cholesterol metabolism of the body.

Cholesterol is one of the fatty substances (lipoids), which circulates in the blood and is found in all tissues and organs of the body. The rise in cholesterol blood level leads to its deposition in the intima of aorta and of the certain other arteries. This, in turn, promotes the growth of connective tissue and results in disturbance of the cardio-vascular system, as a whole. It has been established by Anichkov, that the main process, which characterises this disease, is the primary infiltration of the arterial walls by lipoids. This theory is one of the fundamental theses of the teachings on atherosclerosis. The establishment of the reversible nature of atherosclerotic changes, the possibility of reversed development of lipid infiltration of the arterial walls is, likewise, extremely important. Until lately it was considered that the best that could be done was to stop the further development of atherosclerosis. Treatment was concentrated on that point. However, the investigations of Anichkov and his collaborators allow to conclude that it is not only possible to delay development of atherosclerosis, but even to reverse the course of this disease.

How should atherosclerosis be diagnosed? What are the measures of prophylaxis and treatment of atherosclerosis? Atherosclerosis frequently involves the

following blood vessels: the coronary arteries, aorta, the vessels of the brain, the arteries of the kidneys, extremities and those of the mesentery. Instrumental, X-ray and biochemical methods are employed at the present time for diagnosis of these diseases. Biochemical examination is particularly employed for determination of lipoids and lipo-proteins of the blood.

Prophylaxis by diet is the most important measure in prevention and treatment of atherosclerosis. Usually, in atherosclerosis the metabolic processes of the body are disturbed. Particularly it concerns the synthesis of protein, cholesterol, as well as, of the complex compounds of proteins with lipoids. That is why a rational diet is required. For example, the necessity of avoiding excess intake of fat has been established, since fat is the source of endogenous cholesterol. However, the substances that inhibit the process of infiltration of the blood vessels by cholesterol are present in our common food-stuffs. This was demonstrated by the research workers of the Institute of Therapy of the USSR Academy of Medical Sciences. For example, such is the role of the other lipid—lecithin. For a long time it was administered to the patients suffering from atherosclerosis and brought about improvement of their general condition. Increased intake of ascorbic acid and of the food products rich in vitamin C, limited caloric value of food has a positive effect on the composition of the blood, as well as, on the body metabolism.

It is acknowledged that acute constriction of the coronary arteries, which supply the heart muscle (myocardium), is not always due to atherosclerosis, but may be the result of their spasm which leads to decreased blood and oxygen supply of a certain part of a heart muscle. This disease is characterised by the paroxysmal attacks of pain in the thoracic area, which may progress in duration and intensity.

What are the causes of coronary insufficiency and the most important methods of its treatment? More than 2.5 thousands of cases were studied at the clinic headed by M. Vovsi in order to solve this problem. They were able to collect evidence which supports the view, that besides organic changes of the blood vessels, the leading role in the appearance of attacks of angina

pectoris is played by the psychic or nervous stimulation. A Soviet scientist G. Lang was the first to draw attention to this fact. Association of attacks of angina pectoris with the regulation of coronary blood supply is beyond doubt.

Treatment of angina pectoris is usually carried out in two stages: i. e. treatment of the attack itself with the following improvement of the patient's general condition. The attack is, as a rule, arrested by rest with administration of corresponding drugs, nitrites, in particular, which dilate the coronary vessels and relieve pain. The synthetic sex hormones, reflex therapy and different medicinal preparations are successfully used for prevention of further attacks. At present new methods of treatment are being developed. Of a special significance in the future is the use of dicumarin, neodicumarin and heparin, anticoagulant drugs. These drugs prevent blood clotting and are introduced for prophylactic, as well as, for therapeutic purposes.

Finally, diet, rational daily schedule, rest and medicinal exercises may result in improvement of the patient's general condition. These measures have a positive effect on the coronary circulation and myocardial contractility.

Especially grave is an acute disease of the heart which brings about serious complications, i. e. the myocardial infarction. It is due to necrosis of a certain area of the heart muscle, which takes place as a result of obstruction of the lumen of coronary artery. The attention of numerous countries is concentrated on the problem of myocardial infarction.

The great significance of atherosclerosis of the coronary blood vessels in the origin of myocardial infarction was established by investigations of Soviet, as well as of foreign cardiologists. The role of the functional neurogenic factors should be taken into consideration in discussion of pathogenesis of this disease. Obesity, which aids in the progress of atherosclerosis and the part played by nicotine is not to be forgotten too, since it causes constriction of the

coronary arteries. Thrombosis of the coronary arteries differentiates myocardial infarction from stenocardia. Only recently myocardial infarction was considered to be incurable. At the present time the attitude towards this disease is different. First of all there appears an opportunity to establish a correct prognosis of the potentialities of myocardial infarction. It becomes possible to introduce prophylactic measures in pre-infarctive condition, such as administration of anti-coagulants etc. Besides, it frequently happens that the patient shows recovery, if hospitalized in time. Of course, complete rest is required for a certain time after myocardial infarction. However, as revealed by the evidence of Soviet clinics, many weeks of motionless lying on the back may cause congestion pneumonia. Such complete confinement has poor influence on the nervous-psychic condition of the patient. Therefore, in normal course of this disease light exercises may be introduced from the 2nd-3rd week. At first the exercises should be passive, such as the passive motions of joints, light massage, expiratory motions. Later more complex exercises should be introduced. Practical experience of the Soviet physicians shows that numerous patients who had an attack of myocardial infarction feel quite well in half a year. They are even able to resume work and are efficient for a long time. Therefore it may be concluded that medical science chose the correct route, which gives the opportunity for successful treatment and prophylaxis of myocardial infarction and its relapses.

Treatment of patients in sanatoria after an attack of myocardial infarction is likewise very effective. In the majority of cases the pains in the heart area disappear or are relieved. There is no palpitation, dyspnea of fatigue, sleep is improved, etc. The important role of health resorts and sanatoria should be stressed in treatment of cardio-vascular system.

Timely diagnosis of the initial stages of this disease, observation in the out-patients department and planned complex prophylactic and general hygienic measures result in pronounced decrease of the incidence of cardio-vascular diseases in the USSR.

Grace Downs, who teaches pretty young ladies how to become airline hostesses, overheard a woman buying a pair of men's pajamas in a New York department store.

"One pair?" asked the Sales man politely.

"Well, of course!" replied the woman. "What do you take me — a bigamist?"

DYES AND DETERGENTS AS ANTISEPTICS

BY SURESH CHANDRA BANERJEE

DYES are generally used in colouring textiles, foodstuffs, beverages and medicines. They are synthesized from one or the other of the commercially valuable fractions of coal tar. There is a large demand for dyestuffs for textile colours and for this particular purpose their manufacture does not necessarily involve bringing them to the high state of purity that would be demanded of medicinal dyestuffs. Additionally the dye bases are often linked to metals in order to provide certain textile qualities and frequently these are toxic metals. These facts emphasize the point that the industrial dyestuffs should not be used for medicinal purposes and that only the dyestuffs, free from toxic impurities and specially prepared for therapeutic use, should be available for such purposes. A large number of these dyes, used for medicinal purposes are active bactericides and many of them are also useful therapeutic agents against infection by various protozoa—trypanosomes and plasmodia. The local antiseptic action of dyes can be explained by their bacteriostatic and bactericidal powers. These are often relatively specific. Roughly they may be divided into five classes (1) the azo dyes, (2) the acridine dyes, (3) the fluorescein dyes, (4) the phenolphthalein dyes (5) triphenylmethane or rosaniline series and miscellaneous dyes.

The azo dyes have been used in medicines for many years—more generally recalled under the name 'scarlet R'. The exact constitution of the scarlet R dyes which have been used, seems to have varied in minor details with different investigators. Chemically they have been azo compounds (that is—they contain the linkage $-N=N-$) combined with naphthol. Scarlet red medicinal Biebrich and scarlet sulphonate have been claimed to have a marked power of stimulating the proliferation of epithelial cells. Mallophone—phenylazo-diaminopyridine hydrochloride, a red powder sparingly soluble in cold water, has been employed locally as a general surgical and dental antiseptic in strengths of from $\frac{1}{2}$ to 1 per cent in infections of mouth, conjunctiva or urethra.

The acridine derivatives are mostly yellow dyes—coal tar product—to which the term flavine has been applied. The representative acridine dyes used in

medicine are acriflavine hydrochloride, acriflavine base and proflavine. It appears to be established since 1912 that these dyes possess marked antiseptic and germicidal properties and on this account they have been employed in a number of pathologic conditions. The antiseptic or bacteriostatic action of acriflavine hydrochloride and proflavine appears to be weakened in presence of serum. In the treatment of wounds it is claimed that these drugs are comparatively free from toxic or irritant action on living tissues and that they do not inhibit appreciably the phagocytic action of leukocytes. Acriflavine hydrochloride is claimed to exert a specific bactericidal action on the gonococcus. The evidence indicates that it has a greater antiseptic action than proflavine, though its action is slower.

Flavacid, 3, 7-dimethyl-8-amino-2-dimethyl amino-10-methyl-acridinum chloride has been used as a surgical germicide either for disinfecting the skin or as a wound dressing in strengths varying between 1 in 5000 and 1 in 1000. It has also been employed in ointments of about the same strengths in the treatment of skin diseases. Good results have been obtained from its use in the local treatment of gonorrhea. The acriflavine dyes have been employed in the treatment of wounds, urithrities gingivitis, gonorrheal conjunctivitis, blenor-rhea eczema, furunculosis and other conditions requiring the use of a germicide. The use of acriflavine base rather than acriflavine hydrochloride has been suggested in areas where freedom from irritation due to acid reaction of acriflavine hydrochloride and, proflavine is desirable. In the treatment of wounds the solution generally employed is 1 in 1000 in physiological solution of sodium chloride. Evaporation should be prevented by protective dressing. In the treatment of open wounds, an ointment has been used which contains 1 per cent of proflavine oleate in an ointment base composed of equal parts of petrolatum and calcium carbonate. Solutions of acriflavine hydrochloride, acriflavine base, and proflavine may be boiled or heated in an autoclave to 130°C , without decomposition, but they are sensitive to light and should be stored in amber bottles.

Of the derivatives of triphenylmethane and its homologue tolyldiphenylmethane, the most interesting

are those which result from the introduction of amino groups forming para-rosaniline and rosaniline. On treating rosaniline with hydrochloric acid, the hydroxyl of the carbinol group is split off, permitting the formation of a quinoid group; thus is formed the typical dye known as fuchsin. The red colour of para-rosaniline chloride or fuchsin is changed to violet by the entrance of a methyl group in the amino groups, the intensity of violet colour increasing with an increasing number of methyl groups. Thus gentian violet is hexamethyl-pararosaniline chloride with an admixture usually of pentamethyl-pararosaniline and tetramethyl-pararosaniline chlorides. Crystal violet is a relatively pure form of hexamethyl-pararosaniline chloride. Methyl violet is considered to contain mostly pentamethyl-pararosaniline chloride with some of the hexa derivative and probably some tetra derivative also. It seems likely that in therapeutics it will be found that there is little difference between the penta and hexa derivatives and the mixtures of the two, so that the one most easily obtained in pure form will be the one most used. Gentian violet is being introduced as an antiseptic since 1890. The dye has been found to possess a selective action on certain bacteria and that the majority of the gram-negative organisms survived exposure to gentian violet solutions in strengths far in excess of that required to kill gram-positive organisms; in fact, the action of the dye is sufficiently selective so that often a strain within the species is not affected. Gentian violet is a useful antiseptic for infected wounds mucous membranes and serous surfaces. Its chief application has been in the treatment of affections of the plural cavity—affections in which staphylococci *Ps. aureginosa* and *C. diphtheriae* are the causative agents. The selective action of acid fuchsin, however is clearly brought out only when the organisms are exposed to the dye, with slight elevation of temperature (about 50°). Acid fuchsin is incompatible with gentian violet, and the compatibility of all mixtures of dyes should be determined before any combination is prepared. Fuchsin surpasses trypan red in its distinctive action upon trypanosomes. It is a powerful germicide rivalling phenol in its efficiency, and like many of the other dyestuffs stimulating granulation and epithilization.

Dymixal, a mixture of three dyes containing crystal violet 45%, brilliant green 32%, and acriflavine 23% is proposed for the treatment of burns. It possesses antiseptic action and a flexible eschar. It appears to be more advantageous than a single dye in antiseptic effect against gram-positive and gram-negative bacteria.

Malachite green, a triphenylmethane dye is also an active germicide but differs greatly in its effects on various micro-organisms. It has been successfully used as an antiseptic in wounds by many surgeons. It has the advantage of not interfering with granulation of phagocytosis.

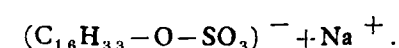
DETERGENTS

The cleaning action of soap and certain naturally occurring detergents has been recognised for many years. Recently the demands of industry for wetting agents and detergents to meet a variety of special purposes have led to a very rapid commercial development of these compounds. More than a thousand wetting agents and detergents have been patented in the past decade. The bactericidal and bacteriostatic action of soaps have been recognised for many years. Detailed studies (Eggarth) on the germicidal action of soaps have shown the importance of such factors as length of hydrocarbon chain, chemical configuration, effect of hydrogen ion concentration, effect of serum etc. It has been found that soaps have got selective germicidal action on micro-organisms. In addition to their selectivity, which is an advantage unless one wishes to attack or differentiate specific micro-organisms, soaps have certain other undesirable characteristics which limit their usefulness. Ordinary soaps have too alkaline a reaction for application on sensitive tissues. Moreover soap is precipitated by hard water. Improved detergents, interface modifiers, wetting and emulsifying agents and related compounds have been synthesised in recent years. These compounds are in most cases superior to soaps in wetting and cleansing abilities and have the additional virtue of stability in acid and alkaline solutions. They may be classified as (a) anionic compounds (sodium lauryl sulphate), (b) cationic compounds (lauryl pyridinium iodide), (c) non-ionised compounds (polyglycerol esters).

The bactericidal action of synthetic detergents was emphasised by Domagk when he demonstrated in 1935, that the cationic detergents Zephiren, possesses excellent germicidal properties. Katz et al reported that an anionic wetting agent derived from naphthelene sulfonic acid inhibited the growth of *Mycobacterium smegmatis*, latter they studied the effects of one cationic and three other anionic synthetic wetting agents and their use for the disinfection of skin surfaces has been recommended. Interesting observations reported by different scientists have shown that alkyl sulfates selectively inhibit the growth of gram-positive

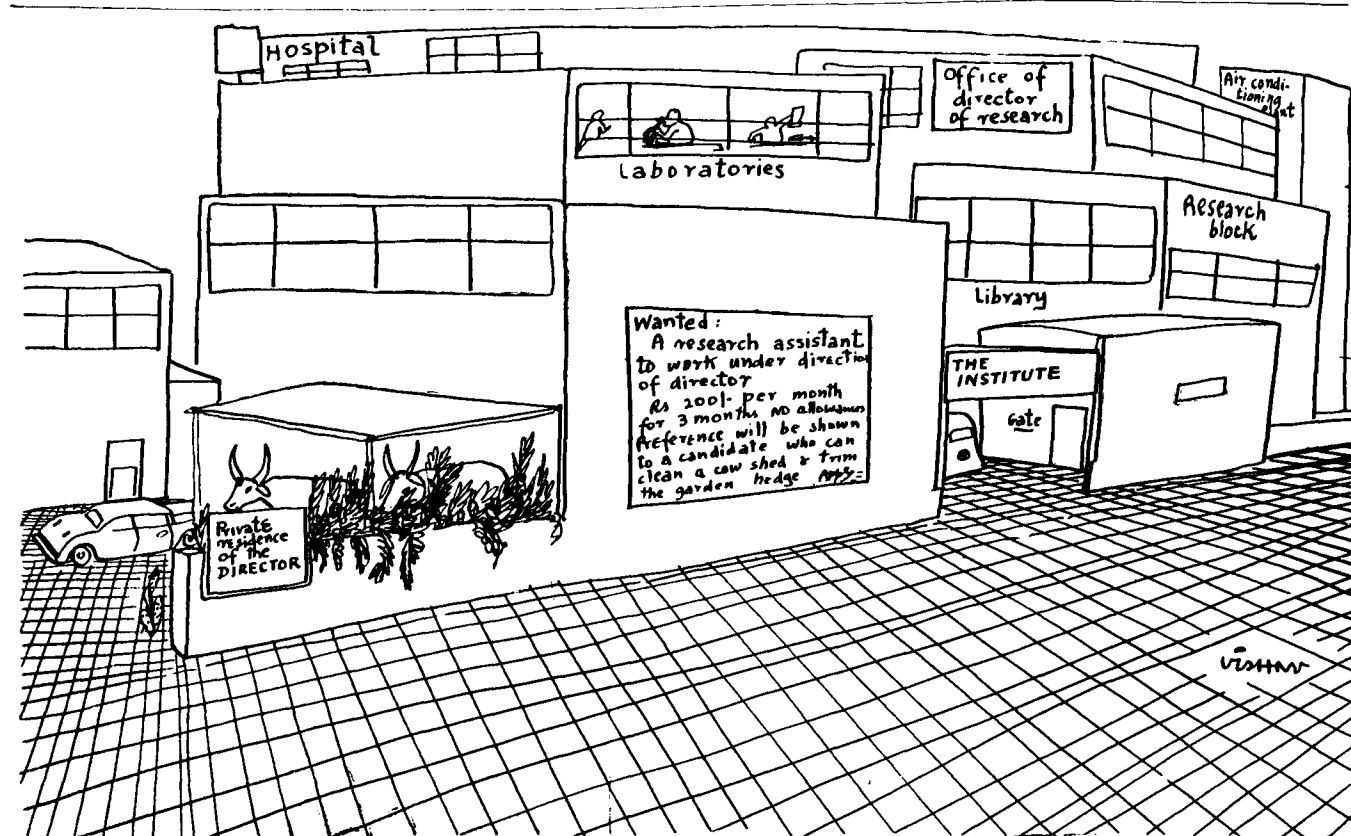
organisms. It is also of interest in connection with these studies, on characteristic synthetic detergents, to note the recent researches on the bactericidal effects of some long chain derivatives of sulfanilamide, and the striking trypanocidal action of long chain derivatives of diamidines and related compounds reported by Yorke and collaborators. These experiments have made a more detailed investigation of the action of synthetic detergents on bacterial metabolism.

A very marked inhibitory action of Zephiran on the respiration and glycolysis of pure cultures of micro-organisms associated with dental caries has been demonstrated by Miller and collaborators. It has also been shown that this compound penetrates the dense matrix of human dental plaque material both in vitro and in vivo, and inhibits the metabolism of mixed flora. Zephiran, typical of the cationic compounds, ionises with the long chain hydrophobic group in the cation: $[(R_1 R_2 R_3 R_4) N]^+ + (Cl^-)$. Sodium cetyl sulfate, typically anionic, ionises with the hydrophobic group in the anion as follows:



Several types of cationic detergents have been investigated such as quarternary ammonium compounds (a) containing aromatic or alkyl-phenyl radicals (b) containing only aliphatic groups (c) containing heterocyclic nitrogen. It was found that all of these compounds inhibited the metabolism of the organisms almost completely at a concentration of 1 in 3000. In some cases a marked effect on bacterial metabolism was noted at concentration as low as 1 in 10000. These cationic detergents inhibited the metabolism of both gram-positive and gram-negative micro-organisms to the same degree. The cationic detergents are more effective inhibitors than the anionic, especially if one compares their activities at a physiological pH. It is unlikely that the superiority of one group over the other is due to physical factors, such as wetting power, effectiveness in detergency or other effect on surface tension. In many cases the anionic compounds are at least equally effective and even frequently superior in these properties. Moreover, the germicidal action of surface active compounds cannot be attributed entirely to their ill effect on surface tension.

Frequently compounds which have the same capacity to reduce surface tension, but which differ in chemical



configuration, vary in their ability to inhibit bacterial growth. The marked activity of cationic detergents may be attributed to the quarternary ammonium structure; because of the well known biological activity of compounds containing this group. However subsequent experiments with Emulsol—606, 608 and 609 made this appear unlikely. These compounds are all lauryl esters of amino acid hydrochlorides $(C_{12}H_{25}OOC-R-NH_2 HCl)$

and differ from the typical, fully alkylated quarternary ammonium compounds. These amino acid esters possess activity which is comparable to that of the quarternary ammonium cationic detergents. It is tempting for the sake of simplicity to consider the effectiveness of the cationic compounds in terms of the positive charge on the ion which contains the long chain, hydrophobic group. It is a well established fact that most bacteria are negatively charged and one might assume that the long chain positive ion is more effective because its opposite electrical charge facilitates absorption.

Since lecithin contains a hydrophilic-hydrophobic structure and a quarternary ammonium nitrogen in the choline portion of the molecule, it was of interest to compare this naturally occurring substance with synthetic detergents of similar structure. Experiments were performed on a sample of lecithin, obtained from soybean and it was found by Baker et al that even at a concentration of 1 in 300 this compound did not inhibit the metabolism of three gram-positive and three gram-negative micro-organisms. In most cases there was stimulation of metabolism.

The action of synthetic detergents on bacterial metabolism is influenced by a number of factors such as, (a) charge on ion containing hydrophobic group, (b) hydrophilic-hydrophobic balance of the molecule, (c) pH of the medium, (d) specific chemical structure (e) general and specific characteristics of the micro-organisms. Certain detergents are extremely potent in inhibiting the metabolism of a number of bacterial species, and that, under the experimental conditions employed, this inhibition is irreversible. Solubility and balance are very important properties of wetting agents and detergents. If the compound has too many hydrophilic groups, it loses its effectiveness as a detergent or wetting agent; similarly, if the balance is over-weighted on the side of the hydrophobic groups, the compound may become too soluble to be effective. In detergents derived from straight chain alkyl compound the maximum efficiency is obtained

when the chain contains 12 to 14 carbon atoms. With higher homologues, the decrease in solubility limits effectiveness.

It was found that the effect of the cationic compounds increased progressively as the pH was shifted towards the alkaline side, whereas inhibition by the anionic types increased with a shift towards the acid side. It is interesting that many investigators have found that increase of pH favours the disinfecting power of basic dyes and decrease of pH that of acid dyes. It is possible that hydrogen ion concentration directly affects the bacteria, altering either membrane or protoplasm in such a manner as to render the micro-organisms more susceptible to the action of the detergent. It is conceivable that hydrogen ion concentration may influence the formation of micelles. It is known that detergents are very apt to change from molecular to micellar solution. In such a case the effective antibacterial concentration of the detergent might be changed markedly. There are many other possibilities which might be considered e. g. the effect of pH on formation of molecular films, or on penetration of films etc. However it is apparent from the results of investigations that special attention must be given to control of hydrogen ion concentration in any studies on the antibacterial action of detergents.

Emulsol compounds, 606, 608 and 609 are interesting since their hydrophobic portion is linked to a naturally occurring substance amino acid. These lauryl esters of amino acids are all very effective in reducing bacterial metabolism and their effectiveness is a function of the number of carbon atoms in the amino acid. To what extent substitution can increase activity must remain for further studies. It is not clear why anionic detergents affect only gram-positive micro-organisms. Wetting or detergent properties *per se* do appear to be the only determinant, because cationic wetting and detergent compounds do not exhibit selective action. Furthermore marked selectivity is shown by non-detergent compounds such as dyes. It is not uncommon to observe stimulation of metabolic processes by drugs or chemicals at low concentration. Therefore its manifestations in the case of the detergents warrant little attention except for the fact the stimulating effect has been much more marked in case of anionic detergents than in the cationic group.

REFERENCES

1. Webb. B.M.J., I, 870, 1917.
2. May. J.A.M.A., 10, 1913.

(Continued on page 34)

MUCOVISCIDOSIS

By DR. STUART S. STEVENSON

Childrens Hospital, Pittsburg, Pa.

This systemic disease of childhood, which also goes by the name of cystic fibrosis of the pancreas, involves the mucous glands throughout the body. It is often confused with idiopathic celiac disease.

A clinical picture of children with chronic nutritional failure was described by Sir Samuel Gee in a paper "On the Coeliac Affection" which was published in 1888. The children he described had bulky, foul-smelling, greasy stools, extreme wasting of the body, a distended abdomen and stunted growth. Because Sir Samuel did not know the cause of this "intestinal infantilism" he called it the "coeliac affection" from the Greek word for abdomen. Today we know that he has describing several diseases, two of which are particularly important in pediatric practice.

One is called idiopathic celiac disease because its etiology is still not known. The child with this miserable affliction is usually well until the latter part of his first year of life, or even later. At this time, he begins to have large, pale, greasy, mushy, foul-smelling stools; he becomes irritable and anorexic; his nutrition suffers severely and his growth becomes retarded. Investigation reveals that he digests the food which he eats but he fails to absorb the products of digestion and they are excreted in his stools. No other defect can be found, and if the child should happen to die of an intercurrent disease, "naked eye examinations of dead bodies throw no light upon the nature of the coeliac infection", as Gee so accurately worded it. Usually such a child recovers completely after an illness of several months or several years.

The second important disease which Gee was describing is called mucoviscidosis. It was not generally well understood as a definite morbid process which resembles celiac diseases superficially but actually has no connection with it, until Andersen's paper in 1938.

It was a clinical and pathologic study of the condition which she called cystic fibrosis of the pancreas (mucoviscidosis)

Idiopathic celiac disease and mucoviscidosis are still confused clinically. It is necessary, however, to distinguish them for they are distinct entities, each with a different prognosis, different treatment and with different genetic implications.

PATHOLOGY

Mucoviscidosis is a systemic disease in which the mucous glands of the body become obstructed with their own abnormally thick and viscid secretions. Its etiology is unknown but the defect is inherited and the disease is congenital. One in 4 of the patient's subsequent siblings may be expected to be similarly afflicted. It affects possibly 1 in 5000 of the general population and it appears in 2 to 5 per cent of all autopsies on infants and children. Its incidence is not influenced by race, sex, or geographic location.

The pancreas and the lungs are the two organs which are most commonly and severely damaged. In the pancreas, the thick secretions block the acini and ducts of the exocrine portion of the gland and the resulting back pressure causes atrophy and cyst formation. Fibrous tissue replaces the destroyed pancreatic substance and eventually the gland loses its ability to secrete the important digestive enzymes—trypsin, amylase and lipase. (The islets of Langerhans are not affected since their insulin secretion does not drain through external ducts, diabetes mellitus is not a complication.) As a result of this process, protein, carbohydrate, and fat are not properly digested and 50

per cent of the ingested calories are lost into the stools. The latter are foul smelling due to decayed protein, frothy due to fermented carbohydrate, and greasy due to their high content of fat. On postmortem examination, the pancreas appears hard and small and microscopic sections show the cysts and extensive fibrosis; thus the disease has been called cystic fibrosis of the pancreas.

The child's nutrition suffers severely as a result of this loss of nutrients. In addition, ingested calcium and iron may combine with fatty acids (some fat is digested by the lower intestinal enzymes and bacteria) to form soaps which are excreted in the stools. Even the calcium which is not so combined is poorly absorbed because the patient cannot utilise fat-soluble vitamin D, and his skeleton eventually becomes decalcified or osteoporotic as a result. Clinical rickets is not usually severe because rickets is a disease of growing bone and these malnourished children have almost ceased to grow. Iron deficiency anemia is not often marked but the marginal intake of iron should be remembered when therapy is planned. Fat-soluble vitamin A is not well absorbed and this deficiency causes a squamous

metaplasia of the epithelium of the bronchial tree and the kidneys pelvis which lowers the resistance of these organs to infection. Ultimately, as a direct result of the pancreatic destruction, the patient becomes nutritionally bankrupt. His subcutaneous fat is gone; the skin of his buttocks and thighs hangs in loose folds; his abdomen protrudes against atonic, flabby muscles; his liver is filled with fat, the result of insufficient nutrition; he is plagued with repeated and chronic infections which magnify his malnutrition; his growth is retarded and finally it ceases altogether.

Meantime, the thick secretions in his bronchial tree prevent proper drainage and clog the tiny cilia whose sweeping actions normally rid the small bronchioles of bacteria and debris. In many areas, indeed, no cilia remain because the vitamin A deficiency has caused the epithelium to degenerate and shed them. The lung tissue distal to an individual bronchiole may be distended with emphysema if the thick secretions cause a partial block which traps inspired air, or it may be collapsed with atelectasis if the block is complete and air is absorbed into the blood stream. Repeated attacks of pneumonia, caused almost always by

ANNOUNCEMENT

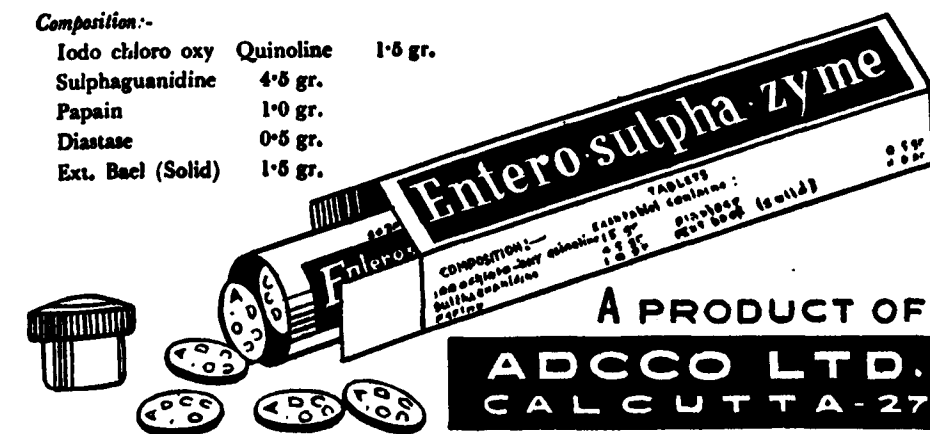
INTRODUCING A SURE REMEDY

For both Bacillary & Amoebic Dysenteries

Entero-sulpha-zyme

Composition:-

Iodo chloro oxy	Quinoline	1.5 gr.
Sulphaguanidine		4.5 gr.
Papain		1.0 gr.
Diastase		0.5 gr.
Ext. Bact (Solid)		1.5 gr.



(Continued from page 33)

- Aldrich. New England, J. Med., 217; 911, 1937.
- G. Domagk, Deutsche Med. Woch. 61, 829, 1935.
- J. Katz and A. Lipsitz, Jour. Bact. 30, 419, 1935.
- B. F. Miller, Z. Baker and R. W. Harrison, Proc. Soc. Expt. Biol. & Med., 42, 705, 1939.
- B. F. Miller and Z. Baker, Science, 91, 624, 1940.
- Egarth A.H., J. Gen. Physiol., 10, 147, 1926.
- Yorke W., Lancet, 238, 410, 1940.
- Z. Baker, R. W. Harrison and B. F. Miller, Jour. Expt. Med., 73, 249, 1941.

Staphylococcus aureus, slowly destroy the bronchial tree and the lungs. Bronchiectasis, lung abscess, and fibrosis develop. Even the heart, ultimately, gives way under the strain of pumping blood through this diseased, fibrotic area and the patient suffers a cardiac failure. This complication, with the right side of the heart huge and dilated, is called *cor pulmonale* and is a frequent cause of death.

Occasionally (in about 5 to 10 per cent of the cases) mucoviscidosis may manifest itself shortly after birth as an intestinal obstruction. A laparotomy reveals intestines which are blocked by thick, almost putty-like meconium which has never been liquified by pancreatic enzymes. The surgeon cleans out the lumen of the gut as best he can, but the children, if they survive the operation, very soon show rapidly progressive signs of the systemic disease and their prognosis is poor. Viscid secretions may occasionally block the biliary ducts, eventually causing cirrhosis of the liver.

One other peculiarity of the disease must be mentioned; the child's sweat has an abnormally high content of electrolytes. This means that under the stress of a warm environment, the patient quickly suffers a depletion of water and salt which must be carefully replaced to avoid renal shutdown and shock.

CLINICAL MANIFESTATIONS

The disease is congenital and may manifest itself shortly after birth as a meconium ileus or as slow weight gain in the face of a good food intake. Some suffer from a persistent watery diarrhea during the first weeks of life that may be misdiagnosed as epidemic diarrhea of the new-born.

The earliest signs of the disease are often respiratory—recurrent bronchitis and pneumonia with *Staphylococcus aureus* found in the nasopharynx and throat, a chronic, spasmodic, hacking cough which sounds like pertussis, and laboured breathing with an expiratory wheeze, which may simulate asthma. Respiratory trouble occurs early, usually in the first month or two and almost always before six months of age. It may be evident before abnormal stools or poor nutrition are noted, and it is found eventually in almost all children with mucoviscidosis.

Stools which resemble large masses of oatmeal coated with aluminium paint and which smell abominably may be noted in the first few weeks of life or these characteristics may not be noticeable until solid foods

are added to the patient's diet. Occasionally the mother notes that fish liver oil "goes right through" and she smells it in the bowel movement. Except for an infrequent, intractable diarrhea during the first month, as noted above, the stools of these children are not usually loose.

The patient progresses steadily downhill if he is not treated and he may present the picture of the advanced celiac syndrome when he is only a few months old: the stunted growth, the scrawny loose skin, the atrophied buttocks and thighs, the protuberant belly. Although he resembles a child with idiopathic celiac disease, the true and serious nature of his trouble can be suspected by the early age of onset, the persistent pulmonary infection, and the failure to gain weight in face of a good and sometimes ravenous appetite. (Remember that celiac disease begins toward the end of the first year or later; it is not ordinarily accompanied by respiratory infection and the patient is almost invariably irritable and anorexic). A history of a brother or sister who died with mucoviscidosis, or even one who died with "chronic pneumonia" or "pertussis" in early infancy, helps to confirm the diagnosis. If the patient himself is known to have had a meconium ileus in the neonatal period, the diagnosis is virtually certain.

DIAGNOSTIC TESTS

The best diagnostic test for mucoviscidosis is an examination of a sample of duodenal juice. The juice is obtained by duodenal intubation performed under a fluoroscope (to make sure the tube is in the duodenum). In the presence of the disease, the juice will be scanty in amount, very thick, and ropy—like egg white instead of like water—and usually it will not contain duodenal enzymes. The sample is sufficient for practical purposes however, to test only for trypsin. This is easily done by mixing the juice with a warm gelatin solution which is cooled subsequently. If trypsin is absent, the juice will not digest the protein gelatin and jelling will occur on refrigeration.

An easier way to test for the presence of trypsin in duodenal juice is to dilute freshly passed stool, uncontaminated with urine if possible, with saline. It is diluted, often from a 1:120 solution, to avoid drying out during the test and also to minimize the action of intestinal bacteria which might liquify gelatin and give a false result. A drop of the resulting mixture is then placed on the emulsion, or gelatin-coated, side of a small piece of unused X-ray film.

After the film is warmed, usually for one hour at 37 degrees C., it is gently washed with tap water. Stool which has the ability to digest protein will have dissolved the film's emulsion and a clear transparent area of the film will appear under the drop. In interpreting the results, the physician must have a report from a control test which was run on a normal stool; must remember that intestinal bacteria may dissolve gelatin, and bear in mind the occasional case of mucoviscidosis where the pancreas is not yet destroyed and tryptic activity is still present in the stool. These possible errors make the test only about 85 per cent reliable in infants. It is a valuable screening procedure however, even though it cannot take the place of duodenal intubation.

Other practical diagnostic tests are not of definitive value and are not often useful in distinguishing mucoviscidosis from idiopathic celiac disease. X-ray examination of the lungs in mucoviscidosis may show increased bronchial markings and patches of atelectasis, emphysema, and pneumonia, but these merely offer confirmatory evidence.

TREATMENT

The two main objectives in the treatment of the disease are to maintain good nutrition and control of pulmonary infection. The caloric intake must be 50 per cent higher than the intake that would be calculated normally for the child's expected weight, to compensate for stool losses. Protein should be included at the rate of 3 to 4 gm. per pound daily. One form of protein that may well be given is predigested casein hydrolysate even though this is unpalatable. Most authorities feel that the diet should be low in fat and that in the early months, simple carbohydrates, such as glucose and honey should be used. A water-miscible preparation of vitamins A and D should be given in quantities sufficient to supply 20,000 to 40,000 I. U. of A and 4000 to 10,000 I. U. of D per day. If one of the polyvitamin preparations is used for this purpose, the patient will usually have a more than ample intake of the B complex and of ascorbic acid. It will often be wise to give extra complements of calcium and iron. In addition, pancreatic substitution products are used in an attempt to improve the digestion. They are partially destroyed by the patient's gastric juice but seem to be helpful. Pancreatin powder may be added to the diet in early infancy (1 gm. to each bottle of formula) and later enteric-coated pancreatin granules may be sprinkled on the food (2 to 5 gm.

daily). As the child grows older, he may be able to swallow pancreatin capsules.

Pulmonary infection is difficult to control but it must be prevented, as much as possible, to avoid permanent damage to the lungs. The patient must be protected assiduously from exposure—which means that he should never be hospitalized if it can be avoided. He should enjoy optimal hygiene in his environment and should be immunized early against pertussis. As a prophylactic measure, he should be given from 5 to 30 mg. per pound of body weight of aureomycin or terramycin daily, in divided doses if desired. Some physicians give 100 mg. twice a day. The drug may have to be changed if the child develops a sensitivity or bacterial resistance. Acute infections or flare-ups call for heroic treatment, and one's choice of drug will depend on the infecting organism. At such times the physician will frequently use penicillin and streptomycin in an aerosol, in addition to systemic therapy, in an attempt to get at the infection imbedded in the fibrosed lung. There is as yet, no convincing evidence that detergents in mist offer any advantage over oxygen and humidity. The latter are invaluable in time of infectious crises in these children with damaged, inefficient lungs and bronchial trees plugged with thick secretions. In addition the patient with advanced pulmonary disease and *cor pulmonale*, who enters the hospital with cyanosis, clubbed fingers, and right-sided cardiac failure, will need digitalization and meticulous cardiac care. At best this is often a terminal chapter in the disease.

PROGNOSIS

The basic defect of mucoviscidosis is incurable. In spite of treatment, about 50 per cent of these children die before they are six months old, many of them with signs of *cor pulmonale*. The prognosis seems to be worse if pulmonary disease appears early. There may be milder forms of the affliction which are not currently diagnosed, and few patients have lived to adolescence and even to adult life. It remains a serious disease, however, and parents must be told this. Even their questions about having another baby must be answered with the fact that there is one chance in four that any subsequent child will be a victim too. Because the disease is incurable and may be chronic, it is a trial to parents and attendants alike and calls for infinite tact, patience and understanding.

REFERENCES

Andersen, Dorothy H. Cystic fibrosis of the pancreas and its relation to celiac disease; clinical and
(Continued on page 38)

MALARIOLOGY

(The Past and the Present)

DR. P. N. GUPTA

Malariaologist

INTRODUCTION

NOW that the World's Health Organisation experts have advocated malaria eradication, because of growing resistance among anopheline population in some spheres of the universe and since the National Malaria Control Programme of India is going to be shaped into eradication, it is worthwhile taking a stock of the past and compare it with the present situation.

THE PAST

Malaria is as old as history. It is mentioned as marsh fever, and pernicious malaria in the first book of 'Epidemics' by Hippocrates, four centuries before Christ. Varren, the Latin writer, one century before Christ advised against building of farms near swamps. Herodotus (484-423 BC) commented that in order to avoid the discomfort of mosquito bites, sleepers protected themselves by means of nets and by building high towers, to the tops of which they would go at night to be out of flight-range of the insects. Malaria is mentioned in the Book of Deuteronomy in the Bible and is alluded to in the Book X of the Iliad by Homer.

Malaria is believed to have been widespread in the ancient Egyptian Empire (3000 BC) at the time of Imhotep, in earliest times in Babylon, Assyria, India and Southern China. The ancient Greeks, Etruscans in Italy in the republic and Roman Empire are believed to have suffered so much that malaria seems to have hastened the end of the Greek and Roman Civilisations.

Great men like Pope Sixtus V, Pope Urban VII, King James I, Oliver Cromwell and presumably Alexander the Great all fell a prey to this scourge. Milton, the poet, Elizabeth 'the Queen of Hearts', Sir Walter Raleigh—the Biographer all suffered from this disease.

The history of malaria is closely linked to military history of the various nations. Malaria attacked the Gauls as they besieged Rome. It upset the Italian expeditions of Lothaire and Fedrick I. In the Seventeenth Century it was present among the English troops operating in the low countries. In the Nineteenth Century it played a role in America during the War of Secession, in Europe during the Crimean War and in the Madagascar expedition. During Peloponnes war Xenophan advised his son not to camp at places with bad air. The armies of Pachacutec were ravaged by malaria in 1378. In Walcheren expedition out of 70,000 British troops who landed on 1st August 1809, 35,000 had contracted malaria by 10th October and 10,000 died. In 1826 every soldier in British force in Arakan either died or was in hospital. In east African campaign in 1916, 51,000 suffered out of 58,000.

Reduced birth rates, increased death rates lowering the expectations of life especially among infants and children, mental and physical effects—affecting social, intellectual and political development, financial and economic losses, increased cost of administration, loss of revenue are all the direct and indirect effects of malaria which has inflicted the universe for centuries immemorial. In addition the untilled soil due to depopulation of malarial conditions among labourers are all factors which have retarded the development of many a countries and in fact destroyed certain kingdoms.

In India before the National Malaria Campaign (1953) malaria struck down 100 million persons annually and of these one million died (The figures became ten fold during epidemic years). Assuming that an attack of malaria entails (at conservative estimates) the patient being put off work for one week and that half of the sick are classed as workers, this means that the country lost

(Continued from page 37)

pathologic study. Am. J. Dis. Child. 56; 344-399 Aug. 1938.

Gee, Samuel. On the coeliac affection. St. Barth.

Hospital Rep. 24:17. 1888 Shwachman, Harry, Mucoviscidosis and the celiac syndrome. Pediat. Clin. North America. May, 1954, pp. 389-403. (The American Journal of Nursing).

at least two million work years from malaria alone. In 1949 national income in India was equal to 54 U. S. dollars yearly per person. The loss of income due to malaria would therefore, be something like 50 million dollars per year (17 million).

TRANSITION—PAST TO PRESENT

The following tables give the energetic, zealous work of the malariologists who have brought us the state as we see today.

(A) GENERAL (A. M. CONTROL)

5th Century 500 BC	Hippocrates Empedocles	Discovered tertian or quartan periodicity. Freed the city of Sileneus in Sicily from Malaria by effecting alterations in local drainage system. Referred to the use of mosquito nets.
1740 1845	Early Egyptian, Greek & Roman Writers Horace Walpole T. E. Dempster	First Englishman to use word 'Malaria' in English. Recognised the correlation between spleen enlargement and malaria-endemicity. Discovered Benzene Hexachloride. Synthesised D. D. T. First suggested the use of oils as larvicides. Use of paris green as a larvicide.
1850 (Approx.) 1874 1898 1927 1936-37 1935	Faraday Zeidler L. O. Howard Paul Muller of J. R. Geigy S. A. Thornten	Demonstrated insecticidal properties of D. D. T. Achieved control of malaria by pyrethrum spraying against adult mosquitoes in Netal & Zululand.
1942	Imperial Chemical Industries	Gamma Benzene Hexachloride established as a powerful insecticide.
1945	Slade	Publically announced the astonishing result obtained by him with BHC.
1945 1946 1949 1949 9th June, 1950	Wasten & Swelle Ngrebel U. S. A. U. S. A. U. S. A. U. S. A. Cyprus Island	Crystallized the idea of 'species sanitation'. Chlordane Piperonyl Butoxide (Synergist) Dieldrin, Aldrin. Allethrine Dread scourge of Malaria finally banished from the island.

(B) TREATMENT

5th Century 1643	Sasruta, an Indian Physician Herman Vander Heyden.	Characterised fever as due to the bites of gnats. Mentions Cinchona bark in his book "Discours et adirs sur lrs flus de venture doulou reux" 1643.
1647		Cinchona bark 'Peru vian bark' began to arrive regularly in Europe from Peru.
11-9-1820	Pelletier & Caventeu, French Chemists	Alkaleid Quinine was extracted from the bark of the tree, named Cinchona by Linnæus in 1753.
1847 1860	Hare Clements Markham	Through his paper introduced treatment of malaria in India. Cultivated Cinchona in India and Ceylon with seed from South America.
1860-1880 1860-1890 1910 1922	Nocht Sergent & Sergent	Industry flourished. Reckless over production led to a fall in prices. Acute attack with Quinine. Noted that Quinine exerted no therapeutic action when given during the incubation period.

1924	Yorke & Macfie	Reported that Quinine given during incubation period resulted in radical cure of B.T. Malaria which had been transmitted by blood inoculation (Trephezoite transmission but prolonged the incubation period in sperecoite transmitted malaria.)
1925	Schulemann, Ochonhofer & Wingler	Produced plasmoquine (Pamaquine) Gametocidal.
1928	Fiesinger	Secondary anæmia seen in forms of splenomegaly may be cured by eral ingestion of large quantities as much as one to two pounds of raw liver.
1928	Sinton & Bird	Demonstrated the radical cure of Vivax malaria by Pamaquine.
1930	Mietzch Mauss	Synthesised Atebrin (mepacrino) Schizonticidal.
1930	Sinton	Standardised malaria treatment by Quinine and plasmoquine.
1939	Chloroquine (resoquin)	Sentoquin (Sentoquine)
1939	Moss & Hermann	Administered Quinine for night cramps.
1944	Woodward Boeemg	Synthesised quinine at Haward University.
1945	F. H. S., CURD, Davey Rose, Imperial Chemical Industries.	
1946	Drake Etel	PALUDRINE.
1946	Parke Davis & Co.	Synthesised Penta Quine.
1947	Elder Field Etel	Camoquine.
1947	Elder Field Etel	Synthesised Iso Penta Quine.
1950	Welcome Laboratories	Primaquine.
		DARAPRIM.
	(C) MALARIA PARASITES	
1847	Meckel	Noticed little grains of pigment in the blood and organs of persons suffering from malaria.
6—11—1830	Laveran (Constantine Algeria)	Described a malaria parasite for the first time.
1882	Richard	Confirmed Laveran's original theory.
1883	King	Put forward an article putting forward 19 reasons why mosquitoes were likely to carry malaria.
1886—1889	Golgi & Collaborates	Worked out the Asexual cycle of the parasites.
1889—1890	Romanowsky	Produced a stain which had a special affinity for the parasites and rendered its study easy.
1892	Pfeiffer	Compared the development of malaria parasite with that of coccidium.
1895	Ronald Ross	Commenced at Mason's instigations to dissect mosquitoes which had fed on malaria patient in an attempt to demonstrate: the malaria parasite in them.
		Found 'Schufners' dots in P. Vivax.
1897	Schufner	Succeeded in his attempts and found malaria parasites in stomach wall of A. Stephensi.
	Ross	Described spots in P. Falcipaum.
	Maurer	Produced leishman stain for staining of blood slides.
1901	Leishman	Modification of Romonosky stain.
1906	Macneal	Found Azures A & B of Kehrmann possessing better staining qualities.
1922	Stephens	Described P. Ovale from blood of a British soldier.
1932	Sinton & Mulligan	First described P. Knowlesi.
1935	Brumpt	Identified P. Galli Naceum found in semidomesticated birds reared in Ceylon.
1944	Jaswant Sing, L. M. Bhattacharjee	Produced water soluble (J.S.B.) stain for blood slides.

(D) MALARIA TRANSMISSION CYCLE

36 B. C. A. D. 100	Varre Columella	Was of the idea that insects might be the cause of disease in man. Marshes bred mosquitoes which were armed with stings and that these insects might even convey diseases by their bites.
1848 1854	Nett of Mobile U.S.A. Beauperthy	Refers to transmission of malaria with assurance. Suggested that mosquitoes were necessary for carriage of yellow fever stipulating that both it and malaria did not occur wherever these insects were absent.
1879 1881	Monson Charles Finlay	Demonstrated life history of filaria bancrofti. Stimulated the aims of epidemiologists in mosquito theory direction.
1894 1897	Mansen Maccallum	Mosquito malaria Hypothesis confirmed. Observed the process of fertilization in the parasite of pegeon, indicating that malaria parasite had a sexual as well as an asexual cycle.
1898 1899	Ross Grassi, Bignami & Bastianelli	Worked complete cycle of the parasite of bird malaria. Observed the complete the development of the human malaria parasite and succeeded in infecting man experimentally from mosquitoes.
1900	Manson (Volunteer—Dr. Sambon and Dr. Carnichacl Signer Terzai)	Confirmed mosquito malaria theory and proved that infection can only be conveyed by the infected mosquitoes in the act of biting.
1900	Grassi	Suggested that there was a development cycle in man during incubation period.
1902	Schaudin	Described how incubation sporozoites actively penetrated the red cells.
1920 1934	Anschutz Raffæle	Exoerythrocytic cycle—Javasparrrow. Indicated that sporozoites might undergo some form of development in endothelial cells.
1937 1940 1944 1944 1947	James & Tate Shortt, Menon and Iyer Mudrew & Reichenow Huff & Coulsten Garnham	Exoerythrocytic cycle of P. Gallinaceum in chicken malaria. Preerythrocytic stage in P. Gallinaceum in chicken Malaria. Preerythrocytic development in P. relictum (Birds). Preerythrocytic in P. Gallinaceum. Found cysts in livers of monkeys and exoerythrocytic P. Gallinaceum.
9—1—1947 1948 17—10—49	Shrott, Garnham & Malames Shortt Carnham Covell & Shute Shortt Covell Shute Garnham Fairley.	Preerythrocytic in P. Cynomoligi (Monkey Malaria). Preerythrocytic cycle in P. Vivax. Human BT Malaria. Preerythrocytic cycle in P. Falciparum (Human M.T.Malaria).

(E) MALARIA—A DISEASE

1924	Kerteweg Kiewiet De Jonge Vander-Scheer, Schuffner	Gave first description of initial fever in Vivax Malaria. Emphasized the necessity of blood examination for diagnosis of malaria.
1937	Taliaferre and Mulligan	Spleen liver and bone marrow undergo considerable lymphoid hyperplasia with cytogenesis of macrophages, parasites being mainly destroyed locally in these organs.

THE PRESENT STATUS OF MALARIA

The reader now would have assessed how the humanity has suffered from the scourage of Malaria, but equally important has been the human effort to get rid of

this parasitic disease.

A stage has now been set when it can be considered how we can eradicate the disease.

Following morbidity rates and comparative reduction gives an idea of the present status of the disease.

NORTH AMERICA

Against a million cases of malaria in 1912-15, incidence in 1949 was 4012, of which only 19 were primary cases.

EUROPE

Albania	half million	(1933)	1221	(1956)	
Bulgaria	half million	(1930)	662	(1956)	
Greece	1200000	(1938)	408	(1952)	since then eradicated.
Rumania	338198	(1948)	216	(1955)	
Turkey	8.6% total admissions	(1940)	0.6%	(1954)	
Yugoslavia	one million	(1935)	796	(1953)	
Italy	974 per million	(1905)	7.5	(1950)	
Cyprus	5908	(1945)	406	(1948)	since then eradicated.

After the introduction of DDT, spectacular results have been obtained and malaria is no problem anymore.

AFRICA

Out of a total approximate population of 132,000,000, the population at malaria risk is 115,863,227. Malaria control in Africa at present is the most serious and difficult problem with which specialists are confronted. While there are a number of schemes being implemented, there are yet no countries in the African mainland where elimination has been finally achieved.

Interruption of transmission has taken place in Madagascar, Southern Rhodesia and Swaziland. Most striking example has been Mauritius where 46395 cases in 1948 have been reduced to 23 in 1952.

AUSTRALIA

Malaria is still a major health hazard in New Guinea, New Britain, New Ireland, the Admiralty, Solomons and the New Hebrides.

In Bulole (New Guinea) the incidence among the Whites has been reduced from 2.4% in 1942 to 0.3% in 1947-49.

ASIA

Out of a total population of 553,944,915 the population at malaria risk is 270,852,000.

Ceylon and Thailand are nearing eradication. In Ceylon from 1936-45 there were 300 to 500 per million cases every year, but in 1949 these dropped to 50-70 per million and in 1955 it was 0.85 per million.

It has declined since then.

SOUTH AMERICA

Most of the states like Chile, Brazil, Venezuela etc. where out of the total population half the population at least was at risk have now declared 'Eradication' a claim made in 1955.

AFGHANISTAN

The prices of land after malaria control in Ghuri District increased from 300 Afghanis per acre to 5000/8000 Afghanis per acre.

INDIA

The National Malaria Control Programme was decided on 13-12-52 when the agreement was signed in New Delhi between India and the U. S. A. This scheme progressing in stages has now 200 units controlling malaria and thus afford protection in all the endemic areas of the country. The Malaria cases have been reduced from 6029001 in 1953-54 to 40,93,627 in 1954-55 and still further since then. In the Punjab there had been a reduction of nearly 85956 fever deaths in 1954 as compared to the year 1950.

Malaria eradication has been accepted to be reached in stages and thus the 200 control teams now working will discontinue spraying in 1960 and will only act as surveillance and assessment teams.

CONCLUSION

The past and the present status of malaria, the losses incurred and the achievements gained have been compared. The transitional period shows the great efforts put in by the special lists.

The human efforts have been greatly rewarded, the goal can be reached if the quickest implementation is made, or otherwise with the growing resistance of

(Continued on page 43)

HYPOTHERMY

BY PROFESSOR V. KOVANOV

MOSCOW

WITHIN recent years surgery has made great progress. In the clinics of the USSR, Italy, France, England, the USA and other countries operations are now performed on formerly inaccessible parts of the human body, including the heart. Surgeons have begun to perform such complex operations on the heart which could hardly be dreamed of twenty years ago. Today operations are performed in cases of congenital heart diseases, stenosed valves in the left half of the heart, insufficiency of the cardiovascular system, etc.

But already during the first operations surgeons were confronted with an obstacle which seemed hard to overcome. For instance, in cases of congenital heart diseases human organs suffer from oxygen hunger because circulation in the organism is markedly disturbed. Instead of entering the pulmonary artery and becoming saturated with oxygen in the lungs the greater part of the venous blood flows directly into the left ventricle and, passing by the lungs, spread through the whole organism. The patient suffers from asphyxia and oxygen deficiency. In such cases operations under gas anesthesia become impossible because, although the anesthetic is given with a large portion of oxygen, it markedly disturbs circulation. The cells of the cerebral cortex, in particular, require oxygen. If blood saturated with oxygen is not supplied even for only a few minutes the cells perish causing the death of the patient. That is why a completely new type of anesthetic is required to make it possible to save the patient's life with a minimal supply of oxygen to the

cells of the cerebral cortex. Such an anesthetic was found.

Already at the beginning of the twentieth century the Russian scientist P. I. Bakhmetyev turned his attention to the way certain animals behave during hibernation which lasts several months. At this period the organism does not take in food, all its life processes are retarded and the temperature of the blood drops. But what is most important, as experiments show, when the organism is cooled much less oxygen is required for the nutrition of the cells than under normal temperature. Scientists recalled these wonderful experiments quite recently—some five-six years ago when, despite the skill of surgeons all operations on congenital heart diseases failed to produce favourable results. A new method of anesthesia called hypothermy originated.

Hypothermy is the artificial reduction of the body temperature in animals and man which leads to the slowing down of blood circulation and metabolic processes. It facilitates a decrease in the reaction of the organism to operation trauma and increases its resistance to oxygen deficiency. This opens great possibilities for the development of surgery and especially for the performance of operations on the heart since the cooled organism can stand these operations much better. Experiments have shown that with the help of artificial cooling operations can be performed on the heart of even weak patients and the aged.

Hundreds and thousands of different experiments were conducted by scientists before the first operation

(Continued from page 42)

mosquitoes to insecticides, what ever has been achieved may be undone.

REFERENCES

- | | | | |
|--------------------|---|----------------------|--|
| Dowling MAC (1953) | Trans Roy SOC. Trop. Med. & Hyg. Volume 47. No. 2 | Rao. BA. (1955) | Indian J. Mal. Vol. IX. No. 4 |
| Mehta DR (1955) | Ind. J. Mal. Volume IX No. 4 | Russel P. F. (1952) | Journal Trop. Med. & Hyg. Vol. 1. No. 1. |
| O. H. M. S. (1952) | Malaria control in the U.K. Dependencies. | W.H.O. S.E.A. (1956) | Malaria eradication SEA/RC 9/6 |
| P. N. Gupta (1953) | Southern Railway Magazine, March 1953. PP. 29. | W.H.O. (1956) | Malaria control in Africa—Mal/Infom/14. |
| | | | Past and Present position of malaria in Swaziland. Mal/Infom/17. |

was performed on man with the help of hypothermy. It was found, for instance, that the organism cannot be cooled suddenly.

Animals placed in a bath with ice-cold water lost consciousness and convulsions set in. The animals perished from paralysis of the heart. This is due to the fact that the organism as a whole begins to fight against the cold.

Then another experiment was attempted, namely the function of the nervous system was stopped. An animal was given an anesthetic and only after that was it placed in the bath. Excellent results were obtained. The organism could easily stand the cooling, and after the operation and subsequent warming the animal felt quite well.

In the Soviet Union the first operation on the heart with the application of hypothermy was performed in December 1954 in Leningrad by Professor P. A. Kuprianov. It was successful. Today such operations are performed by Professor A. A. Vishnevsky of Moscow, N. M. Amosov of Kiev and other Soviet surgeons. They have already performed hundreds of operations with the help of artificial cooling.

The technique of hypothermy is being constantly improved. But its basic principles are as follows. At first the patient, after being prepared for the operation, is given an intratracheal etheroxygen anesthetic. When he falls asleep he is placed in a bath the temperature of which is 5–6°C. Gradually his body temperature is lowered and about half an hour later it drops to 30°C. The patient is then placed on the operating table and, since after cooling is completed the temperature is reduced by another 3–4°C, the surgeon can begin the operation. Usually the body temperature drops to 26–28° and remains at this level for about two hours, in other words for as long as it is necessary to perform the operation. In the course of the operation special apparatuses constantly record the changes in the work of the heart, respiration, saturation of the blood with oxygen, etc. In case of any deviation from normal the surgeon immediately takes the necessary measures.

When the operation is completed the patient is placed in a warm bath and the body temperature gradually begins to rise to normal.

Practice shows that the activity of different tissues and cells may cease when the body is cooled to a definite temperature. In such cases the tissues and cells retain their viability and, when warmed, resume their functions. These thermal limits are called the "biological zero". For instance, if the cells of the cerebral cortex are cooled to 31° the patient loses consciousness. Respiration and the work of the heart cease at a temperature of about 24°C. Some surgeons cite cases when the heart was stopped during an operation for 8–10 minutes without any after effects on the patient's state after recovery.

It is a noteworthy fact that before the application of hypothermy life could be restored only if the heart had stopped for not more than 5 minutes. Cooling below 24° is usually considered mortal for man.

As a rule, patients feel quite well after operations with the help of hypothermy. The value of this method lies in the fact that during the operation the application of medicinal preparations is reduced to a minimum.

However, it would be wrong to suppose that hypothermy can and should be applied in all operations. Usually it is indicated in cases of operations on the heart when it is necessary to exclude it from the system of circulation and also in cases of operations connected with congenital, so-called "blue" heart diseases. Some surgeons (Professors V. I. Kazansky, T. P. Makarenko) applied artificial cooling in cases of operations on the oesophagus and the cardial and subcardial regions of the stomach. But in all cases the individual characters of the patient are taken into consideration.

The successes of operations with the application of hypothermy open broad possibilities to surgeons. Thanks to the method of artificial cooling many human lives have already been saved and surgeons can now perform such operations which several years ago they would not have risked to undertake.

At present comprehensive researches are being conducted in the Soviet Union on the application of hypothermy in surgery and other branches of medical science. Special apparatuses are being created for artificial cooling.

INFANTILE BERI-BERI

By DR. CH. KRISHNAMURTY

Retired Civil Asst. Surgeon, 7/604, Krishnanagar, VISAKHAPATNAM-2 (Andhra Pradesh)

INFANTILE Beri-Beri is much more prevalent than is noticed in the East. One of the most potent causes of infantile mortality in Japanese infants is Infantile Beri-Beri. Between 1920–'29 there was an average of 17,000 deaths. In South China Beri-Beri is common in the later months of pregnancy. It is common in Egypt, Philippines and some of the Pacific islands. In Philippines 28.1% of total deaths under one year is due to it. Almost every pregnant woman in South India suffers from sub-clinical signs and symptoms of Beri-Beri and during puerperium from at least pureperal neuritis commonly known as 'Sutika'. Infantile Beri-Beri kills infants dramatically almost in a few hours and if recognised and treated properly, equally well cures it. It is a disease recognised in infants from the last two and half decades. Funk in 1913 isolated from rice polishings and Yeast a crystalline substance effective for the prevention and cure of experimental Beri-Beri. He called this Vitamin. The term water-soluble vitamin was introduced by mc. Collin and Kennedy in 1916. In 1926 Vitamin B₁ was isolated in comparatively pure crystalline form by Janson and Darath. In 1936 Williams discovered its nature. Infantile Beri-Beri appears to have been known as 'Anasalu' in Telugu districts from a long time, amongst the poor and the under fed. Our ancients of this class believed that it is due to a toxin present in mother's milk and in mothers, where a number of children are lost, the infant is nursed on anything else except its mother's milk—as a wet nurse, goat's milk, Ass's milk etc. The disease is more common in the male infants than amongst the female infants and amongst breast fed infants of mothers who are deficient in their Thiamin content. The disease is more common in the rainy season. It was found in Hong-Kong that immediate breast feeding antedates signs and symptoms in sub-acute and acute infantile Beri-Beri while in chronic forms breast feeding might have ceased weeks or months before. The commonest age is between 1½–3 months while infants of even ten days are not exempt. In the majority of cases definite signs and symptoms are not manifest within a month or two after birth and this is perhaps due to the infant drawing its B₁ requirements from the small balance retained in the mother. As the needs of the infant become greater with its growth, signs and

symptoms of deficiency become apparent. I have had occasion to study infantile Beri-Beri in some station in the northern Circars and my observations were published in the Antiseptic (Aug. '46., Oct. '46., Dec. '51.) While coming across cases of infantile Beri-Beri in the out-patient departments of hospitals, I was struck at its great incidence at Narsapatnam (Visakhapatnam, India) and I was interested in making a study. What obtains in the far eastern countries of Japan, China or Philippines equally well applies to Southern India and the Circar districts in particular. The disease is prevalent in the rice eating poor, who cannot protect themselves with Proteins, Vitamins and fats. The cause for this deplorable state of affairs is not far to seek. In the early part of this century, people subsisting on highly polished rice after the advent of rice mills suffered from Beri-Beri and an impression gained ground that highly polished milled rice causes Beri-Beri (Thimmi Vatham—Numbness and paresis in Telugu. Parboiled rice commonly used in the west coast, South Kanara and some parts of Orissa retains its Thiamin content to a large extent and those who are accustomed to it are comparatively free from Beri-Beri. Beri-Beri was not known to our ancestors who used only hand pounded rice. It is not only the raw milled well polished rice but the other food stuffs of daily use, particularly the dhals are all now a days milled and well polished depriving them of their al-neuronic layer which contains Thiamin. Conscious of this in some districts like Krishna and Guntur, a campaign was started to produce ground paddy rice 'Thiragadi Biyyam'. This is made by grinding dry paddy between wooden grinders with the result all the al-neuronic layer remains intact. The difficulty however is it is too hard to digest with the result those who used it had diarrhoea or dysentery. During the last few years the Government have started to revive hand pounding of grain instead of milling, not only to solve unemployment but also to increase the nutritive value of rice. Non-removal of Kanji is another method of retaining the remaining part of Thiamin and is the practice followed in all jails. Taking an average middle or lower middle class family of rice eaters, the nutritive value of their diet is very poor in its vitamin and mineral content (Thiamin and Iron). The child growing in utero of such a woman starts with an

inherent poverty of building materials for its growth in the lack of Thiamin in particular and lays foundation for Infantile Beri-Beri. This becomes worse in every succeeding pregnancy. It is only within recent years that the attention of the physician has been directed to the possibility of Thiamin deficiency being fairly prevalent. Indigenous people calling Infantile Beri-Beri by the name of 'Anasalu' in Telugu areas describe identically the same signs and symptoms and classify it under 'Potta Anasalu' where signs and symptoms relating to the abdomen, such as colic, vomiting, diarrhoea or constipation or 'Anasalu' of the respiratory tract with Bronchitis or Bronchial pneumonia and so on. There are specialists among the village or the town folk for treating these cases. They are not usually qualified doctors and often an old lady is the specialist. If a child cries intermittently or has green mucoid stools or vomiting the services of the 'Anasalu' specialist are requisitioned in the first instance and often the child is lost. Some people resort to the hospital in the beginning for want of money to go to others or after failing once or twice at the indigenous or the Specialist's hands. Infantile Beri-Beri may occur successively in several children, if the mothers health is not properly looked after and I have come across cases where the mother had lost five or six children consecutively. In the Circar districts of the Andhra State, the common types of Infantile Beri-Beri met with are the Gastro intestinal, the acute cardiac or the aphonic forms. In most cases the commonest complaint is that the child cries intermittently as if having a colic, there is lack of appetite, occasional vomiting, greenish mucoid stools and restlessness. There may be constipation, and tympanitis instead of mucoid diarrhoea in some. In the cardiac type, there is dyspnoea, cyanosis, and muscular rigidity and the body is held tense, Tachycardia, the heart sounds difficult of being counted, the rhythm being tic-tac in character, usually described as pendulum like, the interval between the first and the second sounds being lost. There may be dysphagia, ptosis and aphonia and if not treated immediately, the child becomes more restless, cyanosed, sighs, gasps for breath and dies in a few hours. There may be a mixture of one or two types and there may be all the signs and symptoms in a single case. Some of the cases are complicated with Bronchitis or Bronchio pneumonia and there is wasting as the disease progresses. Examination of the blood shows leucopenia and the total absence of small lymphocytes. Paraplegia is rarely seen in infants as compared with adults. There may be tenderness of the muscles of the legs noticed when the muscles of the calf are gently pressed. The knee jerks

are sluggish. The history and examination of the mother greatly helps the diagnosis. The mother shows unmistakable signs and symptoms of Thiamin deficiency in the form of tingling, particularly numbness, oedema of feet and in addition those of a B₁₂ deficiency also in the form of cheilosis (angular stomatitis, angular conjunctivitis, glossitis) and phrynodema with loss of appetite and anaemia. The mother becomes poorer in health after delivery, the oedema of her feet and general anasarca having disappeared however. The indigenous Beri-Beri specialist treats her now for 'Suthika Vatham' and literally starves her, prohibiting everything that is nutritious. The reason why the signs and symptoms of infantile Beri-Beri are not manifest until about 80-90 days after birth in the average case, is that the infant begins to draw its requirements of Thiamin from the impoverished mother, who retains a small store of B₁ and hence they are delayed. The fact however is there, that in a mother who has potential signs and symptoms a Thiamin and/or B complex deficiency during pregnancy, the ingrowing child develops a diathesis and sooner or later shows signs of a mild, moderate or severe type. These signs are often masked by intercurrent complications like Bronchitis or Pneumonia or convulsions and if they recur, one must isolate the root cause, which is nearly always infantile Beri-Beri from a deficiency of Thiamin in the mother, which the infant has inherited.

The treatment of the most acute cardiac type of infantile Beri-Beri with restlessness dyspnoea, cyanosis, Tachycardia and aphonia presenting a moribund picture should be emergent. Liberal use of Thiamine parenterally in heroic doses saves the child from the jaws of death. 50 mg. very three or four hours may be necessary as was found in the case reported by me in Dec. '51 of the Antiseptic. Amyl nitras inhalations Nitro glycerine, Bromide and digitalis may all be necessary according to indications. There was paroxysmal crying, whining and moaning, extreme restlessness, occasional vomiting, dyspnoea, cyanosis, dysphagia, aphonia and ptosis. The heart sounds were almost uncountable, 200 or more per minute with a typical tic-tac rhythm. The child required 250 mgms. of Thiamine to tide over the crisis.

A moderately severe case was reported as Case I in August '46 in the Antiseptic. This was a male infant aged one month and twenty days, brought in for Bronchitis, inability to cry, aphonia, vomiting and greenish mucoid stools. The child was reported to be apparently alright after birth, for a month. On examination he was rather drowsy and cyanosed, abdomen distended, lungs were full of rales and ronchi.

5 mgms. of Thiamine intramuscularly was injected immediately and symptomatic treatment carried out for the other complications. He required three injections of 5 mgms. each to tide over the crisis and latter it was sufficient to continue Thiamine by mouth.

In case II reported in the same article referred to above, Thiamine was given by mouth alone and the recovery was uneventful. B₁ was not used parenterally as the signs and symptoms were not emergent.

In case III again Thiamine had to be used parenterally once to produce immediate effect and later continued by mouth.

In case IV of the same series, twin girls aged four months, in addition to moderate signs and symptoms of intermittent crying, vomiting, diarrhoea, and hoarse voice and stretching of limbs there was ulceration of the angles of the mouth and anus due to deficiency of Riboflavin in addition to Thiamine.

Case V of the same series was a remarkable one. The child a female of two months was brought cyanosed, sighing and gasping for breath and almost dying. One injection of Thiamine 10 mgms. brought the child back to life and the second injection of 5 mgms. made the child almost normal. I reported a case of chronic Infantile Beri-Beri in Oct. '46 of Antiseptic. The child required 400 mgms. of Thiamine along with Calcium, Cod liver oil and Liver extract in 42 injections during 1½ months and he made a perfect recovery. The child was brought to me 8 months after the start of the illness and was 1½ years old when I first saw him.

Treatment of the mother side by side of the infant for the deficiency of Thiamine with Thiamine and B complex and liberal nourishing diet rich in Thiamine is necessary. During the illness the Child should be either wet nursed, if a healthy one is available or brought up on cow's or goat's milk. Extracts of rice polishings like Tiqui-tiqui are extensively used in Phillippines with very good results for infants. After the crisis, B complex in some form should be given for a considerable time. A cheap form of supplying Thiamine amongst the poor is Hand-pounded rice, Brantea and germinating pulses. This is a good prophylactic in pregnant mothers.

A few facts about Thiamine may not be out of place in this paper. The normal Thiamine hydrochloride requirement is a little less than one mgm. It may be 2 mgms. for an active male and the requirements during pregnancy and lactation is 1.5 mgms. a day. The maximum amount of Thiamine (Dietary and extra dietary)

that can be taken orally is about 5 mgms./day, and this can be achieved only by ingesting in divided doses with meals. Maximum absorption of 8-15 mgms. can be achieved by oral administration of 40 mgms. in divided doses. Thiamine is absorbed in the small intestines. It is stored in the liver, Heart, Kidneys and the Brain.

SUMMARY AND CONCLUSIONS

- 1 The prevalence of Infantile Beri-Beri in the northern Circar districts of the Andhra State is stressed, and the causes for the same have been studied.
- 2 Condensed case reports of typical cases, reported already are reviewed in the light of the present paper.
- 3 The possibility of intercurrent diseases, masking the original picture of Infantile Beri-Beri has been stressed.
- 4 Dramatic improvement and escape from death in moribund state are reported when adequate doses of Thiamine are used parenterally.

REFERENCES

- | | |
|---------------------------|--|
| Goodman & Gillman (1955) | Pharmacology and Pharmacotherapeutics. |
| Manson Bahr (1954) | Tropical diseases. |
| Sheldan (1954) | Diseases of Children. |
| David and Iswariah (1954) | Pharmacology and Pharmacodynamics. |

C.A.F.
CHLORAMPHENICOL
U.S.P.

Leading Antibiotic Since 1950

In the treatment of:
VARIOUS BACTERIAL INFECTIONS.



PACKING:
12 Capsules and
100 Capsules
PALMITATE:
50 C. C. Container.



Manufactured by:
CHEMUNION
LUGANO - SWITZERLAND.

Sole Importers for India
AMARCHAND SOBACHAND,
MADRAS - 3.

Advances in the Indications for Tracheostomy

By DR. P. NARASIMHA RAO, M.S., F.I.C.S.,

Professor of E. N. T. Diseases, Andhra Medical College and Surgeon, King George Hospital, Visakhapatnam.

TRACHEOTOMY as it was originally called is one of the oldest operations and dates back to Galen and Aretacus who lived about the first and second century A.D. Both of them refer to cutting of the trachea for the relief of suffocation caused by obstructive lesions in the upper respiratory tract. Since then many refinements in technique have been evolved though the indications remained to be essentially the same. Well-known conditions causing laryngeal obstruction. It is only recently that the great usefulness of this operation in conditions other than the classical obstructive lesions of the larynx has been emphasised. This was due to the recognition of the damage that anoxia can cause to the central nervous system. To combat these harmful effects tracheostomy is recommended in a wide variety of conditions covering almost every speciality of medicine. Stagnant secretions leading to asphyxia can occur in a variety of conditions. These conditions are also associated with depressed cough reflex. Under such circumstances the only treatment offering any hope of success consists in the removal of obstructing secretions from the respiratory tract. This can be achieved by a tracheostomy which provides a ready avenue for removal of secretions by easy and continued aspiration of the lower respiratory tract even by untrained personnel.

Apart from over whelming infection of the medulla and failure of the respiratory centre, death in bulbar poliomyelitis is often due to cerebral anoxia, accumulation of carbondioxide and their secondary effects, the result of obstruction to ventilation by stagnant secretions. This can be prevented by a timely tracheostomy. A marked reduction in vital capacity associated with a severe and progressive paralysis calls for an immediate operation. This has now become an essential part of the treatment and has saved the lives of many victims of bulbar poliomyelitis. After tracheostomy secretions can be easily removed and the possible occurrence of atelectasis and anoxia is prevented.

The importance of early tracheostomy as a means of ensuring a perfect airway and combating anoxia in patients unconscious as a result of severe head injuries is well established. A good airway is essential but the closure of the nasal passages by secretions and odema and the pharynx by the swollen tongue and excessive

saliva prevent this. Respiration will be laboured with gurgling noises. In such cases one need not wait for classical symptoms of difficulty in breathing and cyanosis, as an early tracheostomy is usually followed by dramatic improvement in respiration. Also this will enable the secretions to be removed easily by aspiration.

In tetanus associated with prolonged spasm of the muscles of respiration and other laryngeal spasmodic conditions tracheostomy eliminates the danger of asphyxia by maintaining a clear airway and reducing restlessness. Also when secretions are present they can be aspirated. Hence this has become a routine procedure in these conditions.

Acute laryngo-tracheo-bronchitis has become common during recent years. There is a possibility of its incidence sharply increasing during the present Influenza epidemic. Apart from bed rest, high humidity and antibiotics, the use of early tracheostomy has greatly improved the prognosis. This keeps the airway free and allows the thick, tenacious secretions to be removed from the tracheo-bronchial tree, greatly relieving the load on the respiratory and circulatory systems. Also direct medication of the lower respiratory tract is rendered very simple.

In addition to the above indications its life saving role in many of the conditions is well recognised. These include paralytic states after injury to the cervical and upper thoracic spine, cerebro vascular accidents, drug poisonings, crushing chest injuries, extensive surgical procedures on the chest, blast burns, post anaesthetic and post operative complications, post operative care of very ill and debilitated patients in whom the cough reflex is too weak to be effective in removing secretions from the tracheo-bronchial tree. There are practically no contraindications for this operation and it does not harm the patient in any way. It helps not only in establishing and maintaining a satisfactory air way but facilitates removal by aspiration stagnant tracheo-bronchial secretions and efficient administration of oxygen and other therapeutic agents. The harmful effects of anoxia are thereby prevented. If these guiding principles are kept in mind tracheostomy can be utilised as a life saving procedure in any other similar situation.

MANAGEMENT OF FAUCIAL DIPHTHERIA

By L. K. GANGULI, B.Sc., M.D., M.R.C.P.,

Hony. Visiting Physician, N. R. Sircar Medical College Hospitals, Calcutta and Hony. Cardiologist, Islamia Hospital, Calcutta.

INTRODUCTION

DIPHTHERIA though a highly infectious disease is preventable. The morbidity rate is on the increase in this country. During the period 1947-1952 the incidence has risen from 369 to 1214 cases at Bombay (Thanawala, 1954) and at Delhi the incidence has risen from 55 to 712 cases from 1947 to 1954 (Health Report, 1955). In Calcutta it is endemic. It is therefore important that in the management of the disease

apart from the curative treatment prevention of its spread should be a major concern of the practitioner.

GRADATION

As the management is dependant on the gradation of the disease, it will not be out of place to mention the various grades and the basis of their gradation—Vide Table 1. We have been following these criteria and found them quite helpful and practical (De *et al*, 1946, 1947).

TABLE—1

Table Showing Different Grades of Faucial Diphtheria and Basis of their Gradation

	<i>Mild</i>	<i>Moderate</i>	<i>Severe</i>
General condition	good-fair	Respiratory difficulty	Respiratory difficulty
Toxaemia	Nil	Present	Obstruction. Great.
Specific complications	Nil	Nil	Present
Pseudomembrane	Small on one tonsil or both tonsils or a single moderate sized patch on one tonsil only.	Moderate sized patch on both tonsils or soft palateuvula or a single large sized patch any where in the throat.	

GENERAL MANAGEMENT

The patient should be isolated and the local health authorities be informed as the disease is a notifiable infectious disease. Special instruction should be given regarding the other children being forbidden to enter the sick room. Even if the patient does not appear very ill bed rest must be ordered. It is realised that the task of keeping child in bed is a difficult task, but all efforts must be directed to achieve the objective. But unnecessary use of force and a violent struggle with the child should be avoided. The minimum period of bed rest is three weeks. For moderate to severely ill patients the bed rest is to be extended to a period of five to six weeks.

To start with the diet should consist of fluids only (milk, barley-water, glucose drink, fruit juice) and later on

when the fever and toxaemia subsides bread, butter, eggs, mashed pottato, boiled fish and vegetables may be added.

The mouth should be kept clean. Gargles and paints are unnecessary. Purgatives are better withheld. Simple saline or soap water enema may be given to open the bowels. In case of very hard stools over night introduction of 1 ounce of olive oil per rectum will soften the stools and the same may be passed without strain.

SPECIFIC TREATMENT

a) *Diphtheria Antitoxin*

As all the illeffects are due to the circulating exotoxin, the main purpose is to neutralise it as quickly and as effectively as possible. It should however be remembered that once the toxin is fixed nothing can be done to undo its effect. It is only the free and

loose toxin which can be acted on by the specific antitoxin. So an early administration of the specific antitoxin in adequate dose should be tried. It is always beneficial to err towards a larger dose of the antitoxin administration than to inject a small amount and wait for its effect. The usual practice followed by us regarding the dosage is given in Table 2.

TABLE 2
Showing the amount of Antitoxin required in different grades.

Grade	Antitoxin in units	Remarks
Mild	30,000-50,000	I. M. in one injection
Moderate	50,000-80,000	I. M. in one injection
Severe	Above 80,000	Half dose I. M. first then half dose I. V. Repeat half dose if necessary 12 hours after.

B) Antibiotics

(i) Penicillin. It is an essential drug in the treatment of diphtheria, though it has no antitoxic action. It is highly specific against *C. diphtheriae* (De et al 1946, 1947) and other concomitant pathogenic organisms, specially the secondary invaders like *Strp. haemolyticus* and *D. pneumoniae*. Crystalline penicillin is preferred and 1,00,000 units I. M. three times a day in combination with diphtheria antitoxic serum gives the best result in all types of cases.

(ii) Other broad spectrum antibiotics like illotycin and achromycin in combination with the antitoxin also gives good results.

Local application of penicillin solution in the form of spray in our experience has no specific value in the treatment of diphtheria.

SERUM REACTION

Administration of diphtheria antitoxic serum intravenously or even by muscular route has certain dangers. In our country parents never volunteer the history of previous serum injections or that their child suffers from attacks of asthma or urticaria. To avoid a catastrophe it is always best to ask the relatives for

information regarding any history of allergy or previous serum injections. In case of a positive history the patient should be tested for serum sensitiveness and if found sensitive desensitisation should be tried in the following way:

Intradermal injection of 0.1 ml., 0.25 ml., 0.5 ml. and 1 ml. of 1:10 dilution of antitoxin in normal saline solution should be given at an interval of 10 minutes each. This should be followed in same order with undiluted serum. After the final dose of 1 ml. the whole of the serum required should be given only by the intramuscular route. Administration of antihistaminics like calciluvine 10 ml. or soventol 1.1 ml. parentally helps in minimising the development of any reaction during the process of desensitisation. In case any reaction occurs adrenaline hydrochloride solution (1:1000) $\frac{1}{4}$ — $\frac{1}{2}$ ml. subcutaneously followed by oral antihistaminics should be given.

SYMPTOMATIC TREATMENT

Restlessness and insomnia are the two common symptoms. More over the child frets and cries because of being isolated or being separated from parents when in a hospital. The safest and the best drug is a mixture of chloral hydrate (1 gr. per year) and potassium bromide in a syrup base given orally. There is always certain amount of spasm of the bronchial tree. For this tincture belladonna m5 added to the sedative mixture is usually quite effective. Ordinary alkali mixture may also be prescribed for diuretic and antipyretic action.

COMPLICATIONS AND THEIR TREATMENT

(a) Cardiovascular. One of the serious and usually fatal complication is the setting in of peripheral failure coming on between the 5th to 10th day of the onset of the disease. It is best treated by raising the foot end of the bed, administration of 50-100 ml. of glucose in normal saline solution by slow I. V. drip or 4-8 Oz. of 5 per cent glucose saline solution by rectal drip, peripheral stimulants like cortical extracts (2mg.) synthetic or natural, 4 hourly or 6 hourly administration of adrenaline 1m., combined with 1/300 gr. atropine sulphate and 1/120 gr. of strychnine hydrochloride subcutaneously. Nor-adrenaline, DOCA and cortisone are also used in case of severe degree of failure.

For the central failure which usually occurs by the 14th day, rest is essential. Sedatives like chloral hydrate by mouth or paraldehyde rectally are very good. Sips of brandy dr. 1 in an ounce of water is also very effective. Antiemetics and digitalis are of no use.

(b) Nervous. The early one to appear is palatine paralysis. Good nursing and special feeding are necessary. In case of partial paralysis thick food may be given. Otherwise feeding by the nasal route has to be undertaken. The respiratory passages should be constantly kept clean and airway free with the onset of the paralysis of the intercostal muscles and the diaphragm. In severe cases patient should be put into an iron lung. Peripheral neuritis involving the legs may set in as late as at the end of the third week. Once the paralysis develops the limbs are to be massaged and passive movement given. Strychnine is the only drug which may be helpful. The value of massive doses of vitamin B1 either as preventive or as a curative is doubted by the author.

(c) Adenitis. Cervical adenitis due to streptococci occurs rarely since the introduction of penicillin therapy. Local application of dry heat and analgesics for the pain are all that is necessary.

(d) Respiratory. Laryngeal diphtheria may occur as a complication of faucial diphtheria due to extension of the disease downwards. In case of obstruction of the passage early tracheotomy should be undertaken. Delay in tracheotomy puts more load on the heart because of anoxia and the patient's condition deteriorates rapidly. In many cases spasm plays an important role in the causation of obstruction. Preliminary trial with steam inhalation, and use of antispasmodics like tincture belladonna or atropine sulphate and use of oxygen inhalation may produce relief. But a very careful watch should be kept to judge whether the patient is improving or not. Repeated intubation may also help.

CONVALESCENCE

Whether the patient belongs to the mild group or not an obligatory period of rest for three weeks is

essential and must be forced upon. Patients should be watched for development of sudden acute heart failure or peripheral neuritis appearing at the end of the third week. These complications can not be prevented but their effect can be minimised by enforced rest. Once these complications develop the period of rest should be prolonged to six weeks or more.

A patient should be considered cured and fit for discharge or resume social contacts only when three consecutive throat swabs are negative for K. L. B.

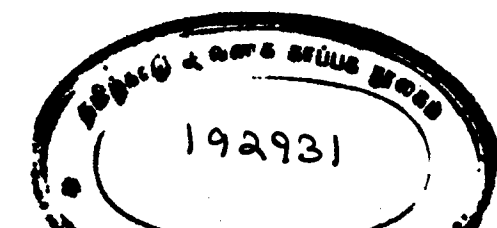
PREVENTIVE TREATMENT

Carriers—Diphtheria is mainly spread by carriers. As such after an outbreak of diphtheria, a search for the healthy carriers should be undertaken. Once detected they should be isolated and treated with crystalline penicillin injections 6 lac units a day for 10 days. Local application of penicillin solution 1000 units per cc. every 2 hours in the form of spray should also be combined with the injection. Other antibiotics like illotycin and achromycin are also effective. In some resistant cases only the removal of tonsils may cure the carrier state.

Contacts—One of the important problems a practitioner has to face is how to prevent diphtheria in persons particularly the children of the house where a case of diphtheria has occurred. It is therefore a question of production of immunity, immediately. The best method is to produce passive immunity in the person or persons who have unknowingly exposed themselves to the disease. Diphtheria antitoxic serum 1000-2000 units I. M. given as a prophylactic ensures a reasonable protection for a period of about 4 weeks. Later on active immunisation can be done. The use of the Schick test is not practicable nor possible for adoption in the production of active immunity in a small group of cases or when immediate preventive measures are to be taken.

Prophylaxis—The best method of prevention of diphtheria is to produce active immunity in the child. As a routine children should be inoculated against diphtheria between the age of 6 months to 1 year. The various methods of producing active immunity are given in Table 3.

2m 2, 1954
NS7



TABLE—3

Showing Methods of Inoculation with Different Agents

Agent	1st dose in ml.	Interval in weeks	2nd dose in ml.	Remarks 6666
1. Toxoid antitoxin floccule (T. A. F.)	1	4	1	A third dose of 1.5 ml. is required after 4 weeks.
2. Alum precipitated toxoid (A.P.T.)	0.5	4	1	1 ml. at school going age.
3. Purified toxoid with aluminium-phosphate (P. T. A. P.)	0.5 (child)	..	..	Adult dose is 1/5th child dose.
4. Purified toxoid with aluminium-hydroxide (P. T. A. H.)	0.1 (adult)	..	..	0.1 ml. after every 5 years interval.

REFERENCES

Delhi Health Committee report,	J. Indian M. A.	25 : 34, 1955
De, M. N. Chatterje, J. R. and Ganguli, L. K.	idem	16 : 73, 1946
ibid	Brit. M. J.	1 : 376, 1947
Thanawala, J. K.	J. Indian M. A.	24 : 205, 1954

TONOFERON

ELIXIR

Colloidal Iron with Folic Acid and Vitamin B₁₂

- ★ Highest Concentration of Iron per teaspoonful
- ★ Maximum Utilisation
- ★ Quick Response
- ★ Palatable

For further Particulars please write to :

EAST INDIA PHARMACEUTICAL WORKS LTD.,
CALCUTTA-26

SHOCK IN GYNAECOLOGY

BY DR. VISHNU SARMA, M. A. (Cantab), M. B., B. Chir., M. R. C. S. (Eng.), L. R. C. P. (Lond.)

Civil Assistant Surgeon, The Government Women and Children's Hospital, Egmore, MADRAS.

(For sometime on the staff of the Birmingham Accident Hospital and Medical Research Council Industrial Injuries and Burns Research Unit, Birmingham, England)

It is immaterial where all this happened and to whom it happened. It is the sort of thing that might happen to any one of us when we are unwary; if it happens too often in private practice we stand to lose all our patients! The purpose of putting this case on record before you is to prove that a good gynaecologist is not necessarily one who skilfully removes the female genital tract and leaves post-operative care to junior people to worry over. Yet the trend is there. You will see many a surgeon reluctant to give away any operative work even under his or her immediate supervision because he believes that only he can do justice by the patient. Yet the hazardous post-operative supervision will be left to the ingenuity and integrity of the overworked nursing staff and a crowd of everchanging knowledge seekers who often grope in the dark without guidance.

A case record is a very valuable document. In some places part of it is printed so that information may be entered in it. In others there is very little except the name of the institute, hospital or nursing home. One should, with a good case record, be able to say what happened without having to pour over pages and pages of illegible writing to find out. There is little place for each medically qualified visitor to scribble his own findings so that the whole thing is a voluminous disjointed collection of grubby papers of different sizes and shapes. It is desirable that much of the nursing and other care given to the patient be entered on printed sheets so that nothing is left out and there is a place for everything. This saves a lot of time and trouble. Almost every case sheet is worth studying. The labour involved in analysing a case sheet is great. It is apt to be tedious and time consuming, but it can be tremendously instructive. Indeed it is a discipline which the sincere student of gynaecology and obstetrics would do well to practise.

If I owned a single seater air-craft and wished to pilot it myself from Bombay to Delhi and I wanted advice about the flight and the hazards on the route. I would prefer to consult the navigator who has flown over this

course and has at the same time been charting the course. He may have flown only a few times but he has flown intelligently. I would rather take his advice than that of a pilot who has blindly ferried air-craft to and fro several hundred times over the same route. In the same way surgical experience may come by performing thousands of operations but surgical wisdom and judgement comes finally only to those who stop to think on the way and plot the course they have followed and ask themselves "Was that correct?"

To begin with I will more or less copy out the case record as it is. This will be Section I. We are concerned only with the post-operative management; not whether the diagnosis was correct or whether the treatment was justified. These are also important questions but we shall leave these out of this discussion.

In Section 2 I have analysed all the information contained in Section 1. Most of it takes the form of a temperature, pulse, respiration and blood pressure chart which is used at the Accident Hospital, Birmingham for cases of severe injury or burns during the shock phase.

In Section 3 I have discussed the management of the post-operative period in the light of recent knowledge on the subject. There has been no autopsy on this patient and one cannot be too dogmatic but I would like you to ask yourself whether the patient need have died.

Section I

Patient. Age 40.
Complaint : Vaginal bleeding.
Diagnosis : Benign gynaecologic disease of the uterus.

Pre-operative condition :

Anæmic Hb. 50%. Red Cell count. 2.7 M.
White cell count : 11,200

Differential count: Polymorphonuclear leukocytes 63%, Lymphocytes 28%, Eosinophils 9%, Mononocytes. O.

Pre-operative preparation:

A course of penicillin/Acid tonic mixture/Iron/Liver extract/B complex/Streptomycin/Calcium gluconate—(Patient admitted two weeks prior to operation which was hastened because the patient began to bleed again.)

Operation:

Total hysterectomy and bilateral salpingo-ooperectomy performed under heavy spinal anesthesia using Nupercaine. Omnopon gr. 1/3 and scopolamine gr. 1/100 for pre-medication.

Operation commenced: 9.50 a.m.

Blood pressure before operation was 110/80. After operation it was 95/60—Glucose saline started in theatre and anaesthetist decided blood would be necessary and that it should be put up in post-operative period.

Post-operative Course:

DAY OF OPERATION

- 11.50 a.m. P. 104. Volume, tension good. I. v. 5% glucose saline flowing. To be followed by one bottle of blood.
- 1 p.m. Blood bottle No. 1. "O" gp. compatible. Started after saline was over. Blood is flowing. (4 p.m. patient had rigor)
- 5.30 p.m. BP 68/30 P-144 volume tension fair. Add more glucose saline after blood. (8 P. M. Patient had fever)
- 8.50 p.m. P. 130/Volume tension very low. Not regular. BP 75/70? Foot end of bed to be raised. I. v. drip of glucose saline. Inj. per cortone 1 amp. 1/m; Inj. Omnopon gr. 1/3. i/m.
- 9.45 p.m. Pulse very feeble. Blood taken again for X-matching. Inj. coramine 1 amp.
- 10.30 p.m. Blood bottle 2. started. "O" gp. Surgeon informed. continue blood transfusion. Pulse still imperceptible. No tenderness of abdomen. No rigidity. Moves well with respiration.

11.45 p.m. Pulse imperceptible. No tenderness of abdomen. No rigidity. Moves well with respiration.

11.45 p.m. Pulse imperceptible. BP not recordable. Coramine and Ephedrine 1 amp.

FIRST POST-OPERATIVE DAY

- 12.45 a.m. Radial pulse just perceptible. Can't be counted. Brachial pulse 130/m. Inj. Methedrine 1 amp. given. BP 60/70? 1st, bottle blood over. 2nd started at 1 a.m. (actually this must be Bottle 3 which the patient had.)
- 2.45 a.m. P. 120. Volume and tension low, BP. 50/30 Getting i. v. drip of blood.
- 5.00 a.m. P. 120 Volume and tension poor. T. 102 Deg. F. BP. 75/70? Blood flowing.
- 6.30 a.m. P. 120 Volume and tension better, than before. B. P. 60/38. Lips dry. Blood transfusion going on. Lungs very clear.
- 7.30 a.m. Patient restless. B. P. 90/60. Tongue dry. Inj. Omnopon. gr. 1/3 given.
- 8.00 a.m. Patient extremely restless. Blood not flowing. Waiting for patient to be quiet and then to start. Inj. Omnomycin 1x2, Vitamin C. 2x3.
- 8.20 a.m. Pulse hardly perceptible.
- 8.45 a.m. Inj. Percortone 1 amp. B. P. 70/30.
- 9.15 a.m. Seen by Surgeon. Give Pethidine I. V. 50 mgm. A wide spectrum antibiotic also given.
- 9.45 a.m. I. v. Glucose saline drip, started by open method. Patient sleeping under effects of I. v. pethidine. P. 150 Volume tension fair, Oxygen flowing. Maintain 2 hourly B. P. record. Tetracycline 250 mgm. i/m. Percortone Repeat at 1 p.m.
- 10.00 a.m. 55/70 I. v. saline, flowing (wide spectrum antibiotic added to drip). Patient quiet and under effects of pethidine. Oxygen flowing through intranasal catheter.

11 a.m. Blood sent for blood urea estimation. Catheterized. A few drops clear urine withdrawn. Tepid sponging. Started because temperature is very high.

12 midday. BP. 62/44 P. 144 Volume tension poor. Patient came round and is talking irrelevantly in between. Not very restless. I. v. Tetracycline 5% glucose saline flowing as a slow drip. Oxygen inhalation continued. Temperature came down to 103.4 deg. F. (axilla).

1.00 p.m. Patient is conscious. Glucose saline flowing. as a slow drip I. v. Tetracycline. Oxygen inhalation. Inj. Percortone 1 amp. i. m. given. To be repeated at 5 p.m. if BP still low. Eyes look jaundiced. Tongue dry. (Hæmolytic jaundice.)

1.25 p.m. 1/2 Oz. clear urine withdrawn through indwelling catheter. Inj. vitamin K. 10 mgm. i. m. Vitamin C. 4000 im. I. v. calcium gluconate 10 cc. to be added to drip. Vitamin B complex 2 cc. i. m. Temp. 102 deg. F. BP. 64/44.

1.45 p.m. Surgeon orders 20% glucose in acqua to be given after the saline is over and a wide spectrum antibiotic Tetracycline and Percortone to be repeated after four hours. To be informed every three hours of patient's condition.

2.00 p.m. Blood urea 38 mgm. Sips of water being given.

3.00 p.m. 1st pint of saline over. 2nd bottle of 20% glucose in acqua and tetracycline antibiotic added.

3.30 p.m. Temp. 101 deg. F. axilla. Conjunctiva becoming yellow. Patient a bit restless. Pethidine 50 mgm. i. m. given., B. P. 68/48 P. 120., Volume, tension fair.

4.00 p.m. Oxygen stopped.

5.30 p.m. B. P. 65/40 P. 120. Volume, tension fair. Inj. Percortone 1 amp. i. m., No distension or bleeding.

6.35 p.m. Urine 1 Oz. brownish colour. Drip flowing.

7.30 p.m. BP. 62/44 P. 112. Volume tension fair. Tongue dry. Patient conscious but at times talking irrelevantly., i. v. Tetracycline in 20% glucose. in acqua flowing., Temp. 101.6 deg. F. axilla. No distension of the abdomen. Urine: Seen under the microscope and could find nothing particular.

8.00 p.m. Feed through Intra-nasal catheter. Give fluids. Percortone and sedative.

10.00 p.m. Tetracycline drip over. BP. 70/30—20% glucose in acqua continued Percortone 1 amp. P. 104 Volume tension fairly poor. Omnopon 1 amp. Patient conscious and talking to her relatives.

SECOND POST-OPERATIVE DAY

2.00 a.m. P. 108 BP. 60/30. Tongue dry. Glucose flowing.

4.00 a.m. P. 104. BP. 60/30 Glucose flowing.

6.30 a.m. Pulse feeble. Felt with difficulty. 80/min. i. v. glucose flowing. BP. 55/25 Inj. per cortone. 1 amp.

8.00 a.m. BP. 56/20 P. 96. Volume tension poor, Respiration 28, Temp. 102 Deg. F. in axilla., Patient conscious but too quiet. Twitching of fingers present. i. v. glucose 20% flowing, slowly. Conjunctiva highly jaundiced. Catheterized 4½ ozs. highly coloured urine. Surgeon advised that Bull-Jockes therapy be started. Urine to be sent for bile pigments and bile salts. Repeat blood urea. Oxygen inhalation. Diagnosis. *Lower nephrosis due to blood transfusion. ? mismatched.*

9.00 a.m. 1/4 Oz. urine withdrawn. High fever. Investigate blood urea and serum potassium. Tepid sponging.

10.00 a.m. Bull-Jockes intragastric therapy started as a slow drip. Patient not fully conscious. Twitchings of hand muscles increasing. Temp. 99.8 deg. F. after tepid sponging.

10.15 a.m. B. P. 66/38. Radial pulse imperceptible. Brachial pulse 90/min. Volume and tension fair. rhythm regular.

- 10.30 a.m. Omnomycin i. m., Percortone 1 amp. i. m.
- 12.15 p.m. 100 cc. 3% sodium citrate and 440 cc. 5% glucose in Aqua by slow drip to take 8 hours.
- 12.20 p.m. Blood urea 55 mgm. %. Urine albumin ++. Blood with Benzidine test. Urine microscopically red blood cells, pus cells, granular casts, motile organisms, Patient gasping.
- 12.45 p.m. Patient expired. Diagnosis. Renal failure (Lower nephron nephrosis) due to mismatched blood transfusion.

SECTION 2

Most of the essential information has been plotted out on a post-operative resuscitation chart based on the one used for severely injured patients during the shock phase at the Accident Hospital, Birmingham, England.

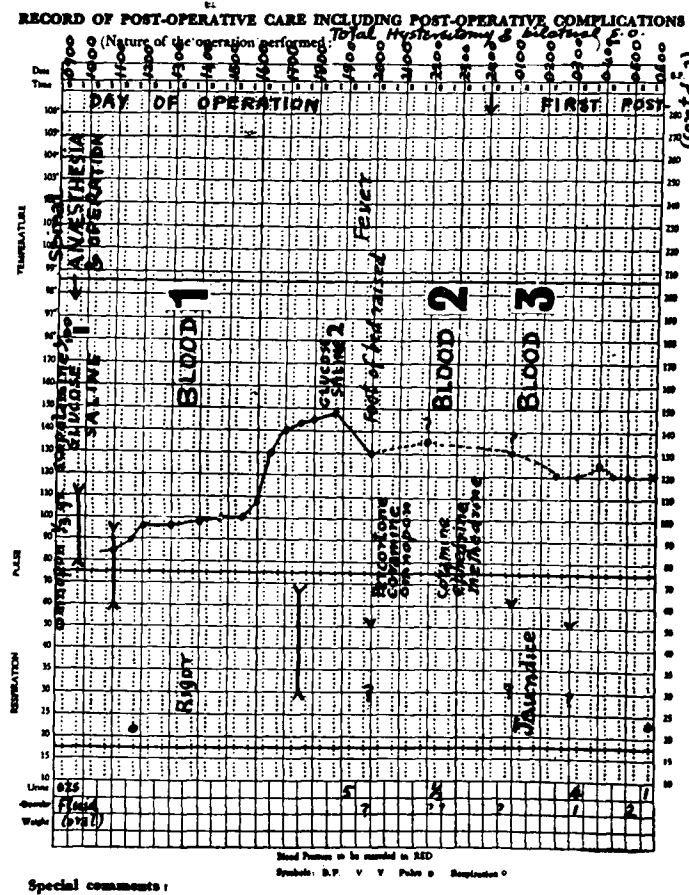


Fig. 1. a

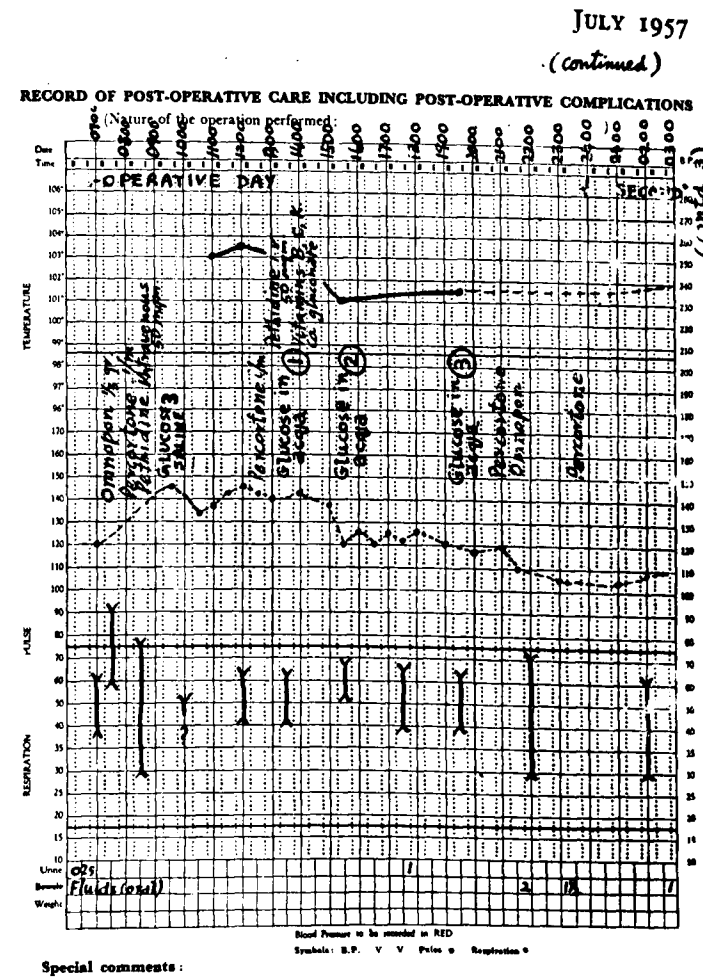


Fig. 1. b

SECTION 3

If you make a close study of the chart in which the Post-operative record has been entered, you will find just what has happened. This patient was given heavy spinal anaesthesia, using Nupercaine. Undoubtedly spinal anaesthesia is a simple form of anaesthesia, suitable in most cases and widely employed. Yet one of the great dangers of such anaesthesia is a sudden fall in the blood pressure. As far as we know, the operation had been uneventful and a straightforward hysterectomy and bilateral salpingo-oophorectomy had been skilfully performed. There has been no notable loss of blood; nor had the operation been unduly shock-producing or delayed owing to technical difficulty in surgery. Yet, it had been noticed that the blood pressure which was 110/80 had fallen significantly to 95/60. It had been quite obvious that blood would be necessary and instructions had been left for that. One wonders why glucose saline had been started during the operation in the theatre, because if there had been shock, the proper thing to use would have been blood.

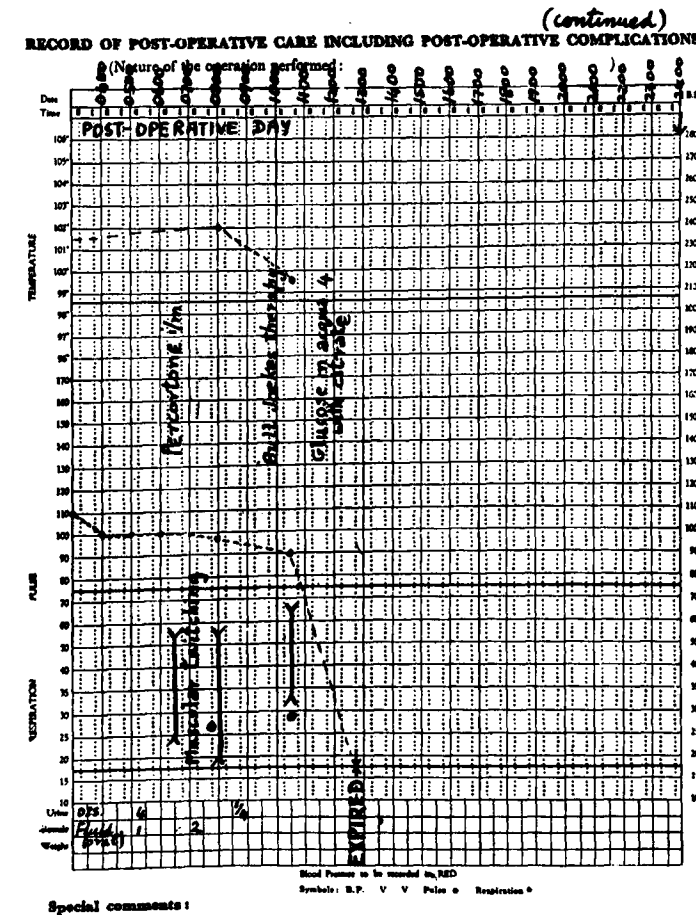


Fig. 1. c

Where blood is not available, plasma expanders have a valuable place. The primary object in the treatment of shock is the restoration of circulating volume and not so much the correction of a fall in haemoglobin. Plasma expanders expand the plasma fraction of the circulating blood. It must be realised that the effect of a plasma expander is a transient one and that every effort must be made to find whole blood to restore the blood volume. It will be noticed from the chart that there had been considerable delay before the first bottle of blood was put up. From the time after operation up till about 3-30 in the afternoon the pulse had been slowly but steadily rising. This had been faithfully charted by the nurse in attendance. For some reason the pulse suddenly shot up between 4 and 6 p. m. to a rate of over 140 beats per minute. It will be seen that it was not until this time that another blood pressure record was taken. At 5.30 p.m., the blood pressure had fallen to 65/30. By now the seriousness of the patient's condition had been realised. Arrangements were made to procure more blood and certain resuscitative proce-

dures were carried out. The foot of the bed was raised; stimulant drugs as well as vasopressor drugs were injected. The patient was also given omnopon. At 3.30, the patient had a slight attack of rigor. At 7 o' clock, she had fever. Glucose saline appears to have been started while blood was being awaited and it will be noticed that the second and third bottle of blood was given over a period of about 4 to 5 hours. When given at such a slow rate, one does not expect shock due to circulatory collapse to be remedied. It will be noticed that after 4 o' clock the blood pressure has never risen above the level of 70 m. m. (systolic) of Mercury. Below this level glomerular filtration does not take place. Between 7 o' clock and 8 o' clock, the systolic pressure has risen above 70. But that is presumably due to the delayed effect of all the vasopressor drugs which had been injected about five hours earlier. When there is post-operative shock and it is desired that the drug should be effective when injected, it is necessary to give it intravenously. Because of peripheral vaso-constriction, drugs injected intramuscularly takes a long time to get absorbed into the circulation and have their effects. It will be seen that again the blood pressure had suddenly fallen and at 10 o' clock on the first day after operation a bottle of glucose saline had been given. Again an attempt was made to inject vasopressor drugs, but this time it does not seem to have had any effect. Presumably the shock had become irreversible. Although there is no record of it, the patient was known to belong to 'O' group. All the three bottles with which she had been transfused also belonged to "O" group. There was an attack of rigor after the first bottle. At about 1 p. m., on the first day after operation she developed jaundice. About an hour after that she was started on an intravenous regime of glucose in water. It is difficult to explain why the patient had jaundice because it preceded the administration of glucose in water. Had the patient not been secreting urine for all this time (and it is also quite obvious that she has been in a state of shock) there must have been considerable haemoconcentration of her blood. It is possible for the administration of glucose in water at this state to bring about haemolysis of the red cells and liberation of blood pigments. The patient's condition had grown steadily worse. She reached a high temperature and at 8 o' clock in the morning her tongue was dry and she showed twitching of her voluntary muscles. At 10 o' clock Bull-Jockes therapy had been prescribed. A last and final effort was made to force glucose in water mixed up with citrate 12 O' clock on the morning. At 12-45 mid-day

on the second day following operation the patient died. During most of the post-operative period she had barely secreted any urine. A small quantity was drawn. The urine was clear to begin with. Later it was very concentrated and finally it contained a large number of red blood cells and casts. Terminally there was a considerable degree of albuminuria. In the post-operative period, her blood urea have been steadily rising. Her temperature had not shown any significant response to antibiotics. Had the patient died of electrolyte depletion as the clinical picture, a rising blood urea, and muscular twitchings all suggest, one might have expected a high level of potassium. This was not borne out by a single isolated potassium estimation performed shortly before her death.

The patient was certified as having died of renal failure (Lower nephron nephrosis) due to mismatched blood transfusion. In this particular case when an attempt was made to find out if blood could be blamed in any way, it was found that the pilot bottles had not been preserved. One could not go very far beyond determining that the patient belong to "O" group. Although one cannot be too dogmatic it is my personal belief that one does not have to look very far to know why the patient had died. For some reason her blood pressure had fallen significantly after operation. There had been inadequate supervision amounting to almost criminal negligence.

We may not have reached the stage of surgical development in which we have begun to appreciate the complexities of electrolyte disturbances which occur during the post-operative period; nevertheless, I believe, better arrangements for the post-operative management of such cases could go a long way to avert such disasters. An early recognition of a fall in the blood pressure could have enabled one immediately to combat it with the use of plasma expanders. Arrangements could have been made to procure blood, and when blood was procured, it could have been given at a rapid rate, based on the clinical condition of the patient as well as observations of her pulse and blood pressure. Vasopressor drugs could have been injected much earlier in an effort to raise and sustain the blood pressure. Had this been done and had this patient received better supervision in the few hours immediately following operation she might not have died.

In Western countries, in some hospitals they have what is known as Post-operative Shock & Resuscitative Units. A patient who has had an operation or has

been severely injured and is shocked, is admitted to a special recovery room in which all facilities are available for skilled medical supervision. Careful clinical observations are made of the patient. The character and quality of the respirations are watched. If there is any lack of oxygen, this is administered, if necessary with the aid of a suitable airway. The colour of the skin is noted; the character and quality of the pulse are observed and the condition of her skin and the state of reactivity are noted. The blood pressure is carefully recorded. An eye is kept on retention catheters, drainage tubes and gastric tubes. Dressings are attended to; infection is controlled; drugs are given to relieve pain. Frequent observations are made on the patient and are carefully recorded on special resuscitation charts. It is by appreciating the value of the special management and care for such patients that we can improve our standards in the future. It will not be by merely prescribing newer and newer drugs which we hear about without understanding the basic principles which govern the control of shock and other manifestations which jeopardise the patient's welfare in the immediate post-operative period.

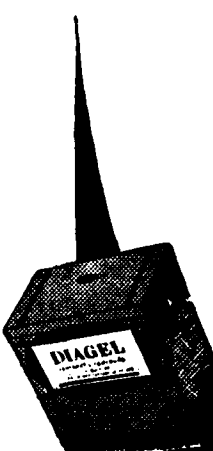
(Continued on page 59)

**AMOEBIASIS
FOR CHRONIC CONSTIPATION
FLATULENCE etc.**

Each Drachm contains:—

Pepsin	..	3 grs.
Diastase	..	4 ..
Bael	..	20 ..
Ishafgul	..	32 ..
Excipients	..	1 gr.

Also available DIAGEL with
Iodo-Chlorohydroxyquinoline — 4 grs.
in each drachm.



Diagel

THE ORIENTAL RESEARCH & CHEMICAL LABORATORY LTD.

GUMARESH HOUSE SALKIA HOWRAH

PAINLESS CHILD-BIRTH

By I. KOSOI, M. Sc. (Medicine)—Moscow-U.S.S.R.

THE practice of giving pregnant women a course of prophylactic psycho-therapy before child-birth has involved a great deal of reorganization among the staff of obstetricians, midwives and nurses, as well as in maternity wards and women's consultation centres.

The method of prophylactic psycho-therapy consists mainly of explaining to women the physiological processes of pregnancy and child-birth, so as to give them a clear understanding of these biological conditions. But how was one to convince pregnant women that child-birth need not be painful, when so many obstetricians and midwives firmly believed that it must be so as a general rule, owing to the opening of the cervix, extension of the ligaments of the uterus and contraction and expansion of blood vessels accompanying the contraction of the uterus?

A great deal of work had first to be conducted among physicians, then six months training courses had to be organized for midwives and finally the lower personnel had to be regularly re-educated. Altogether the introduction of the method of prophylactic psycho-therapy

required a great deal of persistent work as well as a special medical regimen, calculated to give women the necessary protection.

To achieve this it was necessary to perfect the general standard of medical service extended to pregnant women, to inspire the latter with confidence in the whole medical staff, eliminate disturbing emotions connected with the coming child-birth and keep the women continually in good spirits.

The physician's belief in the method of prophylactic psycho-therapy and in the force of suggestion, which is an additional factor in cases when words have not sufficient influence and, finally, the pregnant woman's trust in her physician are all important premises of painless child-birth.

Prophylactic psycho-therapy of pregnant women in preparation for child-birth is a complicated and difficult process. Its success depends both on the initial condition of the patient's central nervous system and on the extent to which we can act on the cortex of her brain. Women's consultation centres, where

(Continued from page 58)

One of the things which would have helped a great deal is autopsy which could not be obtained. It is only by means of meticulous study in the post-mortem room that surgical mistakes can be recognised and their repetition prevented in future. We should make every effort to see that legislation is speedily enacted to make autopsy studies a common place procedure following all post-operative deaths whether they occur in hospitals, nursing homes or other institutions. This is of the greatest importance when death occurs.

It is unfair to be too dogmatic. It is easy to dismiss this particular case as one of lower nephron nephrosis. It may not be possible to disprove this. But, when all the information is recorded on a resuscitation chart it becomes immediately apparent that the patient has been allowed to pass into an irreversible state of shock and unscientific and desperate attempts had been made, too late, to restore the damage which had already come to pass. Our object should be to prevent such disasters. We should appreciate the importance of the

post-operative period and realise that skill in gynaecological surgery is not merely a matter of removing the uterus and its adnexa and sending the patient to be looked after by shorthanded and sometimes unskilled nursing staff directed by an everchanging set of medical attendants who do not feel fully responsible in any way for the care of the patients.

REFERENCES

1. Bowes, Kenneth, Modern trends in Obstetrics and Gynaecology, 2nd series, Butterworth, London, 1955.
2. Browne F. J. & Brown J. C. McClure, Post-graduate Obstetrics and Gynaecology—2nd Edition, Butterworth, London, 1955.
3. Maingot, Rodney, The Management of abdominal operations, H. K. Lewis & Co. Ltd., London, 1953.
4. Sadove Max. S. & Cross James H. The Recovery room, Immediate post-operative management, W. B. Saunders Co., Philadelphia & London—1956.

LIVOZYME I2

*A Non-Alcoholic Potential Hæmopoietic and
Lipotropic Tonic and Tissue
Repairing Agent*

RICH IN

Natural Hæmatinic principles, Vitamin B Complex factors and Digestive Enzymes of the freshly Proteolysed Liver Yeast Extracts fortified by Synthetic Vitamin B Complex factors Folic Acid, Vitamin B₁₂ and Lipotropic factors Choline and Methionine.

COMPOSITION

Each fl. oz. contains

*Proteolysed Liver Extract Equivalent to
(1 oz. fresh liver)*

Proteolysed Yeast Extract 60 gr.

*Stomach Extract Equivalent to
(5 gr. fresh stomach)*

Folic Acid	3 mg.
Vitamin B ₁₂	12 mcg.
Vitamin B ₁	40 mg.
Vitamin B ₂	3 mg.
Vitamin B ₆	2 mg.
Calcium pantothenate	5 mg.
Nicotinic Acid amide	60 mg.
Choline Chloride	300 mg.
Methionine	300 mg.
Copper Sulphate	0.05 mg.
Calcium Glycerophos.	3 gr.
Pot. Glycerophosphate	2.5 gr.
Manganese Glycerophosphate	0.25 gr.
P. A. B. A.	10 mg.

ASSOCIATED DRUG CO., PRIVATE LTD.
YERCAUD (S. INDIA)

pregnant women are systematically prepared for child-birth, are the main link in the system of prophylactic treatment against the pains of child-birth.

The consulting physician's task is to prepare his patient consistently for painless child-birth, from the very first consultation and during all her subsequent visits.

Every pregnant woman is first examined by the obstetrician of her district who registers her and fills in her card. The physician studies his patient's individual peculiarities and establishes a friendly contact with her, so that he can from her first visit and throughout the time of her pregnancy systematically prepare her for child-birth, until she is finally given a special course of lectures.

In the course of frequent talks with her obstetrician the woman's psychology undergoes a gradual change and she acquires the right conception of child-birth, as of a physiological process which cannot and must not be accompanied by pains. These visits enable the doctor to thoroughly understand his patient's personality and her ideas on motherhood and child-birth. He also makes careful examinations, both obstetric and neurologic.

In the last month of pregnancy doctors of the staff of women's consultation centres give their patients a final course of 4 lectures, one every week.

The first lecture is a preliminary one and delivered individually to each patient. Everything is done to create an atmosphere of perfect calm, the doctor's attitude is one of kindness and understanding based on the personal contact and mutual confidence already established between him and his patient in the course of previous visits. The importance of hearing the whole course of lectures is explained and the patient is persuaded to attend them regularly. She is then entered in a group corresponding to her individual peculiarities, the time at which it is most convenient for her to attend the lectures being taken into consideration.

The second lecture is devoted to the anatomy of the sexual organs and the anatomic and physiologic changes that occur in a woman's organism during pregnancy. The functions of the cortex of the brain are explained, as well as its influence on the formation of complicated reflexes and the possibility of regulating child-birth

through the central nervous system. The doctor stresses the fact that child-birth need not necessarily be painful.

The third lecture describes the first, second and third stages of pregnancy, their nature and symptoms. The women are taught certain rules which they must observe in each period and also methods of avoiding pain.

The fourth and last lecture is devoted to the joys of motherhood, after which the women are told about the routine of maternity wards. In doing so the lecturer tries to win their sympathy beforehand for the staff of the ward and to get them used to the idea of all the medical measures which may prove necessary. The doctor ends the last lecture with a short summary of the two preceding ones and states, in an imperative and peremptory way, that child-birth will be painless.

In the cases when child-birth does not begin within 7 to 10 days after the last lecture the women pay another visit to the district obstetrician. He makes another examination and devotes some time to repeating and impressing on their minds the information received at the psycho-prophylactic lectures.

District obstetricians attach great importance to the way lecture groups are formed (4 to 5 women in each group). They always try to put in the same group women of a similar intellectual level. It is quite certain that the success of the lectures depends not only on the physician's ability to read a good lecture, easily understandable and convincing, but also and to a great extent on the proper distribution of the women in groups. If this is done rightly, the women who have interests in common will exercise a good influence on each other.

Midwives are the doctor's best assistants in a course of prophylactic psycho-therapy. Knowing her district well the midwife can make good use of the examples of painless child-birth in the local maternity home. Midwives bring these women to see their new patients and the mothers tell pregnant women of their own experiences and behaviour during child-birth. This is the most striking and convincing proof of the efficacy of prophylactic psycho-therapy.

At the last lecture the doctor reads letters from mothers who have experienced painless child-birth. These letters
(Continued on page 63)

are good propaganda, especially when the names, surnames, addresses and places of work are given.

The general rule is for the obstetrician to give 4 lectures on prophylactic psycho-therapy. One or two supplementary lectures are sometimes given but only in the case of women with a particularly excitable nervous system.

On lecture days (they take place once a week), the lecturing doctor is exempted from receiving patients, including pregnant women. The midwife is his regular and necessary assistant for the lectures. Every district obstetrician has his own midwife, who works with him only. It is her duty to notify pregnant women of the lectures, to check their attendance, prepare visual aids, etc.

In the women's consultation centres all the examinations of pregnant women and observations on their cases are entered in a special card, as well as the results of the preparatory psychic therapy. This card is sent to the maternity ward within the first hour after the patient is brought there. Should this happen at night, the card is sent in next morning.

Another pregnancy card is kept in each case for purposes of registration, medical observation and control over the midwife's attendance to the patient and the patient's attendance at lectures. On the day when the woman leaves the maternity ward her card is returned to the consultation centre with a short account of the child-birth and subsequent period and also of the anæsthetizing effect of the prophylactic psycho-therapy.

Before coming to the maternity ward the woman already knows what child-birth is like and what manipulations it involves. She has no fear of the consequences. The staff of the ward gives her a kind welcome and confirms the information which she has received during the course of prophylactic psycho-therapy in the consultation centre. The obstetrician on duty, frequently assisted by a midwife, tries to establish an atmosphere of mutual understanding and contact during the first examination. On hearing that the patient has been given a course of preliminary psycho-therapy the doctor reminds her again of the way she must apply during child-birth the methods which she has been taught.

The obstetrician on duty and the midwife continually keep the patient in sight, never leaving her unattended.

DEPARTMENT OF FISHERIES,
GOVERNMENT OF BOMBAY.

Announces Introduction of its New Product

SHARKOMALT

A most palatable blend combining the nutritive values of malt extract with the medicinal properties of Shark Liver Oil.

A vital aid to combat wasting diseases and to build a sound constitution.

Available in 1 lb. bottles.

Each fluid ounce contains

Malt Extract	38 gms.
Vitamin A (derived from Shark Liver Oil)	12000 I. Us.
Vitamin D (Calciferol B.P.)	2400 I. Us.

INDICATIONS:

- CONVALESCENCE ● GENERAL DEBILITY ● XEROPHTHALMIA ● NYCTALOPIA (NIGHT BLINDNESS) ● RICKETS ● DISEASES OF RESPIRATORY PASSAGE SUCH AS COUGHS, COLDS, ASTHMA AND BRONCHITIS.

Made at

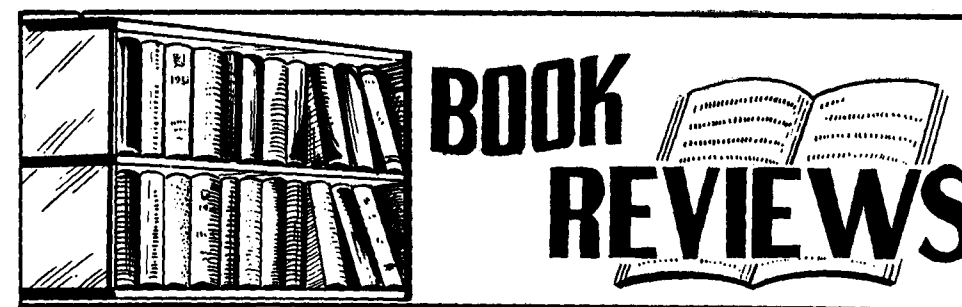
The Fisheries Technological Laboratory
(GOVERNMENT OF BOMBAY)

Sassoon Dock, Colaba, Bombay-5.

(Makers of ● SHARKOVIT ● ELASMIN LIQUID ● ELASMIN PEARLS)

Sole Distributors:

KEMP AND COMPANY LIMITED,
BOMBAY, DELHI, MADRAS, CALCUTTA.



FIGHT AGAINST TUBERCULOSIS IN INDIA—

By Dr. Goel, B.Sc., M.B., B.S., D.T.D., Medical Superintendent, Maa Saraswathi Tuberculosis Hospital, Mathura.

This 83 page booklet has been printed by the author with the object of making people concerned with the magnitude of the problem which tuberculosis presents among the population of India. The author makes wide use of statistics. The first section is devoted to survey the problem. The second part discusses the extent of the disease. Rajyakshama or "the pestilence of the people" is the apt name to give to this serious disease. The next few chapters deal with the spread and recognition of this ailment. Finally the author puts forth his idea on how the spread of tuberculosis may be controlled bearing in mind our economic conditions. This is an interesting booklet. The author has no doubt tried as far as it is within his power to prevent spelling mistakes from being a blemish on almost every page.

**

**

**

INSTRUCTIONS FOR DIABETICS — Indra Labo-

ratories, 127, Mahatma Gandhi Road, Bombay-1 : Printed by: V. V. Bhat, at Famous Printers, 12, Tribhuvan Road, Bombay-4.

This booklet of 63 pages gives a general account of diabetes mellitus and incorporates advice on the diagnosis and treatment of this malady. The main object of the booklet is to suggest a diet which suits Indian conditions and includes many of the vegetables and food products of India. The tables and food values are very useful and an interesting feature and have been printed by the courtesy of the Director General of Health Services, Government of India.

**

**

**

MEDICAL TIMES—The Journal of General Practice, Vol. 85 January, 1957, No. 1 (incorporating a Long Island medical journal and Western Medical Times) Published by: Romaine Pierson Publishers, Inc., 1447, Northern Boulevard, Manhasset, New York.

(Continued from page 61)

The doctors who are on duty adopt timely measures to eliminate the least abnormality in the process of child-birth, so that the patient has no cause for anxiety, pain is either completely absent or diminished and a good outcome secured.

While observing the process of child-birth the doctor notes down in the history of the case every detail of the woman's behaviour, the way she carries out the methods of avoiding pain, etc. The results of prophylactic psycho-therapy are judged by the dynamic observation of all the phases of child-birth.

Although the doctor's opinion of these results is entirely subjective and depends on his personal impres-

sions, it also reflects the patient's behaviour. Unfortunately, nobody has yet proposed any entirely objective criterion by which the results of prophylactic treatment could be judged and we have to depend on the doctor's notes only. The head of a maternity ward has no other means of checking them except by questioning every patient on her case and comparing her answers with the doctor's notes.

Our results are: 69 per cent cases of completely painless child-birth and 24 per cent partly painless—they speak for themselves. A full course of prophylactic psycho-therapy, given in the consultation centre and supported in the maternity ward saves many women from the pains of child-birth.

This journal is meant for the general practitioner. It contains well illustrated and readable articles on a variety of subjects relating to medicine, surgery and midwifery. There is a good radiological feature entitled "Which is your diagnosis?". In addition to articles it contains comments on various day to day problems which concern the general practitioner in America.

* * * * *

CHRONICLE OF THE WORLD HEALTH ORGANISATION—Volume 11 Number 2, February

ISONIAZID THERAPY IN CUTANEOUS TUBERCULOSIS AND SARCOIDOSIS

Holsinger, R. E. and Dalton, J. E., *Journal of the American Medical Association*, U.S.A., 154: 475-481, February 6, 1954.

Ten cases are reported. In the true tuberculoderms two patients with tuberculosis cutis luposa and one with tuberculosis cutis colliquativa showed excellent results after treatment with isoniazid. Streptomycin or dihydrostreptomycin was administered additionally, at least for a part of the time, in these three cases. Another patient with tuberculosis cutis luposa showed a good, but incomplete response to isoniazid and dihydrostreptomycin. It is suggested that the amount of scarring present would naturally retard the penetration of any chemotherapeutic agent. There were two cases of tuberculosis cutis papulonecrotica, one of whom enjoyed a prompt and complete clearing of lesions, persisting even after the termination of isoniazid-streptomycin treatment. The other patient, however, became worse on treatment with these two agents plus PAS. It is possible that the first patient may have been more careful in regard to rest and general pattern of activities than the second. There were also two cases of micropapular tuberculid in the series and both responded slowly to isoniazid treatment alone. At the last observation before writing this paper both were showing unmistakable signs of improvement and the skin of one was largely clear. Of the two patients with sarcoidosis, no cutaneous improvement of any kind followed the use of isoniazid alone. There may have been some pulmonary clearing in one case; there was no clinical improvement of any sort in the other. The authors' current regimen of treatment, generally, is 3 to 5 mg. per kilogram of body weight daily of isoniazid orally plus 1 gm. biweekly of streptomycin or dihydrostreptomycin intramuscularly. Since a preparation combining streptomycin and dihydrostreptomycin in equal parts has become available, a new possibility for reducing vestibular damage or auditory damage is offered. It would seem—though more confirmatory study is

1957, Published by The World Health Organisation, Palais des nations, Geneva.

This monthly publication gives an account of the interests and activities of the World Health Organisation. For Instance, this particular number contains among other things a survey of hygiene and public health teaching in Europe and a well illustrated feature on hygiene in the handling of meat. Those interested in subscribing for this useful journal may approach the Oxford Book and Stationery Company, Scindia House, New Delhi.

needed—that isoniazid may offer faster and better therapeutic results in true tuberculoderms than in tuberculids. There were no side effects in the series which could be attributed to isoniazid. Isoniazid can apparently be offered safely over extended periods, but a lookout must be kept for isoniazid resistance. Isoniazid is probably best used in combination with streptomycin, dihydrostreptomycin, or both, and possibly PAS.

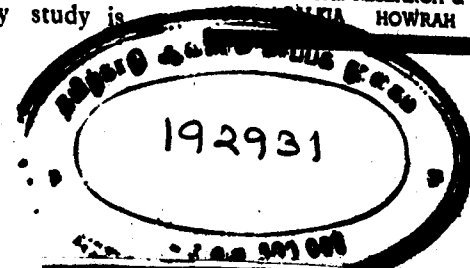
FOR INDIGESTION

Caricaeptol, a combination of papain, Diastase, Tr. Ipecac & Vit. B-Complex, is a stable digestant of both proteins and Carbohydrates. Papain being one of its chief ingredients it is active in both Acid and Alkaline, and also in neutral media.



Caricaeptol

THE ORIENTAL RESEARCH & CHEMICAL LABORATORY LTD.
HOWRAH KUMARESH HOUSE



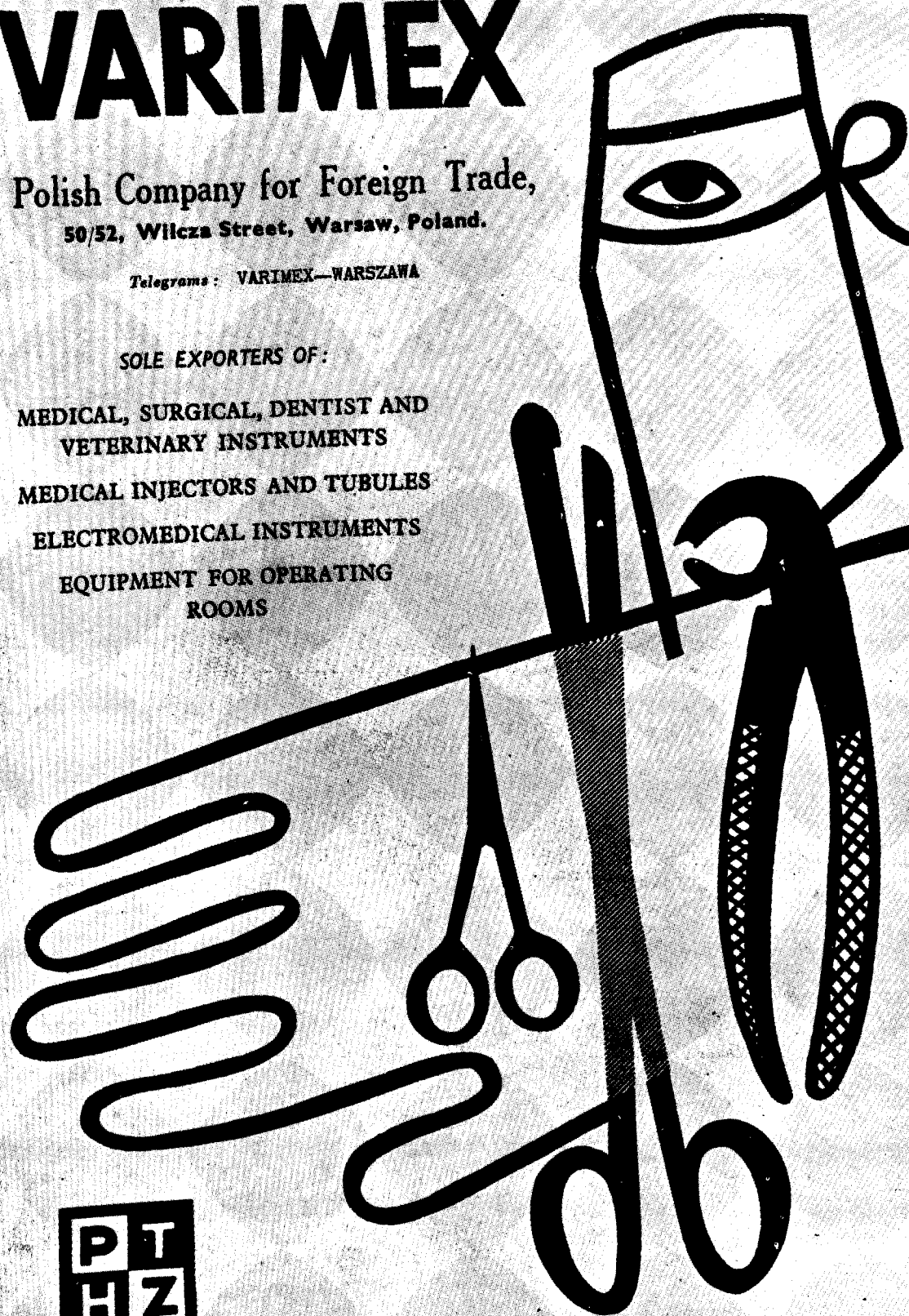
VARIMEX

Polish Company for Foreign Trade,
50/52, Wilcza Street, Warsaw, Poland.

Telegrams: VARIMEX—WARSZAWA

SOLE EXPORTERS OF:

MEDICAL, SURGICAL, DENTIST AND
VETERINARY INSTRUMENTS
MEDICAL INJECTORS AND TUBULES
ELECTROMEDICAL INSTRUMENTS
EQUIPMENT FOR OPERATING
ROOMS



Further information & catalogues supplied on request also by:—

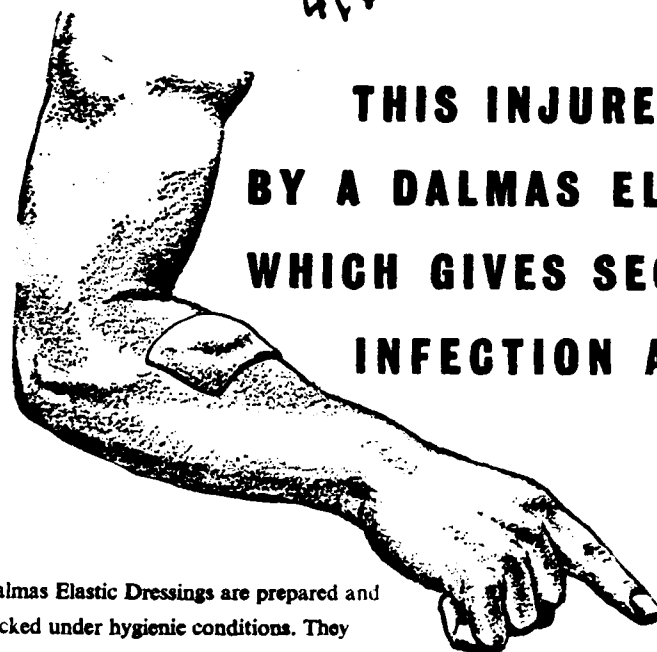
THE POLISH COMMERCIAL
COUNSELLOR'S OFFICE,
42-44 Sunder Nagar,
NEW DELHI

THE TRADE REPRESENTATION OF THE
POLISH PEOPLE'S REPUBLIC

24, Stephen Court,
18-A, Park Street,
CALCUTTA

Jugal Kishore Building,
40-A, Peddar Road,
BOMBAY-26

6-
4/9/57
Regd
TM

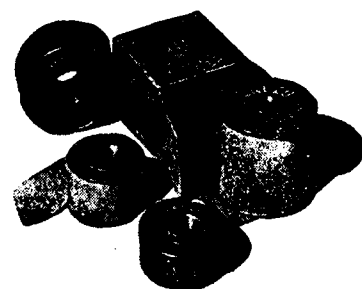


**THIS INJURED ARM IS PROTECTED
BY A DALMAS ELASTIC WOUND DRESSING
WHICH GIVES SECURITY AGAINST OUTSIDE
INFECTION AND CONTAMINATION**

Dalmas Elastic Dressings are prepared and packed under hygienic conditions. They reduce any danger of secondary infection. Always keep Dalmas elastic dressings ready to hand—they are an invaluable aid to rapid healing, easy to apply and perfect in protection.

DALMAS

PRODUCTS



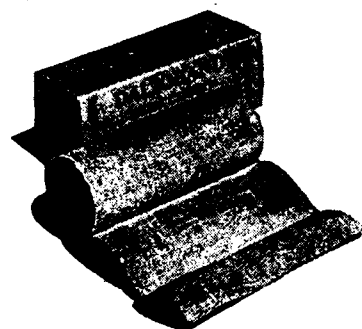
DALZO

Dalzo Zinc Oxide plasters have proved their reliability and efficiency throughout the world. They are hygienically safe and fully antiseptic. Available in 10 yd. and 5 yd. spools, widths $\frac{1}{2}$ in. to 4 in. and $3\frac{1}{2}$ yd. and 1 yd. spools, widths $\frac{1}{2}$ in. and 1 in.



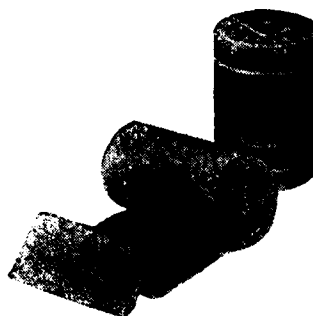
DALZOFLEX

Dalzoflex Bandages and Dalzoflex Strapping. For the ambulatory treatment of ulcerated legs there is no safer, surer dressing than Dalzoflex Elastic Adhesive Bandage. The strapping is recommended for securing abdominal dressings in situ. Available in 1 and 3 yd. spools. Widths from $\frac{1}{2}$ in. to 4 in.



DALZOBAND

Dalzoband Bandages (5 medications). An Unna's zinc paste type bandage which is always moist. These medicated bandages are wound loosely round the affected part and covered with a Dalzoflex bandage applied spirally, size, 6 yds. x $3\frac{1}{2}$ in. Medications include Zinc Oxide, Ichthammol, Urethane, Calamine or Coal Tar.



PERMALAST

Permalast Bandages—The efficient cotton elastic bandage, light, porous and washable. Firm support without restriction of circulation. Permalast is economical and long-lasting. Widths: 2 in., $2\frac{1}{2}$ in., 3 in., $3\frac{1}{2}$ in., 4 in., 6 in. Fully stretched 5 yards long.

Enquiries should be sent to:—

Advani Limited, Calcutta.
H. S. Cox & Co. Ltd., Bombay.
Messrs. Oriental Mercantile Agency, Madras.
M. G. Shahani & Co. Ltd., Delhi.

DALMAS

Manufacturers of Medical and Surgical plasters
for over 130 years.
JUNIOR STREET, LEICESTER, ENGLAND. Est. 1823