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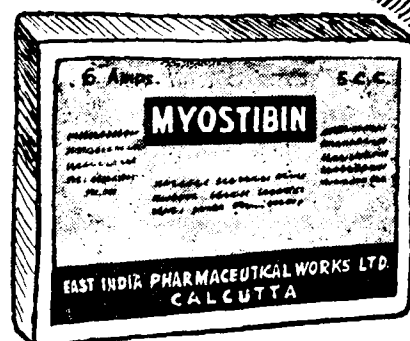
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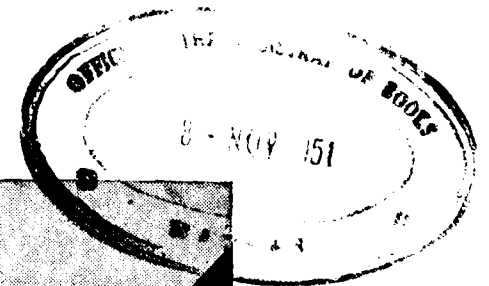
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The Madras Medical Journal

New Series
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No. 2

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THE MADRAS MEDICAL JOURNAL

New Series	APRIL 1951	No. 2
Vol. II		

"Health for your child and World's Children"*

BY

Dr. S. T. ACHAR, M.D., F.R.C.P. (C)

Professor of Paediatrics, Madras Medical College.

We are gathered here to celebrate the World Health Day. Perhaps it would be fitting if some one who is more used to public-speaking than I could address you but the duty has been assigned to me because World Health Day this year is dedicated to the theme "Health for your child and World's children".

We are to-day in the middle of the 20th century, increasingly conscious of the destination and objectives of human evolution. Few would disagree that our "Top Priorities", to use a convenient idiom, are Peace, Welfare and Security, which we must realize as a race, or perish. For this, we must turn our attention more and more to the World's children. For after all the 'Children of to-day are the citizens of tomorrow' and a nation truly marches on the tender feet of its young. Realising this, all the nations of the West like U.S.A., Canada, England and Russia have undertaken and placed at top priority, measures that will promote the healthy development of children. But health cannot mean freedom from physical illness alone. The positive concept of health has replaced the negative and extended its frontiers to include mental health as well, and the social health of harmonious behaviour within the community.

These concepts are directly reflected, as some of you would have realised, in the constitution of the W. H. O. itself. "Health" says the constitution, "is a state of complete physical, mental and social well-being, not merely the absence of disease or infirmity". "The healthy development of the child is of basic importance; ability to live harmoniously in a changing total environment is essential to such development".

*Lecture delivered at Madras on World Health Day July 1951.

I do not think that this comprehensive or synthetic point of view, as we might term it, will evoke dissent among thoughtful persons. It has been the gospel of pediatricians the world over, who have ever attempted to implement the policies and programme of a positive approach to health, amidst children. We are to-day conscious that the physical and mental well-being of the adult depends largely upon what happens in childhood, and the relationship of the child to parents and community. The work of the W.H.O. has to be appreciated against the back ground of this ideology. But may I emphasise the recent character of the concept itself, as a matter of social history? That the community is responsible for its children, and not merely the parents, is ill-understood even now, and every practical measure based on the idea has met with bitter opposition, as an in-road into parental freedom of action. On the contrary, there is truth in the attitude that states' responsibility cannot be abused by the regimentation of children in the cause of any system or theory, economic or political. But such legitimate distrust of interference has resulted in the postponement of legislation on behalf of children until overwhelming urgency was reached, and the undertaking of this work by voluntary and non-official agencies. Instances are child-welfare centres, Dr. Bernardo Homes etc. The local authorities (Municipalities, Town-Councils) have stepped in much later to take over and maintain such institutions.

During the present century, three elementary conceptions have gradually taken root. It is now generally conceded that the child as an individual has certain fundamental rights; that the infant mortality is an index of the living conditions and educational level of the community; and a high infant mortality is not merely human wealth squandered, (which some cynics might even say is not unwelcome in India with its present alarming population increase); but the equally great tragedy is that the survivors are weak in body, sluggish in mind, in short, enfeebled human beings due to the same factors which cause high infant mortality.

I think that every where there is growing consensus of opinion that children as individuals matter profoundly to the future of the race. We can no longer think of them merely in terms of economic utility, or as fodder in the competition for armaments. Each child must have the maximum opportunity to unfold itself, as a right, and in terms of physical welfare and social happiness. Where there are under privileged children in large numbers, the blight is upon society as a whole. I would term such an attitude realistic rather than idealistic. Its conspicuous instance was in Britain during the war, when infant mortality fell to the lowest recorded level in spite of national privation. Sacrifices were imposed on the entire adult community in order to see that children were fed even better than previously, and were gladly accepted. I might particularize the U. K. milk scheme of 1940 and the growth of "School Meals Service".

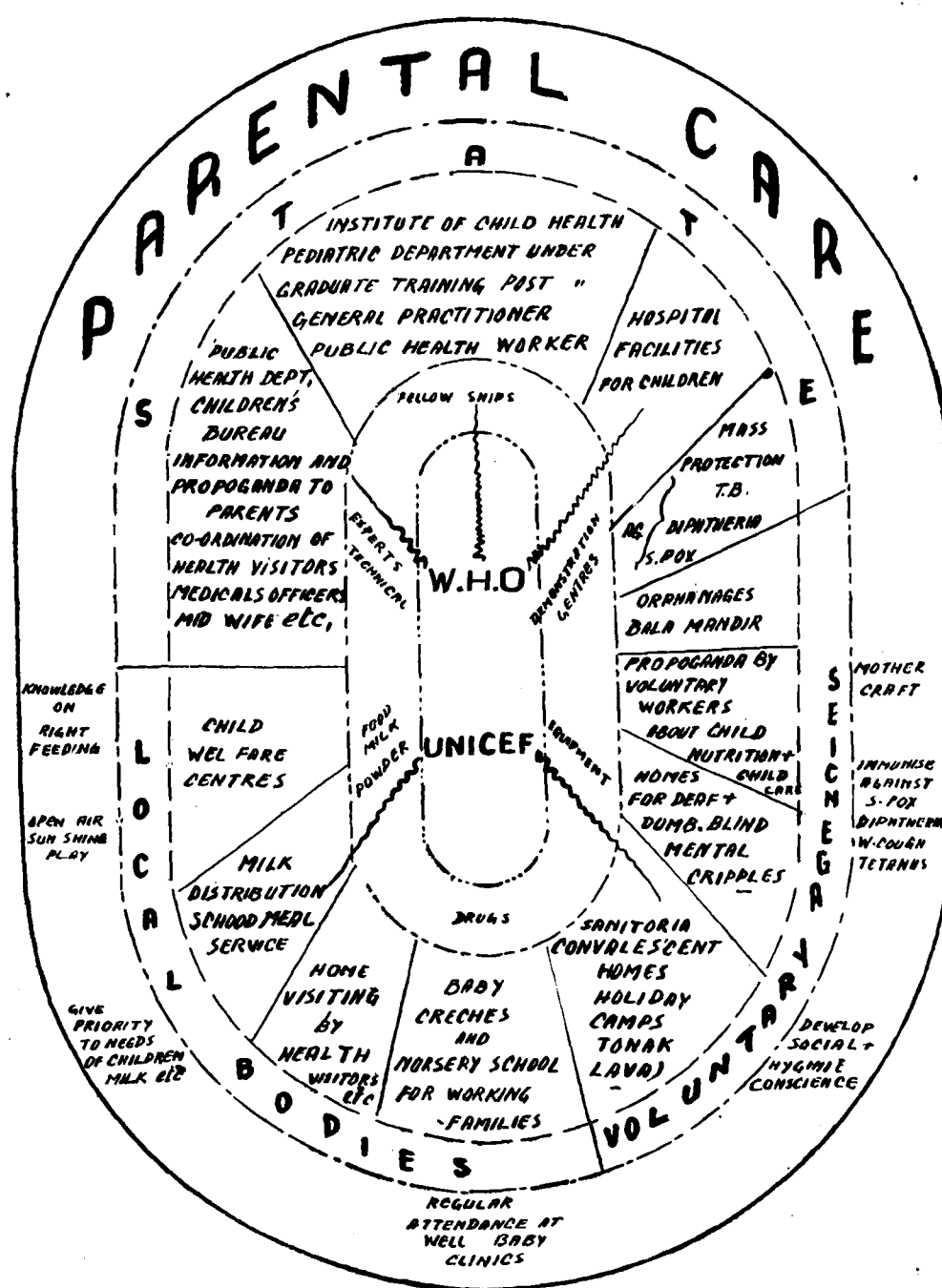
I myself suffered privations in 1946 in England having to go with black coffee with an allowance of a pint of milk for an adult per week, while the children - the poorest equally with the rich - and expectant and lactating mothers, got a liberal allowance, and the children of Britain, even those of the poorest quarters, looked well fed, better fed, I was told than ever before.

As is well known, earliest infancy is the most critical period for the survival of the new born baby; with every day, week and month, the risks gradually lessen, and when the child is well on the way towards its first birthday, it can reasonably be expected that he will grow to adult age, though such chances are less in India, Egypt and some of the countries east of the Suez, because the child health services and economic conditions leave room for a lot of improvement. This infantile mortality in our country still remains at the appalling figure of 150 to 200 per thousand live births in different parts, while some countries have in recent years attained a figure of less than 30 per 1000, namely Sweden, Australia, N.Z., the Netherlands and North America. At the upper end of the scale we find rates as high as 200 for Bombay, 175 for Egypt and 160 for Chile. What is amazing is that such a situation existed almost everywhere in the world until a 100 years ago. For example only a hundred years ago Germany had a rate of 300, to-day Western Germany is about to reach the level of 50. So we in India need not be despondant if only we put co-operative and sincere nation wide effort, making full use of the technical and scientific knowledge which has enabled the Western countries and North America to make such rapid improvement in recent years. A low infant mortality which in turn connotes more robust surviving children, is no longer considered to be the privilege of countries with favourable climate. Children born in the hot humidity of tropical countries or in the darkness of an arctic winter can enjoy good health as well as can children of temperate zones provided the necessary public health measures are taken by the community and understood and followed by people. Child health and welfare is an inseparable part of any modern public health programme and the infant mortality rate is a good indicator not only of the health of the children, but of the health of the entire nation as well. The manifesto issued by our Director, Medical Services, on the subject of to-day's celebration stresses that Health is one and indivisible and child health measures are inevitably mixed up with general health measures against tuberculosis, syphilis, eruptive fevers, malaria, and water-borne diseases. In our planning here, it is obvious we must take note of the local conditions, and while availing of the experiences of the past 100 years in the west in applying modern medical and scientific knowledge to the task, we should remember that in those countries with a low infant mortality like North America, Europe, Australia and N.Z., the stress at present is on saving premature babies, congenitally defective babies and babies born with Erythroblastosis, and

preventing road accidents for the older children (accidents being the leading cause of mortality among the older children there). Take U.S.A. for example. Diarrhoea and the infections have long since fallen from the leading causes of death—having been reduced by nearly 2/3 from 1936 to 1948. As for nutritional defects, they hardly exist. All this has been achieved by (1) growth of a great governmentally financed public health movement. The federal Govt. through its Children's Bureau has long been active in the business of teaching mothers how to care for themselves and their children in accord with the best scientific thought of the day. Some 300,000 letters from individual mothers are answered every year by experts in this bureau. They are also responsible for keeping up-to-date the bulletins for parents which cover all ages of childhood and adolescence. Infant care, the most popular of all these bulletins today reaches 1 out of 2 new mothers. Over 26 million copies have been distributed in the past 35 years. (2) The enormous development of voluntary associations interested in promoting health. There are roughly 20,000 such organisations in U.S.A. and the annual budgets of these private voluntary health organisations total close to 50 million dollars (nearly 23 crores of rupees) apart from the resources of the American Red Cross. The monies are given voluntarily by individual citizens or business enterprises. In addition, millions of citizens volunteer their services to work in hospitals or clinics, to transport patients, to organise educational programmes etc. (3) Good diet, environmental hygiene with some time for rest and recreation.

It will thus be seen that the responsibility for the health of children in the United States is, briefly, a joint National Enterprise. It is shared by parents, private groups, and local, state, and Federal authorities. Action at these different levels involves the kind of co-ordination and common feeling, which characterise a successful Democracy. No one factor can be singled out as responsible chiefly for progress. But I might instance the role played by the vehicles of Mass Education, *viz.* Newspapers, Popular Magazines, Free health Bulletins and Radio Talks. The bare facts are sufficiently eloquent. The Infant Death rate is now a third of the 1915 level, the death rate for pre-school and school-age children has been nearly halved, while definite increase has been recorded in the average weights of both babies and children. The lesson comes home to us in India. Our children form 40% of the population, and number about 135 million. No country, except our great neighbour China, has a child problem of this magnitude. 10 million of our children are infants under 1 year, 42 million pre-school between the ages of 1 and 5, and 83 million of school age. 80% of this population is scattered in remote villages, where medical facilities do not exist.

Our problem, then is the stupendous one of educating the mothers of these children in efficient child care, the provision of adequate nutrition



for children even at the risk of imposing sacrifices on the adult population, Environmental Hygiene and Prophylaxis, and the control of Tuberculosis amongst children, alarmingly on the increase. If modern anti-biotics and drugs of the sulfa group could reach our villages, particularly for treatment of respiratory and bowel infections, this would register a significant advance. I would specially emphasise the call for co-ordinated effort on the part of individuals, private agencies, and all concerned departments of state. Here in Madras State, we have already the nucleus for a progressive evolution. We have the network of child welfare centres, Medical Officers attached to these centres, who undergo refresher courses periodically in the Pediatric Department, and Health and Social Visitors, recruited on an increasing scale. The Pediatric department itself was opened by the Govt. in 1948, with a small staff, and the limited objectives of hospital care of sick children and undergraduate training. Now, in harmony with the broadening perspective in Pediatrics, it has expanded its scope to the training of various personnel necessary for the maintenance of child health and received a generous grant of equipment from the W.H.O. I must stress that a properly-organised department of Pediatrics (a better term would be an institute of child health) is a *Sine Qua Non*. We have to shape the desired future, and the W.H.O. itself is nothing but a medium through which people and nations can help each other to achieve child-health. The accompanying diagram usefully illustrates the spreading links of co-ordinated effort possible in such an evolution.

Finally, I might close upon the practical note of what individuals themselves can achieve. Far from being insubstantial, this is a great deal, and of irreplaceable value. Firstly, we can acquire knowledge of proper nurture. In our villages, the grandmothers are pediatricians *de facto*, and superstitions and imperfect knowledge occasion injury and disaster. We must use all vehicles of mass education, to infiltrate light into darkness. Secondly, we must make adequate nutrition available for children, as a top priority, and even at cost of adult sacrifices. Thirdly, we must use and expand our present network of ameliorative organizations. Fourthly, we must utilise all preventive and immunisation measures against communicable diseases, such as small pox, Diphtheria and Typhoid. We must develop a different civic sense in this regard, by not sending children suffering from slight mumps, cold, sore eyes etc. to school. Fifthly, we must become conscious of the menace of Tuberculosis and active in its prevention. People should realise that children in contact with an infective case in the house are likely to become easily infected, but that they may not cough as an adult would. They may slide away from life with convulsions, or develop T.B. of the bone. Sixthly, we must realise that even minor ailments of children cannot be neglected. A thrush in a baby, so easily curable in its early stages, can become mortal if neglected. Even itch, untreated, may involve serious sequelae. Seemingly negligible joint pains might lead to prolonged invalidism by ignorant stress or strain,

where timely rest would have saved. It is here that the periodic medical examination of school age children pays rich dividends in the long run.

But we need not despair. The advance in countries like the U.K., and U.S., has been phenomenal, but, let us remember, of recent growth. Conditions, not imaginable to-day, were permitted to exist in those countries as late as fifty years ago. The Roman mother of the Gracchi is reputed to have pointed to her children as her jewels, and chief possessions. Animated by a like spirit, let us press on towards the goal, undeterred by the magnitude of the task to which we have pledged ourselves.

Chloramphenicol (Chloromycetin) in the Treatment of Gonorrhoea

BY

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It would appear that the development in rapid succession of new anti-biotics with overlapping spectra of therapeutic activity has placed in the hands of the physician a number of remedies in the treatment of venereal diseases either singly, in succession, or in combination. Alone among venereal infections, acute gonococcal infection seems to be quickly and rapidly susceptible to the effect of almost all the antibiotics administered in small doses over a period of a few hours to one or two days. A number of reports (Smadel, Chen, Greenblatt, Robinson, Greaves and their respective collaborators) have appeared in American literature on the beneficial therapeutic effect of Chloramphenicol in gonococcal infection.

A short clinical study of this *anti-biotic in gonorrhoea was undertaken in the Venereal Department of the Government General Hospital, Madras, in the beginning of this year. The diagnosis of gonorrhoea was established by clinical examination of the patient and bacteriological examination of the pus smears. Cultural examination for diagnosis and cure was not attempted as facilities were not available in the attached laboratories.

Various schedules of dosage were tried ; 3 gms in a single dose, 3 gms spread over 24 hours, and 6gms administered in multiple doses per day for two days. No other medication was administered locally or parenterally.

Tables I, II, and III give the relevant information regarding the number of persons treated, the type of disease, and the dosage schedule.

*Chloramphenicol used in this study was supplied through the courtesy of Messrs. Parke Davis & Co.

TABLE I.

Particulars.	Male.	Female	Female children.	Total.
Number of persons treated ...	18	7	5	30

TABLE II.

Particulars.	Males.	Females.	Total.
Acute gonorrhoea ...	15	4	19
Chronic gonorrhoea ...	...	1	1
Acute epididymitis ...	3	...	3
Acute bartholinian abscess ...	...	2	2
Vulvo-vaginitis (in children) ...	...	5	5
Total ...	18	12	30

TABLE III.

Particulars.	Males.	Females & children.	Total.
Some in a single dose ...	5	3	8
2 gms. in a single dose ...	...	1	1
1½ gms. in a single dose ...	...	2	2
3 gms. in divided doses for one day ...	1	1	2
6 gms. in divided doses for two days ...	12	5	17
Total ...	18	12	30

The progress of each case was carefully followed day after day both clinically and bacteriologically. Fourth hourly urethral and cervical spreads were examined in a number of cases under study and it was found that the intra-cellular disposition of the gonococci disappeared during a period of 4—6 hours but it took a minimum period of 21 to 27 hours for the complete disappearance of the extra-cellular organism from the spreads. A few isolated extra-cellular pairs were found after 24 hours. There was a corresponding qualitative and quantitative improvement in the clinical condition.

No appreciable difference in the rapidity of therapeutic effect and cure was observed as between the schedules of treatment dosage adopted.

The patients were followed up for a period ranging from three weeks to four months after treatment and no evidence of clinical or bacteriological relapse was discovered except in one married woman who reported two and half months after therapy with a clinical and bacteriological recurrence. She and her husband were successfully treated with 6 gms of Chloramphenicol each in two days. The recurrence in the woman can only be explained on the basis of relapse since the husband failed to show any evidence of infection.

Five cases of acute vulvo-vaginitis in young girls were treated successfully with this drug. It was difficult to make the children swallow the capsules. The anti-biotic in a palatable elixir form would be a welcome modification for administering to children.

Three patients with acute gonococcal epididymitis were treated with Chloramphenicol, one with 3 gms, the other two with 6 gms. There was marked reduction in pain and tenderness and swelling of the epididymis within 24 to 48 hours though a non tender residual thickening was felt in the lower portion of the epididymis which persisted for a period of about two weeks.

Toxic and allergic manifestations.—These are minor. Frequent loose motions developed in five cases. One patient developed angio-neurotic oedema of the face on the fifth day after treatment.

CONCLUSIONS.

1. A clinical study of the effect of Chloramphenicol on 30 cases of gonococcal infection is described.
2. Except for one patient others achieved a clinical and bacteriological cure during a follow-up observation period ranging from three weeks to four months.
3. Chloramphenicol appears to be an effective drug in the treatment of gonorrhoea.
4. Its prohibitive cost compared to that of Penicillin will be a deterrent against its routine use in the treatment of the disease.

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Rural Medical Relief

BY

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Much has been said in the press and on the platform that qualified medical men should settle down in the villages and work with a spirit of sacrifice towards national well being. In implementing the recommendations of the Bhoze Committee for providing adequate medical relief in the villages, the Government of Madras have opened in certain selected areas, primary Health Centres. I have been in charge of the primary Health Centre at Kilpennathur village in Tiruvannamalai taluk, North Arcot District from 5th July 1949 and I feel that a short description of its working will bring out certain problems of Rural Medical Relief. Advocates of rural medical relief should get acquainted with these problems and work towards their solution.

Location of Centre.—The centre is on the Tiruvannamalai-Tindivanam trunk road, thirty two miles from Tindivanam and ten miles from Tiruvannamalai, and a little over hundred miles from Madras city. Five miles distant from my centre towards Tiruvannamalai is another primary health centre. Five miles further away at Tiruvannamalai is a Government Hospital with an authorised strength of thirty five beds. This Hospital is under the charge of a male medical graduate assisted by a lady doctor. In that town there is a maternity and child welfare centre with a lady doctor in charge. Towards Tindivanam at a distance of eleven miles is a District Board Hospital with a Licentiate in charge. Six miles north on the bus route is another District Board dispensary run by a Licentiate. In a northwesterly direction about five miles away there is a primary health centre. It will be noticed that this centre is well surrounded by doctors and it is not unusual for a patient to have consulted them all. My jurisdiction extends over nineteen villages embracing a population of 20,408.

The People.—They are all agriculturists living on small plots of land. They are all poor and uneducated and their economic status is very very low indeed. Many of them have not travelled beyond Tiruvannamalai. Their general knowledge and achievements in general education are very meagre, and they have no idea of modern scientific achievements. Many live in small low roofed, filthy mud houses huddled together like cattle, ignorant of the simplest laws of sanitation. No village has any latrine, private or public and promiscuous urination and defecation, particularly at nights, is the rule. Street lighting is unknown. Proper water supply is nonexistent, the source of drinking water is usually from a filthy tank nearby. Except for two villages there are no roads to reach the villages,

and so the commonest reason given for not coming to the centre for treatment is "can't walk — too far — and none would carry me to the hospital".

These simple, ignorant, ill clad, underfed, uneducated country folks are deeply steeped in superstition, which is carefully nursed and profitably perpetuated by some interested parties who make a living on it, and laugh at the doctor with his stethoscope and array of bottles. There is such a curious blending of religion, superstition and medical treatment that a single medical officer, no matter how long he lives here, cannot separate them. There is nothing but the simplest truth in what Dr. A. Bramwell Cook said, "No amount of text book study can prepare a doctor for the problems of superstition, prejudice, and customs with which he has to contend in India. Thousands of infants die annually, because mothers attribute every disease to teething." The astrologer and the magician are held in a greater esteem than the medical officer; and another curious fact is that the people would rather trust the compounder or the nursing orderly; and pay heavily for a distilled water injection rather than take the advice of the medical man; and have the best available treatment free of all charges.

The Dispensary.—From 5th July 1949 onwards it has been run as a small hospital, and on certain occasions there have been as many as twenty eight inpatients per day.

Patients come streaming in at all times, morning and evening, noon and night. They have no appreciation of time and do not understand hospital working hours. On auspicious days there will be a crowd, on evil days the orthodox will not turn up even though he may be dying and a little medical attention may be life saving. The idea of attending the clinic daily until declared cured by the medical officer or staying as an inpatient for careful medical attendance is unknown. Usually a patient will appear before the doctor once in ten days or so. None will bring a bottle to take medicines home so that he may drink a mixture three or four times daily. The villager does not know, and cannot, and will not, understand that certain medicines have to be taken every three or four hours or some injections have to be taken twice or thrice daily etc. He does not understand that certain diseases require prolonged treatment and require hospitalisation for many days. Many have never seen or heard of a hospital; and even if they have seen yet they do not understand its working. Prolonged treatment *i.e.*, treatment for more than three days is extremely unpopular; and none will submit to such an ordeal. The quack promises cure in three days, the Doctor must cure in a shorter time.

The patient comes to the dispensary prejudiced with his own view of the disease; and the line of treatment to be followed. He will want the doctor to treat him according to his own wishes and not according to the

principles of medical practice. Quite often a patient will come and demand an injection, 'a good injection', he does not want to be examined, but wants only an injection! Stranger still some one will walk in and say, "My brother is sick—give me medicine". The doctor cannot elicit from any one the symptoms or nature of the brother's illness—but medicine is demanded and there is not a bottle to take the medicine home. Any amount of persuasion to bring the brother to the centre for treatment will fail; and the usual reply is "village is too far — — can't walk" so what?

The greatest problem in rural medical relief is the adamant reluctance of the villagers in coming over to the hospital for treatment. Many wish the doctor to come to their homes and treat the sick there. They would rather bring a quack from a distance of forty miles and pay him twenty rupees and food for a single day's visit than come to the centre 100 yards away, and have the benefit of modern medical treatment. Usually the patient is brought to the centre in a wretched state—when all forms of home treatment have failed, and all quacks have deserted the patient's village. At this stage the patient is usually beyond treatment at the Primary health centre, and requires admission into a fully equipped hospital; but the patient's relatives will not remove the patient to the hospital at Tiruvannamalai, Vellore or Madras; nor will they buy any essential drug not stocked in the centre, for they expect the centre and the Government to do everything for them; and the patient is taken back home to certain death or to natural recovery after some days.

However in spite of many obstacles, this centre is considered to be very popular, and has been praised by all inspecting officers and visitors. A table showing the attendance at the centre is given below. Many of the primary centres have failed, some are virtually closed down and some are working half-heartedly with a poor daily attendance.

TABLE SHOWING THE ATTENDANCE FOR THE YEAR 1950.

PARTICULARS.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
Total outpatients ...	360	370	916	1450	1552	2086	2185	2048	2269	2441
Total inpatients ...	19	44	89	204	255	360	412	328	383	262
Leprosy ...	236	523	876	929	1023	1100	1197	1235	899	676
Delivery ...	...	3	...	...	...	4	5	3	7	1
Minor operation ...	5	4	11	23	43	54	37	46	47	40
Grand Total ...	615	937	1881	2583	2830	3546	3794	3611	3551	3379
Daily average ...	19.9	33.4	60.5	86.1	91.3	118.2	122.3	116.5	119	109

The successful working of any rural dispensary is dependent entirely on the initiative and hard work of the medical officer in charge. It follows therefore that the medical officer to be posted there should be chosen after exercising great care. He should adhere to certain rigid principles as :—

- (1) Be on duty at the centre during working hours.
- (2) Should not demand any money from patients for the treatment given, for this is the ruin of many a rural clinic.
- (3) Show a great professional interest and a sense of responsibility.
- (4) Should be married and his wife live with him, preferably one who has no children, or one whose children are young and require no schooling. This will not influence his wanting to get away from the village, where usually there are no decent schools.

A medical graduate posted to a primary centre immediately files his request for a transfer because :—

- (1) There is no scope for income if he is a conscientious worker ;
- (2) without proper companions and common amenities of life the village appears dull and monotonous ;
- (3) whereas he may learn a little about " the real India " there is absolutely no means of furthering medical knowledge or gaining professional experience ; for if a patient appears before the medical officer once a fortnight or a month, and even at that only for a few seconds, for the patients bitterly resent careful examination, what chance has the poor doctor of gaining any professional experience—of diagnosis, treatment and prognosis ?

Steps Taken to Popularise Centre.—To attract the village crowd, and make the villager enjoy the benefits, of modern medicine certain steps were taken to popularise the centre, as :—

- (1) Building thoroughly cleaned, white washed, screens of white cloth put up, new furniture obtained and the place made neat and attractive.
- (2) In-patients ward opened, drugs procured.
- (3) Leprosy treatment inaugurated, subcutaneous and intradermal oil injections given.

- (4) Pamphlets on antenatal care printed and distributed free to expectant mothers.
- (5) Maternity centre opened—confinement cases admitted.
- (6) School Medical inspection arranged with permission of the District Educational Officer, but this proved a total failure as the school authorities did not realise the importance of medical inspection of school children.
- (7) Lantern lectures delivered.

Maternity and Child Welfare.—There are two trained midwives at the centre, but it is hard to break the time honoured custom of the village barber woman attending at childbirths. Persuading pregnant women to attend the clinic has not produced satisfactory results. Only when the labour has been progressing for four or five days ; and the barber woman has given up all hopes will they come and many with ruptured uterus or unconscious eclamptics. Recently a woman in labour for seven days and with ruptured membranes six days was brought in a very exhausted condition ; and under sodium pentothal forceps applied and a live baby delivered. Shark liver oil and iron mixtures are distributed to all expectant mothers and children ; but who wants these or appreciates their value ? What they require is good nourishing food.

Venereal Diseases.—These diseases are quite common but none will take the proper treatment or go away after taking one dose of a mixture. Sulfathiazole, Stibophen, Penicillin, Bismuth and intravenous arsenicals are all available for treatment, but no patient to take the proper treatment, not more than one injection.

Leprosy.—Realising the high incidence of leprosy in this area, a leprosy clinic was started five days after the present medical officer took charge. At his invitation the Provincial Leprosy Survey Officer has undertaken a survey into the incidence of leprosy in the villages. This is the only clinic for miles around undertaking intradermal injection over leprosy patches ; but cases will not come regularly. Many cases stop after the third injection or so.

RELIEF MEASURES.

- (1) The quacks and magicians treat the sick at their own homes. This coupled with the transport problems common to all villages is responsible for the reluctance to come over to the hospital. The medical officer should be provided with an ambulance type of jeep, as is being used in the army, so that each village is visited at least once a week, and cases are evacuated to the hospital.

- (2) Appointment of two or more nursing orderlies who will visit the villages daily to dress wounds and ulcers and administer routine mixtures to cases already seen by the doctor as outpatients at the dispensary or patients discharged from the clinic. These orderlies can also be made use of in detecting cases requiring hospitalisation.
- (3) A lady doctor should be made available for antenatal and maternity work.
- (4) When cases requiring expert treatment are advised to go to Vellore or Madras the majority refuse to go. Specialists in various branches may be made to visit centre once a month.
- (5) A health committee may be formed to organise village planning, housing, water supply, drainage and other matters of general sanitation. Serious steps should be taken to educate the villager on the modern methods of life; and raise his economic status. The task is too heavy for a single medical officer.

"The serious illnesses are not peculiar to towns only. They occur in villages frequently. The villager requires all the medical amenities which are demanded in towns. The problem is to convey such amenities to the village." But an even greater problem than this is that when such amenities are present in the village someone has to unceasingly toil to make the villager have full benefit of them, instead of the amenities running to waste as at present here.

A Note on an Embryological Concept of Ancient Indian Medicine

BY

A. ANANTHANARAYANA AYER,

Professor of Anatomy & Principal, Stanley Medical College, Madras.

In South India there is an indigenous system of medicine practised in Tamilnad called 'Siddha' Medicine. The word 'Siddha' comes from 'Siddhar', which means one who has attained salvation while alive. There were eighteen siddhars who have sung verses containing not only the highest spiritual and ethical wisdom but also subjects like medicine.

The precise age when these books were composed is not definitely known. In the case of some of the works there are widely ranged estimates of antiquity from about the beginning of the Christian era to about 1000 A. D. However, some of the Siddhars and their works are known to be comparatively recent.

A work entitled 'Atmarakshamritam, Vaithia Sara Samgraham' came into my hands sometime back. The existence of such a work was suggested by Dr. C. Dorairajan. This book is available in the Oriental Manuscripts Library, Madras. It is, as indicated in its preface, a compilation from ancient Siddha texts available in print or palm leaf manuscript, which the publisher Kandaswamy Mudaliar had garnered. It was printed by one Veeraswamy Mudaliar in his press at Conjeevuram in the year named Virothi. The book was therefore published about 62 years back i.e. in 1889. The verses contained in the work are not all of equal quality in style or content. It is likely that material culled from different periods has been included in the compilation.

In this note I am specially drawing attention to one particular concept dealing with the development of the embryo. In a verse in page seven, it is stated that in the second month of pregnancy the embryo is comparable to a kazhachi fruit on the creeper. This comparison is to an object familiar in South India, used in indigenous medicine for certain preparations and also handled by children for play, as the seed resembles playing marbles. I have absolutely no doubt that if there is any precise information contained in this comparison, the particular piece of knowledge is indigenous and not imported.

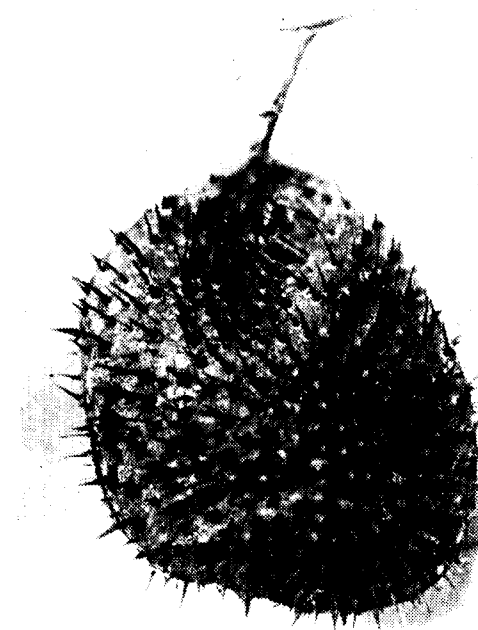
One would naturally think at first, that the comparison was to the size of the embryo as a small round mass. But there is something more in the simile. The words used are 'Kazha kodikkai pol' which literally

translated means 'Bonducella creeper's fruit like'. The Botanical name for the plant is *Caesalpineia bonducella*. If the natural pod on the plant is seen by a modern embryologist who is also aware of this ancient concept, the idea would certainly strike him that the comparison could aptly and well be to the chorionic vesicle covered with villi and containing the embryo within. The accompanying figure is a photograph of the fruit of *Caesalpineia bonducella* detached from the creeper. It shows a flattened ovoid covered with spines all round. The seed inside would represent the foetus.

I do think that the interpretation given here is not purely imaginative or far fetched. I am convinced that the ancient savant who described the embryo of the second month in the 'Vaithia Sara Samgraham' and compared it to the fruit of *Caesalpineia bonducella*, knew precisely what he was talking about and had firsthand knowledge of the early embryo covered with the foetal membranes and chorionic villi. The simile is so apt. Let us give credit to the scientific observer, whoever he be, whenever he has lived.

Ayer, A. A.

Embryological Concept of Ancient Indian Medicine



Photograph of
CAESALPINEA BONDUCELLA FRUIT

with which the embryo of the second month of pregnancy is compared by an ancient Siddha physician.

An Old List of Medical Works in Tamil
Prepared by Dr. Whitelaw Ainslie, M.D.

BY

D. V. SUBBA REDDY,

Professor of Physiology, Madras Medical College.

Numerous and exhaustive are the lists of medical works in Sanscrit, published in the various parts of India during the last one hundred and fifty years of Renaissance of Hindu learning. But little attention was paid to cataloguing of the medical treatises in the South Indian languages. For over twenty years, I have been engaged in the preparation of a list of medical manuscripts in Telugu, scattered all over the state and private libraries in South India and abroad. In the course of this investigation, chance put into my hands a list of Tamil medical works, prepared by Dr. Ainslie, a learned and experienced medical officer of the Madras establishment, in the first quarter of the nineteenth century, with the assistance and collaboration of some of the most erudite Pandits of South India.

Dr. Ainslie gives in the Appendix to his book "Materia Medica of Hindusthan" printed at Madras in 1813, a list of books, about which he adds the following words in the Preface "With respect to Catalogue of Medical Books in Tamil, etc. which will, from its novelty, excite curiosity, I shall briefly state that, in making it out, the first authorities have been consulted.....The Tamool and Telungoo, I adopted is that of the most learned Hindus of the Southern Provinces of India, Brahmins from the Pagodas of Madura, Srirangam, and Tanjore.

In the later and more comprehensive volume published in 1826 in London, and entitled "materia Indica" the title page mentions the inclusion of "a copious list of Oriental Books" and in the course of the Preliminary observations, Dr. Ainslie, deals with the medical treatises of the Hindus in a sympathetic and scholarly manner. After explaining that the different nations or tribes of India have their respective medical authors and that those of the Hindoos of upper Hindusthan, are numerous and are nearly all in Sanscrit, he writes "But the medical books which more particularly call our attention are those of the Telingas and Tamools. Few of the first are composed in Telingoo but in Sanscrit and are either transcripts of texts, common in higher provinces or written by some of the

APRIL 1951

Maharshies... of Lower India. They are all in verse and remarkable for the minute, though strange descriptions they give of the symptoms of diseases; they at the same time, betray a woeful ignorance of the internal economy and nicer functions of the human frame; and are but too often obscured by mystical illusions and a blind belief in the powers of magic and enchantment."

"The Tamool medical works, on the other hand, are many of them originally written in what is called high Tamool (Yellacanum) which is allowed to be a richly cultivated language and peculiarly energetic.... The poetry in which all scientific works are written, is much admired by those who have made it a study; so liberal would appear to be the poetical license in permitting, as in Greek, the transposing, altering and occasionally altogether taking away certain letters, in order to harmonise and vary the rhythm.... Those sastrums are supposed to be more valuable than many which are written in Sanscrit; they are said to be less shackled with the mythological doctrines of the original Ayurveda, to contain a greater number of valuable formula and to show a still more minute attention to the enumeration of morbid symptoms but, like them, they evince a firm conviction in the belief and in the intervention of evil spirits and offer many curious rules for averting their machinations."

The list was in my possession for some years. Recently one day my friend Dr. A. A. Ayer made a casual enquiry whether I have any information on Tamil Medical classics. I have great pleasure in publishing this valuable but not easily accessible list for the promotion of Medico-historical studies in South India.

A LIST OF TAMOOL MEDICAL AND SCIENTIFIC BOOKS

The greater number of these were originally written in high Tamool verse (yellacanum); others were composed in Sanscrit, and subsequently translated into Tamool.

1. Vytia Vaghadum Ayrit Anyouroo—

A medical work by Reeshe Aghastier: it is written in Tamool poetry, and consists of 1,500 verses.

2. Tunmundrie Vaghadum—

A medical work, originally written by *Tunmundrie* in Sanscrit, and translated into Tamool verse by Aghastier. It consists of 2000 verses. The Hindoo practitioners hold it in high veneration, for the particular account it gives of many diseases, and the valuable receipts it contains.

3. Cunda Pooranum—

A work on ancient history, originally written in Sanscrit verse, by Reeshe Aghastier, and afterwards translated into Tamools by Cuchiapa Braminy. It consists of 1000 stanzas.

4. Teroovuleaudel Pooranum—

A work on moral philosophy, originally written in Sanscrit, by Aghastier, and subsequently translated into Tamool verse by Purunjoudy, a Pundarum. It consists of 3,367 stanzas.

5. Poosavedy—

This book treats of the religious rites and ceremonies of the Hindoos. It was written by Aghastier, and consists of 200 verses.

6. Deekshavedy—

A work which treats of magic and enchantment, on the use and virtues of the rosary, and on the education of youth. It consists of 200 verses, and was written by Aghastier.

7. Pernool—

A medical work, written by Aghastier, in high Tamool. It consists of 10,000 verses, and treats fully of all diseases, regimen, &c.

8. Poorna Nool—

This book consists of 200 verses. It was written by Aghastier, and treats chiefly of exorcising; it also contains many forms of prayer.

9. Poorna Soostrum—

A work on the intuition of religious disciples, and on their forms of devotion, and which also treats of the materia medica and regimen. It was written by Aghastier, and consists of 216 verses.

10. Tirmooler Vytia Vaghadum—

A medical work by Tirmooler, a great prophet of antiquity. It treats particularly of the symptoms of diseases, and of the diet that ought to be observed during the administration of medicine. It was written in Tamool verse, and consists of upwards of 2000 stanzas.

11. *Curma Candum*—

A medical shaster by Aghastier, written in Tamool verse, and consists of 300 Stanzas; supposed to be translated from the Sanscrit of Dunmuntrie. It treats of those diseases which are inflicted on mankind for their follies and vices.

12. *Aghastier Vytia Ernoot Unjie*—

A work on medicine and chemistry, written by Aghastier, in Tamool verse, and consisting of 205 verses.

13. *Aghastier Vytia Nootieumbid*—

A work in Tamool verse, written by Aghastier. It consists of 150 stanzas; and treats of the purification, or rendering innocent, of sixty-four different kinds of poison (animal, metallic, and vegetable), so as to make them safe, and fit to be administered as medicines.

14. *Aghastier Vytia Vaghadum Napotettoo*—

A medical shaster, written by Aghastier, in Tamool verse, on the cure of gonorrhoea; and consisting of 48 stanzas.

15. *Aghastier Vytia Padinarroo*—

A medical shaster, written by Aghastier, in Tamool, and consisting of 16 verses. It treats of the diseases of the head, and their remedies.

16. *Aghastier Vytia Eranoor*—

A medical shaster, written by Aghastier, in 200 Tamool verses. It treats of chemistry and alchymy.

17. *Calikianum*—

A work on theology, written, in Tamool verse, by Aghastier, and consisting of 200 stanzas.

18. *Mooppoo*—

A medical shaster, written by Aghastier, in Tamool verse, and consisting of 50 stanzas. It treats of the eighteen different kinds of leprosy, and their cure.

19. *Aghastier Vytia Ayrit Eranoor*—

A medical shaster, written by Aghastier, in Tamool verse, and consisting of 1,200 stanzas. It treats of botany and the *Materia Medica*.

20. *Aghastier Vytia Anyouroo*—

A valuable work on medicine, written by Aghastier, in Tamool verse, and consisting of 500 stanzas. It treats very fully of many diseases, and contains a great variety of useful formulae.

21. *Aghastier Vytia Moon-noor*—

A work on pharmacy, written by Aghastier, in Tamool verse and consisting of 300 stanzas.

The account of the medical and other works of Aghastier in the foregoing list, was obligingly procured for me by Dr. M. Christy, from a learned Brahmin belonging to the great pagoda at Madura.

22. *Kylasa Chuttamoony Vadanool*—

This work explains the art of making nine metals into strong powders. It also treats of arsenic and other powerful medicines.

23. *Boger Elnooroo (700 verses)*—

This teaches the mode of compounding many powerful medicines.

24. *Caresal Punjady of Aghastier Moonooroo (300 verses)*—

This teaches how to compound strong powders, pills, and other forms of medicine.

25. *Nadysastrum*—

This work treats of the pulse.

26. *Vydeya Vagadum*—

This work enumerates the names and nature of many diseases and medicines.

27. *Concananinar Nool*—

This teaches how to compound many powerful medicines.

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This work enumerates the names and nature of many diseases and medicines.

6. Concananinar Nool—

This teaches how to compound many powerful medicines.

7. Cumbaly Chuttamoony Neguntoo—

A dictionary of drugs, and the art of compounding medicines.

8. Boger yogamarga Mooleka—

Coyasiddy, or the art of strengthening the body: Yogasiddy or the art of making cūpums (tonics) and several other medicines.

9. Aghastier Vydeyah Moonooroo (300 verses)—

This chiefly instructs us in the art of making various powders.

10. Boganinar Termoomuntrum—

This explains the art of preparing several medicines, into which the metals enter.

11. Pannamaday Sellady—

This treats of several medicines prescribed for different diseases.

12. Bogur Noguntoo—

Treats of corrosive and soluble drugs, also of precious stones, and of various animals. It moreover instructs us how to mitigate the violence of powerful drugs, and to make spirits and tinctures.

13. Yoo Yee Moony Ennooroo (800 verses)—

This explains the art preparing several medicines in general.

14. Dunvuntry Vagada Vydeya Chintamoney—

This teaches us how to judge of the pulse; and also treats of fever and other diseases, and of the best mode of prescribing for them.

15. Veyady Goona Vagadam—

Treats of the pulse; it also treats of many diseases, and of the nature of animals, and contains some valuable receipts.

16. Ponnammuttay Palaculembum Attavany—

This enumerates several medicines, and treats of a few diseases; it is not a book much sought after.

17. Attavany Vagadam—

A work similar to the last.

18. Agarady Neguntoo—

A dictionary of medicine, of good repute.

19. Aghastier Auyerutty Annooroo (1500 verses)—

A general work on the *Materia Medica*.

20. Aghastier Aranooroo (600 verses).**21. Aghastier Moopoo Anbadoo (50 verses).****22. Aghastier Goonnoo vagadam Moonoor (300 verses).**

23. Aghastier Dundakum Nooroo (100 verses)—

These are various works of Aghastier on chemistry and physic. They also treat of theology, and of the best means of strengthening the human frame.

24. Netra Vydeam Moonoor (300 verses)—

On the nature of the diseases of the eyes and the best remedies for such complaints.

25. Kermapacum Moonoor (300 verses)—

On the diseases occasioned by sin in this world, or occasioned by man's imprudence.

26. Cestravedy Moonoor (300 verses)—

The art of surgery is explained in this work.

27. Detchavedy Ernoor (200 verses)—

A work on physic, said to be from divine inspiration.

28. Shessyam Nooroo (100 verses).

29. Wotteyam Moopatrendoo (32 verses)—

The following six arts are explained in these two books, viz., vussyam, stumbanam, moganam, aukershanam, oochatanam, maranam.

30. Yoogy Moony Chintamany Elnoor (700 verses)—

Both chemistry and the science of physic are treated of in this work.

31. Coraker Vypoo Nooroo (100 verses)—

A work similar to the last mentioned.

32. Concaner Goonavagadam Annooroo (500 verses)—

The good and bad effects of medicines are here treated of, and medicine in general.

33. Chuttamooneyar Ganam Ernoor (200 verses)—

A curious work, being partly theological and partly medical.

D. V. Subba Reddy : An Old List of Medical Works in Tamil

34. Chuttamooneyar Culpum Nooroo (100 verses)—

The art of making strengthening medicines from various plants.

35. Ramadaver Annooroo (500 verses).

36. Ramadaver Ernooroo (200 verses)—

Both of these books treat of corrosive and soluble drugs also of chemistry and general medicine.

37. Camalamoony Sootrum Elvateľoo (77 verses)—

This treats of chemistry and physics.

38. Edacatoo Siddapaudel Moopattunjoo (35 verses)—

A work similar to the last.

Association Notes.

The Third Executive Committee meeting of the Madras Medical Association was held on 20th August 1951 at the residence of the President Dr. A. B. Hardy. The following members were present.

1. Dr. (Miss) A. B. Hardy --- *President.*
2. „ M. V. Ramanamurthy --- *Vice-President.*
3. „ G. D. Veliath.
4. „ R. Mahadevan.
5. „ R. E. S. Muthayya.
6. „ C. K. Prasadaraο.
7. „ C. Raghavachary.
8. „ T. Parukutty Raman.
9. „ G. Victor.

The minutes of the previous meeting were read and passed.

The bill of the printers for printing the January issue of the Journal was read and passed.

The Committee then resolved to put on record its appreciation of the services rendered by Dr. P. Arunachalam during the period of his office as the President of the Association.

The Committee then expressed its thanks to Drs. K. S. Sanjivi, D. V. S. Reddy and C. K. P. Menon for the help rendered in connection with the preparation of the material put before the Director of Medical Services at the time of the deputation.

The letter from Dr. J. C. David, accepting the invitation to deliver the annual oration for 1951 was read.

Dr. C. K. Prasadaraο tendered his resignation of the office of Secretary and the membership of the Committee. The Committee did not accept it but requested Dr. Prasadaraο to continue till the next elections as a change in the office-bearers at this juncture would involve some official procedure under the rules of registered Societies. The resignation was therefore withdrawn.

SPECIAL NOTICE TO CONTRIBUTORS

The Journal welcomes scientific papers on all subjects coming within the purview of medical science, and topics concerning medical education or of interest to the medical profession. Papers from non-members of the Association must be communicated by a member.

Manuscripts must be typewritten on one side only of the page, double-spaced, with ample margin and should not be offered to any other Journal for prior or simultaneous publication. Ordinarily papers should not exceed 12 pages of foolscap Mss. and authors are requested to condense their manuscripts as much as possible.

Clinical photographs, skiagrams and photo-micrographs should be printed on contrast glossy paper and sent unmounted, or if mounted, colourless paste should be used. All diagrams and graphs should be drawn with waterproof Indian ink on white drawing paper or Bristol board.

References to literature in the text should be given in accordance with the established international system followed in the cumulative medical index.

The galley proof will be sent to authors for correction and should be returned corrected with the least possible delay. Authors must not make any change in the text of the manuscript at the proof stage.

Authors will be supplied with 25 copies of reprints of their papers gratis. If extra copies are required, they could be had at a small additional cost on intimation at the time of returning the galley proof.

All communications pertaining to publication of papers in the Journal should be addressed to the Editorial Secretary.

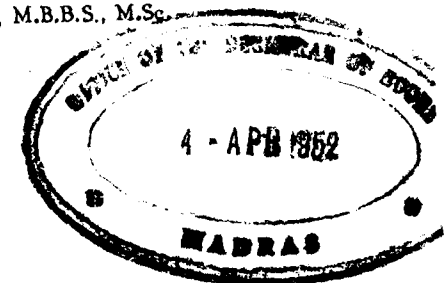
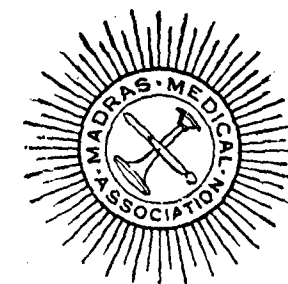
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THE
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PUBLISHED QUARTERLY

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EDITORIAL NOTICE

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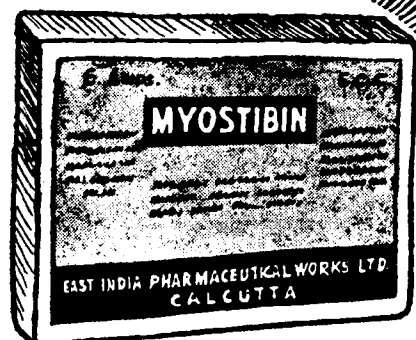
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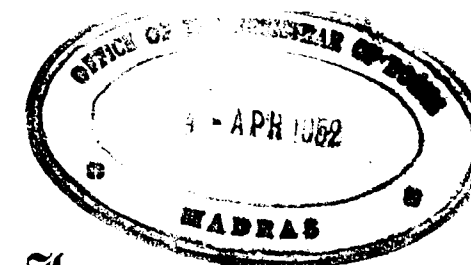


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Unconventional views on the Polygenous Origin of Cancer

BY

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It might seem that we were stating the obvious in the heading "the polygenous origin of cancer". But a perusal of modern cancer literature will leave a lurking feeling as if the research workers were after 'the cause of cancer' in the hope that one single cause will sooner or later be discovered which will put into orderly sequence all the multifarious etiological factors that have been incriminated from time immemorial as being responsible for the cancerous condition.

The cancerous condition in which I would include the epithelial cancers and the sarcoma, is in fact an uncontrolled proliferation of tissue whose cells have taken on some of the embryonic property of growth by segmentation without the differentiation and organization that occur during development. The capacity of cells to segment continues from embryonic stage through life in varying degrees in various tissue cells as seen in the repair of wear and tear, in the healing of wounds and regeneration of parts. But in all these instances some factor brings back the normal equilibrium of the rate of tissue proliferation without allowing it to grow 'wild'. Cancer is an uncontrolled proliferative tissue reaction, just as hyperpyrexia is an uncontrolled thermal reaction. Some ancient physicians once sought to find the cause of all fevers. Some of us seek to find 'the cause' for all cancers. Both are polygenous in origin.

In the field of cancer where problems are bristling on every side and where 'hypotheses' are mere 'views' and 'speculations', it would do no great harm if a few more questions are raised at least as a corrective to our credulity.

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When any etiological factor bearing on cancer comes to notice, irrespective whether such association be near or remote, we have to take into consideration if such causative agent is exteroceptive *i.e.* coming from the external environment, or interoceptive. Another consideration is whether the factor is a predisposing one or activating one. Sometimes the distinction between the exteroceptive and interoceptive cause is not definitely clear cut. When a person handling a particular dyestuff gets a cancer of the skin of the hand, the cause is certainly exteroceptive, but if a cancer of the kidney is caused due to the excretion of the eliminative products of the dyestuff does the cause become interoceptive? Similarly the predisposing cause and activating cause are also difficult to extricate into separate categories. Further, usually two stages of the cancerous process are assumed. First the initiation of the cancerous change *i.e.* metamorphosis of one or more cells of the tissue into the cancer cell, and secondly the continuation or promotion of the cancer with or without acceleration of the rate of proliferation. Such a two stage conception might conveniently explain the varying natures of different types of cancer regarding their latency, slowness or rapidity of growth, etc. Even the distinction between 'initiation' and 'promotion' would sometimes fade. In physics the movement of a body at rest is initiated by the operation of a force and then it would move and continue to move. If the same force continues or other forces operate then we have a change in velocity or acceleration. So it is quite possible that the same factor or different factors might be at work at the two stages usually enunciated.

Chronic irritations.—Different kinds of chronic irritation have been cited as causative factors for cancer from ancient times to modern days. The occurrence of cancer at the base of the horn in cattle tethered by rope tied thereon, at the site where the Kangree pot of live charcoal comes into contact with the ventral aspect of the body wall, on the lips in smokers, on the inner aspect of the cheek in chewers who keep the tobacco 'cud' therein, on the palate in some that smoke with the fire within, in the stomach, cervix and breast, parts of body subjected to repeated slight injury, at sites of chronic ulcers etc. are instances to the point.

Chemical factor.—The frequent incidence of cancer in chimney sweeps and workers in coal tar suggested the presence of chemical factor in the etiology. The highly increased potency of 3:4 benzpyrene and other polycyclic hydrocarbons in inducing carcinogenesis of the skin suggested the possibility of a specific molecular structure common to all carcinogenic chemicals. But the most thorough experimental search for such a chemical bond of molecular structure has been so far futile.

Irradiation factor.—The occasional occurrence of cancer of the skin subjected to the influence of intense sunlight in peasants and fisher folk whose occupation often necessitates the frequent and continuous exposure

of the bare body to the radiations of the solar spectrum has been long recognized. In more recent times X-ray and radium have adduced further evidence to the specific potency of irradiation as an etiological factor in carcinogenesis.

Hormonal factor.—The carcinogenic potentialities of the hormones controlling reproductive life in the individual and developmental growth in the embryo, imply a sort of kinship of these hormones to a hormonal factor which might induce cancer formation. The Hypophysis is recognized to be the master gland of internal secretion controlling the cycle of the gonads in responsive relation to their phase of activity. In an interesting experiment the ovaries in mice were transplanted as autografts into the spleen. From this vicarious location the internal secretions of the ovary had to pass into the portal stream and were destroyed in the Liver before they could get access into the general circulation. The Hypophysis was thus made "unaware" of the functional state of the ovary and the hypophysis sent in incessant 'hormonal messages' through the blood that reached the ovary stimulating the ovary to continuous hyperfunction. The ultimate result frequently was a cancer of the ovary. Hence we have sufficient evidence to assume that normal hormones of the reproductive cycle could in some instances of massive dosage become carcinogenic. Similarly gigantic doses of certain sex hormones have been observed to induce breast cancer in mice. The kinship between the hormonal factors involved in the cancerous process and the reproductive process is definite.

Total privation of innervation.—That all tissue cells other than the nerve cells and the amoeboid floating cells, do get an innervation from the autonomic nervous system is plausible. Should such innervation exist, it may be expected also to regulate among other functions, the dividing activity of the cell in co-operative relationship with its neighbours. If for any reason the cell is deprived of this kind of innervation and yet continues to survive, it may become 'wild' in an otherwise regulated nexus *i.e.* it would become cancerous.

This view as presented here is original. But if it be objected that it be purely speculative some logical argument can be adduced in its favour.

Tissue culture has been known for some time now. Cells of tissue culture when transplanted back into the host becomes carcinogenic. Whatever regulating nervous influence was present in the animal body at original source, was absent in the culture flask. On regrafting into the host, if along with its vascularization the new tissue fails to get an innervation, it would grow 'wild' in its local setting. There is further evidence that any restrictive or regulating influence commandeering the

cell is not exclusively hormonal. When tissues were repeatedly transplanted from one host to another at the site of the same anatomical organ from which the original graft tissue came *e.g.* when breast tissue was transplanted repeatedly from one mouse to another in series, it was observed that the tissue tended to become malignant. In such an instance the hormonal milieu and the physical stress and strain of neighbouring tissues are present at the site in the successive hosts as in the original donor. The only factor which could be considered to be lacking is the nerve supply. As far as references are accessible to me there is a hiatus in our knowledge of the nerve supply in cancers. This seems to be a very important gap.

Genetic factor.—Extensive analysis of statistical data has not yielded any reliable evidence to suggest that cancer is transmitted in the human being as a genetic trait in the Mendelian sense. But it has been possible to breed out a strain of mice very prone to cancer. This is one more example of the possibility of selective inbreeding of a special quality that the breeder wants to accentuate. But such a possibility definitely points to a genetic factor either stimulating carcinogenesis or at least predisposing to it.

Milk factor.—The presence of a milk factor in the milk of a special strain of mice and transmitted to their foster babies suckled by the foster mothers has been mooted. The suggestion that the factor was a virus has also been made. But more precise knowledge on this aspect of the question has yet to be garnered.

Infective factor.—All attempts at isolating a bacterial cause for cancer have failed. The view that a virus was the infective agent has been put forward. Also the milk factor has been suggested to be a virus. Viruses have also been mentioned as the cause of certain instances of bird cancer. The amount of precise knowledge we have on this factor is very little.

Primary and secondaries.—Cancer does not produce an immunity reaction in the organism due to the basic identity of its protein with that of the host tissue. Hence the possibility of establishment of active immunity generated by a primary and this preventing the formation of secondaries at other sites does not arise. The extension from the primary focus to adjacent parts in anatomical continuity causes local spread and to remote parts through anatomical channels causes secondaries. But while admitting the formation of such secondaries one can yet legitimately ask the question, whether the cancerous process could not manifest as multiple primaries in plural locations? Such a possibility cannot be negated off hand.

The enigma of the causative factor being a curative agent.—One of the interesting and striking points about cancer is that a factor that stimulates its formation when applied in small doses destroys the cancer in larger doses. While coal tar is known to have a carcinogenic effect, some coal tar products have been reputed to have anticancerous effect. While continued exposure to X-rays and radium is known to stimulate cancer formation, radium and X-rays also happen to be the chief therapeutic agents to be combined with surgery in its treatment.

How does this come about? It is usually taught that the destructive effect of radium and X-rays is on the tender body of the young cell during mitotic division. This seems like a statement borrowed from the teaching regarding absence of immunity of the new born child against many pathogenic bacteria. The explanation seems naive; but to my mind the carcinogenic property of irradiation and the carcinicidal property of the same kind of irradiation in larger doses has not so far been satisfactorily explained. I would lead in a new and original line of argument.

The ordinary metabolic life of a cell has a phase of comparative rest from mitotic activity followed by the eventful changes in its internal structure consequent upon mitosis with its sub-stages of prophase, metaphase, anaphase and telophase. After such division the cell is reconstituted and rests before another cycle of division commences again.

Assuming that irradiation like all radiant energy has the effect of stimulating growth processes and division of cells, an overdose of this stimulus would tend to successive quick divisions of the cell without sufficient time being given to the daughter cells to reconstitute themselves as viable cells. This hyperactivated mitosis without a resting phase ultimately leads to the destruction of the nuclear structure which gives the cell its place as the unit brick of the stuff of which living bodies are made. The cell, in short, fragments itself to death in acute katabolic mitotic activity without getting the necessary restful anabolic phase. This view not only gives an understandable explanation to the therapeutic value of radium or X-rays, but also for the great effect of such treatment in the more rapidly mitosing types of cancer. In cells which have lost their ability to divide *e.g.*, nerve cells, it is not possible to have normal regeneration of tissue, and it is not also easily possible to have the stimulated mitosis of unbridled character that makes cancer. The view here presented gives an integrated and unitary explanation why the same kind of stimulus could be carcinogenic and carcinicidal at different doses.

Parthenogenesis and cancer.—The ontogenic process of development of the individual is generally inaugurated by fertilization. Then segmentation and tissue differentiation follow. Though fertilization is a unique event we know that it is not the only mode of initiating the

ontogenic process in biology. Parthenogenetically a mechanical, electrical or chemical stimulus can initiate the growth of an ovum in a lower animal and give rise to a living larva. When embryonic development could be initiated by polygenous stimuli, there is no need to assume that carcinogenesis is due to a single cause.

Closing remarks.—There are some who tell us that carcinogenic factors like irradiation in some unknown manner produce mutations of genes; that mutations of genes in the germ cells produce variant species; that a type of mutation of genes in somatic cells leads to cancers; that the gene in cancer not only gets itself mutated or mutilated but also dislocated into the cytoplasm; that such mutilated and dislocated genes are of the nature of viruses; that such a conception would unify all the known hypotheses bearing on the etiology of cancer.

Anyone who has thought intensively on any problem, concrete or abstract, would be convinced that ultimate solutions of apparently complicated problems are usually simple. But this very general conviction should not lead us to wishful thinking, however fascinating the temptation. The possibility of an ultimate simplicity in the unification of the different hypotheses, cannot justify a biased interpretation of experimental data aiming at that goal. The problem of the origin of cancer is complicated, its solution is yet confused. It is not yet time to give up the hypothesis of the polygenous origin of cancer.

Drugs in the Treatment of Dysenteries

BY

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Though dysenteries encountered in India were described by British Medical Officers as early as Clive, the definite differentiation between epidemic bacillary dysentery and endemic amoebic dysentery was not made till 1890 by Koch and Kartulis, after a study of conditions in Egypt.

Protozoal dysentery was later found to be due to more than one protozoa and the bacillary form due to more than one bacteria. Today there seems to be some evidence of a virus dysentery which sometimes passes for 'Intestinal Flu' or acute infectious gastroenteritis or epidemic vomiting and diarrhoea. Some have described a Helminthic dysentery as well.

We shall here confine our attention to the two important dysenteries i.e., Amoebic and Bacillary, with perhaps some passing reference to other protozoal dysenteries.

Amoebic Dysentery.—Three expressions are in use, sometimes to mean distinct entities or to mean one. They are, Amoebic dysentery, Amoebic colitis and Amoebiasis. The word amoebiasis should mean infection by *Entamoeba histolytica*, which may mean infection anywhere i.e., lung, brain, kidney, stomach, vagina, pericardium, bone etc. (It is said that urinary amoebiasis is very rare). This nomenclature is mentioned with some emphasis for the reason that Emetine is found to be more effective in all amoebic infections except amoebic dysentery—strange as it may sound.

Some distinguish amoebic dysentery from amoebic colitis or enteritis, a subacute condition with enteritis or abdominal symptoms but not passing blood and mucous alone, where free vegetative amoeba are not easily found in the stools. The question arises if such cases should be actively treated with emetine or should emphasis be laid on local treatment and the oxyquinoline group of drugs.

There are now divergent tendencies to look on the 'Amoebic Carriers' on the one hand as persons suffering from amoebiasis which is perhaps not causing manifestations severe enough to send for the doctor and on the other a belief that *E. Histolytica* can lead a saprophytic stage

in gut. It is said that some of these have symptoms of infection though not colitis while others show no symptoms at all. However, it may be said as with most protozoal diseases, recent infections yield fairly readily and quickly to active chemotherapy, but may relapse; chronic infections on the other hand are easily improved but difficult to eradicate.

It may be said here that much is still to be desired of chemotherapy in this field, since none of the drugs in any combination has answered the demands of ideal treatment. An ideal amoebicide should be active by mouth, should kill organisms in the trophozoite or cystic stage in the gut, should reach the liver and other infected tissues in a concentration high enough to deal with the parasites, should be of low toxicity etc. So far, no known drug satisfies all the requirements.

"Amoebicides" that are now in use can be assigned to three Categories.

(1) Those when given systemically kill amoeba either in bowel or tissue by a direct action ex. Emetine, Carbarsone, Vioform.

(2) Those that act indirectly by rendering the bacterial flora of gut unfavourable for amoeba ex. Penicillin, Sulpha compounds and possibly Chiniofon and Diodoquin. The two latter also have a slight direct amoebicidal action. These may clear the lumen of the bowel of *Entamoeba histolytica* but are not effective if the tissues are involved. They clear the bowel of the parasites for a few weeks or possibly months and when the normal bacterial flora returns, the pathogenic organisms i.e., *entamoeba histolytica* flourish once more.

(3) Those that get concentrated in the liver and act well in amoebic hepatitis, but much less on the amoeba in the gut.

Improved methods of 'in vitro' testing have made it possible to see whether an amoebicide acts directly on the amoeba or on the commensal organism in the gut. A combination of amoebicides is therefore more effective than any one alone.

Let us now consider the merits and demerits of each.

Emetine.—Despite recent developments, emetine still remains our mainstay in amoebiasis, unless aureomycin and chloroquin displace it at a later date.

Emetine is of greater value in non-alimentary infections than in amoebic dysentery. This seems to suggest that the injected emetine does not reach in optimum concentrations the lumen of the gut or the mucosa

of the gut. It is attempted to reach the lumen by giving oral emetine bismuth iodide, but emetine being a drug with a low margin of safety, cannot be given in bigger doses I. M. to reach the mucous or submucous tissue fluids in optimum concentrations. Other factors are also possible to explain the anomaly of emetine being more effective in non-alimentary infections.

For acute conditions passing blood and mucous with free vegetative amoeba in stools, the standard treatment according to U. S. army seems sound. It consists of 1 gr. emetine hydrochloride intramuscularly for six consecutive days, from the seventh day emetine bismuth iodide 3 gr. by mouth suitably encased at bed time for 12 consecutive days. There is a slight difference of opinion on the next measure i.e. whether a retention enema of 2½% chiniofon should be given daily with emetine bismuth iodide or should the retention enema be replaced by oral diodoquin 2 tablets of 3 gr. each thrice a day for a week. Some seem to have great faith in retention enemas, while others say that diodoquin in its insoluble form serves the same purpose. Others say that emetine bismuth iodide with diodoquin may tend to iodine intoxication and therefore the two should not be given together.

The British treatment rounds off the above treatment with acetarsol 4 gr. twice a day for ten days at the end.

One should like to refer to three points in connection with emetine treatment. (1) Some think that when parenteral emetine is given emetine by mouth is unnecessary. Often injected emetine may not be excreted into the gut to exert the action. Theoretically, amoeba has to be attacked in the lumen of the gut or deep in the wall of the gut or more often both. Hence oral and parenteral are both essential in treating alimentary amoebic infections. It has also been noticed by some, but not corroborated that a long parenteral treatment with emetine tends to emetine resistant organisms. It has also been noticed that emetine resistant amoeba are also resistant to other drugs—strange as it is. Altogether, emetine resistant amoeba or emetine resistance in general is a moot issue. (2) The role of secondary bacterial organisms in amoebic dysentery has gained considerable importance of late. It was accidentally observed by Hargreaves and Biggam in 1945 that moribund cases of amoebic dysentery dramatically responded to penicillin, which was just tried as a last resort in a case nonresponding to recognised treatment. Penicillin and sulpha compounds have by themselves no appreciable action on *entamoeba histolytica*; but today they form an essential part of treatment of amoebic dysentery. Acton and Knowles studying the effect of bacterial flora on amoebiasis, tried to influence emetine action by vaccines of organisms in gut. Results were not very reassuring. Better results are

now obtained by using 1,50,000 units of procaine penicillin twice a day for 3 or 4 days. With sulphasuxidine, even better results were obtained. The removal of secondary bacterial infection in gut or alteration of bacterial flora by penicillin and sulphasuxidine today, marks a definite advance in chemotherapy of intestinal amoebiasis. It is also found that sulpha compounds without penicillin are not of much use.

(3) A third point of considerable importance is the use of emetine by many clinicians in vague cases of gastrointestinal upset or because the patient suffers from slightly enlarged and tender liver and with a remote history of vague diarrhoea. Emetine in the experience of some acts as a mild stimulant of liver cells and has a beneficial action on conditions where the functions of liver are damaged, say in chronic alcoholism. I remember the days when the Calcutta School of Tropical Medicine advocated emetine for all chronic hepatitis, particularly of malarial origin, catarrhal jaundice, chronic hepatic congestion etc. It should however be said that injections of emetine as a therapeutic test in patients with chronic malaria, infective hepatitis, liver carcinoma etc., have sometimes led to disaster. It is therefore advised to forget that emetine has any desirable effect on liver conditions except amoebic hepatitis.

In approved case of amoebiasis of liver, if symptoms do not abate with about six injections of emetine, attempts should be made to remove pus with a needle. Injections of emetine into a liver abscess do not seem to have any advantage over ordinary hypodermic injections. If the abscess is secondarily infected with bacteria, penicillin may be tried. Some adventurous clinicians have tried 1/16 gr. of intravenous emetine mixed with 60 mg. thiamine for 8-10 days in cases of amoebic hepatitis. Result not superior to 1 gr. intramuscular administration.

Emetine toxicity.—This has to be borne in mind but not to cause alarm. Vasomotor depression, capillary paralysis, myocardial damage, ventricular fibrillation have been noticed experimentally and occasionally clinically. The following changes in the circulatory system have been noticed electrocardiographically or otherwise.

Charters (1950) (Tr. Roy. Soc. Trop. Med. & Hyg. vol. 43, p. 513. Mar. 1950) examined 11 patients before and immediately after they received 12 daily I. M. emetine of 1 gr. each. Average fall in blood pressure was 8 m.m. systolic and 4 m.m. diastolic. Exercise tolerance deteriorated in 7 of 9 patients after emetine but returned after an average of 32 days. Pulse rate before emetine average 80, immediately after the course 86 and after a month 80 again. Electrocardiograph in 6 cases showed deterioration, inversion of T or flattening but showed improvement after a month's interval.

Two patients were seen after accidental emetine overdosage 20 and 32 gr. respectively in 1 gr. injections daily. In one there was tachycardia, lowered blood pressure, poor exercise tolerance which cleared in 12 weeks of last injection. The second had diarrhoea which ceased after a week, dermatitis which disappeared in 3 weeks. In one case 80 gr. emetine were given in four years without toxic signs. No Cardiac enlargement irregular rhythm or any other serious cardiac irregularity was noticed.

A kind of diarrhoea following dysentery when a patient is treated with emetine has been frequently noticed. This is indeed emetine diarrhoea, due to the irritant property of emetine (because of its irritant property in stomach, it is named emetine) in the gut. But if one restricts to six injections of 1 gr. daily intramuscular keeping the patient at moderate physical rest, and a reasonable watch over the circulatory system, nothing untoward or alarming is likely.

Emetine resistance.—This remains unestablished, resistance of amoeba to emetine is hypothetical. Some go so far as to say that amoeba are not only likely to develop resistance to emetine, but such emetine resistant amoeba are resistant to other amoebicidal drugs. It may be said that alkaloids induce resistance less frequently than synthetic chemotherapeutic agents. We know of paludrine resistant malaria but not of quinine resistant malaria.

A dilution of 1 in 5,000,000 was found lethal to *Entamoeba histolytica* in vitro in 2-4 days. A higher dilution maintained for a sufficiently prolonged period tends to destroy amoeba in vivo. In vitro findings are not applicable to treatment in the human. When the gut is previously rendered alkaline, emetine is said to act better.

One is not sure even now if emetine acts by a direct action i.e., emetinised tissue fluids being lethal to the organisms in the wall of the gut or if emetinised R. B. C. when ingested by amoeba destroy the organisms.

With regards emetine resistance, we are only sure that emetine does not act against the cysts of amoeba and in this sense emetine resistance is possible.

Emetine is an isoquinoline compound and it is but natural that other isoquinoline compounds were tried.

Oxyquinoline group.—This includes Chiniofon or Yatren, or Quinoxyl, Enterovioform and Diodoquin all containing Iodine. The recent chloroquine is also a quinoline compound but without Iodine. This has raised an interesting possibility to Pharmacologists, if the amoebicidal activity

in the early compounds is due to Iodine at all. It was thought that the higher the Iodine content, the more effective was the compound as an amoebicide. The action of chloroquine however seems to suggest that the amoebicidal property resides in the quinoline structure independent of Iodine. In vitro none of the oxyquinoline compounds show amoebicidal activity. Enterovioform due to its chlorine content is more irritant and cannot be administered rectally. Chiniofon is effective against the cysts though its activity against the free vegetative form is much less than emetine. Chiniofon is not found useful in amoebic hepatitis. Even therapeutic doses of chiniofon sometimes result in diarrhoea. Its anti-bacterial action in gut is also likely to contribute to its amoebicidal property. Chiniofon cannot be given I. V. as it damages the liver.

Diodoquin being insoluble and nonabsorbed exerts a direct action in the gut particularly against the cysts. Pruritis ani and a slight enlargement of thyroid were frequent side actions of diodoquin. Some clinicians feel that with diodoquin, it is unnecessary to resort to rectal treatment of amoebic infections of gut, which needlessly adds distress and discomfort to patients.

However iodoxyquinoline compounds, preferably diodoquin remains an essential part of treatment alimentary amoebiasis, today.

Arsenicals pentavalent.—The arsenicals form an item in the course of treatment of amoebic gut infections by the British school, but not by the American. Arsenicals are of use only in attacking the cysts and not the active vegetative forms, though carbarsone shows slight amoebicidal activity. Some have tried acetarsol rectally with sodabicarb in an attempt to remove the cysts.

The arsenicals are of very little value in amoebic hepatitis. Very lately an arsenical has come from Germany called *Milibis* or *Wia* which is a bismuth derivative of p. N-glycolylarsanilic acid. It is said to act locally and not absorbed from gut. In doses of 0.5G t.d.s. for a week, milibis claims to clear the gut of active amoebae.

Improvement is also attempted with carbarsone. If the oxygen attached to the arsenic atom of carbarsone is replaced by a sulphydryl group (SH) toxicity is lowered; if the hydrogen atom of the sulphydryl group is replaced by methyl or phenyl group and carboxylate them, an appreciable amoebicidal activity is conferred to the originally inert parent carbarsone. These compounds are absorbed and arsenic can be detected in bile, liver and intestinal tract. Preliminary results with these compounds have shown that they are 90% effective against trophozoites in tissues and cysts in the lumen of the colon. (*Vide* J. A. M. A. vol. 140 1949-p. 1251). But it is good to remember that all arsenicals are potentially toxic compounds.

Kurchi Alkaloids.—The Indian preparations of Kurchi or *Holarrhena antidysenterica* have also a definite amoebicidal property, being less toxic than emetine and with an action on the bacterial organisms as well. It is not possible to fathom the reasons for their unpopularity in the land of their birth; probably they are not available in a suitable form, or they have not been standardised properly or that Indian psychology demands their being taken out and brought back with the halo of import license. I believe it is popular in France.

Chloroquin.—This antimalarial has been found to be effective in amoebiasis. When administered in doses of 0.3Gm. B.D. for two days followed by 0.3Gm once a day for a week, 60% of acute cases and 90% of amoebic hepatitis are reported to have responded favourably (Conan-Amer. Jl. Trop. Med. Vol. 28 of 1948-p. 107). Barring mild gastric uneasiness, no other toxic symptoms were encountered. Chloroquin is completely absorbed from the gut, otherwise it cannot be useful in malaria. The effect on amoeba in the colon must be due to plasma or tissue concentration and not local action. Chloroquin is said to get concentrated in liver 400–500 times what obtains in plasma. Liver abscess refractory to emetine is said to respond to chloroquin 0.5G B.D. for two days, followed by 0.5G once a day for ten to fifteen days. Though chloroquin is an inferior substitute for emetine in amoebic infections of gut, it is a satisfactory or superior substitute in amoebic hepatitis. Today this drug because of its efficacy and low toxicity, promises to displace emetine completely in the treatment of amoebic hepatitis.

Antibiotics-Aureomycin.—During the last year and a half, many reports have come, of the value of aureomycin in amoebiasis. It is a bit too early to give a final assessment; but aureomycin is in boom today for amoebic dysentery. Claim is made for complete 'Cure' of amoebiasis in a week, which is indeed amazing. Aureomycin seems to be equally effective in amoebic colitis, amoebic hepatitis and amoebic carriers. Treatment consists in giving 500 mg. orally, four times a day for a week.

As it stands, the action of aureomycin can be either (1) a direct lethal action on *Entamoeba histolytica* in gut (in vitro tests have confirmed this) (2) indirect action on amoeba through alteration of environmental bacterial flora (3) action mediated by the vascular system or (4) a combination of one, two or more possibilities. What is more astonishing, a series of cases resistant to emetine carbarsone and oxyquinoline treatment, responded most satisfactorily to aureomycin. The amoebiasis research unit of Durban obtained an immediate cure rate of 94% with aureomycin, a cure rate higher than with any other single agent (*Vide* Lancet vol. 2, 1950, p. 10). Aureomycin in their view is the drug of choice in acute ulcerative amoebiasis, but it should be given with other drugs like

diodoquin to prevent relapses, not uncommonly seen in the first month after a course of aureomycin alone. Hall (*vide* Lancet above) treating acute and chronic cases in Veterans Minneapolis, reports good results in chronic amoebic dysentery and in cyst passers, but emphasises that aureomycin should not be used alone in hepatic amoebiasis, but should be supplemented by emetine, chloroquine or both. Findings with aureomycin therefore are very encouraging; despite an earlier remark ".....that much is still to be desired of chemotherapy in this field, since none of the drugs in any combinations has answered the demands of ideal treatment". It is hoped that during the next year or two aureomycin will help to dispel current cynicism in this field.

Other antibiotics also give some hope.

Bacitracin.—This new antibiotic is also amoebicidal and eradicates amoeba from stools of 2/3 of patients treated. But it does not prevent reappearance of amoeba later. Doses of 80,000 units daily for about 10 days is recommended. But it is found inferior to aureomycin.

Chloramphenicol is of less value than aureomycin. Polymyxin and Terramycin also hold out hope. Fumagillin or H3 a new antibiotic from a species of aspergillus has a very high amoebicidal property in the presence of bacterial flora of gut. Barring aureomycin, the rest of the antibiotics have not been extensively applied to human clinical dysentery for evaluating them today.

We may now pass on to consider briefly other protozoal dysenteries. During the first world war dysentery in an epidemic form was traced to coccidia i.e. *Isospora hominis*.

This form of dysentery was not controlled by emetine, chiniofon or diodoquin. It tends rather to get cured spontaneously.

Balantidiasis.—This is caused by a ciliated protozoan and the clinical condition resembles amoebic dysentery in symptomatology. The arsenicals like acetarsol and carbarsone on the one hand and diodoquin on the other are tried by different clinicians. They have obtained divergent results, one claiming better effect with the arsenicals while the others claim better results with diodoquin. Mepacrine is also said to be of value. Biniodide of mercury has lethal effect *in vitro* and so some have tried 30 mg. of biniodide daily for 2 or 3 days. Some claim good results with oil of chenopodium. Altogether the treatment is unsatisfactory.

Giardiasis.—This is a flagellate protozoa, infecting the upper gut and often invading the bile passage. Many vague abdominal discomforts are due to giardiasis.

For this we have in mepacrine a valuable remedy. In doses of 1½ gr. t.d.s. for 5-7 days, symptoms disappear rapidly. Some prefer to give two courses of treatment after an interval of a week or ten days. I may here mention that mepacrine is useful also in *Leishmania Americana*, another flagellate infection, when used in 10% strength locally infiltrated. The clinical condition goes by the name of Espundia or naso-pharyngeal leishmaniasis.

Chilomastis mesnili, another flagellate infestation, of low pathogenicity, associated sometimes with symptoms of diarrhoea and dysentery, is controlled by Acetarsol.

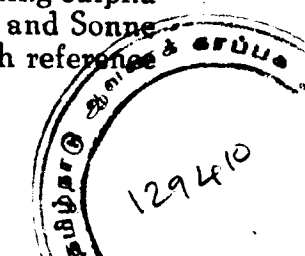
Malaria and Kalazar can also give symptoms of dysentery.

Bacillary Dysentery.—It may be said that treatment of Bacillary dysentery has undergone a revolutionary change. When I was a House Surgeon about a quarter of a century ago, a dogmatic Professor of Medicine, thumping his fist on the table said emphatically, that soda sulph was *the Specific* in bacillary dysentery. Witness this statement of Manson Bahr in his book of Tropical Medicine in 1925. "In all cases alike of bacillary dysentery, even in the severest, treatment should be preceded by a mild purge; the most suitable one for the purpose is castor oil to which 15 min of Tr. Opium may be added". This today will be deemed a pharmacological monstrosity. Again "The routine treatment with saline aperient has received general commendation. The best salt for the purpose is sodium sulphate in drachm doses exhibited *two* hourly for the first day and afterwards every four hours until the stools become faeculant". This is a physiological monstrosity-giving a saline hydrogoue purgative and expecting the stools to become faeculant. (p. 376). This line of treatment in 1925 is on a par with the treatment of malaria in this city about 60 years back by 20 grains of calomel a day-calomel being expected to wash out toxins and also the malarial parasites in the stools.

This is mentioned to have an idea of progress in therapeutic concept. Today, in treating bacillary dysentery we say "Combat dehydration and acidosis" while the earlier physicians were inducing dehydration and acidosis—the patient possibly responding in spite of the doctor.

Sulpha compounds and Bacillary dysentery.—Treatment of bacillary dysentery today is firmly in the saddle with the sulpha compounds. The main points at issue here are (1) Choice and principle governing sulpha therapy (2) The response of the three strains i.e. Shiga, Flexner and Sonne to this therapy (3) The place and scope of earlier treatment with reference to sulpha therapy.

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(1) When Sulpha therapy was first introduced for bacillary dysentery, a principle was firmly believed in or adopted, which is being challenged to-day. The poorly absorbed sulpha compounds were the ones of choice, as they are expected to exert a direct lethal action on the organisms. Before long, physicians were disillusioned by the observations that (1) the 'poorly absorbed' sulpha compounds when given in massive doses were certainly absorbed, in particular sulpha guanidine (2) the readily absorbed sulpha compounds were also being equally effective in controlling acute bacillary dysentery. To put it differently, we had to change our concept to believe that absorption is necessary for action. Today, sulphadiazine, sulphathiazole and sulpha merazine are deemed effective singly or in combination and that, in much smaller doses than sulphasuxidine or sulphathalidine. Because of their (relatively) poor absorption, sulphaguanidine and sulphasuxidine can be given in much larger doses than the others with a virtual freedom from toxic effects. One cannot say, how much of the beneficent effect of the unabsorbed group is due to the little amount that is absorbed. Succinyl sulphathiazole and phthalyl sulphathiazole as they pass down the intestine, slowly liberate sulphathiazole and how much of the action is due to the absorbed sulphathiazole and how much to the unabsorbed moiety, it is difficult to say.

Treatment of persistent Carriers of dysentery bacilli is different, as there, the unabsorbed sulphalidine group is the choice.

The dose of sulphasuxidine-guanidine group is about 20-24 Gm. a day while sulphothalidine is nearly half of it while the dose of sulphadiazine for bacillary dysentery should be $1\frac{1}{2}$ to 2 Gm. four hourly for first two days and t.d.s. from 3rd to 7th day. A maximum of about 40 Gm. should suffice though one cannot specify exact dosage schedule for any condition. If succinyl and phthalyl sulphathiazole are used for more than a week, vitamin B & K have to be supplemented to replace diminished synthesis by the organism in the colon.

Of the three poorly absorbed sulpha compounds, Sulphaguanidine is of least value as it is absorbed erratically and its conjugated form is relatively insoluble in urine. Hardy (1945) (Pub. Health report vol. 60, p. 1037) after a comparative study of ten sulpha compounds in shigellosis and allied dysenteric infection, came to the conclusion based on toxicity, availability and relative efficacy, that sulphadiazine is the drug to be recommended. Anderson and Snodgrass (1949) (Text book of Medical Treatment by Dunlop et al) feel "We are unable to convince ourselves that there is much to choose between sulphathiazol, sulphadiazine, sulphamerazine and sulphamezathine whether regarded from the point of view of therapeutic activity or freedom from toxic effects".

(2) Are the three common strains of dysentery organisms equally amenable to these compounds? Flexner and Sonne infections are said to be comparatively mild and may not call for any treatment at all. There is no doubt that shiga, Flexner and Sonne are more susceptible to these compounds than *B coli*, *streptococcus faecalis*, *proteus*, *typhosi* and *paratyphosis*.

Succinyl sulphathiazole has been found to be effective in carriers and is safe for the reason that in large doses there is less risk of toxic absorption. It is mainly used as a preoperative measure in bowel surgery.

A note of caution that is very imperative today, is that prolonged or unnecessary use of these compounds, particularly the less absorbed ones may lead to symptoms of avitaminosis as the essential organisms concerned in the manufacture of several vitamins in the gut are likely to be destroyed.

(3) Role of Phage, Vaccine and Sera treatment.—Regards phage treatment neither severity, duration or any clinical symptoms improved with phage treatment. It was not even of value prophylactically. Bacilli were not reduced to any extent by four day treatment with phage. During the second war, the Germans used bacteriophage as standard treatment in dysentery. During the Axis retreat from El Alamein large quantities of bacteriophage was captured and retested on many including many German prisoners of war. Results were unsatisfactory, though the German doctors praised the treatment. In vitro experiments seem to have given a false hope with this compound, Vaccines are mentioned to say that they are of no value.

Regards Serum treatment of bacillary dysentery, despite 50 years of use before the arrival of sulpha compounds, there is no universal agreement, as to, the benefits. Mild cases do not require sera. Fulminant cases die despite serum therapy. Toxaemia in shigellosis may be marked demanding serum treatment-shiga giving Exotoxins. Polyvalent sera alone is practicable, as time is required for bacteriological diagnosis. But specific serum shiga to cases of infection is of undoubted value. Anaphylactic shock and serum sickness were quite frequent as result of serum therapy. The British Pharmacopeia of 1948 has excluded antidysenteric serum in its seventh revision. Felson's pooled convalescent serum is also of doubtful utility.

However on theoretical consideration, some physicians feel that in acute toxaemia of dysentery, antisera have still a place.

Lastly, it is strange that no antibiotic has been found effective in bacillary dysentery—anyway not superior to sulpha compounds, though chloromycetin acts against typhoid and aureomycin against amoebic dysentery.

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Rehabilitation of Cerebral Palsy Children

BY

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The problem of crippled children and much less of the cerebral palsy children has never attracted the attention of the Indian physicians and surgeons even to day. The brunt of the treatment has been left to the orthopaedic surgeon who tried to do some operations on tendons and nerves which in many cases ended in unsatisfactory results. In countries like U.S.A. the problem has attracted very good sympathy both from medical personnel and the lay public. Various organisations such as National society for crippled children and adults, and cerebral palsy associations in various cities and states are able to establish well equipped hospital with trained personnel for the treatment of these exceptional children. Research with regards to its treatment has also progressed because of this organised and co-operative effort.

There is urgent need in our country to realise the magnitude of the problem. The medical profession must get interested in this disease and help these handicapped children as much as they could. The paper explains the various procedures that can be done even with meagre resources and equipment. This is to stimulate interest in the subject so that in the near future a consolidated effort can be put up for the establishment of very well equipped rehabilitation centres.

In 1862 Dr. William John Little first described cerebral palsy and it is known after him as "Little's Disease". His description of the disease as a feeble minded child drooping, grimacing and with a "Scissors" Gait, gives an extreme condition in cerebral palsy. The cerebral palsy now includes various conditions from a very mild case of spasticity to extreme type of spastic athetoid.

Dr. Winthrop M. Phelps who is a pioneer in the treatment of these children defines as a "Neuromuscular disability caused by injury to the motor centres of the brain". This is a comprehensive definition which includes all varieties.

The incidence of the disease in U.S.A. is described by Dr. Phelps after repeated investigations as 7 cases per year for each of 100,000 population; and effort is made to start a national registry for these cases. In our country it is not possible to estimate as there are no records. I was under

the impression that there are not many cases in our country but, am surprised to note that there are a fair number of these exceptional children. On an average about 100 cases of these children were seen in one year in the orthopaedic department of General Hospital.

Etiology.—There are a number of different unrelated causes of the cerebral palsy which may be operative pre-natally, during birth or at any time after birth.

- (1) Heredity of the disease is not proved so far.
- (2) Incomplete development or mal-development of the motor area of the brain may be the result of adverse influences occurring during embryonic development of the nervous system particularly during 3rd to 6th month of gestation. Adverse influences such as X-rays to the mother and trauma etc.
- (3) Trauma to the head during birth such as due to instrumentation and abnormal positions of the Foetus.
- (4) Intracranial injuries incident to birth account for certain proportion of cerebral palsy. Anoxaemia Intracranial haemorrhages, severe jaundice, etc. predispose to this condition.
- (5) Rh-incompatibility might also result in this condition.
- (6) The condition is more common in premature babies and in babies who have been brought up in incubators.
- (7) In infancy, childhood and adult hook cerebral palsy may follow encephalitis associated with meningitis, whooping cough, measles, etc., also in convulsions followed by high fever. In adults usually it follows severe gun shot wounds or accidents resulting in severe lacerations of the brain.

Pathology.—The lesions are seen in the brain. They may be diffuse or localised to one or more areas and depending upon its location different types are seen. Lesions of the cerebral centre result in spastic paralysis, but not all the muscles become spastic. Damage to the motor area proper results in flaccidity of the muscles which is somewhat similar to flaccidity of poliomyelitis. Therefore most lesions in this area result in a mixture of flaccidity and spasticity of muscles. Lesions may be located towards the vertex of the motor area and affect chiefly the legs and if one side of the brain is involved hemiplegia will result. Lesions of the base of the brain in the basal ganglia and extra pyramidal tracts result in release of involuntary impulses and are reflected by many different kind of involuntary motions resulting in athetosis. The apparent spasticity in the athetoid is not produced by the basilar injuries but by continued



A case of Spastic Paraplegia with Typical scissoring of the legs. Taken before commencement of Physiotherapy treatment. May '51.



Dec. '51. Crutches provided and taught the balance. Able to stand with the help of crutches and also walk.



Nov. '51. Walking calipers provided and training given to walk in between parallel bars (devised).



Jan. '52. Able to stand without crutches and maintain balance for a little while still continues treatment and can walk long distances with crutches. Patient feels happy and finds interested.

tension in an effort to control the involuntary movements. Lesions of cerebellum result in ataxia. (From Dr. Phelps "The cerebral Palsies").

Dr. James Papez of Cornell University New York reports after studying a number of brains of cerebral palsy cases that sometimes the defect is visible as a shrunken gyrus or abnormal clefts. The defect may be diffuse in various parts of the brain. The histological findings are large virus bodies not in the nucleus but in cytoplasm of the nerve cells. These findings are to be confirmed by other workers in the field, which might give new clue for treatment of the infection.

CLASSIFICATION OF THE CLINICAL TYPES.

1. Spastic variety.—
 - (a) Hemiplegia. (c) Paraplegia.
 - (b) Diplegia. (d) Quadriplegia.
 - (e) Monoplegia.
2. Ataxic variety.
3. Athetoid variety.

Signs and symptoms.—These vary very widely from a mild case to an extreme case. A mild variety may be difficult to diagnose unless a routine examination of the muscles is done. The mild case can be spotted very easily by observing the gait, e.g. Hemiplegia with the arm flexed at elbow and with a flexed wrist abducted thumb and dragging one leg. A paraplegic with toe walking etc. An extreme case might present itself with stupid appearance with wide open mouth, saliva dribbling and complete stiff limbs. In some of these children there will be defective vision and hearing too. Not every child is mentally backward, on the other hand, some are average or above average. In these children rehabilitation will be a sure success.

Treatment.—The aim of treatment in these children is to attain the highest degree of independence from the parents, or attendants both physically and economically. It is possible to gain economic independence in those cases where the intelligence is average or above average if education is given along with physical disability treatment. In others the aim will only be gain physical independence.

I had an opportunity to visit in U.S.A. various institutions such as Wood's Schools in Leanghorne, Pennysleavia and Weidner School in Philadelphia where mostly cerebral palsy children are treated. These children get their education along with the treatment for their physical disability so that they may not loose time as both these take very long

time before appreciable improvement is noticed. In addition in various states there are cerebral palsy clinics in some hospitals where these children are treated as out patients. In those hospital schools there are specially trained teachers to teach these handicapped children and their programme is so arranged that every child gets physiotherapy during the course of the day. Fifty years ago Sir. Robert Jones observed that the treatment of these spastic children involved operative, mechanical and educational stages which cannot be separated into parts. The truth of the above statements is seen in the institutions in U.S.A.

The various types of treatment of physical disability can be classified as follows and in a particular case all these may be required or only one may be required.

1. Medical treatment.
2. Surgical treatment.
3. Rehabilitation.
 - (a) Physiotherapy.
 - (b) Occupational therapy.
 - (c) Psychotherapy.

The medical treatment includes administration of certain drugs for the control of spasticity such as prostigmine, curare, Dilantin Sodium etc. None of them specific but gives relief to certain extent in some cases. Defects in vision and hearing must also be corrected wherever necessary.

The value of surgical treatment is a debatable question and I am of the opinion it should be withheld to the last and should be done very sparingly. There are various operations described for correction of various deformities e.g. tendon lengthening for contracture tendo-achilles, obturator neurectomy for scissor gait etc. The same results can be achieved by physiotherapy though it might take a long time, but at the same time avoid the ultimate disability due to operation.

The most important of the treatment is physiotherapy and occupational therapy. The occupational therapy or functional therapy deals with self-help activities of life such as toileting, eating, dressing etc. These are very essential to make children independent of parents and attendants.

Physiotherapy consists in exercising the weak muscles and stretching the spastic muscles to correct the deformities and to teach them sitting, standing and walking. The above treatment will take from six months to one year as the child must be taught step by step. These exceptional

children will not have normal instinct of various activities of a normal child called the mile stones in the growing child such as crawling, sitting, standing, walking, etc. as the child being handicapped and cared for by the parents does not develop them. Therefore it will take longer time for these children to pick up those activities as also due to their poor intelligence.

The fitting up of braces will help to prevent the flexion deformities of knee and ankle and allow the child to stand straight and later walk. First standing balance is taught before a mirror and later the child is taught steps in between parallel bars. Still later a pair of crutches are given for walking which are gradually replaced by a walking stick. In all these cases progress is slow and the treatment must be persisted without despair. In the case of hemiplegic children stout leg brace to correct the deformity of the leg will improve the gait. The normal hand must be tied for few hours a day and the child must be forced to use the affected hand in lifting toys etc.

Psychotherapy becomes necessary as the child becomes an adult and to fit the individual to the society.

A few cases have been treated in the physiotherapy department of General Hospital. Many of these children did not have the full benefit of the treatment as parents find it difficult to bring them to the hospital regularly. In other cases who are outsiders they find it difficult to stay in Madras for a long time and have the treatment, as treatment in these cases requires a pretty long time. There are no facilities for admission for these exceptional children. Till such time when such facilities are given it is not possible to show any encouraging results, in these cases.

A few pictures of those cases treated in this department are shown. Braces were given for these children to make them walk better. In one particular case treated for the last one year there is a remarkable improvement seen. The child who was not able to stand or sit is now able to walk with a pair of crutches. In due course the crutches will be discarded and replaced by the walking stick. I must congratulate the parents for their patience which has certainly been rewarded.

In conclusion I would like to add the Medical profession must get interested in this disease and encourage the parents to persist in the treatment. The main treatment in all these cases is rehabilitation and rehabilitation only.

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"Ancient Egypt and South India"

Need for a critical study of the original Medical texts for evidence of cultural intercourse in the second millennium B. C. between Ancient Egypt and India.

BY

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Three considerations have prompted the author to write and send this short note to the Journal. Cultural intercourse between ancient Egypt and India in the second millennium before Christ may be deemed a historical probability but will not be accepted as a historical fact, unless definite proofs and evidences of various types are available. If philological and linguistic interchange and usage is established beyond doubt, then, the solution of the problem is partly within sight. Secondly it is not very often that oriental Scholars of Europe or America or Indian philologists, study Ancient Egyptian Documents with a view to ascertain the mutual indebtedness of Egypt and India in the days before 500 B. C. Indian Libraries do not have the necessary references, or, monographs on Egyptology. Not many Indians have taken either interest in or training to study, even the translations of the Egyptian Texts, or given sufficient attention to the original papyri themselves. Thirdly, even if there had been an occasional reference to the exchange of natural products or commercial articles or even of ideas, I have not come across any reference so far, to the possibility or evidences, of any inter-relations between Ancient Medicine of Egypt and of India, of pre-Hippocratic period.

Therefore I have made bold to bring to the notice of the Medical Historians of the World, an interesting Article, written by Mr. Raja Rao and published in the "HINDU" in its Sunday Edition dated 13th October 1946.

The Article is entitled "Tamil in Ancient Egypt". For the benefit of those who have not the above article at hand, for ready reference, a brief summary and the relevant extracts are given. By way of introduction, the writer tells us that in the course of his investigations into the affinities between Indus Script and the Minoan Script, he came across the passage which he interprets, as a Tamil sentence, spoken by the early Cretans, about 2000 B. C.

The article begins with the amazing statement "The discovery of a complete sentence in colloquial Tamil in an Egyptian medical papyrus that originated about 1400 B. C. affords one more proof of the intimate cultural contact between Egypt and India even in those remote times".

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After referring to the sartorial fashions and Coiffure of the paintings in the Theban tombs and the names in an Egyptian Document suggesting Tamil origin or influence, nearly 4000 years ago, he comes to the crucial text. Let me quote his own words:—

"The second document is a Keftian spell for the eyes. (See section 108 of the Eber's Papyrus No. 10059 in the British Museum Details are given on pages 71, 98 to 100 of Dr. Hall's admirable Guide to the Egyptian Collections in the British Museum of which he is the Keeper). On page 230 of his very interesting book "Aegean Archaeology", Dr. Hall had reproduced the original Egyptian Text of the Spell or Mantra, his own transliteration and translation of the title. Dr. Pendlebury thinks that the spell is a mere *mumbo jumbo*. Hall and Macalister are of opinion that the mantra contains references to the Cilician God, Tarkondemos and the Etruscan God, Tarquinius. Dr. Hall's translation of the passage is as follows:—"A charm against the Arab Disease in the Keftian Language". *Santikapupivai—aiman—tirkkar*—My friend, Sriraman S. Srikantha Sastri, M.A. Professor of Ancient History, Maharaja's College, Mysore translates the first part of the text thus:—

"A spell to remove the Desert Hill land disease in Keftian speech."

Finally, Mr. Rao summarises the nature of the spell "The effect of the mantra is to hypnotise the eyes into forgetfulness of the pain due to the inflammation. The medicine prepared according to the formula, given in the Papyrus, should be smeared over the eyes or painted on them with a goose-feather. The mantra has to be repeated by the Doctor four times at each application of the ointment. Further details regarding the medicine will be found on pages 98 to 100 of the British Museum Guide (Egyptian Section) prepared by Dr. Hall himself".

* * * *

Though I have had the pleasure of knowing some South Indian enthusiasts and amateurs in Egyptology and listening to their views on figures, the fashions and the names of ancient Egypt, suggesting Indian or Dravidian Origin or influence and though I myself have collected some data on these lines, this is not the time or place, to enter into any discussion on this aspect.

My chief interest and investigations, are primarily concerned with the problems of history of Medicine and secondly, with the ancient historical Records of Egypt and ancient literature and Puranic lore of

India. As one of the few Indians who has spent years in the study of Ancient Medicine of Indian and of Egypt, may I point out that the matter is not so simple as Mr. Raja Rao thinks and that he would have lost nothing by making his suggestion or publishing a note in any journal of the learned societies in India or Abroad to elicit the opinion and criticisms of the experts in the field. I admit that I also believe, like Mr. Raja Rao, that there are close affinities between ancient India and Egypt. I am as eager as Mr. Raja Rao to prove that there were contacts and cultural inter-change between India and Egypt, four or five thousand years ago.

I would like the Indian Scholars particularly the Vedic or the Ayurvedic Scholars and Siddha Scholars to study, not only the entire text of the famous Eber's Papyrus, from which Mr. Raja Rao's text is picked out but also the other major and minor medical papyri of Egypt. It cannot be denied that the reading and dating of these Papyri is a very complicated matter, familiar to only a few experts in the field. The translations into European languages have been done by one or two experts and there has not been sufficient attention or intensive study of these documents by historians and scholars of Oriental learning. Dr. Hall may be the keeper of Egyptian Records but his view that the particular passage is a "charm against Arab Disease in Keftian Speech" need not be taken as the final word. Dr. Pendlebury might think that the spell is a mere *mumbo jumbo*, as all the Vedic lore and Oriental Culture and the Egyptian Hieroglyphics were, till the middle of the last century. Unless the original deciphering of the Papyri and the translations are absolutely infallible, there is no purpose in our transliterating, stretching vowels and sounds and translating into other languages. Any Vedic Scholar reading the last paragraph of Mr. Raja Rao's article may quickly retort that the spell is undoubtedly taken from Adharva Veda or similar ancient Sanskrit medical books.

I may mention in this connection that a suggestion has already been made that the Egyptian Papyri are probably the old Texts of Ayurveda or its earlier forms. The Egyptians preserved the medical lore in writing, while the Indians committed the text to memory and taught them orally to pupils. All the Egyptian Medical Papyri are therefore only fragments of ancient Medicine in the most ancient garb and language. The ancient Indian Tradition, that Somaka, a foreigner belonging to the Lunar Race or to a race of worshipers of the Moon, stole the ancient Vedas and that he was chased and killed by Vishnu, in the form of a fish 'Matsyavathara' appears to contain a core of truth and this may explain the presence of highly interesting Medical Records in Egypt and Assyria and also the absence of similar records in India. If the story of the deluge and the story of the churning of the ocean, all of which were regarded as fairy tales, are gradually beginning to be appreciated, as

having elements of historical truth, and if evidences of the worship of the serpent, the Sun and the Moon can be detected in all ancient civilisations of Egypt, Assyria and India of the second and the third Millennium B.C., equally true and historical may be the story of the stealing of the Vedas, a legend based on some historical events of the dim and distant past millenniums before any date that Archeologists assign to the Indian civilisation of the Indus valley or the Dravidian civilisation. The other alternative possibility appears to be that Egypt and Assyria was the birth place of Medical Art which came into India—through two routes; one by the land route—in the North-west—into Indus Valley and Punjab along with Aryans and flowered into the classics of the school of Takshasila (the lectures of Atreya and the Samhitas or Compendiums of Agnivesa, Bhela etc. and the treatises of Charaka and Sushruta) and the other, through the Sea route, in the South—into South India and developed into, or became merged in the Siddha System of Medicine.

Time and persistent research may ultimately unravel new clues and tracks indicating the direction of the flow of cultures, inter-change of knowledge between ancient Egypt and India, 3000 years ago or even earlier. It is my earnest prayer that the Scholars of the West and the East, will not postpone any longer to scrutinise the available sources and records and that the rising generation of archaeologists, trained in highly scientific and technical procedures, will look for and unearth new materials, that will help in finding the key to the mystery of the stolen Vedas.

Development of our knowledge of Cancer

BY

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INTRODUCTION

Of all the diseases that afflict man, Cancer or malignant growth stands out as the most striking and singular in its mode of onset, behaviour and progress. It attacks indiscriminately - young or old, man or woman, prince or peasant. No country, race or climate, is free from Cancer. Very often its approach is silent and insidious without warning signs as fever or pain that many a victim is unaware that anything injurious is going on in the body till the disease is well advanced. And unless treated early and effectively, it grows steadily and relentlessly invading and destroying neighbouring tissues and organs till the whole organism is killed. The cause or causes of Cancer still remains a mystery. These circumstances will explain the fear and the horror that the very word Cancer evokes in the human mind. Here is something strange and fatal that strikes without a sign or a warning from the clutches of which there is no protection or precaution. This in the main reflects the attitude of many a man towards the problem of Cancer or malignant growth.

During the last fifty years a crusade against Cancer is being waged by devoted workers in various centres of the world. Their endeavours have met with considerable success not only in unravelling the mystery surrounding the origin and cause of cancer but also in the ways and means of its effective treatment and control. Cancer is no longer a mysterious disease and it need not necessarily be fatal. With the facilities at the disposal of the medical science to-day it can save two out of three persons afflicted with Cancer if the disease is detected in the early stages; and the vast majority of Cancers commonly found in India are those of the skin, oral cavity, cervix rectum, and penis—all of which can be detected with simple inexpensive equipment. In India today the problem of Cancer presents a pathetic picture. One of the greatest difficulties is to detect the early cases. It is the sad and depressing experience of almost every surgeon or radio therapist that the vast majority of cases coming for treatment to the cities where alone proper facilities are available are far too advanced for any effective therapeutic measure. The early cases mostly present themselves to the general practitioner, the family physician and the out-patient departments of Government hospitals without realizing the seriousness or significance of the presenting signs or symptoms. It is

in these places that every doubtful case should be subjected to all the diagnostic aids at the disposal of modern medicine. Delay by useless and merely symptomatic treatment is criminal and fatal. In the words of Oberling "the golden hour passes and with it the last chance of the patient". It is very often ignorance and not apathy that is standing in the way. A general knowledge of the nature of Cancer, of its common warning signs, and the facilities available for its early diagnosis and treatment will go a long way in tackling the problem of Cancer in India.

What is Cancer.—The word "Cancer" means crab. It was Hippocrates who first gave this name. What special characteristic of malignant growths made the father of medicine pitch upon the word "Cancer", it is not possible to say. But the very sound gives the impression of a growth having ramifications or claws that can extend from the main body and bury themselves deep in the human flesh.

Before the discovery of the microscope the knowledge of the minute structure of the human body was vague and imaginary and tumours that grew and developed in the human system were classified mainly in accordance with their naked eye appearance, and their tendency to progress or not towards a fatal termination. It is interesting to note that as long ago as A. D. 150 Galen put forward a classification of tumours which for its insight and comprehensive grasp stands true even today. He classified them into three categories:—

1. Tumours according to nature.
2. Tumours exceeding nature.
3. Tumours contrary to Nature.

In tumours according to nature he included all those swellings that manifested themselves during the life time of an individual in response to a physiological stimulus as the growth and development of the breast at puberty and the uterus in pregnancy. In the second category of tumours exceeding nature are included conditions of inflammatory hyperplasia where the reparatory process over shot the mark producing swellings as the formation of bony swelling at the site of union of the fractured ends of a broken bone. The third category of tumours contrary to nature constitute what we now understand as true tumours. It will be seen that in every attribute they are contrary to nature. They grow and develop in their own way without conforming to the collective needs of the body, serve no physiological purpose and use up nourishment vital for the body's health. Even among these Galen recognised a benign and a malignant group reserving the word Cancer to the latter which invariably progressed to a fatal termination.

Galen's views held undisputed sway for 17 hundred years right down to the days of Virchow in the 19th century. By that time increasing use of the microscope had revealed and finally established the fact that every organism - plant or animal—is made up of innumerable cells of differing shape and size embedded in a ground substance of varying composition and amount. Minute examination of Cancer showed that they too were made up of cells closely resembling the normal cells of the body. Thus it became recognised and established that Cancers arose from certain normal cells of the body which for some unknown reason developed an abnormal rapidity of growth. Herein lay the mystery of Cancer—why a single cell or group of cells in the human body which have so long worked in perfect harmony and adjustment with millions of others suddenly develop a peculiar behaviour, refuse to co-operate with its neighbours and start to multiply with extraordinary rapidity into an aggressive disorderly mass invading and destroying neighbouring cells till the whole organism is killed. This was the state of our knowledge of Cancer till the beginning of the 20th century.

TRANSPLANTATION OF TUMOURS

Early in the present century Jensen (1902) demonstrated that malignant growths analogous to those developing in the human body are prevalent in animals and that they could be successfully transplanted from one animal to another of the same species. Careful observation and study of those transplanted tumours showed that the growths that developed in grafted animals were formed entirely by the multiplication of tumour cells originally introduced. No malignant transformation of the normal cells of the new host ever took place. It was the same original tumour continuing to grow and the cells were the direct descendants of the same cell or cells which first turned malignant—only the environment had undergone a series of changes from host to host. Though there was intimate contact between the inoculated tumour cells and the tissues of the host which formed a supporting stroma and also supplied the growing tumour cells with blood vessels and nourishment, there was no evidence of transference of malignancy from one to the other. For successful transplantation it was found necessary that living cancer cells must be present in the transplant and the host selected must belong to the same species. If the cell were disintegrated or dead the transplant did not take. These observations demonstrated beyond doubt that the disorder in cancer was within the cell and bound up with the life and activities of the cell and when the cell died or disintegrated the disorder also died along with it. It was capable of transmission to the descendants of the cell but not to the neighbouring cells. Jensen's discovery made it possible for a growth to be kept alive by a series of successful transplantations almost indefinitely and subject it to prolonged study. This was the starting point of a crusade of experimental work to master the secret of Cancer.

Carcinogenic agents.—For many years clinical observation of Cancer cases had established the fact that many cases of cancer followed chronic irritation of some form or other. The common sites of Cancer were not healthy areas but sites subjected to trauma or irritation as scars from burns, fistulous tracts or edges of chronic ulcers. Habits and customs that tend to produce excessive irritation in specific areas showed a relative preponderance of cancer at those sites. No better example can be given than the Cancer of the anterior abdominal wall common in Kashmir peasants. Anterior abdominal wall is not a common site for Cancer but in Kashmir and Tibet it is common among the poorer classes. These people carry during winter burning coal in earthenware pots beneath their clothes in apposition to the anterior abdomen to keep themselves warm, resulting in most cases burning of the skin and consequent scar formation. From one of these scars occasionally Cancer develops. In occupations and trades the same predilection was noticed. Persons who worked with tar showed a tendency to develop Cancer of the skin. As long ago as 1775 Sir Perceval Pott observed and wrote about the causal relationship between tar and cancer skin. For 140 years it remained a clinical observation; then in 1915 two Japanese workers Yamagiva and Itchikawa put this observation into experimental test. They painted tar on the inner surface of the ears of rabbits daily for a period of months and succeeded in inducing cancerous growths on the painted area. This was the first successful production of experimental Cancer. This was hailed as an epoch making discovery and opened up a new field of fruitful research all over the world. Tar is a highly complex substance and attempts were first directed to find out and isolate the specific constituent in tar that brought about this change. This led to the discovery of numerous polycyclic hydro-carbons, showing varying degrees of Carcinogenic activity. Important among these were Dibenzanthracene, Benzpyrene and Methyl Cholanthrene. The structural pattern of these compounds was found to be important as the shifting of the position of a single double bond will convert some highly carcinogenic hydrocarbons into wholly innocuous ones and *vice versa*. Earnest attempts were made to find out any particular grouping of radicals common to all these agents which, if present can be pointed out as the factor responsible for cancer. But this attempt was not successful. Some of these carcinogenic hydrocarbons, however, showed a close structural similarity with certain physiologically active agents normally present in the human system as Vitamin D, male and female sex hormones etc. Perhaps the most significant of those is methyl cholanthrene, a compound derived from cholic acid a constituent of normal human bile. This close similarity and structural relationship led to the suggestion that these naturally occurring physiological substances like Vitamin D, male and female sex hormones and bile acids may by alteration within the body be changed into carcinogenic agents and spontaneous cancer be the end result of their long continued activity. The idea was brilliant and suggestive but before it could be clarified or substantiated it was found that these polycyclic

hydrocarbons were not the only substances showing carcinogenic activity and that this property was shared by compounds wholly unrelated to hydrocarbons and even by X-Rays, Radium, Ultra violet rays and infectious agents. Thus instead of one single agent producing cancer the investigator was faced by a bewildering array of agents showing nothing in common except their capacity of initiating malignant change in cells. The mechanism by which this transformation was effected still remained unsolved. Further progress in this direction became difficult and the idea began to take shape that all these agents functioned as predisposing or extra cellular factors pushing the cell to the brink of cancer, while the fundamental cancerous change remained intracellular and inscrutable.

HEREDITARY AND GENETIC FACTORS IN RELATION TO CANCER

Work on the possible hereditary and genetic factors in the causation of cancer has yielded useful information. Advance in this line of experimental cancer research was especially due to the remarkable and painstaking work of Maud Slye. To quote the words of Oberling "One day while still only a girl she burst into the Pathology laboratory of H. Gideon Wells in Chicago exclaiming that she simply must study the heredity of cancer and would need some mice and a corner of his laboratory. Well, the few mice became a thousand then ten thousand then hundreds of thousand and the modest corner to which she had been assigned became an institute where they were housed under the most perfect conditions, pedigreed, selectively bred, observed throughout their lives and at last autopsied with scrupulous care". Most of the work was done on cancer of the breast in mice. It was observed that the cancer rate in the descendants of a cancer mouse was higher than in the general mouse population. On the basis of this observation, by inbreeding and selection it was found possible to produce strains of mice which are highly susceptible and strains which are highly resistant to the apparently spontaneous production of breast cancer. Recently Bittner has shown by ingenious experiments that the hereditary tendency to cancer is transmitted through the female and not through the male and so, the condition could not be due solely to genetic factors.

He separated the offspring of a low cancer strain immediately after birth and had them foster fed by the mother of a high cancer strain and watched the result. He was astonished to find a very definite increase in their tendency to the development of cancer. Similarly when the offsprings of a high cancer strain were removed by caesarean section and foster fed by the mother of a low cancer strain, the incidence of cancer showed a definite decline. These striking experiments showed beyond doubt that the greater or lesser tendency to the incidence of cancer was influenced not by genetic forces but by some factor that was apparently transmitted to the offspring through the milk of the mother mouse. This

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is called the Bittner milk factor or the transmissible agent. It is now generally agreed that this transmissible agent is probably a virus. These experiments go to show that cancer is not a hereditary disease in the sense that a tendency to its incidence or otherwise is not bound up with chromosomic filaments and therefore beyond our control to prevent.

VIRUSES IN RELATION TO CANCER

The role of viruses as causative agents of malignant tumours was brought into prominence by the discovery of Peyton Rous of a malignant growth—a sarcoma—in a fowl (a Plymouth Rock hen) which showed the remarkable characteristic of transmission by means of cell free filtrate. Tumour filtrate from a Berkfield or Pasteur Chamberland filter free from even minute particles like bacteria was found to give rise to a typical growth when injected into a fresh animal. This remarkable and unique characteristic immediately raised Rous Sarcoma into a class by itself distinct and separate from the common run of tumours where transmission is possible only with viable cells, and doubts were even entertained whether it could be classified a tumour at all in the ordinary sense of the word. Further work, however, revealed the existence of other tumours of animals capable of transmission by a cell free filtrate—papilloma of cotton tail rabbits (Shope), adenocarcinoma of the kidneys of leopard frogs (Lucke). It is now generally recognised that these tumours of fowl, rabbits, and frogs are caused by viruses. The discovery of the Bittner Milk factor and the view that this is probably a virus has given added impetus to the virus theory of malignant growth. Whatever it is that the milk contains is so effective that sometimes a single nursing during the first days after birth is sufficient to transmit the cancer incitor not only to the young but also to their descendants. It must have passed through the gut wall and reached the rudimentary mammary glands through the blood persisting there till the glands developed and producing cancerous growths when the animal begins to age. The advocates of the virus origin of cancer maintain that the action of trauma chronic irritation or chemical agents is merely provocative, inducing the tissue disorder facilitating the virus to act while the actual malignant change is brought about and maintained by the virus alone. According to them the virus may lie dormant for years in the body and spring into neoplastic activity only when the conditions congenial for its growth and action takes place. The behaviour of the virus responsible for fever blisters is pointed out as an example. This virus remains dormant and unnoticed in the body for years asserting itself only periodically in the form of blisters on or about the lips usually in association with other disorders. The course and action of the Bittner Milk factor is also suggestive. It enters the body during the first few days of the animals existence through the mother's milk, lies quiescent for a long time apparently in the rudimentary mammary glands and starts its neoplastic activity only when the hormonal

influence has made the mammary tissue susceptible. The conception is attractive but the main objection against it is that it remains unproved. The proved virus growths of animals are only isolated instances. In the vast majority of cases no virus origin could be demonstrated.

Discussion.—Fifty years of research and study on cancer have brought to light a bewildering array of facts concerning its growth and development especially in experimental animals. It is therefore pertinent to ask the question—How far have these observations increased our knowledge and understanding of the cause of cancer apart from its detection and treatment. Are we now able to protect ourselves against Cancer and prevent its incidence. The reply is not simple and no definite "Yes" or "No" can answer the question fully and satisfactorily. Clinical observation and experimental study have demonstrated beyond doubt that in the growth and evolution of cancer two definite sets of factors come into play—which can be called extra cellular or predisposing and intra cellular or exciting. The predisposing factors in the causation of Cancer are many and varied. They may be physical, chemical hormonal or even microbic. Very often they act together and for a considerable length of time. They differ in different types of cancer and in different countries, communities and strata of society. The factors that predispose to cancer of the skin in England or Australia may be fundamentally different from those that cause the same type of tumour in our country. Very often it is seen that diet, occupation, social habits and customs of the locality have a pronounced influence on many types of cancer affecting those areas. These factors have therefore to be studied individually and locally.

The variations in the cancer rate in different countries, the marked difference in the site incidence of cancer and the virtual immunity of some races and communities against certain types of cancer are all attributable to these predisposing factors.

The exciting Cause of Cancer brings about the final cancerous change which converts a normal cell into a malignant cell. It is sudden, intracellular and irreversible and is the same, as far as we know, in every type of cancer or malignant growth. Our knowledge of the nature of this change is still vague and obscure. Two probable theories are advanced by students of cancer—one school believes that cancer cell is a new race brought about by a subtle and elusive change in the enzyme constitution. The action of the multitude of predisposing agents is ultimately to bring about this intracellular change. The supporters of this theory argue that many of the carcinogenic agents as X-Rays, radium, ultraviolet rays etc., are harmful to the health and growth of normal cells and when they continue to act, the normal cells try to adapt and change to withstand the

unfavourable conditions, and the cancer cell can be looked upon as a unique development of a specific cell type in an adaptive response to adverse conditions.

The other school is inclined to think that the exciting cause of Cancer is an Ultra microscopic virus developing within the cells and continuously stimulating it to excessive growth and reproduction and then passing on to the descendants when the cell divides. The function of the predisposing factors, whatever their nature was only to bring about conditions favourable for the virus to grow and develop. Now it must be admitted that "Viruses" form a group of organisms about which we do not know sufficiently well. They seem to lie in the misty borderland between the living and the non-living. Some of them are so small that in size they are not much bigger than complex protein molecules. They can grow and develop only in association with living cells. Recent studies by Stanley have established the fact that certain viruses causing disease in plants can be crystallised and kept. If a small quantity of these crystals is introduced into the plant, the disease starts and as it increases and develops a much greater quantity of the same crystalline material can be recovered from the plant. Here we have an instance of an infectious agent in crystalline form apparently reproducing itself. Instead of assuming that the crystalline virus on entering the plant cell begins to grow and multiply, it is more reasonable to suppose that the virus so altered the synthetic process of the plant cells in such a way that those cells continued to produce more and more of the same substance and this alteration in the intracellular process produced the outward and visible signs of disease. Such an idea of the action of virus if applied to cancer will bring the two theories—virus and derangement—much more in line. The fundamental change in both is in the subtle intracellular synthetic process which is altered in such a way as to produce the original stimulant and thus the cycle goes on repeating itself indefinitely. But it must be admitted that so far no virus, crystalline or otherwise, has been demonstrated in any case of human cancer. Even if we accept the virus origin of cancer, observations go to show that it is a strictly conditioned virus completely dependant on the receptivity of the tissues. It may be dormant for years and spring into growth and activity only when the tissues have become susceptible. Whatever theory we prefer, it is abundantly clear that our present knowledge of the intracellular changes in cancer is too vague and incomplete for any effective step to prevent its occurrence, and our only hope of precaution and prophylaxis against cancer lies in a close study of the extra cellular or predisposing factors and the so called precancerous conditions and avoiding them wherever possible.

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