

SURGICAL & MEDICAL NEWS

Vol. I No. 1

OCTOBER 1954

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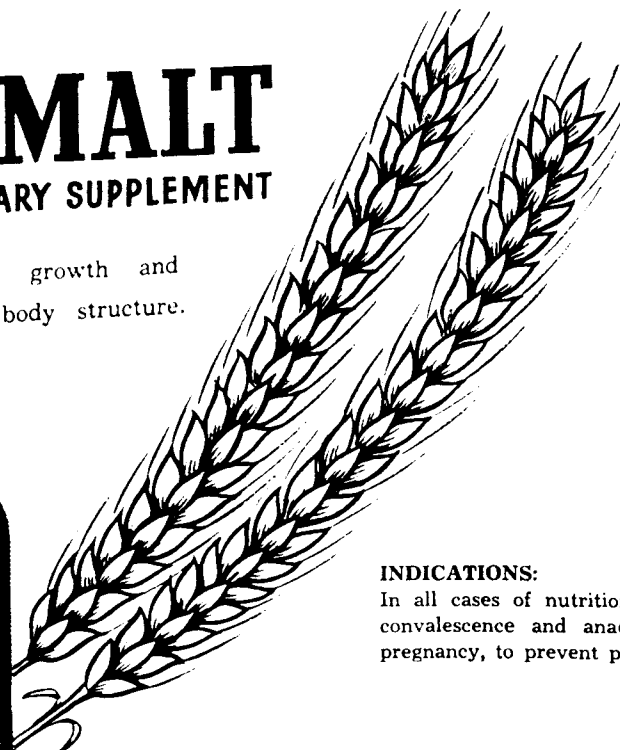
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Manuscripts should be submitted to us duly typed in double space with wide margin on one side of the paper in duplicate. Footnotes and bibliographic references should be on the lines of the Quarterly Cumulative Index Medicus of the American Medical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

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The **SURGICAL & MEDICAL NEWS** is the first Journal of Industrial Medicine & Surgery to be published in India and is an useful publication for all Medical Officers attached to Industrial Organisations, Factories, Railways etc., in particular and to the members of the medical profession in general.

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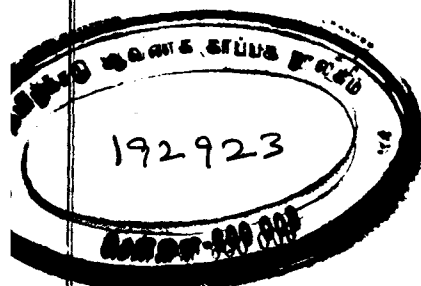
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(A Quarterly Journal of Industrial Medicine & Surgery)

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OUR COVER PAGE

Mr. J. Antos, Charge D'Affaires a.i. of the Czechoslovak Embassy in New Delhi presents medicines of Czechoslovak manufacture to Hon'ble Raj Kumari Amrit Kaur, Union Health Minister, Government of India on behalf of the Minister for Health, Government of Czechoslovakia, Dr. Josef Plojhar.

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SURGICAL & MEDICAL NEWS

OCTOBER 1954

MESSAGES



Ganeshkhind,
Poona 7,

14th September, 1954.



I congratulate you on your enterprise in starting a Journal for the dissemination of technical knowledge among members of the medical profession attached to industrial organisations. The journal should fulfil a great need in the domain of industrial medicine and I wish it a bright and prosperous career.

E. S. Bapna



Minister for Health,
New Delhi.

8th August, 1954.

I am glad to hear that you propose to publish a Scientific Journal on Industrial Medicine and Surgery. In view of the rapid industrialisation of our country, special measures must of necessity be taken to protect the workers from industrial hazards. The Journal which is devoted to problems connected with Industrial Health is, therefore, bound to be of great use to all medical officers working in industries. I wish the publication every success and hope it will maintain a high standard.

Amit Kaur



Ministry of Health,
Government of India,
New Delhi.

25th August, 1954.

....glad to know that you are bringing forth a Quarterly Journal of Industrial Medicine & Surgery intended mainly for the dissemination of technical knowledge among the members of the medical profession attached to industrial units.

Wish your enterprise all success.

M. M. Chatterjee

OCTOBER 1954



Vice-President
India
New Delhi

27th July, 1954

I am pleased to know that you will be publishing a journal of Industrial Medicine and Surgery in September. I do not know why you should say that it will be non-controversial. Scientific development always takes place through controversies, criticisms and discussions, and you cannot avoid them if you wish to be faithful to the task of furthering the bounds of knowledge.

I wish your journal success.

Handwritten signature

OCTOBER 1954

Ambassade De France,
Aux Indes,
New Delhi,

18th August, '54.

....We appreciate the importance and usefulness of such a Journal as yours. It will certainly do a most useful work in spreading information on industrial medicine and surgery.

Andre Padoux

Chandigarh,
19th August, 1954.



It is my pleasant duty to send my felicitations for the first issue of the "Surgical and Medical News".

The need for a non-controversial journal devoted mainly to dissemination of technical knowledge about industrial medicine and surgery was felt since long and I hope the "Surgical & Medical News" will successfully perform the task it has undertaken.

I wish the journal every success.

Jagat Narain

New Delhi,
23rd August, '54.



I am glad you are publishing a journal on Industrial Surgery. I wish the same every success.

V. V. Giri

OCTOBER 1954



Raj Bhavan,
Kurnool,

29th July, 1954.

I am very glad to learn that it is proposed to publish the "Surgical and Medical News" from September 1954. I understand that it will be a quarterly journal devoted to Industrial Medicine and Surgery, and will be edited by a team of highly qualified and experienced Chief Medical Officers of some leading industrial organisations. There is obvious need for such a journal, and I wish it all success.

can find

Australian High
Commissioner's office,
New Delhi,

2nd August, 1954.

I am pleased to know that it is intended to publish "SURGICAL AND MEDICAL NEWS" in India.

The publication of a journal dealing with Industrial Medicine and Surgery is a recognition of India's growing industrial status, just as it is of the pressing need in all countries today taking on the modern economic techniques to provide for the effects of these techniques on the health of the workers.

I wish it every success,

W. R. Crocker

Srinagar,

31st July, 1954.

I am happy to know that your new magazine 'Surgical & Medical News' is coming into existence. It will be the first Indian magazine in this line and as such will serve a very useful function. Surgery and medicine have made and continue to make very rapid advances, and it is imperative that our Medical students and those in the medical profession should remain constantly in touch with new developments. I wish you all success in your endeavour.

Yuvaraj Karan Singh

OCTOBER 1954



Minister of State
in charge,
Calcutta,

31st July, 1954.

Journalism on Industrial Medicine and Surgery is a new venture in India and yours, I hope, will serve the time when industrialisation is running apace.

I wish your journal a long and useful life disseminating progressive ideas in the field of Industrial Medicine.

A. D. Mukharji



Governor's Camp,
Uttar Pradesh,

23rd August, 1954.

I wish your 'Surgical & Medical News' every success. I hope your magazine will contribute in maintaining a high standard in industrial medicine and surgery.

R. D. Mukharji

Bihar Governor's Camp,
Ranchi,

5th August, 1954.



I am very glad to know that a new journal devoted to Industrial Medicine and Surgery is coming out for the first time in India. This will fill a long-felt lacuna in the country. I welcome the attempt and wish the journal a successful career.

R. D. Mukharji



OCTOBER 1954

Chief Minister's
Secretariat,
Uttar Pradesh,
Lucknow,

31st July, 1954.

"...Glad to learn of the coming out of the 'Surgical & Medical News'. It is gratifying that the venture is being assisted by eminent men in the medical field. The promoters have all my good wishes for success to their efforts"

Lieutenant-Governor,
Vindhya Pradesh,
Rewa,

30th July, 1954.



....very much pleased to learn that the Journal is to be published shortly and have great pleasure in sending my good wishes. I am of the opinion that such Journals can render much assistance to the growth of science and industry.

Embassy of the People's
Republic of China
in India,
New Delhi,

6th August, 1954.

....We congratulate you on the publication of your Quarterly Journal of Industrial Medicine & Surgery and wish you success in your work.

OCTOBER 1954

ABOUT OURSELVES

WITH the help and guidance of several leading Members of the Medical Profession attached to big Industrial Organisations covering various ranges of manufactures in the country and also that of our able and astute honorary Chairman, Dr. G. S. Melkote, Labour & Public Works Minister of Hyderabad, we are presenting our Inaugural Number, the first Journal of Industrial Medicine & Surgery to be published in India.

The subject of "Industrial Medicine & Surgery" has been acquiring considerable significance and requires a separate publication for itself to afford a wider treatment in all its ramifications. The absence of such a Journal devoted to Industrial Medicine was being felt in this country for some time past and more particularly after the attainment of political independence in the light of the rapid industrialisation of the nation under various development plans which in their wake have brought many problems.

One such problems is the health of the Industrial worker which has come to be recognised as an important factor in the setup. The individual worker who is a cog in the big wheel of industry is subject to the ailments and discomforts of the individual person, as also to the risks and hazards peculiar to an organisation or a group in the organisation. For instance, the coal miner is subject to the common ailments of any other human being living next door to him as also to the individual disease of Silicosis peculiar only to his clan. Thus he is in need of medical attention and assistance in two spheres, individually as a common man and in a group as a miner. The Industrial Health is concerned mostly with the latter and obviously is in the nature of a Preventive Therapy. The Industrial Medical Officers are always striving to prevent workers from contracting an individual disease and to protect them against industrial hazards peculiar to different types of industries in which they are employed. All these require specialised study and treatment.

So far members of the medical profession attached to Industrial Organisations who were called upon to tackle such problems as pertain to Industrial Health, Occupational diseases etc., have had no *forum* for the exchange of their ideas nor any wider scope for an Industrial Physician who had something of importance in his own sphere to communicate to the medical profession at large in general and to his fraternity in particular. Thus the Industrial Physician of Bihar Coal Mines has had no chance for exchanging ideas with his counter part in Textile Mills of Coimbatore down south through a common and popular medium.

Today Industrial Physicians are widely scattered in India and there are no means of pooling each other's knowledge and experience in different industries for the common benefit of the industrial worker as also the Industrial Physician Industrial Health as a subject has

been very little understood in our country and still less taught except for a solitary school in Calcutta which coaches students for the Diploma and Certificate courses. No other Institution teaches the subject as a post graduate course. Under these conditions, the experience and new ideas of several industrial Medical Officers of some standing and experience attached to various types of leading Industrial Organisations, if pooled together and sorted out should prove of immense value to other members of the profession attached to industrial units and also to the workers themselves and thus ultimately contribute to increased industrial health and which would in turn mean higher production thereby stepping up the national economy.

As Mr. W. R. Crocker, the Australian High Commissioner in India says in his message of good wishes and appreciation issued on the occasion of launching this Magazine (appearing elsewhere in our columns in this issue), the publication of a "Journal dealing with Industrial Medicine & Surgery is a recognition of India's growing industrial status, just as it is of the pressing need in all countries today taking on the modern economic techniques to provide for the effects of these techniques on the health of the workers. The same views have been endorsed though in a different language by the West Bengal Health Minister, Hon'ble Shri A. D. Mukherjee in his message.

We have made a valuable addition to a plethora of Medical Publications already in existence but entirely on a new subject of vital importance to the industries and also to the nation. It will be our earnest endeavour to be of some service to the members of the medical profession attached to Industrial Organisations in particular and to the medical world in general in all possible ways and our publication, as stated by the Union Health Minister Hon'ble Rajkumar Amrit Kaur in her message, would be of great use to all Medical Officers working in industries and would maintain a high standard in the dissemination of progressive ideas in the field of Industrial Medicine & Surgery. But at the same time we would like to strike a note of subdued optimism in the achievements of targets we have set before ourselves in respect of increasing the Journal's standard and also in regard to progressive dissemination of technical knowledge which is bound to be a slow process, particularly in view of the handicaps and difficulties inherent in such a new field as we have chosen to enter under the presentday conditions in the country.

We do not pretend it is perfect, far from it. Like other Journals in the field we have our own shortcomings too, more so because of the nature and range of subjects we have to deal under a set of circumstances. But it will certainly be our constant endeavour to eliminate these by and by and thus improve upon each issue and to attain a progressively higher standard. To attain this objective we seek the active and practical assistance of our Subscribers and readers and hope it will be forthcoming in no small measure. By getting into touch with the opinions of our readers we shall certainly be able to assess our faults and weaknesses, as well as our strong points and thus make suitable adjustments as circumstances might require.

SALT IN INDUSTRY

SODIUM Chloride, the common kitchen salt has long been recognised as an important constituent of food, almost as important as the vitamins. Even the early workers on dietics did not fail to realise that the so called energy yielding food, containing all the required amounts of proteins, fats and carbohydrates but deprived of salt brought about a condition, characterised by depression, loss of muscular activity and early fatigue. This was attributed to the formation of acids, specially sulphuric, as a by-product of protein metabolism. It was possible to obviate this acid intoxication to a certain extent by administering sodium carbonate. But the results were neither satisfactory nor spectacular. Addition of sodium chloride and chloride alone would improve matters. The importance of sodium chloride or rather of the chloride ion was of theoretical and experimental importance only till Haldane started administering sodium chloride to coal miners, to cure the dreaded condition, the miner's cramp. He noted that miners working at the coal face and exposed to a temperature ranging anywhere from 110 to 140° perspire freely. To compensate they drink copious quantities of filtered water. The loss of chloride is not made good. There is an osmotic in balance of tissue fluids as a result of which fluid is retained in the muscles resulting in cramps. Haldane was able to prevent this condition developing in a large number of miners by adding 10 grains of common salt per gallon of water (which incidentally works up to 0.015%). It looks paradoxical that sweat, the most dilute of all animal fluids with a specific gravity of about 1003 and containing 0.3 to 0.5% of total salts should be able to work such havoc.

Haldane's problem faces a section of our Factory workers today. Those working in Iron & Steel Foundries, Boiler Rooms, Stoker Rooms of Ships etc., sweat profusely. The total amount of fluid lost has been stated as from a fraction of an ounce to half a pint by various authors. The amount of salt lost is, no doubt, considerable. What is being done to replenish the salt? Very little, as could be seen from the number of cases that turn up at the medical outpost, complaining, though not of cramps but at least of tired feeling loss of energy etc. It is a common sight in most foundries to see a bottle of salt tablets, sometimes with the cork and outer wrapping in situ placed on a shelf just above the drinking water fountain. But how many workers know what it is or why it is placed there? Some may even attempt to pinch a tablet or two to use as moth repellents at home. They should be explained about Salt physiology in simple terms and the advantage of consuming it stressed. Medicine in any form is repugnant to the normal human and worse still a bottle of salt tablets. Compulsory swallowing of a couple of 'salts' at the gate in the traditional military style has been tried in some factories, but with no better results. The factory workers are not disciplined like soldiers and they are always very good at evolving antidotes for any compulsion enforced on them. So a method which entails voluntary ingestion of salt garbed in the form of a canteen product is to be evolved. We would recommend a method recently tried in a big Iron Foundry in the South recently. Without notice a section of workers were supplied with Butter Milk (Lassi) free of charge at the warmest part of the shift. There was a huge demand for the same, even from the 'unfortunate' neighbour who

(Continued on page 12)

ALLERGY IN TEA GARDEN PRACTICE

By W. J. AITKEN, Lt.Col. I.M.S./I.A.M.C. (retd).

(Late Chief Medical Officer to Tea Estates.)

EVER since the subject of Industrial Medicine was born, its practitioners have been plagued by the problems of allergy and sensitization. In some industries, where the difficulties have been specially acute, a great deal of research has been devoted to this problem, but in many cases no systematic survey of the risks has been attempted, and indeed, often little or no information has been recorded for the benefit of newcomers to the industry. As an example of this patchy neglect, it should be noted that even in their specialised book on occupational diseases of the skin, Schwartz and Tulipan make no reference whatever to the hazards of the Tea Industry, showing how little attention has been paid to the problem in the past. It may therefore be of value to put on record a few personal observations regarding some of the examples of hypersensitivity which may be met by any tea garden Medical Officer. These notes are not intended to be exhaustive in their scope, but rather may suggest the possibility of a background of allergy in many of the disorders which the doctor will meet from time to time. Even more important, in my opinion, is the suggestion that the obscure disease may be connected with the patient's occupation, as obviously little progress can be made in the cure until the worker is separated from the irritant.

At all the stages in the production of tea, the workers are exposed to contact with substances to which they may be, or may become, sensitive. During the off-season, when the bushes are being pruned, those carrying out the work are inevitably smeared with sap from the cut stalks. In the majority of cases, this causes no trouble; but a few people develop rather resistant skin eruptions, either wet or dry dermatitis, which settle once the patients are withdrawn from exposure to the irritant. As the cut ends of the stalks are very sharp, it is not feasible to employ protective clothing, as this would have to be too stiff and too warm to allow the worker to carry out the very strenuous work involved. In the majority of cases, the workers do, in fact, wear an apron of leather or sacking, but the limbs are quite unprotected.

A somewhat similar state of affairs exists in regard to those engaged in plucking, who may develop a dermatitis due to the sap from the cut stalk. Here, it may be argued, gloves would be adequate, but unfortunately, in many districts plucking is carried out chiefly in the hot weather, when the gloves would be most uncomfortable, in fact they would be liable to set up eruptions on their own account; and in any case they would

(Continued from page 11)

was not in the "sweating list." The salt content was gradually increased day by day, that now each worker is receiving about 3 Gms. of salt in two glasses of Lassi. The efficiency of work is said to have improved and the workers look fresh after the shift. This appears to be a good psychological approach to a ticklish problem. Even the cost of running a scheme like this could not be high. Allowing for the high cost of articles two glasses of Butter Milk containing 3 grams of common salt will not work out to more than 3/4 anna. Surely it would be a wise move to invest less than an anna and keep a worker active, alert, happy and enthusiastic during a full shift.

Finally talking of salt, one is reminded of the 'Salt Hunger' of certain animals. It is said that animals from the arctic regions migrate thousands of miles down in search of salt to satisfy their physiological wants. Most of them meet with death in this pursuit. Whether this is to satisfy the palate or the physiology is for the Zoologist to determine. As Industrial Hygienists we would rather prefer the 'Pinch of Salt in a Glass of Lassi' to the ticketless travel of the arctic bears.

probably be unacceptable to the pluckers, as any loss of dexterity would be reflected in a reduction in the workers' earnings.

From the field, after being weighed, the leaf is taken to the factory for processing, and, en route, other people are exposed to the possibility of contact dermatitis during loading and unloading of the transport. At this stage, it might be feasible to employ protective clothing, while some estates are even able to use mechanical means of carrying out the work. Unfortunately these are few in number, and on account of the big acreage to be covered, purely mechanical loading and unloading is unlikely to be an economic proposition on the remainder.

Many factories use a process in which the leaf is allowed to wither for a period before being processed. To ensure that this occurs evenly, the leaf is spread out by hand on tiers of shelves, then, when ready, taken to the rolling room and fed to machines which crush and tear it, after which it is spread out on a concrete floor to ferment. During all these stages, the use of gloves and aprons afford reasonable protection against harmful contact, but may, in very hot weather, be difficult to wear. Another danger arising from the fermentation process is that the sap may be partly absorbed into the floor, to later affect sensitive workers who may happen to be walking about barefooted. This danger must always be kept in mind, as it sometimes happens that a man from outside may be sent into the factory on a message, and, by crossing the floor become exposed to the risk of a contact dermatitis of the feet.

After fermentation the leaf is fed into the driers and baked at a very high temperature, to become the familiar brown colour of the "tea leaf" which is to be found in the packets of tea purchased from the shops. Now comes the process of sifting, by which the different grades of tea are separated from each other. This is carried out in a special room, the sifting room, and it results in the air being filled with fine particles of dust and tea. This stage is probably the biggest source of trouble for the doctor, as not only is the dust irritating to the skin, but if inhaled often gives rise to bronchitis and asthma, or, if it gets into the eyes, to a troublesome conjunctivitis. In a temperate climate, masks would offer protection for the lungs and eyes, but the dust is highly penetrating and is often found inside the clothing, especially about the flexures. It is usual to have exhaust fans fitted to minimise the concentration of dust in the factory, and the efficiency of these can usually be seen from the brown discolouration around

(Continued on page 14)

the discharge point outside, but nevertheless, from the nature of the sifting methods, it is impossible to prevent a considerable concentration of dust in the atmosphere while the machines are at work.

Similar conditions, but to a much lesser extent, exist in the packing room, where the boxes are agitated violently in order to settle the contents and fill all available space before the lids are applied. Here, the exhaust fans are usually much more effective.

Next in the list of occupational hazards must be put those connected with cultivation. As in other modern agricultural establishments, free use is made of chemical fertilisers, which carry with them their usual danger to the user. Also, sometimes the tea bushes are attacked by pests, the remedy for which is D. D. T. In different parts of the country, different forms of D. D. T. are employed, sometimes a powder is used by dusting, sometimes a suspension as a spray. In the former case the dust may adhere to the worker's skin, setting up a contact dermatitis, or, if inhaled, it is liable to cause a rather persistent pharyngitis, which, however, subsides at the end of the dusting season. If, on the other hand, the suspension is employed, the emulsifier is also liable to give reactions among the workers, though, in my experience, these are less frequent than the reactions to the powder. Once again, protective clothing and masks may give protection, and in this case, the heating effect of the clothing is not so important as the dusting is usually carried out in the early morning.

In the past, it was the practice for the Company to procure the food grains required by the workers and to sell them at a special concession rate. This involved a further hazard for some of the workers as the ration store was always very dusty when the contents were being checked or distributed, and hence the Medical Officer had to be on the look-out for cases of contact dermatitis or asthma from this cause. Even today cases may arise on very isolated gardens where rations still have to be handled by the Company.

Another danger of this occupation, which, though rare, must be very carefully considered by the Doctor as endangering the patient's livelihood is that of photosensitivity due to drug reactions. I personally have seen two cases following sulphonamide therapy, fortunately on the management side, so that reasonable precautions could be enforced, but had the pluckers been involved, their co-operation would almost certainly have been lacking until great damage had been done.

DIABETES—ITS RELATION TO INDUSTRY

BY SAMUEL SOSKIN M. D.

Associate Clinical Professor of Medicine, University of California at Los Angeles

FROM the standpoint of industry, the question of the employment of the diabetic cannot be confined to a decision on whether it should hire individuals who admit to having this condition. When the attitude of the employer toward the diabetic is either unknown or is known to be adverse, he is faced by the likelihood of unwittingly hiring a certain number of individuals who can and will, for the time being at least,

conceal their diabetic condition. Furthermore, the incidence of the onset of diabetes in the general population of working age is such that any large employer must be prepared to deal with the question of what to do about a fair number of his employees in whom diabetes may become manifest weeks, months, or years after they are hired. Thus the statistician, Marks, has calculated that the chances of eventually becoming diabetic for men

(Continued from page 13)

Other jobs on the tea estate which must be listed as carrying some risk of the development of allergic reactions are the care of the factory machinery, the maintenance of the garden transport and the herding of the cattle belonging to the garden workers. I have not mentioned hay fever in any connection, but the position of this disease is probably too obvious for it to require special attention.

Treatment, fortunately, is usually fairly simple once the under-lying cause has been recognized and the worker withdrawn from exposure. Usually it is possible to find some alternative employment on the estate which does not adversely affect the patient, but sometimes considerable difficulty may be experienced in convincing the patient that he or she must take up a less remunerative work. This is particularly the case where a bonus for good plucking or overtime work in the factory has to be given up; but, as education spreads among the workers, so it is becoming easier to help them to understand their disabilities and to minimise them. Generally speaking, the management is most co-operative in helping to bring about the re-habilitation of the affected worker and also in investigating the cause of the trouble, so that others may, as far as possible, avoid it in the future. For example, it may be possible to improve the ventilation of a certain room to reduce the dust content of its atmosphere, but in such cases the doctor must use great tact, as it is obvious that a major reconstruction would only be considered where an appreciable danger existed, and a single case of asthma, say, would not justify any considerable expenditure.

Another way in which the doctor could help would be by excluding from engagement those who have a family history of allergy. In the majority of gardens, all new workers are sent for medical examination before being

signed on by the estate, and if at this stage those giving a hint of hypersensitivity in the family could be excluded, then it is reasonable to suppose that there might be a reduction in the incidence of allergic diseases.

In conclusion, I must strongly emphasise that such diseases constitute only a small part of the work of the tea garden Medical Officer, who has to spend most of his time dealing with illnesses such as malaria, dysentery, helminthiasis, bronchitis, influenza and so-called Naga sores. However, by the early recognition of cases of hypersensitization, he can practically eliminate quite an appreciable cause of chronic sickness. He should also remember that other ordinary illnesses may, in fact, have been brought on by occupational conditions. To give an example, I must quote a personal experience when I came across three cases of renal colic in about a fortnight. Here the predisposing causes were exertion in the heat leading to profuse sweating and dehydration, and the fact that the managers concerned did not carry water with them when they were away from their bungalows for long periods. Thus intermittent urinary stasis was set up.

I have personally seen many of the conditions listed during a comparatively short period on tea estates, and believe that others have had similar experiences. It would be of great value to all who work on tea estates if we could only get our individual experiences more widely shared. It is very good to know that a journal devoting its attention to problems of industrial medicine has been started, and I hope that all tea garden Medical Officers will be encouraged to submit their own personal observations on matters relating to their own industry, and will so find relief from the tedium of day-to-day routine. In this way, their work may indeed become their hobby, and true satisfaction their reward.

between the ages of 15 and 50 are about 22 per 1000, while for women in the same age range the chances are about 42 per 1000. Thus about one in 50 of an employer's present male employees and about one in 25 of his present female employees may be expected to develop diabetes at some time or other.

Refusal of employment because of his condition may be interpreted by the diabetic as an infringement on his inalienable rights to "life, liberty and pursuit of happiness". For our nation as a whole, any considerable degree of unemployment among diabetics would, of course, also represent a definite loss of manpower and productivity. Nevertheless, it is obvious that in our highly competitive and free-enterprise economy the employer has the right to and the need for obtaining satisfactory answers to three basic questions before establishing a mutually fair and reasonable policy regarding the employment of diabetic.

THE QUESTIONS ARE:

1. Do they make good employees from the standpoint of productivity, absenteeism, etc.?
2. If so, can they be employed in any capacity for which they are fitted by ability and training, without regard to the presence of diabetes?
3. If not, what considerations determine the capacities in which they should be employed?

The first question has been categorically answered in a recent statement by the Committee on Employment of the American Diabetes Association. It says that the experience of hundreds of companies employing them indicates that well-controlled and well-regulated diabetics, who keep themselves constantly under medical supervision make good employees. "Indeed, they are self-disciplined and well-balanced individuals, they often become outstanding workers in whatever positions they occupy". To this I might add, from personal experience with the diabetic employee, that the feeling engendered by non-prejudicial acceptance of his handicap is apt to make him an unusually hard working and loyal employee.

The Committee observes that a diabetic is well-controlled and well-regulated if the fasting blood sugar is not below normal limits and not above 150 milligrams per 100 cc. by the Folin Wu method, and if the patient is under regular medical supervision. However, it goes on to say that "although these or more nearly normal blood sugar levels are desirable, greater hyperglycemia

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alone, if not extreme or habitual need not be considered a disqualification for employment, in those cases where the patient's personal physician and the industrial physician both feel that other limits should be observed". In my opinion, the blood-sugar standard suggested by the committee is more theoretical than real, and more emphasis should be placed on their qualifying remarks. The degree of blood-sugar control which is desirable or necessary or possible in a particular diabetic is a highly individual matter: and such considerations as the absence of polyuria and polydipsia, the lack of evidence of dehydration and demineralization, the absence of recurring acidosis or of hypoglycemic episodes, and the demonstrated maintenance of constant normal weight and strength appear to me to be more important criteria than any arbitrary standards based on the blood-sugar level. These criteria are best evaluated for each individual diabetic, by the patient's personal physician and the plant physician acting in co-operation.

With the above criteria in mind, the answer to the second question can be simplified by dealing briefly with two categories of diabetics. The well regulated diabetic who requires no insulin for the control of his disease presents no special problem, and can be treated more or less as a non-diabetic employee. At the other extreme, the employer has every right and reason to refuse employment to un-cooperative and poorly regulated diabetics and to those who are not under regular medical care. This leaves us to deal with the more severe diabetics who require insulin as well as dietary regulation for the control of their disease, but who are well-controlled and under regular medical management. Such diabetics make good employees, when employed in suitable capacities and under appropriate conditions of work.

The general restrictions as to the nature of the employment suitable for the insulin-treated diabetic depend upon the fact that he must constantly maintain a mid-position between inadequate control of his diabetes on the one hand, and hypoglycemic reactions on the other hand. This is usually not difficult to accomplish when insulin administration, food intake, and physical exercise are routinized and are balanced against each other in a predictable fashion, day after day. Hence diabetics should work the same hours on a steady shift; or, if they must work on a rotating schedule, the "Graveyard shift" from midnight to 8.00 A. M. should be avoided. Furthermore the work should not entail emergencies which require the diabetic significantly to delay or omit an injection of insulin or a meal; and the

Occupations and Cigarette Smoking as Factors in Lung Cancer

By

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(This four-year study offers additional evidence tending to connect heavy cigarette smoking with cancer. In addition, it lists several occupations that seem to have some etiological relationship to the disease. They need further study, as it is suggested.)

THE sharp increase in lung cancer mortality constitutes one of the most spectacular disease phenomena of the past two decades. In the United States the age-adjusted mortality rate for lung cancer climbs from 2.7 per 100,000 population in 1930 to 11.0 in 1948, a more than four-fold increase. In at least one state, California, pulmonary cancer now accounts for more deaths than does pulmonary tuber-

culosis, and among males aged 45-64 it causes 4 percent of all deaths.

Attempts to explain this rising mortality as spurious, e. g., as due to improved diagnosis of the disease, do not stand up. The lung cancer death rate—which unfortunately is still our approximation of incidence rate—has increased two and a half times more rapidly

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work should not be so variable in its demands for physical exertion that it requires considerable muscular work on one day and little on another.

The particular jobs in a given plant that are suitable for the diabetic should be selected with regard to (a) safety to himself, (b) safety to others and (c) conservation of the employer's property. Because of the occasional occurrence of hypoglycemic reactions without warning, even in well-controlled diabetics, it is unwise to employ them on moving machinery which might be hazardous to the unwary operator, or to require them to work on platforms or ladders above the ground floor level. It should also be remembered that diabetics may have a somewhat greater than normal susceptibility to upper respiratory and skin infections. Hence one should avoid exposure to skin irritants, to dust-laden air, and to conditions leading to wet shoes or bruised feet, in order to minimize the possibility of preparing the way for boils and carbuncles, pulmonary tuberculosis or gangrene of the feet.

As regard safety to others, the chief hazards to be avoided are the operation of motor vehicles or other types of self-propelled machinery; and the placing of diabetics in positions of responsibility for the physical safety of others, where a momentary lapse in vigilance might result in disaster.

Similar considerations to those that apply to safety to others also apply to conservation of the employer's property. It is therefore not wise to entrust the diabetic

with the operation of trucks costing many thousands of dollars (particularly on long hauls), or with the operation of delicate machinery even if non-hazardous, if there are no automatic safeguards to prevent damage to the machine requiring costly repairs. This applies also to important control or monitor operations in which a brief lapse might result in the spoilage of considerable product. It should be kept in mind that the older diabetic, and even the younger diabetic of 15 to 20 years' duration, may suffer some loss of visual acuity (particularly in depth) and may also lose proprioceptive functions to some degree, before becoming aware of his short-comings.

However, all these restrictions that I have emphasized should not lead to the false impression that the usefulness of the diabetic in industry is sharply limited. For, despite these restrictions, the U. S. Civil Service Commission early in 1952 was able to compile a list of over 1200 positions in the Federal government for which diabetics were eligible. This list is not available in its original form, since only enough copies were prepared for inter-office use by commission personnel. However, the American Diabetes Association has published a shorter list of some 450 jobs constituting a careful selection from the total in the original pamphlet. It is, therefore, fair to conclude that the well-controlled and well-regulated diabetic under regular medical management can be a good and often is a valuable employee; and that such diabetics, when properly utilized, constitute a worthy section of the nation's manpower.

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among men than among women. One can hardly presume that physicians have applied diagnostic improvements so much more completely to men than to women. Likewise, the increasing proportion of lung cancer found as a cause of death among autopsies supports the conclusion that we are dealing with a real increase in the disease¹.

Environmental changes appear to offer the best explanation for the phenomenon. Previously published studies have implicated cigarette smoking²⁻⁵ and certain occupations⁶ especially those involving exposure to radioactive and chromate ores and asbestos in the causation of lung cancer. However, the number of persons known to have such occupational exposures in the United States is relatively small.

The present investigation was undertaken four years ago: (1) to determine whether any additional occupations might be involved in lung cancer and thus deserve intensive investigation, and (2) to obtain data on the role of tobacco usage in the lung cancer.

METHODOLOGICAL CONSIDERATIONS

Definitive study of whether an occupation or cigarette smoking is a causative factor in lung cancer requires that the incidence rate for the exposed group be determined. This rate is then compared with that of a control population, the most acceptable control being all the rest of the population from which the exposed group came. Assuming the same diagnostic and reporting standards for both groups, one may thus determine how a member of an exposed group will develop the disease if he were not a member of the exposed group. If the likelihood of developing lung cancer is substantially increased by being in the exposed group (e. g., a certain occupation) one may conclude that the exposure is a causative factor in the disease. The key to this analysis lies in determining comparative incidence rates for a suspect group and a control population.

But first it is necessary to identify suspect exposed groups. That was the aim of the present study. The importance of pin pointing these groups arises from the fact that incidence studies require assembling sizable populations and observing the occurrence of the disease in them—a large and expensive task. If, for example, data were obtained implicating occupations beyond those already known to be causative factors in lung cancer, one would be justified in assembling populations of the occupational groups and observing them for lung cancer incidence rates—a study which would develop more

definite proof of the presence or absence of an etiological relationship.

Several methods of investigation have advanced our knowledge in this sphere. First, is clinical observation of association between a case or a few cases of lung cancer and some exposure, e. g., asbestos. One defect of this method is that such clinical observation depends largely on chance and often involves such small numbers of cases that the validity is questioned. Where made, of course, such observations are helpful.

Another common method of identifying suspect occupations in a highly fatal disease, such as lung cancer, is to note the frequency of the various occupations on death certificates where the disease appears as the cause of death. The frequencies of the occupations on such death certificates may then be compared with those on all death certificates for the general population. If certain occupations appear with much greater frequency on death certificates for lung cancer than on certificates where death is due to other causes, one may conclude that the occupation may be involved and should be intensively investigated. Important achievements may be credited to the use of this method. However major difficulties with this use of death certificate data arise from the following circumstances: only one occupation may be recorded: while this is supposed to be the "usual occupation" it is often not correctly recorded and duration in the occupation is not recorded. All these circumstances tend to blur the identification of suspect occupations from death certificates.

The method selected in the present study was to determine the lifelong occupational and tobacco-usage history of lung cancer patients (and a control group) by actual interview with the patients. The work history included the number of years engaged, name of company, industry, a description of duties, and listing of products and hazardous materials known to the patients.

DATA COLLECTION

Patients observed during 1949-1952 in eleven California hospitals (three county general hospitals, 5 veteran or military, two university, and one private hospital) comprised the study group. An interviewer especially qualified in occupational analysis obtained the data from each patient in the co-operating hospitals whose condition permitted the interview. The session with each patient often lasted two hours or more, since many details about smoking were obtained and the information about every occupation was highly detailed.

A total of 518 patients who finally had histopathologically proved diagnoses of lung cancer were ultimately included in the analysis.

For every patient in the case series another patient admitted to the hospital about the same time — of the same age (within five years), sex, and race — for a condition other than cancer or a chest disease was chosen in a random manner, as a matched “control”. Two interviewers, one working in Northern California and one in Southern California Hospitals, obtained the data from the lung cancer patients and control patients using the same schedule in identical manner. That interviewer bias did not enter into the determination of tobacco-usage history seems likely, among other reasons, because the results closely parallel those obtained in other investigations where such bias apparently was excluded, and because the results for the two interviewers were very similar. It is difficult to conceive how interviewer bias might have affected the occupational data, since both lung cancer patients and control patients mentioned hundreds of occupations and none of these was suspected by the interviewers. Preliminary findings were kept from the interviewers until the end of the data collection.

METHOD OF ANALYSIS

Each record was reviewed by a Physician, particularly with respect to the pathological diagnosis. An industrial

hygiene chemist completed the listing of materials usually involved in the occupations mentioned by the patients but not necessarily known to them. Thereafter, the data were coded and tabulations prepared.

Attempts to analyze the data concerning type of industry and exposure to materials already identified as toxic or carcinogenic did not prove fruitful. Hence the major analytical effort with respect to work history went into the data on occupation itself. This had been coded according to the Dictionary of Occupational Titles (2nd edition, 1949), prepared by the Division of Occupational Analysis, U. S. Employment Service, a code with 367 three digit titles. Particular attention was devoted to the question of years of exposure because present knowledge of carcinogenesis due to environmental agents indicates the duration of exposure and a long latent period or critical factors.

Data on tobacco usage were analysed so as to reveal the type and degree of smoking, as well as the fact of smoking itself.

Finally, an attempt was made to separate the effects of tobacco usage and occupations which appeared implicated.

Table 1 — Age Distribution of Lung Cancer Patients and Controls

Age	Cases			Controls
	Adeno. Carcinoma	Other types of Carcinoma	Total	Total
Total	46	472	518	518
Under 40	3	22	25	26
40-49	6	56	62	59
50-59	19	194	213	213
60-69	14	154	168	169
70 and Over	4	46	50	51

Table 2 — Sex and Race Distribution of Lung Cancer Patients and Controls

Sex and Race	Cases			Controls
	Adeno. Carcinoma	Other Types of Carcinoma	Total	Total
Total	46	472	518	518
Total male	42	451	493	493
White	41	420	461	461
Negro	..	20	20	12
Other	1	11	12	12
Total female	4	21	25	25
White	3	15	18	18
Negro	1	3	4	4
Other	..	3	3	3

FINDINGS ON SMOKING

Tables 1 and 2 reveal the distribution of the lung cancer patients according to their biological characteristics-age, sex, race, and the essential similarity of the matched control series in respect to these characteristics.

Tobacco usage by lung cancer patients and the control group is shown in Table 3. Here one may note that 484 (93 per cent) of the cases gave histories of having

smoked cigarettes; where as only 394 (76 per cent) of the controls gave a similar history. No such greater frequency of tobacco usage in other forms (pipe, cigar, chew, and snuff) occurs among the lung cancer patients when compared with the control group. In fact, 68 of the control group used tobacco in a form other than cigarettes exclusively; whereas only 15 of the lung cancer patients did so-relative frequencies which are not much different for the non-users of tobacco in the two series.

Table 3 — Tobacco Usage during 20 Years prior to Study Reported by Lung Cancer Patients and Controls

Manner of using Tobacco	Cases			Controls
	Adeno-carcinoma	Other Types of Carcinoma	Total	Total
Total	46	472	518	518
Total not smoking Cigarettes	6	28	34	124
No use of Tobacco	4	15	19	56
Tobacco other than cigarettes, only	2	13	15	68
Total smoking Cigarettes	40	444	484	394
Cigarettes only	31	298	329	240
Cigarettes and other	9	146	155	154

Table 4 — Amount of Cigarette Smoking during 20 Years prior to Study Reported by Lung Cancer Patients and Controls

Packages of Cigarettes Smoked per Day	Cases		Controls	
	Number	Per cent	Number	Per cent
Total	518	100	518	100
Nonc	34	7	124	24
1/2	19	4	50	10
1/2 —	71	14	105	20
1 —	304	59	199	38
2 or more	80	15	22	4
Not recorded	10	2	18	3

This suggestion of an effect by cigarettes only is consistent with other investigations in the field. Some support for the hypothesis that cigarette smoking affects the development of epithelial carcinoma of the lung more than adenocarcinoma may be noted. Six out of 46 (13 per cent) of the cases of adenocarcinoma did not smoke cigarettes; whereas only 28 out of 472 (6 per cent) of the patients with other types of carcinoma, described variously as squamous, epithelial, undifferentiated, did not smoke cigarettes.

One commonly used measure of the amount of exposure to cigarette smoking, the average number of

packs smoked per day appears in Table 4. Seventy-four percent of all lung cancer patients reported smoking one or more packs of cigarettes on the average per day over the preceding 20 years, compared with a frequency of only 42 percent among the controls. “Excessive cigarette smoking” (two or more packs per day) occurred almost four times as commonly among the case series as among the control group.

Other items which may indicate the amount of cigarette smoking include the age at which the individual began smoking, whether or not he smokes before breakfast, and whether or not he “inhales”. Table 5

reveals that, by all of these criteria, the lung cancer patients smoked cigarettes to a greater extent than did the control group. Also, approximately two-fifths of the lung cancer patients stated that they had had a "cigarette cough" usually antedating the onset of their illness by many years; 120 said that they had a cough for five years or more. The frequency of such "cigarette cough" was only about one-half as great among the control and only 39 of the control patients indicated that their cough had lasted five years or more.

Table 5—Age of Beginning Cigarette Smoking, Smoking Habits and "Cigarette Cough" reported by lung cancer Patients & Control

Cigarette Smoking Characteristics	Number	Cases		Controls	
		Per cent Bases on Cigarette Smokers Only	Per cent Based on Total	Number	Per cent Based on Cigarette Smokers Only
Total	518	..	100	518	..
Total Cigarette Smokers	484	100	93	394	100
Began 15 years of age	166	34	32	116	29
Began 15—24	286	59	55	243	62
Began 25 years of age	32	7	6	35	9
"Inhale"	449	93	87	327	83
"Smoke before breakfast"	373	77	72	229	58
"Cigarette cough"	204	42	39	112	28

One can hardly escape the conclusion of Doll and Hill that "smoking is a factor and an important factor in the production of carcinoma of the lung", and the more recent conclusion of Doll "The results amount, I believe, to proof that smoking is a cause of bronchial carcinoma"

The cigarette smoker or prospective cigarette smoker may wish to know how much his chances of developing lung cancer are increased by such smoking. Acknowledging that a correlation exists one may still inquire how many times does cigarette smoking increase the likelihood of lung cancer? Further what is that likelihood in absolute terms? To answer these questions definitely would require that records of cigarette smoking for large numbers of persons in the lung cancer age be assembled. These persons would then be placed in categories with respect to cigarette smoking e. g., non-smokers, moderate smokers, and heavy smokers. Finally they would be observed for a sufficient length of time to determine the rate of lung cancer among the various categories of cigarette smokers and the non-smokers. (such studies are now under way).

However, statistical devices have been developed for data such as those in the present investigation which, if

SIGNIFICANCE OF FINDINGS ON CIGARETTE SMOKING

The data clearly show cigarette smoking to be more frequent and intense among lung cancer patients than among the control group. Our data parallel that of other recent, well controlled studies, all indicate a positive covrelation between cigarette smoking and lung cancer, a correlation which increases steadily with the amount of cigarette smoking.

one is willing to make certain assumptions, yield an answer to the question, how many times does cigarette smoking increase the likelihood of lung cancer? Application of Cornfield's formula to the data from four studies, including the present one (Table 6), indicates that for men aged 50-59 the prevalence of lung cancer is from four to 11 times as great among smokers as among non-smokers and from seven to 27 times as great among heavy smokers as among non-smokers. Similar ratios were found for the 60-69 age group. This formula involves the assumption that in so far as smoking history is concerned, the patients are a representative sample of all lung cancer cases and the controls are a representative sample of all other persons in the general population.

FINDINGS ON OCCUPATIONS

As noted earlier, the records for lung cancer patient and controls showed all occupations followed and their durations in years. A listing was prepared of the occupations pursued by at least five patients or controls for five years or more. This listing revealed 81 occupations in this arbitrary frequency-and-duration category.

Table 6—Estimated Prevalence Rates* of Lung Cancer per 1000,000 Males of Selected Ages & Various Cigarette Smoking Habits

		Number		Estimated Prevalence Rates Quantity Smoked Daily			Relative Prevalence	
		Lung Cancer	Control	Heavy **	All Quantities	None	Heavy	All Quantities
Patients aged 50-59 Years								
1.	Doll and Hill	276	275	94	42	7	13	6
2.	Wynder & Graham	258	210	117	47	4	27	11
3.	Sadowsky, Gilliam and Cornfield	198	208	87	44	12	7	4
4.	Present	213	213	102	46	6	17	7
Patients aged 60-69 years								
1.	Doll and Hill	197	199	137	63	0	..	..
2.	Wynder and Graham	187	160	138	70	5	29	15
3.	Sadowsky, Gilliam and Cornfield	76	71	44	71	5	9	4
4.	Present	168	169	433	78	17	25	5

Table 7 presents a random sample of these occupations and the number of patients and controls who at some time during their work history had been engaged in them for five years or more. It will be noted that among the 518 lung cancer patients seven had worked as authors, editors, or reporters (occupation) for five years or more, and among the 518 controls, nine had been similarly engaged. Relative frequencies of occupation would appear to have the same logical significance as such frequencies of cigarette smoking. The latter is, of course, much more common among both case and control groups that is any single occupation. Hence, the numbers pertaining to any one occupation would be less impressive than in the case of cigarette smoking. However the frequency with which the lung cancer patients had pursued certain occupations was substantially greater than the frequency with which control patients had pursued these same occupations.

The occupations for which the frequency among cases was atleast twice as great as among controls, using the same frequency-duration category as before, appear in Table 8. Such a tabulation, of course, shows the occupations classified according to an arbitrary code which was not devised to reflect common occupational

exposures that might be responsible for lung cancer. Further analysis therefore included the detailed examination of records of individual cases and controls and regrouping of occupations according to possible common exposures. For example, one occupational group, number 530 (plumbers, gas fitters, and steam fitters) showed 16 cases and 10 controls with a five-year employment history. Examination of these 26 individual records revealed that substantially all the difference between case and control series was due to the steam fitters who had a heavy exposure to asbestos. It was also noted that other types of work involving asbestos occurred more frequently in the employment history of cases than among the employment history of controls. Thus, a new category, including steam fitters, asbestos workers, and boilermakers—all involving exposure to asbestos—was found to occur 10 times among the cases and only one time among the controls.

Table 9 presents the data for occupations grouped according to possibly significant exposures. Although numbers in each of the categories are small, the differences between cases and controls appear to implicate the occupations listed.

Table 7—Twenty Per Cent Sample from complete list of Occupational Groups in Which There Were at Least 5 Cases or 5 controls Employed for 5 years or more

Occupation	Persons Employed in Occupation at Least 5 years	
	Cases	Controls
006 Authors, editors & reporters	7	9
088 Ship captains, mates, pilots and engineers	8	8
105 Clerks, general office	2	8
155 Canvassers and solicitors	3	11
180 Salesmen to consumers	7	4
227 Waiters & waitresses except private family	14	10
266 Policemen & detectives, public service	6	3
307 Animal & livestock farmers	6	5
317 Farm hands, animal & livestock	10	10
433 General woodworking occupations not elsewhere classified	8	7
516 Painters, except construction and maintenance	3	6
524 Brick & stonemasons & tile setters	5	1
532 Construction occupations not elsewhere classified	45	25
542 Locomotive firemen	3	6
560 Attendants, filling stations and parking lots	10	9
583 Mechanics & repairmen, not elsewhere classified	15	16

Table 8 — Occupation Groups in Which the Frequency of 5 Year Employment Among Cases Was at Least Twice as Great as Among Controls.

Occupation	Persons Employed in Occupation at Least 5 Years	
	Cases	Controls
016 Engineers, civil	5	1
138 Stock clerks	7	3
266 Policemen and detectives, public service	6	3
430 Lumbermen, raftsmen and wood choppers	11	5
478 Machine shop and related occupations not elsewhere classified	8	3

Table 8 — Occupation Groups in Which the Frequency of 5 Year Employment Among Cases Was at Least Twice as Great as Among Controls.

Occupation	Persons Employed in Occupation at Least 5 Years	
	Cases	Controls
485 Welders and flame cutters	10	1
520 Occupations in production of petroleum	5	2
523 Construction machinery operators, not elsewhere classified	7	3
524 Brick and stonemasons and tile setters	5	1
538 Brakemen, railroad	10	2
570 Firemen, other than process firemen	11	2
573 Cranemen, derrickmen, hoistmen and shovelmen	15	6
575 Drillers, extraction of minerals and construction	7	2

Table 9 — Cases and Controls Employed for at Least 5 Years in Selected Occupation Groups.*

Occupation	Persons Employed in Occupation at least 5 years.	
	Cases	Controls
1. Welders and sheet metal workers doing welding	14	2
2. Steam fitters, boilermakers and asbestos workers	10	1
3. Electric bridge crane operators — metal industry	5	1
4. Occupations in the extraction of lead, zinc and copper ore	9	3
5. Marine engineers, firemen, oilers and wipers	12	6
6. Construction and maintenance painters	22	12
7. Cooks, commercial (excluding cannery cooks)	35	21

* Occupation groups based on regrouping according to common occupational exposures after detailed examination of records.

Table 10 — Example of Adjustment for Smoking Applied to Welders and Sheet Metal Workers Doing Welding.

		Packages of Cigarettes Smoked per Day						Total
		None	$\frac{1}{2}$	$\frac{1}{2}$ —	1—	2 or more	Not re-corded	
ALL cases and Controls								
male*	1. Cases	22	16	69	296	80	10	493
	2. Controls	110	45	105	193	22	18	493
	3. Total	132	61	174	489	102	28	986
	4. Proportion of cases among total cases & controls	0.167	0.263	0.396	0.605	0.783	0.357	
Welders and sheet metal workers doing welding								
male	5. Cases	0	0	2	11	1	0	14
	6. Controls	1	0	0	1	0	0	2
	7. Total	1	0	2	12	1	0	14
	8. Expected number of welder cases **	0.167	0.0	0.792	7.260	0.783	0.0	9.002

Expected proportion of cases among welders = $\frac{9.002}{16} = 0.563$.

Observed proportion of cases among welders = $\frac{14}{16} = 0.875$.

Ninety-five per cent confidence limits for the proportion $\frac{14}{16} = (0.617, 0.984)$ —Statistically at 95 per cent level.

* Females excluded from total group, since only males are included in groups to which the test was applied.

** Obtained by applying the proportion of cases among total cases and controls in each smoking category to the number of welders in that smoking category. (Line No. 4 > line No. 7.)

Note: This test also was applied to all other occupation groups shown in Table 9. The group "steam fitters, boilermakers, asbestos workers" was on the borderline of statistical significance at the 95 per cent level. None of the other groups met the 95 percent level of statistical significance.

It is of interest to note that several of those with the most striking differences involve exposure to metallic particles and fumes and products of metallic combustion. This observation tends to corroborate the suggestion of Wynder and Graham that "hot metal" occupations may be involved in lung cancer.

In recent data of Doll the only occupation with an important excess in the cancer group was that directly concerned with the production of gas. Little or no support was found indicating that other occupations suffer special risks. However, Doll's study was based

upon experience in England where the employment pattern differs from that in the United States, especially California. Also, Doll used an occupation code of only 76 categories which may have been too coarse to reveal the differences found in the present investigation where a code of 367 categories was used and analysis carried to subgroupings of these.

It may be noted that 77 persons with lung cancer had an exposure of more than five years to suspect occupations (unduplicated count in seven occupation groups) according to the data in Table 9. This number

represents a not insignificant proportion of the total (518) lung cancer patients in the entire study.

A further question upon which the present data might be expected to throw some light is the extent to which cigarette smoking and occupations operate as separate factors in lung cancer. For example both cigarette smoking and welding appear to be related to the disease, but do welders get lung cancer more frequently merely because as a group they are heavy cigarette smokers? Although data from the present study involve small numbers for many of the occupations, analysis does indicate that welding as an occupation operates as a factor distinct from cigarette smoking in relation to lung cancer (Table 10). The group of steam fitters, boilermakers, and asbestos workers lies on the borderline of statistical significance when the effect of cigarette smoking is controlled. In the other occupational groups the numbers are such that the differences might arise from chance variation more than five times in a hundred.

However, all the occupations listed in Table 9 deserve intensive study determine their precise relationship to lung cancer.

One important step is to assemble populations of individuals employed in these occupations, and with varied smoking histories, in order to observe their lung cancer incidence rates. These rates may then be compared with the rate for the corresponding age-sex group in the general population. One may thus determine how being in a particular occupational group affects the chances of developing lung cancer and likewise how cigarette smoking modifies these chances.

CONCLUSION

The data in this study constitute still another link in the chain of evidence connecting lung cancer with cigarette smoking evidence, which the New England Journal of Medicine notes to be "so strong as to be considered proof within the everyday meaning of the word". It is time for those concerned with health education and with the ethics of advertising, at least in health and medical journals, to take note. Further investigation should seek the exact component of cigarette smoke—tar, arsenic, or other—which is responsible.

The data also suggest that several occupations (table 9) in addition to those previously identified as having an etiological relationship, may be involved in the development of lung cancer. These occupations should now

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be intensively studied to determine to what extent persons engaged in them suffer a special risk of lung cancer. Thereafter, if an etiological relationship is clearly established, the precise exposure and mechanism responsible should be identified in order that protective measures may be introduced.

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OCCUPATIONAL LOSS OF HEARING

A Report of the Committee of Consultants as presented to
The Workmen's Compensation Board of the State of New York

INTEREST is widespread in the workmen's compensation problems that are associated with so-called occupational loss of hearing, that is loss of hearing not casually related to a single work accident but casually related to an injuriously noisy work environment. These are not the problems of workmen's compensation in New York State alone. Several states share our concern and have a like need to find answers to vexing questions basic to the determination of workmen's compensation cases where occupational loss of hearing is claimed.

It is important that there should be clear standards by which the degree of noise exposure in a work environment may be shown. Equally important are standards for determining whether hearing impairment is permanent or temporary, and if permanent, what part of the impairment is caused by the injurious noise exposure.

Current concern in these problems stems from a decision of the New York State Court of Appeals in 1948. That was the claim of SLAWINSKI vs. Williams & Co., (298 N. Y. 546), in which a schedule award of workmen's compensation benefits was affirmed, based on a permanent hearing impairment found to be caused by injurious exposure in a noisy work environment.

Six months after the decision was handed down in the SLAWINSKI case, the Court of Appeals in another case, ROSATI v DESPATCH SHOPS INC. (298 N. Y. 813), affirmed another schedule award for permanent hearing impairment caused by injurious noise in the work environment.

Slawinski worked in the forge department of his employer's factory on heavy machine hammers of which

there were approximately 100 in the room where he worked. Rosati was a riveter in a steel plant, and had worked there for 27 years.

Two other occupational loss of hearing cases have been decided by New York courts. One is RUSSO v Despatch Shops, Inc. (280 App. Div. 1008, 1030), in which the issue was not as to Russo's right to a schedule award for permanent impairment of hearing, but solely as to which of two carriers for the employer was to be charged with the liability. The other is GABOR v American Magnesium Corporation (275 App. Div. 1014), in which permanent impairment of hearing was not claimed, but there was a temporary disability from tinnitus (buzzing and ringing in the ears). Award for a short period of temporary partial disability was affirmed by the court. Gabor worked as a rotary filer in a room where 80 men did similar work.

As a result of these decisions, claims for awards have been filed with the Board in considerable number by claimants who allege permanent impairment of hearing from an injuriously noisy work environment. The Board, therefore, must have certain standards by which to apply to a variety of different situations the principles that have been laid down by the courts. Granted that hearing is impaired, questions arise on other employments than those which the courts has already considered, as to the kind and degree of noise and the work environment that create an injuriously noisy work exposure, and as to the proper standards by which permanency of hearing impairment may be ascertained and how its degree should be evaluated, to mention just a few of the several problems that face the Board and its Referees in the occupational loss of hearing cases.

(Continued from page 24)

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Those are problems to which scientific and medical associations have not yet themselves found complete answers, although much research and study are currently in progress. Accordingly, in September, 1952, in an effort to find standards by which evidence in loss of hearing cases ought to be evaluated and in order to determine the obligations of employers and the rights of employees, the Board constituted a Committee of technical experts as consultants in the problems of industrial noise and the permanent effects on hearing of work in noisy environments. To this Committee the Board referred a series of questions. These are questions to which it seemed desirable to have careful answers, in order that case records could be developed with appropriate evidence and the determinations made that underlie award decisions. Committee members were selected for eminent attainment and experience in the field of otology and injurious noise exposure. Designated as Chairman was Dr. Stacy R. Guild, of Baltimore Maryland, and others were Dr. Gordon D. Hoople, of Syracuse, Dr. Otto C. Kisch, of New York City, Dr. Joseph C. Serio, of Buffalo. The Chairman and Drs. HOOPLE and RISCH were selected by the Board. Representatives of employers and workers were requested to nominate one member each to the Committee, and Dr. Nash and Dr. Serio were so designated. Those experienced in workmen's compensation will appreciate that the questions submitted to this Committee were designed to elicit practical answers for the guidance of the Board and its Referees. Unlike the learned societies, our problem is not the development of scientific literature in the field, as much as it is the development of standards for weighing evidence and adjudication claims.

Notwithstanding differences of experience and view point, it is gratifying to record that the members of the Committee were unanimous in their report. Because under the New York law a considerable responsibility for administration rests on carriers, this report is made available to them in the hope that it may be helpful.

Inevitably, during the period in which the Committee consultants have been discussing the problem and preparing their report, a number of claims have accumulated awaiting completion of claim records. Calendars are now being established so that these cases may move forward as speedily as evidence is presented, and closed with proper decision in each case. Those concerned with these claims, both on behalf of claimants and carriers will greatly assist themselves and the Board if they will see that the record in each case is developed with such evidence as the Committee report indicates is

pertinent with respect to the particular issues underlying cases of this type.

In-as-much as there will continue to be for some further period of time the need to review problems in the light of scientific progress in the field, the Committee is being continued.

—Mary Donlon, Chairman,
Workmen's Compensation Board,
New York State.

Your Committee of Consultants, appointed to consider the problems raised by industrial noise, respectfully submits the following report:

The Committee members, without exception, agree that the problems raised by industrial noise are important, and that solutions to these problems are needed quickly because numerous claims for compensation awards, for hearing losses allegedly due to occupational exposures to noise, are pending settlement.

The Committee also realizes that factual evidence is as yet insufficient to support precise answers to certain of the questions, you have asked. The answers to these questions, which will be designated, therefore amount only to the present best judgments of the members of the Committee. The Committee expresses the hope that all parties concerned with the answers in question will recognise their limitations, with respect to degree of precision, and will be prepared to accept, without prejudice, such modifications of the answers as may be indicated whenever better factual information on the topics is acquired.

QUESTION 1

Under what circumstances does a noisy industrial environment present an occupational loss of hearing hazard?

QUESTION 1 (a)

What number of decibels constitutes an occupational hazard?

ANSWER TO QUESTION 1 (a)

The evidence is not yet sufficient to support a precise answer, in terms of decibels or of other quantitative units. Reasons for the lack of observational data suitable for the



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establishment of safety standards for industrial noise are given in a recent paper by a member of your Committee. The best answer that can be made to this question at the present time must therefore be in qualitative, rather than in precise, terms.

In the opinion of your Committee, the following statements constitutes a fair summary of the present status of knowledge with respect to this important question:

Some persons are more susceptible than are others to the injurious effects of noise on hearing. The proportion of persons who are especially susceptible is not known.

Noises differ from each other in "composition" as well as in intensity. Noises of the same "over-all" intensity (as measured with a standard sound level meter using the "flat" network) may differ markedly in the damage caused to hearing. High-pitched sounds are in general more injurious to hearing than are low-pitched sounds of the same physical intensity. The amount of the difference between the injurious effects of even two noises, of the numerous different industrial ones has not been established.

The longer a person is exposed to a noise which is, for that person, of a potentially injurious intensity, the greater is the probability that a permanent hearing loss will occur. The more intense the noise, the shorter is the time in which it may cause permanent damage to hearing.

What is known qualitatively about the above stated three important factors makes it seem probable to your Committee (1) that most persons exposed for several hours daily to noises at intensity levels above 120 decibels, whatever the "composition" of the noise, will in a matter of months suffer permanent damage to hearing; (2) that for most industrial noises at "over-all" levels of 100 to 120 decibels, exposure for several hours daily for a long period of time will cause permanent damage to hearing in a considerable proportion of persons, the proportion being higher the more closely the noise approaches the intensity level of 120 decibels and the more the noise is dominated by high-pitched components; and (3) that the hearing of a few very susceptible persons may be permanently damaged by exposure for many years to certain noises at levels between 90 and 100 decibels. All decibel levels mentioned are based on the standard reference level of 0.0002 dynes per square centimeter.

QUESTION 1 (b)

What effect on (a) above, has distance from the source of the noise?

ANSWER TO QUESTION 1 (b)

Under acoustically ideal conditions, with no reflecting or absorbing surfaces of any kind, distance from the source affects the intensity of a sound in accord with the so-called inverse-square law for any radiant form of energy; i. e., the intensities of the sound at two different distances from its source are inversely proportional to the squares of the respective distances. This ratio is the logical consequence of two facts: (1) a sound wave, when not reflected or absorbed, spreads out evenly in all directions and has its acoustic energy at any instant distributed equally over all units of the surface of the sphere whose radius is the distance to which the wave has then travelled from its source; and (2) the surface of any sphere is in proportion to the square of its radius (the formula for the surface of a sphere, in terms of its radius, is $4\pi r^2$). Under ideal conditions, therefore, the pressure exerted by a noise on a unit of area, such as a square inch, is at a distance of 20 feet from the source, for example, one-one hundredth of that at 2 feet from the source, instead of being the simple inverse ratio of the two distances, namely one-tenth. In terms of decibels, which are based on logarithmic instead of on arithmetic ratios, it may be noted that a drop to one-one hundredth in level is equivalent to a decrease of 20 decibels, and that a drop to the level of one-one-thousandth (in the example used above, this drop would occur at a distance of somewhat more than 63 feet) is equivalent to a decrease in intensity of 30 decibels.

In industrial situations, the acoustically ideal condition for uniform spread of a sound from its source is never encountered. Walls, floors, ceilings and other surfaces reflect the sound waves, thus increasing the total intensity within the room; barriers may deflect the direct travel of a sound to certain areas, clothing and other soft materials absorb an appreciable proportion of the sound waves, etc. Simple calculations of the effect of distance on intensity, based on the inverse-square law, therefore often yield grossly erroneous results. By complicated procedures that take into account the numerous factors of reflection and absorption of sound in a given situation, it is theoretically possible to calculate with a reasonable degree of accuracy the relative intensities at different locations in a factory, of a sound from a given source. The only practical method,

however, to determine the effect of distance on sound intensity in an industrial situation (either inside or outside a building) is to measure with a sound level meter the intensities present at the different locations of interest.

QUESTION 1 (c)

What effect on (a) above, has continuity of noise as contrasted with intermittent, recurring or sporadic noises?

ANSWER TO QUESTION 1 (c)

Continuous exposure, during each workday, to a noise of a potentially injurious intensity without doubt causes more damage to hearing than does intermittent or an occasional exposure to the SAME noise. Only in case the intervals between the bursts of noise are extremely brief does the above statement not hold; in such cases the effect on hearing is probably the same as is that of the continuous noise.

The noises created by trip hammers, drop hammers, punch presses etc. are sometimes referred to as "sporadic". When that is the usage of the word, consideration must be given to the fact that measurement of the peak intensity of such sounds is difficult because of the sudden onset and brief duration. The peak intensities of such sounds may be extremely high compared to the average intensity of each of the "Sporadic" bursts of noise; and the injurious effects of such sounds may well be due to the effects of the peaks (each of which may be similar to the blast from a small detonation) on hearing, rather than to the average level of the sound, or to its intermittent character.

QUESTION 1 (d)

Which test is most suitable, for workmen's compensation purposes to measure noise hazard in the work environment?

ANSWER TO QUESTION 1 (d)

The only practical method by which industrial noises can be measured with a degree of accuracy sufficient for workmen's compensation purposes is a sound level meter. Several firms make acceptable sound level meters. All of the instruments are far from being "fool-proof," and probably always will be. Some of the pitfalls that may be encountered in the use of these delicate instruments and potential causes of seriously

erroneous data are well described in a recent paper by Williams and Cox. Sound level meters yield reliable measurements only when they are properly used by persons specially trained for the purpose.

For workmen's compensation purposes, your committee regards it as extremely important that the "composition" of each industrial noise, as well as the "over-all" level of intensity, be determined. In other words, so-called band analysis should be made to determine the intensities of each of the several components of the noise. To do this, accessory apparatus must be used with the sound level meter. Such apparatus is commercially available. To provide sufficient information for workmen's compensation purposes, the accessory apparatus should be capable of providing an analysis of the noise by "octave bands". In special circumstances the use of bands narrower than an octave may be desirable, for correlation with the hearing losses caused by the noise in question.

QUESTION 2

What period of time away from noisy environment is necessary before accurate appraisal of permanent hearing loss can be made?

ANSWER TO QUESTION 2

The evidence that has been obtained until now either in New York State or elsewhere, so far as the members of your Committee have been able to ascertain, is not sufficient to support a precise answer to this question.

In the opinion of your Committee, a satisfactory answer to this question cannot be made until such time as a carefully conducted research investigation has made available for study the records of at least 100 persons with occupational deafness of considerable degree each of whom had at least three reliable examinations of hearing made while still working in the noisy surroundings believed responsible for the loss of hearing, with the last of the three examinations made within a month of the cessation of the exposure, and each of whom had, during the first month after ceasing to be exposed to noise, examinations of hearing at approximately weekly intervals, followed by examinations at monthly intervals for the remainder of a year after final exposure to the injurious noise.

Because of the practical importance of this question and the unsatisfactory amount of factual information on the subject, your committee urges that encouragement be

given, by the Board and by others, to efforts to obtain research data of the type outlined in the above paragraph.

Until such time as the above discussed research evidence is available on which to base a precise answer, your Committee is of the opinion that the present policy of the Board in this matter should be continued, namely, that appraisal of permanency of an occupational hearing loss be made after an interval of not less than six months after the cessation of exposure to the injurious noise.

The Committee further recommends that no settlement of a claim be made unless the hearing loss has become stabilized, and believes that, if hearing has changed since cessation of exposure to noise, determination of stabilization should be based on a minimum of three examinations made at least one month apart.

For answering Questions No. 3 and No. 4 are combined, and No. 4 is answered first because the answer to it strongly affects the answer to part (a) of No. 3.

QUESTION 4

What is compensable hearing loss: i. e., hearing loss as to high frequency sounds, or ordinary speech sounds, etc.?

ANSWER TO QUESTION 4

In the opinion of your Committee, the ability to understand speech is, for almost all persons, the aspect of the hearing function of most importance in everyday social and economic activities, and therefore it should be the basis for compensation awards in cases of occupational deafness. Losses of hearing for the tones of high frequency that do not affect the understanding of speech should be given consideration, in the making of awards, only in those rare instances in which the claimant has customarily worked at tasks for which good hearing for tones of these high frequencies is a prerequisite for employment.

QUESTION 3

Measurement of hearing loss. Question 3 (a) What type of test is most suitable for workmen's compensation purposes to determine the percentage of hearing loss?

ANSWER TO QUESTION 3 (a)

The logical consequence of the answer to Question 4, above, is that the test "most suitable for workmen's

compensation purposes" is, theoretically, a direct examination of the ability to understand speech. Your Committee wishes that it were possible at the present time to recommend to the Board some specific method of direct testing of the ability to understand speech, for adoption and use routinely in its determinations of compensation awards for occupational deafness. At the present time, however, the factual circumstances do not warrant making such a recommendation.

Instead, your Committee recommends that until such time, in the future, as a practical and accurate method of direct testing of the ability to understand speech and of *conversion of the observations into percentages of disability* has been approved by national organizations of otological specialists and has become accepted and used by practicing otologists of the State of New York, the Board should continue to use, for workmen's compensation purposes, the methods in current use, in each community, of calculation from pure-tone audiograms, of the ability to understand speech.

Your Committee regretfully recognizes that none of the methods of calculation now in use is wholly satisfactory, that each method yields at best only a rough approximation of the percentage of the disability suffered by a person with occupational deafness, and that as a consequence it will probably be necessary, in numerous instances, to continue to adjudicate claims for awards on the basis of practical compromises between the several items of available evidence with respect to actual ability to understand speech.

QUESTION 3 (b)

Should evaluation be given to the age factor in fixing percentage loss of hearing due to work hazards?

ANSWER TO QUESTION 3 (b)

Without doubt, the ability to hear declines with advancing age, even in persons who are not chronically exposed to industrial or to other loud noises. The rate of decline is not the same in all persons, but in the vast majority of persons the "normal" decline in hearing during the first five decades of life is limited to losses for tones so high in pitch that the loss does not affect the ability to understand speech. After the age of 50 years the "normal" losses often begin gradually to involve hearing acuity for tones in so called speech range of frequencies.

The evidence with respect to the "normal" loss of hearing with age (so-called presbycusis) is sufficient, in

the opinion of your Committee to warrant the following recommendation:

A proper allowance for "normal" aging effect on hearing is 0.5% for each year that a person is older than 50 years: below that age no allowance for the "normal" loss of hearing.

Because, for any given individual, the recommended allowance is only an approximation, the committee believes that, if the Board so desires, it would be equally fair to everyone concerned, except for those at the extremes of the age groupings made, to make a flat allowance of 5% for all persons between the ages of 51 and 60 years, inclusive, and of 10% for all persons more than 60 years of age.

QUESTION 5

Value of hearing aid in reducing compensable loss (e. g., eye glasses in cases of reduced vision). (a) If employer is required to furnish hearing aid, should he be liable only for uncorrectable loss of hearing? (b) If hearing aids are to be recommended, what appliance is most suitable under the workmen's compensation program?

ANSWER TO QUESTION 5

Your Committee recommends that, in the making of a compensation award for occupational deafness, no consideration be given to the question of whether or not the ability of a claimant to understand speech is improved by the use of the hearing aid.

QUESTION 6

Use and value of pre-employment examinations to determine any existing loss of hearing.

ANSWER TO QUESTION 6

Your Committee strongly recommends the routine making of pre-employment examinations of hearing, and is certain that the records of such examinations, properly made, would constitute important evidence, in the event of future claims for compensation for occupational deafness, in the determination of the proper award to be made. The interests of both the employer and the employee would be protected by such examinations.

QUESTION 6 (a)

Which test is most suitable?

ANSWER TO QUESTION 6 (a)

The pre-employment examination of hearing should include, as a minimum, the determination, for each ear separately of the air-conduction thresholds of hearing for each of a series of tones, from low to high in frequency, over the range from about 125 cycles per second up about 10,000 cycles per second. These tests should be made by a properly trained examiner, using a correctly calibrated pure-tone audiometer, in a room suitable for the making of accurate tests of the hearing acuity of persons with normal hearing. In case the pure-tone air-conduction audiogram indicates definitely impaired hearing, the examination of hearing should be extended to include such other items as are, in the opinion of the physician in charge of pre-employment examinations, indicated by the individual circumstances.

QUESTION 6 (b)

What frequency of tests is recommended?

ANSWER TO QUESTION 6 (b)

The Committee recommends that new employees who are assigned to work in locations where it is suspected that the noise may be injurious to hearing, also those employees who are shifted to such a location from a less noisy one, have repeat tests of hearing made after one week, after one month, and after three months of exposure to the noise; thereafter tests should be made at approximately yearly intervals. The Committee believes that by such tests, particularly those during the first three months of exposure to the noise, those persons whose hearing is especially susceptible to injury by noise can be identified in time to make possible the prevention of a serious degree of permanent damage to hearing. Such persons can, when identified, be protected from acquiring an occupational deafness by assignment to work in less noisy surroundings or by use of suitable local protection of the ears. (ear plugs, ear "muffs," etc.).

QUESTION 6 (c)

To whom should copies of examination conditions precedent to hearing loss.

ANSWER TO QUESTION 6 (c)

Your Committee recognizes that this question is outside its field of special competence to answer, but expresses the opinion that the records of hearing tests should be handled in the same manner, with respect to

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A Resume on the Health Problems of a Colliery Population in South India and Efforts to solve them

By T. C. RAMCHANDANI, F.R.C.S.,
Chief Surgeon and Medical Officer

The three coalfields managed by the Singareni Collieries Co. Ltd., and situated at Kothagudiam, Yellandu and Tandur in the Hyderabad State Comprise the biggest coal producing centres in South India with a productive capacity of 1,25,000 tons of coal per month.

THE three coalfields managed by the Singareni Collieries Co. Ltd., and situated at Kothagudiam, Yellandu and Tandur in the Hyderabad State comprise the biggest coal producing centres in South India with a productive capacity of 1,25,000 tons of coal per month.

KOTHAGUDIUM COALFIELD

The present study is mainly limited to the Kothagudium coalfield. This coalfield is situated in the Palvancha Taluk of the Khammameth District in the

South East of Hyderabad State. It is connected by a branch railway line extending for 34 miles from Dornakal Junction on the main Bezwada/Wadi line of the Central Railway and is 185 miles by rail from Hyderabad city. The railway station at Kothagudium is known as 'Bhadrachellam Road' being some 18 miles distant from the Bhadrachellam Temple—a place of Hindu pilgrimage, situated on the left bank of the Godavari River on the Andhra-Hyderabad boundary line. About 50,000 pilgrims from the States of Hyderabad, Andhra and Madras pass through the station during Sri Rama Navami festival in April each

(Continued from page 31)

filing and as to whom copies are furnished, as are the records of other parts of physical examinations of employees.

QUESTION 7

Value of treatment, if any, to reduce hearing impairment.

ANSWER TO QUESTION 7

The hearing loss caused by exposure of an injurious intensity is not improved by any treatment, either medical or surgical, of which the members of your Committee are aware. If part of the hearing loss of a person is due to some cause other than exposure to noise, appropriate treatment directed toward alleviation of the loss from the other conditions may of course be beneficial.

QUESTION 8

Are catarrhal and respiratory tract infections conditions precedent to loss of hearing?

ANSWER TO QUESTION 8

Upper respiratory tract infections, including catarrhal conditions, often are associated with impaired hearing

and may be, by extension of the condition to the middle ear, the indirect cause of the impairment. Your Committee wishes, in connection with this answer to the direct question, emphatically to point out that hearing losses caused by exposure to noise are due to damage to the inner ear whereas the middle ear is the part affected by extensions of upper respiratory tract infections or catarrhal conditions.

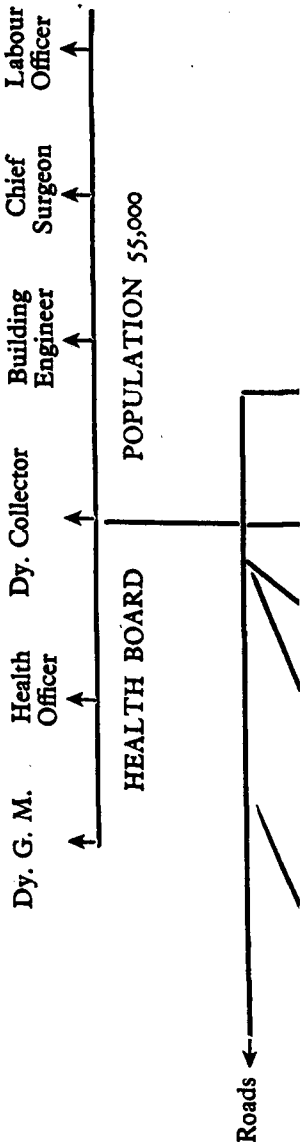
QUESTION 8 (a)

If pre-employment examination discloses a pathology conducive to loss of hearing, does that constitute an employment handicap for purposes of the Second Injury Law?

ANSWER TO QUESTION 8 (a)

This question concerns legal matters upon which your Committee does not feel competent to express an opinion.

STACY R. GUILD. PH.D., Chairman.
GORDON D. HOOPLE. M.D.
C. STEWART NASH. M.D.
OTTO C. RISCH. M.D.
JOSEPH C. SERIO. M.D.



year. This mass movement round a particular day in the hot summer month creates a problem of epidemiological importance to be referred to, later.

There are at present 6 developed mines and a few others are in the process of exploration. The area comprised by this coalfield is 12 sq. miles with a population of 55,000. About 90% of the population is constituted by the employees and their dependants. About 12 years back this piece of the Deccan Plateau was a huge mass of jungles infested with wild animals with the exception of a small strip where a few hamlets represented what is now known as the 'Old Kothagudium Village'.

To-day Kothagudium has developed into a township with broad roads, electricity, filtered water supply, schools, parks, playgrounds and clubs and two bazaars.

THE SOCIO-ECONOMIC BACKGROUND

The majority of the workers numbering about 15,000 is drawn from the neighbouring villages of the Hyderabad State. A fairly large section of the population is illiterate or semi literate and of primitive sense. They are superstitious and are often indifferent to social and health measures initiated for them. Much progress has however been made in recent years with the opening of Primary and Secondary Schools, running of Adult Education Classes and inauguration of Welfare Schemes.

(1) *Housing condition* :—The housing condition is in a gradually developing stage with half the number living in pucca quarters and the other half in grass huts.

(2) *Economic Status* :—The workers in these Collieries have a higher standard of living than in the areas surrounding the Collieries. The wage structure is such that the lowest paid unskilled worker, with all the amenities, Free Housing and Concessions is almost on a par with a skilled worker in other Industries. There is some addiction to alcohol among a small section of miners but, by and large, workers may be said to be of fairly moderate habits.

(3) *Hygienic Habits* :—As many workers are drawn to the Collieries from the outlying poorer areas they have brought with them the unhygienic habits of their villages. They are poorly clad and are in the habit of defaecating in open spaces. The Colliery's management has erected several large latrines and workers are being educated to use these.

(4) *Moral Standards* :—These are no better or no worse than one expects to find in any Industrial area. Petty thieving is indulged in occasionally but there is no large scale thieving, house breaking etc. at the Collieries. Sex morality which was rather low when women were employed underground in the Mines has improved greatly since the withdrawal of women workers from underground work.

(5) *Political consciousness* :—It is often absent or nil among a vast number of the labour population and for this reason they are often exploited by interested political groups for purposes which ultimately harm them. Going on or attempting to go on strike on slight pretexts is becoming increasingly common. Disobedience to authority is another disquieting feature born out of instigation by political parties.

FAMILY LIVING STUDY AND NUTRITIONAL STATUS

With the exception of the small labour force at Gorakpur camp the Colliery labour is homogeneous. The staple diet is rice. Wheat and Jowar are taken not as a habit but due to scarcity of rice. Among pulses Arhar dal is consumed in great quantities. As regards fat, ground nut oil finds favour. Common ingredients of local labour diet are chillies, onions and tamarind in great proportion. The disproportionate use of condiments is one of the main reasons in dissipating the digestive capacity of men. Mutton and beef are commonly taken and some classes also take pork. Cheap vegetable are bought and some use products of kitchen gardens such as bottle-gourd. Supply of vegetable is very inadequate and costly in the local market. Expenditure on grains is in direct proportion to income. Milk is scarce and costly and not within the reach of an ordinary labourer. Few families keep buffaloes and goats and use them mainly for augmenting income than for personal consumption.

The calorific value of an average labourer's diet has been determined by a nutritional survey to be 3,008 or just sufficient for a manual worker and not sufficient for a hard worker. The diet significantly lacks in animal protein and fat and vitamins and is therefore insufficient in quality.

DISEASE INCIDENCE

A review of the disease incidence of the past few years shows that Malaria is on steady decline so much so that the morbidity rate per 1000 in this disease has been

brought down from 207.16 in 1950 to 27.42 in 1953. This remarkable result has been achieved through a programme of anti-malarial campaign making free use of D. D. T. and B. H. C.

Cholera which was highly prevalent as recently as 1951 has been brought down through universal chlorination of drinking water by means of chlorine gas (chloronomes) and by timely anti-cholera inoculations. The annual Bhadrachellam Jatra which so long acted as a potent contributory factor in production of this epidemic is being successfully managed through collaboration of the Government, Railway and Collieries with the result there was not a single case of cholera in 1953 and 1954. 20,000 inoculations have been done in 1954. Small pox has similarly been controlled by preventive vaccinations and about 15,000 vaccinations have been done this year so far.

Diarrhoea and Dysentery cases still continue to show periodic incidence.

Influenza cases have recently increased, perhaps due to dust nuisance as the roads are mostly kutchha.

SOCIAL AMENITIES

Payments are made weekly—usually on Saturdays. In addition to daily wages the following concessional facilities are also given to the workers e. g.,

- (1) Concessional supply of food-grains. About Rs. 30 lacs are spent by the Company annually on the concessional supply of food-grains.
- (2) Concessional supply of certain non-rationed articles such as dal, chillies, sweet oil and tamarind.
- (3) Clothings such as Sarees, Shirts and Shorts are given at half the purchase rates.
- (4) Maternity and Sickness benefits.
- (5) Bonus and Provident Fund as per rules.
- (6) Warm coats and woollen blankets issued free of charge to certain categories of workers in the winter and rainy seasons.
- (7) Hot Coffee or Tea served free of cost at pit mouths during winter months.

HOSPITALS AND DISPENSARIES

The Company runs a modern and up-to-date '200 bed' hospital and three dispensaries at Kothagudium,

one 50-bed hospital at Tandur and a well equipped dispensary at Yellandu with further plans for more up-to-date dispensaries, T. B. and V. D. wards.

The Kothagudium Colliery Hospital is one of the best of its kind in India with laboratory, X-ray and other facilities. Practically all the Medical Officers are highly qualified and have special post-graduate qualifications.

Surgical operations of high order both of the emergency and selected types are performed with successful results.

An instance of a rapid rally of all available medical facilities is furnished by the very successful handling of 25 cases of a major cage accident going down the 500' shaft which occurred in the fateful morning of 2-6-1952. All the cases were injured seriously, some with multiple fractures involving spine and lower extremities with associated complications. All the cases survived and the disabled ones have since been rehabilitated.

The Colliery hospital being the only large hospital within a radius of 70 miles has to cater to the needs of the civilian population also in spite of its limitations with regard to accommodation simply on humanitarian grounds. This, otherwise, is the duty of the State to provide hospital beds for vast number of people.

PUBLIC HEALTH ORGANISATION

There is an efficient public Health Organisation. This is managed solely by the Collieries. The State Government have under consideration the formation of a Mines Board of Health.

SOCIAL WELFARE ORGANISATION

There is a Labour Welfare Organisation under the Coal Mines Welfare Fund. A Maternity & Child Welfare Centre is still to develop.

FUTURE HEALTH PLANNING

A chart attached in a separate sheet will give a concrete idea of our aims and objectives which were conceived about 4 years back. During this period a substantial part of our objectives on the medical side has already been achieved. The expansion on the health side is also progressing though at a slower pace as there are several hurdles to be overcome.

(Continued on page 35)

DARAPRIM—NEW ANTI-MALARIA DRUG

(FROM A MEDICAL CORRESPONDENT)

Hope that malaria, one of the world's most prevalent diseases, can be eradicated completely has been raised by the development of a potent drug which has been proved by extensive testing—Ed.

AN anti-malaria drug more powerful than any heretofore known has been reported by the U. S. Public Health Service. Several years of testing Daraprim, as the drug is called by its manufacturers, preceded the reports to the American Society of Tropical Medicine and Hygiene at meetings in the autumn of 1952 in Galveston, Texas. There is hope that Daraprim might completely eradicate one of the world's most prevalent diseases.

Conservative scientists of the U. S. Public Health Service say that a person could, if he took Daraprim, go into a region heavily infested with malaria-carrying mosquitoes and not contract the disease, either while there or after leaving. Volunteers who were given the drug after being bitten by malaria-infected mosquitoes showed no symptoms of being stricken with the disease even a year after the infection and treatment.

The scientific name for Daraprim is pyrimethamine. The drug was made by Dr. George H. Hitchings in the course of a search for antagonists to nuclei acids. First

announcement of it was made at a meeting of the American Chemical Society in April 1950. The drug then was given extensive tests no mice and birds by Dr. Ian M. Rollo in London, England. Later still, further tests were carried out in the United States by Drs. G.



Medical officers examining malaria specimens.

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CONCLUSION

The conception of Health and disease has recently undergone a complete reorientation. Health is no longer considered as mere absence from disease nor disease as an isolated phenomenon related to a single factor or individual. The latter belongs to a family and families constitute the community. What happens in the community affects the families which in turn affects the individual and vice-versa. Thus public health has become synonymous with community health and no one should doubt to-day the necessity of all medical practitioners being fully appreciative of the socio-economic, occupational, environmental, emotional or even genetic factors in the maintenance and promotion of both physical and mental health, prevention of ill-health, cure and alleviation of disease and after cure and rehabilitation which are parts of the continuing responsibility dovetailed with one another.

Health services to be comprehensive as to give maximum benefit to the common man necessarily depend on properly planned and carefully conducted medical education. A training of medical practitioner is incomplete if it does not include an opportunity to observe at first hand the patient as a person, in relation to his family and occupation and the various stresses and desires he is subjected to.

The citizen of to-day has a right to expect adequate health—measures who along with these rights takes the responsibility of playing his part in the scheme of things. No scheme of health—measure can to-day be successful unless and until it has constant and whole-hearted support of the public.

I am grateful to Mr. S. K. Nargundkar, A. I. S. M., General Manager, S. C. Co. Ltd., for permission to publish this, his suggestions and advice and also to Dr. B. Das., M. B., D. P. H., D. T. M., Health Officer for assisting me in preparing this article.



A public health officer administers the new anti-malarial drug Daraprim to a patient during studies for the cure and the prevention of malaria.

Robert Coatney, Albert V. Myatt, Thomas Hernandez, Geoffrey M. Jeffery, W. Clark Cooper, Joseph Greenberg and Helen L. Trembley, all of the U. S. Public Health Service.

Daraprim is some 12 times as powerful as chloroquine, standard anti-malarial drug in wide use as a suppressant in recent years. In tests with volunteers, 25 milligrams of Daraprim weekly was as effective in suppressing malaria as 300 milligrams weekly of chloroquine. Even the 25-milligram dose probably is larger than is needed to suppress malaria. Unlike chloroquine, Daraprim completely suppresses and cures malaria. Persons taking chloroquine alone will contract the disease if they are attacked by the relapsing form after they have stopped taking the drug. Primaquine, another recently developed drug, will prevent the relapses, but Daraprim needs no supplemented drug. Primaquine is too toxic to be taken over a long period as a suppressant.

Daraprim is odorless and tasteless. It is prepared as a small white tablet which is easily swallowed. It is inexpensive and since a small dose is so effective, its ultimate cost to the user can be kept very low. This factor is most important in areas where the prevalence of malaria has kept many wage earners from gainful employment.

First tests with Daraprim were made on birds. Satisfied that the new drug did indeed have "unbelievable" potency as an anti-malarial tests on human volunteers were begun. The latter tests were particularly severe as they were made against the Chesson strain of malaria. This strain heretofore has been one of the most difficult to control.

The Public Health Service scientists also made tests to determine whether the malaria parasite might develop resistance to Daraprim. This resistance was developed under hospital and laboratory conditions, the tests showed, and the resistance could be transmitted by mosquitoes. However, the curative dose was so close to the dose at which resistance could be induced that it was considered unlikely that such a development would be a deterrent to use of the drug.

As treatment for an acute attack of malaria, Daraprim is effective, but it takes longer to act than chloroquine.

While tests were being made in the United States, English researchers were testing the drug in Africa. These tests give hope that by treating the population of malarial areas through one or two rainy seasons, the disease can be eliminated. In one such test, in an



A malaria infected anopheles mosquito feeding on a volunteer during tests of Daraprim, a new anti-malarial drug being tested at Thlanta, Georgia.

isolated village, every person was treated at the time when most of the population would be infected with malaria. The human population was cured in about two months and the mosquitoes, which ordinarily would have acquired infection, were kept malaria free. In a bag of 100 mosquitoes taken at a time when all should have been carrying malaria germs from the people they had bitten, not one mosquito was found with parasites in its body.

The new drug also gives promise of usefulness for other diseases, and tests are being made. However, its most universal application now is against malaria.

DEVELOPMENT OF STREPTOMYCIN

Years of plodding research against overwhelming odds preceded the discovery by Dr. Selman A. Waksman, American scientist, of the first effective antibiotic against tuberculosis — a notable advance in the war against human diseases

THE ward of the 1952 Nobel prize in medicine and physiology to Dr. Selman A. Waksman of Rutgers University, in the Atlantic Coast State of New Jersey, discoverer of streptomycin and other antibiotics, will give added support to the Institute of Microbiology in New Brunswick, New Jersey. For Dr. Waksman is a down-to-earth scientist whose greatest desire is to continue investigations which have revolutionized medicine, industry and agriculture. He will add the Nobel prize money to his share of the income from streptomycin royalties which he is using for research upon microorganisms.

The faculty of the Caroline Medico-Surgical Institute, Stockholm, Sweden, which awarded the Nobel prize to Dr. Waksman, cited him for "his discovery of streptomycin, the first effective antibiotic against tuberculosis". The prize was presented by the Swedish king. The development of Dr. Waksman's researches is told in this account officially prepared in connection with the Institute of Microbiology:

Streptomycin, which has proved a drug of even greater potentialities than penicillin, was isolated in September 1943, but the work which made its discovery possible had been under way in Dr. Waksman's laboratory at the Rutgers University College of Agriculture since 1915.

The search for an antibiotic substance which would have the power to destroy or weaken microbes dangerous to man and animals actually began in 1939. It was preceded by long and valuable work aimed at specific agricultural and industrial problems linked with microbes in the soil—their role in the decomposition of plant and animal residues in nature, their valuable work in making compost, in providing the necessary nutriment for the growth of mushrooms, in the manufacture of enzymes, in the production of sulfuric acid, and in the ability of microbes to destroy steel pipes. Underlying all work in antibiotics is the discovery by early researchers that certain varieties of microbes had the power to destroy others. Dr. Waksman had formally explored this phenomenon in its application to human disease in 1932 when, under a grant from the National Research Council, he undertook to study the fate of tuberculosis microbes when exposed to the action of the billions of microbes present in each handful of soil.



Dr. Selman A. Waksman, director of the Rutgers University Institute of Microbiology, New Jersey, and discoverer of streptomycin, who shares the 1952 Nobel Prize in Physiology and Medicine with Dr. Hans Adolf Krebs, professor of biochemistry at Sheffield University, who was honoured for his researches into the combustion processes of the body. Here, Dr. Waksman examines stationary flask cultures of *Streptomyces griseus*, the organism that produces streptomycin, in the incubating room of his laboratory. (Photo: Courtesy of "Time")

In 1939 Dr. Waksman sharply altered the line of his former agricultural investigations and set to work on the development of microbial strains which would have therapeutic value for humans and animals. The outbreak of World War II helped make his decision, as did the success of a former student and protege, Dr. Rene Dubos of the Rockefeller Foundation for Medical

Research in developing tyrothricin. Dr. Dubos, who went to the United States from France and was trained under Dr. Waksman, contrived the unbelievable feat of training a microbial strain to exist on pneumococcus microbes as food. He also successfully developed a practical method for converting the antibiotic substances produced by these trained microbes to a powder. His work found immediate practical application in the treatment of various infections in man and in animals.

Dr. Waksman set himself two specific problems. One was to find a microbe with the power to produce an antibiotic capable of interfering with the growth of and destroying the microbe which caused human tuberculosis. The other was to find a microbe capable of destroying pathogenic (dangerous) microbes without harmful effects upon the tissues of the host, namely the human and animal body. Penicillin was discovered in England during the progress of the experiments and showed great power against one of the great microbial groups—the gram-positive forms (capable of being dyed with a certain stain). One of streptomycin's early predecessors of the same general family, namely streptothricin, indicated that it had promise in the other half of the microbial population—the gram-negative organisms.

From the beginning of his work in 1915, Dr. Waksman had taken particular interest in a variety of microbes known as actinomycetes. His work with this particular group of organisms is probably one of the longest continued researches by an individual upon a research project. When his new line of investigation began, he quite naturally used as laboratory material those organisms upon which he had worked so long. Back in 1915, Dr. Waksman and R. E. Curtis isolated "Actinomyces griseus". From a strain of this organism, now known as "Streptomyces griseus," came the miracle drug streptomycin.

This short review serves merely to illustrate the interconnections and long history of microbiological research. Though streptomycin was discovered in 1943, the basic knowledge which lay behind its discovery had been accumulating almost 30 years. Its foundation, in turn, dated back to Louis Pasteur (1822-1895), French chemist and bacteriologist, and Robert Koch (1843-1910), German bacteriologist and physician, and even far beyond.

A year after the work began in 1939, its first result evolved. It was actinomycin, derived from the actinomycetes. It has remarkable properties to destroy microbes, but was almost as efficient at destroying living

(Continued on page 39)

animals. It easily could have been used as an animal poison. Soon after actinomycin came clavacin and fumigacin. These too were either too toxic or not active enough. In 1942, the discovery of a selective agent which killed many bacteria and slowed to a stop the growth and reproduction of others was announced. Known as streptothricin, it was streptomycin's direct predecessor. Its importance lay in the fact that it showed a murderous preference for gram-negative microbes, thus supplementing the gram-positive killing power of penicillin and tyrothricin.

Streptothricin showed great promise in the animal body. It successfully attacked varieties of bacteria which had resisted other agents, and it seemed not too toxic. Its promise dimmed, however, when it was found to have a delayed toxic effect—it destroyed the disease infection, but later the animal succumbed to the streptothricin.

Dr. Waksman set in motion two types of exploratory testing. One involved literally starving the bacteria in a sample of soil, then introducing a dangerous bacterial strain. The method, used by Dr. Dubos in "training" bacteria, determined whether the soil microbes could learn to exist upon the dangerous bacterial strains as food. This is necessarily a slow method. Simultaneously, Dr. Waksman started testing work with agar plates. This involved growing cultures of pathogenic (disease-producing) bacteria, then dropping other living organisms (from the soil, manure pile or peat bog) into the culture. If a clear patch developed around the second group, it showed that the newly-introduced microbes were wiping out the hosts in their cloudy culture.

Mathematically it was possible for the endless search and testing to go on for years. Using such methods, Dr. Waksman and his student assistant, Albert Schatz, succeeded in isolating two promising strains of "Streptomyces griseus". One came from the throat of a chicken, the other from a heavily manured field. The strains were effective on both the problems being attacked—against the armored tuberculosis bacillus as well as the general group of gram-negative types. Amid growing excitement, the tests went from test-tube to laboratory animals—still with almost universal success.

Heavy-yielding, the strains aroused great hopes which were abruptly checked as the strains became less vigorous and yielded increasingly less streptomycin. With intuition which came from recognition of the importance of the soil itself as a main source of life, Dr. Waksman

NEW SURGICAL TECHNIQUE FOR SAVING INFANTS

BY DR. STEVEN M. SPENCER

A new method of relieving pressure on the brain caused by hydrocephalus has been developed in an American hospital for children; early diagnosis is a most important factor in its successful use

THE clock on the wall ticked off the details of the quiet, systematic bustle which marks the beginning of every operating-room drama. Nurses whisked in and out with carts and trays. An attendant adjusted the big overhead lights. There was the click of instruments as they were laid in precise array on sterile cloths.

The cast of performers on this day was unusually large. Crowded into the arena were five surgeons, three nurses, an anesthetist and a general-purpose technician, each with a specific assigned task. By contrast, the focus of their organized activity was unbelievably small, a baby girl three weeks old and no longer than a doctor's forearm. She lay on a special operating table the size of a footstool, which had been placed on top of the regular table. Already in an anesthetic sleep, Nancy had been propped on her right side, with strips of adhesive tape to keep her from rolling. The position was important, for this was to be no ordinary operation. The baby was on her side so that two major operations could proceed at one time upon her small body.

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planted the microbes in rich earth in the hope that new generations would regain their parents' strength. They did—and more. Showing their unpredictability, the microbes developed new strains, which were even more active.

But streptomycin was still months away from its first sensational conquests. Thousands of tests were still to be made; Endless searching went on for better ways to grow and purify and strengthen the product. Finally test were made upon live chicken embryos and white mice—the nearby Poultry and Animal Husbandry Departments laboratory gave valuable assistance at this point since Dr. Waksman's laboratories did not have the necessary elaborate animal-testing facilities. The delicate embryos and small animals furnished ideal testing ground, both for the ability of the preparation to do its job and also to test toxicity.

Tests were expanded to include baby chicks and guinea pigs. Commercial laboratories then supplies test

What had brought Nancy to the Children's Hospital of Philadelphia, Pennsylvania, in the United States, was one of several inborn defects which, if not corrected, usually result in mental retardation, blindness, crippling or death. Her condition had been diagnosed as hydrocephalus, often called "water on the brain." It consists of an abnormal accumulation of spinal fluid, the increased pressure of which squeezes the brain and distorts the head. Fortunately, hydrocephalus is not too common but neither is it very rare. To the parents of a baby so afflicted it has always been a heart-breaking tragedy. Until very recently 90 percent of the infants born with hydrocephalus died before they were two years old. Most of these who survived were seriously handicapped, mentally or physically or both. Usually their heads were greatly enlarged.

This small patient on the miniature operating table was to have a better chance at normal life. The two teams of surgeons, one working on the spine and the other on the abdomen, would carry out the two phases of a remarkable new procedure, designed to pipe off the

material to the clinics. Scientists improved the manufacturing processes still further and built a pilot plant for small-scale manufacture. Then late in 1944, small quantities were released to certain medical clinics for tests. Later, as additional quantities from the miniature factory became available, the U. S. Army joined the testing work. Other universities and hospitals began to amass test results. The secret of the miracle drug soon became known and the discovery of streptomycin and its medical miracles flashed around the world.

But streptomycin was not the end of the research road. It has been followed by new antibiotics—grisein, streptocin and neomycin. The potential of the latter has led to speculation that it may replace streptomycin—certainly it may prove to be an important supplement, since it is highly active against bacterial strains which seem to develop a resistance to streptomycin.

excess spinal fluid and prevent the damaging rise in pressure within the skull and spinal canal.

The operation, developed in its present form by Dr. Eugene B. Spitz, neurosurgeon, and Dr. C. Everett Koop, chief surgeon, both of the Children's Hospital staff, is one of the most effective solutions yet offered for a problem which heretofore has challenged the best surgical efforts. It is part of a concentrated preventive attack which the Philadelphia Children's Hospital doctors and other teams, notably Dr. Frank D. Ingraham and his associates in Boston, are making against certain anatomical causes of mental retardation.

In addition to hydrocephalus, the main ones under consideration here are subdural hematoma and cranio-stenosis. They differ from one another in many details, but they have one thing in common. All of them place a constricting barrier, of fluid, membrane or bone, around or against the infant's brain. Since the brain at this age is growing with amazing rapidity—doubling in volume during the first nine months of life and attaining 80 percent of full adult development by the end of the second year—it is obvious that any physical restraint upon such growth will have serious consequences, in



Surrounded by surgeons, nurses and special technicians, young Kenneth Waltz is being prepared for a double operation which will relieve the pressure on his brain caused by hydrocephalus. Dr. Spitz, making an adjustment of the covering towels at Kenneth's back, will open the spinal canal and attach a plastic drainage tube to it. Dr. Koop, opposite, will make an abdominal incision and prepare the abdominal cavity to receive the drainage tube which will carry off excess spinal fluid and thus relieve the cranial pressure. Development of the technique has saved the lives of many infants who otherwise would have been doomed to death or tragic disfigurement.



Recent developments of a surgical technique which relieves the murderous pressure of hydrocephalus on an infant's brain has made it possible for many afflicted children to grow up normally. Dr. Everett Koop, left, and Dr. Eugene Spitz, both of Children's Hospital in Philadelphia, Pennsylvania, brought the procedure to its present success. Here, they are examining nine-month-old Kenneth Waltz who is in need of the relief they can give him. Nurse A. B. Person is an important member of the team since post-surgical nursing is a vital factor in the success of the operation.

some cases squeezing the brain into a layer of tissue only a fraction of an inch in thickness.

From this it follows that the restraining shackles must be cut away early in life if the brain is to have adequate room in which to grow. An operation which will help a baby at three weeks or three months of age may be useless if put off until he is a year or a year and a half old.

In Nancy's case the first signs of trouble has been feeding difficulties and a fever when she was only five days old. Her doctor at the hospital where she was born immediately began a search for the cause. First he found blood in the spinal fluid. Then he noticed the baby's head was beginning to enlarge, an observation he confirmed with a tape measure. Finally, when a needle puncture revealed intracranial pressure and a thinning of the brain, the doctor suspected hydrocephalus and sent Nancy to Philadelphia.

Following the operation, which involved inserting a plastic drainage tube between the spinal canal and the abdominal cavity, she began almost at once to improve. The "soft spot," or fontanel, where the bones of the forehead are joined, previously had been taut and bulging. As soon as drainage was established it flattened

out. The head lost its swollen appearance and slowed down to a normal rate of growth, so that over a period of months the rest of Nancy's body was able to catch up with it and eliminate any disproportion in size. She began to eat normally, and to laugh and smile like any well and happy baby. Her mental development, by all tests, is proceeding at a good pace, showing that the operation was done in time to prevent any serious brain damage.

The urgent necessity for prompt action is a point which all physicians working on this problem feel has not been fully understood or strongly enough emphasized. Errors of two types have been made, both resulting in tragic loss of previous time. Some parents have done nothing because they have been advised the situation was hopeless. Others have been told that the odd shape of the baby's head or some slowness in development was nothing to worry about and that the child would grow out of it.

It is a doctor's business to worry about these things, asserts Doctor Spitz; it takes only a few minutes for a physician to determine, by feeling the bones of a baby's



Barbara Ann Scheel, shown here playing with an older sister while her mother reads to two brothers, was saved from death or savers mental retardation by the surgical technique developed for the relief of hydrocephalus by two American surgeons. Alert and cheerful now, she shows no signs of the affliction which would have hopelessly deformed her head without the prompt action by her parents and the skill of the surgeons.

head, whether there is anything to worry about and whether a more detailed and extensive examination is needed. It is a mistake to assume that convulsions and other neurological disturbances are due to other causes.

Convulsions are not normal and always should be investigated to determine the underlying cause.

Appreciation of the need for earlier recognition and treatment of neurological conditions in children is what prompted the heads of several departments at the University of Pennsylvania School of Medicine—Dr. I. S. Ravdin of surgery, Dr. Francis C. Grant of neurosurgery, and Dr. Joseph Stokes, Jr., of pediatrics—to establish the special pediatric-neurosurgery unit at the Children's Hospital. Doctor Spitz, assistant professor of neurological surgery, was placed in charge, and Doctor Koop, chief surgeon at the hospital and associate professor of pediatric surgery, works closely with him. Through coordinated study of the large number of cases brought to this center it is hoped to accumulate additional information which in turn may lead to more improved methods of treatment.

It would be misleading to suggest that operations will prevent more than a fraction of the cases of mental deficiency. The factors responsible for a large proportion of cases have not even been identified and could not be expected to yield to surgery. But "brain-crowding" conditions of the type discussed here occur so often that it is possible to save thousands of lives and minds through alertness and prompt care on the part of parents and physicians.

Successful surgical relief of hydrocephalus requires much careful preliminary study of the patient, a high degree of surgical judgment and skill, and smooth teamwork on the part of everyone in the operating room—surgeons, anesthesiologists, nurses and technicians. The surgeons feel that credit for important help should go to the chemical companies which developed the nonirritating plastic tubing and which cooperated with the doctors in finding the proper type and size for the delicate operation.

Of 45 babies with congenital communicating hydrocephalus who had the spine-to-abdomen drainage tube installed, 38 have survived, with apparent relief of the condition. Surgeons at Children's Hospital believe they can expect success in approximately 80 percent of the patients with this type of abnormality. Another group of infants being salvaged by early neurological surgery consists of those suffering from subdural hematoma, a cystlike sac of fluid which forms beneath one of the membranous coverings of the brain. It is caused by injury at birth or during early infancy or by infections and blood conditions. The hematoma sac is filled originally with blood. Eventually it contains only a pale

orange or yellow fluid, but the fluid has such a high protein concentration that it draws more fluid into the sac, until the fluid mass has swollen the baby's head and created damaging pressure upon the brain. Among the commonest symptoms are convulsions, vomiting, development retardation, irritability and feeding troubles. The child with subdural hematoma may also be subject to frequent infections.

A condition usually considered rare may tend to become less rare when a successful treatment for it is found. Patients previously neglected and uncounted in the medical statistics are brought to the attention of doctors who can do something for them. This has been the experience with subdural hematoma. In 1937 Doctor Ingraham, of Boston Children's Hospital, who has been a pioneer in children's neurosurgery, perfected techniques for diagnosing and removing this brain-crowding lesion. Since then the number of subdural-hematoma cases being seen by the doctors has increased steadily.

In this condition, as in hydrocephalus, the shape of the baby's head is frequently what first causes parents or friends to become concerned. Surgery for releasing the brain from the bonds of a subdural hematoma is carried out in the skull itself, which is first pierced with a needle to confirm the diagnosis. Preliminary drainage is then established through small burr holes drilled with a stainless-steel brace-and-bit.

Draining the hematoma may be all that is required. Often, however, the baby must return to the operating room, after an interval of observation, for a more extensive operation. At that time a segment of the skull is temporarily lifted off and the tough membranous hematoma sac is removed. The membrane alone, even when empty, can bind and hamper the development of the underlying brain tissue. The sac sometimes extends over two thirds of one hemisphere of the brain, and in many cases it partially overlies both the right and left hemispheres.

Of all the things which can interfere with the development of a baby's brain few are as strange and tragic as

the premature closing of the seams of his skull, a condition known as craniostenosis. It may occur before birth and in some instances probably is hereditary. The brain, striving to grow at a normal rate and finding certain of the cranial suture lines, or "expansion joints," firmly closed by bony fusion, pushes out in other areas, where the bone is softer. This produces a variety of bizarre skull formations. The eyes bulge out. Pressure on the optic nerve often causes blindness. Parts of the brain atrophy under the excessive pressure, with resulting mental retardation. The high intracranial pressure also may cause headache, vomiting and convulsive seizures.

The amount of surgery which small infants can tolerate never fails to astonish those not familiar with the truly phenomenal advances which have been made in this area of children's medicine. The youngest craniostenosis patient at Children's Hospital was only 18 days old when he was operated upon. Another child, born with three deformities—craniostenosis, a pushed-in, or "funnel," chest, and a "blue-baby" heart—had all three surgically corrected during one hospitalization, when he was only two years old. An unusual aspect of his case was that even though the skull bones had fused together prematurely, they had been so poorly nourished because of the heart condition that they remained thin and allowed the head to expand with the growth of the brain. At the age of two, however, pressure was affecting the boy's vision. The operation was just in time to restore his sight and save his brain.

It should be emphasized again that success can be achieved in all of these cases only if the affected infants are brought to the neurosurgeon as soon as an abnormality is suspected. A second factor important in the saving of such threatened lives and minds is the presence of neurosurgical teams trained in children's problems, teams which include not only surgeons but anesthetists and nurses. Unusually vigilant nursing is required by infants with brain troubles. Through the training efforts of such centres as the unit at the Children's Hospital, surgical groups capable of carrying out brain-saving operations soon should be within reach of children everywhere.

(The Saturday Evening Post)

New Orientation in the Teaching of Preventive Medicine

BY W. PALMER DEARING, M. D.

ALL of us in this world conference on medical education are concerned with methods of equipping the physician of tomorrow for his full role in raising the level of health of the people he serves. That role will obviously vary from place to place and from time to time depending on the particular health problems that predominate in a given country on the capability of medical knowledge to solve those problems.

No system of medical science and thought in the world today can claim the capacity to solve all health problems. Some diseases of worldwide prevalence, such as malaria and enteric infections cannot be dealt with effectively without the application of engineering and sanitary science. Others, such as the nutritional deficiency diseases, cannot be dealt with effectively without attention to economic and social conditions.

Moreover, since no physician can function apart from the society in which he lives, his role will depend upon the degree of acceptance which the people give him. H. Cullumbine (1) found, for example, in his recent survey in Ceylon, that practitioners trained in Western medicine and those trained in the Ayurvedic systems were each called upon to treat about one-fourth of the illnesses reported by some 18,000 families, and that 1 in every 20 sick persons was receiving treatment from both the types. Dr. Cullumbine comments: "Patients with illnesses which Western medicine has shown it can control are placed in the care of Western practitioners; where such superiority on the part of Western medical science has still to be conclusively proved to the layman, then help from the traditional Ayurvedic system is sought." I venture to predict that a similar study in any other society, Western or Eastern, would reveal a comparable independence on the part of patients in their choice of physician.

Terminology differs in England and the United States, as all of us are aware. The British physician refers to "social medicine" the American, to "preventive medicine." Recognizing the terms as interchangeable, I will use the nomenclature of my own land.

THE NEED FOR ORIENTATION

One of our philosophers, Professor Theodore M. Greene, of Yale University, describes the ideal doctor as "one

who understands the human body as completely as possible in the light of all relevant sciences, who understands the human mind and its working as well as possible in the light of all relevant modern psychology and psychiatry, and who in addition understands a human being in his full potential spiritual stature" (2). In the light of modern health problems, I would add to this the requirement of an understanding of the physical and social environments in which his patients live.

If we in this conference can agree on these attributes of an ideal physician, we will readily discern the need for new orientation in the teaching of preventive medicine. For, although medical education today does a superlative job in giving the medical student a thorough grounding in anatomical and functional pathology, and a skill in diagnosis and therapy, most people agree that it falls short in developing the deep understanding of human nature and human behaviour which the physician must have if he is to practice prevention as well as to cure; to promote health as well as treat disease. Likewise, the medical school too often fails to prepare the student to apply the universal principles he has learned in settings other than that of the completely equipped and fully staffed teaching hospital. The medical school, therefore, needs to be as well grounded in the social milieu in which its graduates will practice as in the latest findings of medical science.

This means that no standard pattern for medical education can be applicable in all times and places. What society requires of a medical school in Edinburgh or Boston will not necessarily meet the needs of society in Thailand or Lambarene. Yet the faculties, students, and practitioners in all these widely differing societies have much to share in knowledge and experiences.

SOME UNSOLVED PROBLEMS

In this spirit of exchanging experience, I shall talk of our efforts in the United States to reorient certain aspects of medical education from the standpoint of preventive medicine, and I shall discuss some of the unsolved problems in my country.

Like my colleagues in public health work, I know that preventive medicine is not the exclusive field of the public health specialist. The increasing problem of cardiovascular diseases and cancer, of diabetes, rheumatic conditions, and mental disorders cannot be

controlled by environmental sanitation, by immunization" or by quarantine. The recent shifts in the major causes of death and disability require the practicing physician to use preventive techniques in combating the health problems of a population whose proportion of old people is increasing. He must use all available health resources in a community to achieve early case finding, prompt diagnosis and followup treatment, and rehabilitation services—all contributing to prevention insofar as they forestall continuing disability premature death.

Public health can be thought of as the organized application of preventive medicine, and traditionally it has been concerned with the prevention of health threats to the community as a whole. The private physician, when he is consulted by a person in an acute phase of illness, tends to be concerned primarily with the restoration of the health of the individual.

Medicine has made phenomenal progress in diagnostic and therapeutic techniques, and medical education is geared to introduce the student without delay to new developments in these techniques. The medical schools have well-established departments in the basic and clinical sciences staffed by specialists who keep abreast of current advances in their fields. What is lacking is equal concern to advance the knowledge and application of preventive measures in controlling the conditions that undermine health.

SOCIAL CHANGES AFFECTING HEALTH

During the last half century revolutionary changes have occurred in community life in the United States. In place of the large stable family in a small, self-contained community, where social relationships are well established and all age groups have a place, we find smaller family groups that move frequently from place to place and maintain few continuing contacts with their neighbours and relatives. Earlier dependence on grandparents and aunts and cousins in time of illness or economic distress is being replaced by dependence on the community and its institutions.

Concurrently, methods of production have vastly improved making possible higher standards of living. Education at all levels has become more widely available. Regional differences and barriers are diminishing under the impact of rapid communications. The interdependence of the welfare of the individual and the community is manifested in the growth of a multiplicity of community hospitals, public health departments,

social welfare agencies, and systems of social insurance which have developed to meet newly identified needs.

Conditions of work, increased leisure time, and diversified recreational activity also manifest sharp contrasts with the past. High tension in both work and play and problems of personal relationships produce or intensify not only the emotional but also many of the physical disorders that are prevalent today. Prevention and treatment of these disorders require knowledge of the interplay of personal and environmental forces which condition man's behaviour and his death.

Moreover, there is need for a new look at the modern environment. Preventive medicine research in the past found the sources of many infectious diseases in the insanitary environment, and today it is necessary to study the industrial and urban influence as the possible source of continuing and new health hazards which may be controlled on a communitywide basis. Pollution of the air and water by industrial wastes, sub-standard housing, and exposure to new chemicals of unknown toxicity are all parts of the modern environment which contribute to the major health problems of the United States.

THE PHYSICIAN'S ROLE IN PREVENTIVE MEDICINE

The changes in American life have been accompanied by parallel changes in medical practice. Forty years ago, the family practitioner had intimate personal knowledge of his patients and their families. Today, however, he is yielding ground to relatively impersonal hospital practice by specialists, each often concerned with but a fraction of the total problem confronting the patient. At the same time, increased scientific knowledge and public understanding of health requirements have broadened the demands upon the medical profession.

Today's physician should be equipped to deal with the effects of the total environment on health—the social environment as well as the physical. He should be prepared to plan the total health care of the patient, preventive as well as therapeutic. Exclusive attention to a restricted range of biological phenomena can no longer be considered good medical practice.

There are many evidences that undergraduate medical education in the United States today falls short of preparing physicians for their full role in health maintenance and the prevention of disease. A conference on psychiatry and medical education, held in 1951 concluded that there is a concerted demand that physicians assume res-

ponsibility for the proper practice of preventive medicine. A questionnaire distributed to 3,500 community leaders throughout the United States by the conference's Preparatory Commission brought some 700 opinions that physicians of today are not giving the service expected of them. Some of the specific statements were: "They do not have time or inclination to listen to and consider the patients' feelings", "They do not have enough knowledge of emotional problems and socio-economic family backgrounds", "In treating physical disease, they are often out of touch with the personal and social problems and pressures of the rank and file" (3) The Conference report stresses the need for a greater mutual understanding between individuals and their personal physicians and a greater degree of collaboration in the promotion of health.

Accurate diagnosis and prescription of remedies and treatment regimens taken by themselves may be of little avail in preventing illness or its recurrence. For example, a physician writes on Mrs. X's record: "Malnutrition slight. Inadequate intake due to poverty. Treatment: codliver oil tablets. Return in 1 month" The social worker, who has been in direct touch not only with Mrs. X but also with her family, has a broader view of the situation, and I think you will agree, a more constructive approach to treatment. She has studied the family budget and knows its limitations. She is helping Mrs. X to find a cheaper apartment nearer her husband's work in order to stretch the earnings. The social worker is thus taking action to prevent serious malnutrition by helping the family to have more money and food.

Another illustration comes from the family adviser service in the University of Pennsylvania Medical School. Mrs. G had high blood pressure and according to the family had no other health problems except that her father-in-law was ailing and irritable, and the children might be better off if they could play outdoors. The student health adviser's sympathetic talks with the father-in-law induced the latter to undergo regular treatment for his pernicious anemia. The health adviser also found a nearby church whose minister was delighted to have the churchyard used as a playground. Mrs. G's blood pressure, to her surprise, kept going down. The medical student who served as the family health adviser might have needed many years of experience in practice to learn for himself that high blood pressure can sometimes be alleviated by treating some other person's ailments and by getting a playground for the children (4).

I am sure that the experience of my colleagues in other parts of the world leads to the same conclusion we are

arriving at in the United States: that the diversity of specialised medical and related services available in the modern community requires today's medical student to have knowledge of all community resources for preventive medicine. He must learn how to establish working relationships among a variety of specialized personnel and facilities if people are to receive the services needed to prevent and treat illness and to return patients to useful activity.

In addition to his concern with individual patients and their families a physician should also be prepared to assume leadership in the attack which the community makes upon health problems through the organization and operation of community health services. If medical schools are to do a good job in training the physicians for this leadership role, they must give attention to the health problems of communities as such. Medical schools as well as their graduates should realize that, if physicians relegate themselves to the rôle of the medical technician, there is real danger that leadership in organizing medical and related services which the public demands will, by default, be forced upon others.

STRENGTHENING COMMUNICATION AND TEAMWORK

Dr. Alan Gregg, in an address at the annual meeting of the Association of American Medical Colleges in 1952 (5) made an eloquent plea for better communication among the numerous specialists in medicine and between medicine as a whole and the public at large. He draws a striking analogy between the paralysis, necrosis, and other disturbances of function which result from disruption of the communication systems within the human body—the lymphatics, the blood vessels, and the nerves—and the eventual fate of medicine if some way is not found to foster communications between the "steadily proliferating subdivisions, bailiwicks, precincts, disciplines and specialties." I would like to elaborate Dr. Gregg's thought to identify the social sciences—sociology, anthropology, and economics—as disciplines with which medicine must specifically improve communication.

These questions of communication and team work are the active concern of medical educators. The Association of American Medical Colleges joined with the American Psychiatric Association in organizing and conducting two conferences on psychiatry and medical education, one of which was mentioned earlier. The Association of American Medical Colleges similarly sponsored and took an active part in a Joint Conference on the Teaching of

Preventive Medicine. The experience gained in these three conferences has led the Association of American Medical Colleges to plan a series of teaching institutes to cover the entire structure of medical education.

Dr. George Packer Berry, dean of Harvard Medical School and past president of the association, reports that these institutes, to be held at annual intervals, will include sessions to consider the inter-relationships in teaching among groups of the basic sciences medical ecology, clinical teaching including the internship, and specialty training and the continuing education of the physician (6). As a device to focus the interest of the several medical departments on methods of integrating their work, these institutes will promote mutual understanding and community of purpose among the various specialized subdivisions of medical education and the related institutions in the community.

A national Commission on Chronic Illness established in 1949 held a conference on the preventive aspects of chronic disease in 1951 (7). All interested professional groups were represented. In addition to medical education, health and social welfare agencies and the public were represented. That conference produced an inventory of current scientific knowledge concerning the nature and prevention of the chronic diseases. Considered also was the problem of improving care for the chronically ill, covering such fields as professional education and organization and coordination of services. Medical educators and physicians who participate in such conferences contribute sound medical guidance. At the same time they gain a deeper insight into the skills and potential contributions of other professions in dealing with common problems.

A national conference on cardiovascular disease in 1950 (8), in addition to sections on technical knowledge and research, included important committees on community services for education and prevention on case finding and epidemiology, on facilities and services for treatment and management, and on integration of community services. Represented in these committees were medical educators, cardiologists, health officers, hospital directors, and community service agencies. The professional education committee dwelt upon the importance of including broad knowledge of the techniques and resources for prevention in the teaching programmes for every profession.

In the same year a national conference on ageing and its problems (9) considered a wide variety of social and economic factors involved in satisfactory health main-

tenance, work, recreation, religious activity, and living arrangements for the ageing population. A section of that conference also stressed the need for giving professional personnel a clearer insight into the total phenomenon of ageing in addition to their specialized technical instruction.

These and other conferences, groups, and seminars have contributed materially to the complex task of pulling together the viewpoints of traditional and emerging specialties in health and related fields. They have aided in identifying common interests and purposes; and they have set a base for the interchange of concepts and ideas which we know to be important to the preventive medicine component of modern medical education.

STRENGTHENING EDUCATION IN PREVENTIVE MEDICINE

Let us now consider some of the specific steps that some institutions are taking to meet the challenges we have been discussing. Methods of getting the student to see patients as individuals with families and jobs; of getting social science skills and viewpoints into medical schools; and of getting medical schools and their communities into more effective relationship with each other are being actively sought.

We are trying, for example, to restore some of the values formerly realized in the apprenticeship training on which medical education was once largely based. Obviously, we do not want simply to return to the past or to discard the advances of the last century. We do want, however, to improve methods by which the medical school itself can give the student an opportunity to complement his specialized training with an understanding of the role of the family physician.

Experiments being conducted in several schools in the United States represent the gradual introduction into the medical faculty of representatives of the social sciences. This process started with the employment of social workers to assist in the clinical teaching of the social and community aspects of medicine. More recently sociologists have been appointed to several faculties to develop the application of the social sciences to medical education and research.

As an additional step in integrating the various essential components of medical education, several schools are experimenting with the expansion of their relationships with the community. These efforts are

designed to provide a useful teaching and research laboratory in comprehensive medicine and are similar to experiments being conducted in other countries for similar purposes. Dr. Richard Scott (10) has recently described the Edinburg University general practice teaching unit in which selected medical students are introduced to a "family doctor practice" for some 2,000 patients. The unit comprises two physicians, a public health nurse, a medical social worker, and a pharmacist. Dr. Scott points out that the students seem at first to be preoccupied with clinical matters, then become increasingly interested in the preventive aspects of general practice. During the next step the student talks more freely with the patient and becomes concerned with the physical and economic components of the patients background.

In addition to their value as additions to the armamentarium of medical education, these developments will undoubtedly improve medical education's understanding of community needs and responses and they will strengthen channels of communication between clinical medicine and other professional disciplines. This communication is essential to the practice of preventive medicine, and the opportunity for students to observe patients in environments other than the hospital ward should be of the greatest practical value.

Not all medical educators, however, are convinced of the feasibility or even the desirability of expanding the community relations of the medical school. A number of the deans interviewed in a study conducted by the Public Health Service (11) indicated that the costs of providing community services were a major deterrent; others cited problems of personal shortages. Some deans even questioned the propriety of extending the influence of medical schools through community services. They feared that such developments would divert the school's already inadequate resources from the major functions of training and research.

This fear is understandable because of the financial crisis which is facing medical education in the United States. The great advances in medical science make medical education increasingly expensive.

An understanding between the community and the medical school of the role and responsibility of each, however, would allay the fears of medical educators about the burden of community service and would help materially to solve the financial problems of many schools. The high-grade medical service which accompanies clinical teaching constitutes a great benefit to the

community, but it is simply a byproduct from the point of view of the medical school. In many parts of our country, it is, nevertheless, still customary to charge the cost of this service, including the full expense of operating a university hospital, to medical education. With this sort of book-keeping, it is not surprising that a dean should view with concern a suggestion that he add to his costs and dilute the efforts of his already overworked faculty in order to supervise medical students in the community. The community needs to appreciate the service its citizens receive, either in a hospital or elsewhere, and to work out with the medical school a proper allocation of costs and assume its responsibility of paying for the medical service. If this is done, the medical school will have adequate resources to finance what is increasingly recognized as an essential part of its educational programme.

EXPERIMENTS IN COMMUNITY SERVICE

Despite the questions and complexities, however, some medical schools are experimenting with methods to help their students to observe and understand the influence of home and family factors on health. Some of the devices which have been developed are social case studies; preceptorships; assignments of students to general practice clinics or as family advisers; and participation in home care programmes. In addition, several medical schools are assuming broader responsibilities for participating in the development of effective patterns of community health service. Each of these methods increases the student's opportunity for participation in the practice of preventive medicine and helps the medical faculty maintain a high degree of awareness of community structure and health needs.

SOCIAL CASE STUDIES

Several medical schools in the United States are actively experimenting with methods of providing closer contact between medical students and the physical and social setting in which their patients live. One striking example is the family adviser service at the University of Pennsylvania Medical School (12). In this programme a student, throughout his 4 years of undergraduate training, observes and studies all factors that affect the health of a carefully selected family—housing, food, manner of living and family relations.

Other medical schools are endeavouring to orient students in the recognition of the importance of social factors of illness by having students conduct medical-social family studies during their supervised clinical

experience. These studies are made with the aid of the social service departments of the teaching hospitals and include home visits. (13, 14).

PRECEPTORSHIP

The preceptorship is an adaptation to modern standards of practice and a modern social setup of the old apprenticeship method of training. Some medical schools assign senior students for several weeks or months to preceptorships with general practitioners. At the University of Nebraska, one of several institutions which has adopted this practice, evaluation of the programme indicates that it equips the student with a perspective concerning the needs of individual patients and their families, the demands of general practice, and community resources (15, 16) the student has an opportunity to observe the methods used by skilled physicians in serving their patients. He sees patients in their normal home and working environment and observes the way in which physicians draw on public health, welfare, and other agencies in dealing with the health and related problems of their patients.

The preceptorship system obviously needs careful selection of practitioners who can maintain close relationships with the medical schools in furthering the goals of the plan. The practitioners must, of course, have the time, competence, and type of practice needed to give satisfactory apprenticeship training. There also must be safeguards against the dangers that the students will be used for services that have little educational value and thus lose the opportunity for learning the satisfaction of serving patients as people.

GENERAL PRACTICE CLINIC

Several schools are experimenting with use of a general practice clinic for instructing students, in place of the exclusive use of specialty clinics. One such experiment is in progress at the University of Tennessee (17) where a large percentage of graduates enter general practice. Family practitioners in the community are on the staff of the "family general practice clinic." They assume primary responsibility for the care of the patient and have available specialists as necessary. The students thus have an opportunity to work with physicians who know at first hand the problems and resources of their community. They also study social and environmental factors in health and illness with the aid of a social worker assigned to the clinic.

A similar programme adapted to practice in an urban area is that at the Cornell University School of Medicine

(18). In this New York City institution, senior students are assigned for 22½ weeks to a combined clinic in medicine, pediatrics, psychiatry, and preventive medicine. A full-time staff from the departments of medicine and pediatrics forms a nucleus for the organization of this teaching device. The department of preventive medicine focuses all its fourth-year teaching in the clinic. A full-time social worker and a visiting nurse are assigned to the clinic, and part-time specialist consultants are available.

There are many other developments in the direction of expanding community relations of medical schools, but these indicate the trends.

CONTRIBUTION OF THE SOCIAL SCIENCES

Mentioned earlier were the contributions the social sciences can make in the preparation of physicians for their full role in the practice of preventive medicine. By drawing on the departments of sociology, psychology, anthropology, and economics, for example, some schools are enriching the curricula of premedical and undergraduate medical education. By bringing the social case worker into the team of physicians, students, and nurses in the experimental programmes described, some medical schools are providing valuable learning experience in social diagnosis and therapy.

There are other fields in which the social sciences can be used more extensively and to great advantage in medical schools. In the selection of applicants for admission, for example, medical schools might well draw on the techniques of educational psychology. These techniques are aimed at more precise evaluation of a candidate's personal attributes so as to distinguish those individuals who give promise of success in the study and practice of medicine.

Application of new knowledge in the psychology of learning can aid the medical school in improving its methods of teaching. Recent studies clearly indicate the need for greater use of visual aids in the teaching of "didactic" subjects. Greater understanding of the dynamics of interpersonal relations, moreover, will help in promoting interdepartmental collaboration at the faculty level, both within the medical school and with other colleges of the university.

Finally, there are large fundamental problems in preventive medicine and public health which cannot be solved without the combined efforts of medical research with social and biological research. When a major health problem of a community is being solved by treating the

environment—as in enteric infections—many millions of individuals are protected from disease without realizing what has happened.

However, when the preventive measures require individual decision and action we are faced with fundamental problems of individual and group behaviour. This is true in gaining a family's acceptance of immunization or a mother's acceptance of healthful practices in infant and child care. The task is even more difficult in gaining the co-operation of individuals and families with the physician in his efforts to prevent chronic disease and mental illness and to maintain personal health.

Research into the "how and why" of individual and group behaviour is being recognized by many leaders in preventive medicine and public health as essential to professional education and to sound planning of public health programmes. Such research involves both the medical and social sciences, and the medical school can be a leader and a partner, through the initiation and support of studies in co-operation with the schools of social science.

CONCLUSIONS

The 4 years that the undergraduate student spends at medical school represent, of course, only one phase—though an extremely important one—of a life-time training in preventive medicine. His home environment, his earliest schooling, and his premedical education lay the foundations for his medical career and for his role in family practice, in a clinical specialty, in industrial medicine, in hospitals, in public health, in research, or in teaching future physicians.

Raymond Allen, the physician-president of one of our large universities (19) has expressed a thought with which I would like to close. He says "Medicine with its age-old concern for the sick the poor as well as the rich, the weak as well as the strong, has been an influence for good surpassed only by the moral precepts of religion". Medicine of the future, if it is to progress as a social as well as a biological science, must broaden its outlook and adjust its educational programme accordingly.

I believe we can all agree that as Dr. Allen states, medicine is coming of age as social science in the service of society.

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An Enquiry into the Role Played by the Anatomy of the Liver in certain Hepatic Disorders

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(Based upon a Talk given to the members of Shimoga branch of I. M. A. during May 1954)

DISEASES are classified as belonging to one of five broad groups i. e. Congenital defects, infections (bacterial, viral or parasitic) degenerations, vascular disturbances and new growths. Onset of a disease in a particular organ brings about pathological changes in its histology according to Virchow. As a result of this change in the normal histology of an organ, functional disturbances take place resulting in symptoms and signs peculiar to that disease. Take for example syphilitic endarteritis in the lenticulo-striate vessels. This results in diminished blood supply to the regions supplied by these vessels such as the pre-rolandic gyrus whereby the nerve cells suffer from lack of nutrition particularly oxygen and so record their protest by dysfunction and palsies result, mild or severe according as the diminution of blood supply is small or big. Similarly if the coronary vessels in the case of the heart are diseased, anginal attacks occur. The lungs are invaded by pneumococci and pneumonic consolidation results diminishing the aerating surface in the lungs thereby causing in their turn anoxia and respiratory embarrassment in addition to constitutional symptoms like fever due to the infection. Infections of the intestines cause disturbances in the absorption of food and water leading to inanition and dehydration and due to increased irritability colicky pains. Diseases of the kidneys result in disturbances in acid-base equilibrium of blood, retention of nitrogen in the blood and changes in the blood vessels causing hypertension. Till about the last two decades medical men were satisfied in interpreting diseases in terms of pathological changes they brought about in the several parts of the body they affected. During the last two decades they have become interested in finding why certain parts of the body are

affected by one predominant type of disease i. e. why degeneration and vascular disturbances are more common in the brain, whereas inflammatory changes are common in the lungs, and rheumatic infections and coronary diseases in the heart. It might be that a particular bacteria or virus has a sort of biological affinity for a particular type of tissue as shown by the viruses. But this will explain only inflammatory diseases affecting particular organs and not diseases caused by degenerations and vascular disturbances. One has to look elsewhere for explaining why one type of disorder is common in a particular organ and not in another. This can be partly explained by the anatomical peculiarities of that part of the body which has become diseased. The brain is supplied by end-arteries and so paralysis is the common disease in this organ. The lungs are highly vascular and so when there is a systemic infection the bacteria find it easier to settle down in the lungs, especially if this tissue is suitable to them to settle down and grow. Similarly a M. P. finds the spleen the most suitable place as this organ is a blood reservoir and the M. P. gets its quota of food most easily here than elsewhere. It is therefore quite reasonable to assume that the preponderance of a particular type of disease in a particular part of the body can be at least partly explained by the anatomical peculiarities of that part of the body apart from considerations of tissue susceptibility and local immunity which may explain the presence or absence of certain type of infections in certain parts of the body.

Let us now extend this analogy and consider whether there is an anatomical background for the greater incidence of certain types of disorders in various diseases of

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| <p>16. The place of the preceptorship in undergraduate medical education. Panel discussion. In Proc. Annual Conference on Medical Education & Licensure of the American Medical Association.</p> <p>17. Packer, H. General practitioner supervision.</p> | <p>18. Barr, D. P.: The teaching of preventive medicine.</p> <p>19. Allen, R. B.: Medical education and the changing order. New York, the Commonwealth Fund, 1946, 142 pp.</p> |
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the liver. The commonest hepatic disorders are in their order of incidence, acute and chronic hepatitis, cirrhosis of liver, passive congestion and hepatic amoebiasis in tropical countries. Reticuloses embracing as they do lymphoblastomas (like leukemias, Hodgkin's disease and lympho-sarcoma) though rare are now assuming an importance out of proportion to their degree of incidence.

ANATOMY OF LIVER

The liver is a solid organ in the abdomen and is mostly intra-peritoneal. It is held inside by the intra-abdominal pressure and various ligaments attaching it to the diaphragm and surrounding viscera. It consists of two lobes mainly and is further subdivided by a reticular frame work into a number of lobules. The hepatic circulation is derived from two sources i. e. (1) the portal vein which is the carrier of most of the nutritive elements absorbed from the gastro-intestinal tract and (2) the hepatic arteries which carry about 25% of the total blood supply to the liver at great velocity and great pressure. The portal vein and hepatic artery ramify in a network of Capillary-like-vessels called "sinusoids" from which the blood is collected by the central vein which join up to form the hepatic veins which ultimately join the inferior-Vena-Cava. Both the portal veins and hepatic arterial ramifications are richly supplied by the vaso-motor nerves. The vagus and sympathetic (7th to 9th dorsal segments) are the nerve supply to liver. The liver secretes bile which is collected by the bile capillaries and conveyed across the bile duct into the intestines.

PHYSIOLOGY

Till about two decades ago changes in the portal system occupied the main place in the descriptions of hepatic disorders and only minor notice was taken of the hepatic artery and changes in its circulation. Animal experimentation, techniques which involve use of injection, corrosion and preparation of casts, trans-illumination and direct observation 'in vivo' have enabled medical men to study the changes occurring in circulation and morphology in hepatic disorders. The following observations have been made by the above studies:

- (i) During digestion and with increase in bodily metabolic activities, the flow of blood in the portal circulation is greatly increased.
- (ii) Portal-venous-pressure is greater than pressure in other veins in the body but is low when compared

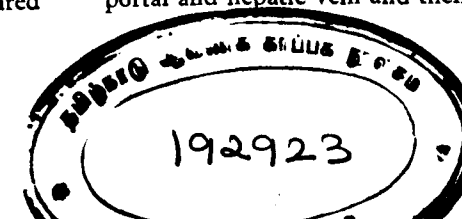
with the arterial pressure (average mean in normal dogs was 2.1 Cms of saline (Grindlay) and this pressure was doubled in cirrhosis of liver.

(iii) Flow of blood in the portal system of veins is streamlined. If Indian Ink were injected into superior mesenteric vein, the particles were found in the right lobe of the liver while if injected into the splenic vein, it was found in the left lobe of the liver. Selective distribution of portal blood in the liver occurs, Blood from the upper part of the gastro-intestinal tract, from parts of the colon and from the spleen goes into left portion of the liver. Whereas the remainder of the portal blood goes to right. The localisation of the abscesses in the liver may result from such streamlining.

(iv) The young Russian Surgeon Eck (1877) proved beyond doubt the essential nature of portal blood for the liver by his famous operation of shunting the portal vein into inferior-vena-cava and thereby causing hepatic atrophy and central fatty degeneration. Mann and others have emphasized by their several experiments the importance of portal circulation in restoration of the liver after partial hepatectomy. The presence of portal circulation is as important in the causation of hepatic hypertrophy as its absence is in hepatic atrophy.

(v) The pressure in hepatic artery is the same as in any other systemic artery i. e. 120 mms Hg. The hepatic artery carries a small volume of blood at great velocity while the portal vein carries a large volume of blood at slower speed and with much less pressure. The question is still unsettled as to whether the liver can survive the loss of its supply of arterial blood. Mann and his associates reported that ligation of the hepatic artery at its point of origin is without effect but the ligation of the hepatic branch of hepatic Artery at its entrance to the liver is always followed by death in the dog. Markowitz and associates suggested that the immediate life saving function of the hepatic artery in the dog is to maintain the tension of oxygen at a value that is incompatible with proliferation of the anacrobic organisms that are constantly present in the hepatic tissues such as E. coli. The blood in the portal vein carries some oxygen but most of the oxygen to the liver is carried by the hepatic arterial blood, which provides about 25% of the total blood supply to the liver.

(vi) By means of trans-illumination and visualisation of intra-hepatic-circulation 'in vivo' it was found that a great number of sinusoids emptied into the central veins. The branches of the hepatic artery and the portal and hepatic vein and their ramifying sinusoids had



an arborescent distribution throughout the hepatic substance. It was found that the degree of circulatory activity in different regions of the liver is highly variable, even in a single sinusoid of a simple lobule. There is also a definite intermittency of circulatory activity in any group of lobules and even this intermittency is variable. Not all the lobules are active at the same time. While some are active, others are resting. In more than 75% of the regions studied, the sinusoids were inactive, when neither excitatory or inhibitory factors were exercised over the intact liver.

(vii) While it was easy to distinguish between the capillaries of the portal vein and hepatic artery at the periphery of a lobule it was difficult to distinguish one from the other near the central vein into which both drained. The portal and arterial blood communicated with one another in the lobule in their inter-lobular course. Daniel and Pritchard emphasized the presence of innumerable intra-hepatic pathways of various lengths through which blood can pass from the portal vein into the inferior-vena-cava.

(viii) Stimulation of the hepatic nerves by local application or intra-venous injection of epinephrine causes constriction of intrahepatic blood vessels while stimulation of the vagus nerve causes no perceptible effect. Administration of glucose, isotonic saline or sucrose causes an increase in flow in both portal vein and hepatic artery while use of bile salts has been reported to produce an increase in the hepatic arterial flow only.

(ix) The total hepatic flow of blood was determined in patients by Bradley and associates by Hepatic vein catheterisation to be 1500 c. cs. per minute on an average. Dock by perfusion in livers obtained at necropsy got a value of 2420 c. c. Lichtwitz estimated the total daily flow of blood through the human liver at 2000 litres of which 1200 litres were portal and 800 litres were arterial in nature. Schweigk suggested the existence of a mutual relationship between the hepatic artery and portal vein in the normal liver.

(x) In cirrhosis of the liver great destruction of the vascular pattern was present, unlike the normal liver, anastomoses of fair size between portal and hepatic veins were fairly common.

(xi) Experimentally unilobular atrophy, usually of left lobe, occurs with or without generalised cirrhosis as a result of nutritional deficiencies, disturbances of portal circulation, free flow of bile and from various hepatotoxins. It is possible that a decrease in portal pressure

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and nutrient blood supply more profoundly affects the left lobe because of the longer and more slender left branch of the portal vein whose arborisation is at a greater distance from the main stem than is that of the right branch. According to the concept of streamlining, blood derived from the small intestines and ascending colon does not mix appreciably in the portal vein with blood from the splenic vein. Therefore the former flows pre-dominantly to the right lobe of the liver while the latter flows to the left lobe. Himsworth and others have used this phenomenon of streamlining to explain the predictions of hepatic injury for the left lobe of the livers of rats that are in states of nutritional deficiency. "To apply these concepts human material is tempting but difficult".

Till very recently medical men were concerned with the influence of portal obstruction and portal-hypertension. For example it was well known how ascites was caused by obstruction of portal vein by a gland or a tumour in the porta-hepatis or when the radicles of the portal vein were pressed upon by the contracting fibrous tissue in cirrhosis of the liver, or, due to back pressure on the hepatic veins in congestive-heart-failure. It was also known that nature tried to assist herself by forming collateral anastomosis between portal circulation and systemic circulation by establishing communications between the gastric veins and the Oesophageal vein, between veins of colon and duodenum and left renal vein, between the accessory portal system of Sappey and the epigastric and internal mammary veins, between the paraumbilical veins and the superficial abdominal veins and lastly between superior haemorrhoidal veins and middle and inferior haemorrhoidal veins. We also knew that when the oesophageal varies ruptured it resulted in hematemesis and when the haemorrhoidal veins ruptured it caused bleeding piles. When nature failed to help herself man stepped in and operations like Talma-Morrison's "button-hole" operation were devised to shortcircuit portal with systemic circulation.

What has been of recent origin is our present conception of nutritional cirrhosis and the administration of the essential amino-acids-methionine, choline and inositol in addition to B-complexes to cure this type of cirrhosis.

The other aspect of liver disorder which has been elucidated in recent times has been the administration of antibiotics to cure pyrexias of hepatic origin as now we know anaerobic organism, usually B. coli, are the normal habitants of liver and when for some reason the hepatic artery is unable to supply the desired quota of arterial

Difficulties of a Doctor in the treatment of Industrial Workers

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BY Industrial Workers I mean those manual labourers who work in a factory which does not possess a hospital of its own for indoor treatment but only affords first aid and out door treatment and also does not provide quarters for them so that they have to make their own residential arrangements. The majority of industrial firms in my district belong to this group.

Something must now be said about these labourers. From 60 to 65% of these people (according to my estimation) hail from other provinces and live without their families, in Bustees of Kutch houses consisting from 5 to 10 rooms in each house and three or four persons live together in one room. They come from the same or adjacent villages of their province and work generally in the same factory. Another 25 to 30% of labourers live in adjacent villages of this place and attend the works by various means of transports. The rest of the workers from 5 to 10% are local inhabitants and live with their families.

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blood, the liver cells suffer from a state of anoxia and the anaerobic organisms flourish and cause a state of septicaemia which yields to streptomycin treatment, this antibiotic being specific for E coli.

It was thought till some time ago that tuberculosis of liver was rare but knowing that the liver has also a systemic blood supply and that miliary tuberculosis is generalised tuberculosis, miliary tuberculosis of liver is a very common terminal complication of most of the debilitating diseases of any system.

Reticulosis of the liver is a new group of diseases about which very much definite has not been known. Whether they are of the nature of a functional hyperplasia or a type of reaction to infection or is of the nature of a new growth is still to be settled. Their response to deep ray therapy suggests that the condition may probably be neo-plastic in nature.

CONCLUSION

Liver is a mystery organ. Its functions are multifarious. The innumerable functional tests of the liver

Those workers who come from other provinces live as far as possible in such Bustees as are near their place of work. When they are indisposed they attend to their works' Dispensary for medicines. But when they are unable to attend there or to move out of their rooms for sickness, they send for the nearest doctor and if they do not improve within 2 or 3 days they are sent in the majority of cases to their village homes by their fellow men without waiting for any further treatment. Only those who are acutely ill and cannot be sent home stay back.

With an experience of many years in three different roles as stated below I may state to a certain extent the difficulties encountered in treating such cases. It is not my intention to enter into details of these difficulties which may lead to many undesirable expositions of other people which I want to avoid. I shall only try to give a picture of the real situation mentioning the salient features relating to this problem so that a short and comprehensive idea may be obtained by those interested.

clearly indicate its various responsibilities. It is one of the most important organs of the body whose various functions have not been completely explored. It is therefore incumbent on us that we should try to know more and more about this important organ and devise better methods to overcome its dysfunctions due to disease.

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The three different roles as stated above are (1) As a resident medical officer in a fairly big Govt. Hospital the only one in the whole of the district in various capacities for over two decades, where industrial workers from all the factories in this locality are sent for treatment for injuries or diseases as indoor or outdoor patients and also for special examinations and treatments.

(2) As an independent private practitioner treating industrial workers and (3) As the medical officer of a big industrial firm of this place.

The population of this place has been gradually on the increase as more and more industries are cropping up in the district. Then the influx of the refugees has caused the population to swell up considerably. But the regular number of beds in the hospital remain almost the same as they were before. The nursing medical and menial staff in the residential list of the hospital have not been much increased. Extra beds have to be arranged in all the wards almost three times the normal capacity. Bad accident cases from the industrial units and other emergency cases are pouring in all day and night and the hospital has to carry a superload of more than three times its normal capacity upto the last limit of available space by extra beds, often filling up the verandahs and two rows of beds on the floor of the wards. But this is also insufficient and falls far too short of the demands. Scores of bad cases have to be refused admission for want of any further accommodation. No creek or corner is now available to put another extra bed. Curses, abuses, insults of all kinds threats of reporting to the highest authorities and of writing to the daily papers for publication about the callousness of the doctors for refusal of admission are daily occurrences. But what can the medical officers do under such difficulties? And who will save them from the difficult situation? The house staff are overworked, their energies are strained to the maximum. It is no wonder then that cases are often neglected and they cannot give that much of attention that should be given to the cases under their charge, with the result that there is often deterioration in the condition of the patients and delay in their recovery. Complaints from patients and their parties often come for such neglects and they are often taken to task by their superior officers for this. They are in a difficult position, but what can they do under the circumstances? Then, often due to rush of patients something or other goes out of stock completely and the doctors are in a difficult position consequently. Then it often happens that some bad case is brought in for admission but cannot be admitted for want of bed; the relations who brought the patient silently disappear leaving the patient

behind. Sometimes these cases are found to be suffering from T. B. Lungs. T. B. cases are not admitted in the hospital. Where to send them, there is no hospital in this district for admission of T. B. cases. The medical officers are in great difficulty in disposing these cases.

I shall next relate the difficulties of the private practitioner treating the industrial people. Generally there are two reasons why they seek the help of the private practitioner. The first and main reason is to obtain a medical certificate for going home on sick leave. They always have some kind of complaint for asking this leave and it often becomes very difficult for the private practitioner after examination to make out a proper diagnosis to fit in for the period of leave asked for and which he will recommend. Hundreds of such certificates come to us and in one instance a particular doctor who lives near a fairly big Bustee finds "Blood—Dysentery" as a very handy diagnosis for all his cases month after month and quite a lot of these every month, and for which he generally recommends leave for one month at first with further extensions if and when necessary. The second difficulty of the private practitioner is to treat the labourer when he is lying acutely ill at his bustee residence. His room mates and friends at first tried to have him admitted in the hospital but as there is no bed vacant he is dumped back again to his house and the private doctor is called in. This generally happens in the evenings after the worker-friends of the patient return from their work. They leave their ailing friend all alone in the morning without any food and go to work thinking that Nature might cure him. On return they find their friend in a worse condition and then runs to the doctor after trying for admission in the hospital. The doctor comes and finds the patients in a bad, sometimes, in a semicomatose condition without any food or even water for at least 12 hours. He examines, prescribes medicines, gives injections if necessary and gives necessary instructions to the friends of the patient about his feeds and medicines, etc. During the night the doctor is often roused once or twice to give reports or called again to see the patient. The next morning the doctor goes to see the patient and finds that his friends are making themselves ready to go to their works. They are sorry that they could not send the patient home because he is too ill to undertake the journey. At the request of the doctor some one of them agrees to stay back and look after the patient. But to what purpose? It is often found that instead of one dose of medicine at a time three doses have been given by his friend with the idea of making a rapid recovery. He does not know how to

prepare the patient's food. The patient is lying in a mess without being cleaned or washed and with the soiled clothes still on his person. The friend of the patient has not the slightest idea of nursing. They will not agree to engage any private nurse. The doctor considers his Nursing as more important than his treatment in this case. Then the patient may need Oxygen to be administered. His blood, stools, Urine, in short all kinds of pathological tests may be necessary for proper diagnosis of the case as early as possible. The party is not willing to pay any extras for these. The doctor is in great difficulty.

Then sometimes the patient is found to be a bad and open case of pulmonary tuberculosis. He is living in a congested room with other workers in an unhealthy and smoky bustee area. The doctor is in great difficulty because he knows that the patient is rapidly spreading the fell disease to all his friends and he makes a frantic effort to find some way to isolate the patient. He finds this impossible. He cannot be shifted to any tubercular hospital or sanatorium. There is no room or place for him before at least six months. He is to be X Rayed. He cannot be done unless he pays for this even in a hospital. There are no facilities for free X Ray examination of these patients. The doctor finds great difficulty in making out the exact extent and nature of the damage without such X Ray. The patient may be a bad case of Typhoid or some other disease requiring the administration of costly medicines which the party cannot pay. He may require blood transfusions. It is difficult or even impossible for the doctor to manage this. So the treatment of all such acute cases of the industrial people just mentioned is a difficult problem for the private practitioner and he sincerely feels that he cannot do justice to these cases. Although he earns some money out of these cases he ardently and honestly hopes that all such cases of the industrial workers who require treatment for their diseases in their bustee houses should under no circumstances be kept there but sent immediately for admission to the hospital if proper medical aid is really intended to be given to them. The medical practitioners will remain satisfied by earning money by treating them at their chambers as stated above although in many of these cases the question of pathological tests and X Ray examinations do arise, and require to be solved. But the most important and burning question which is uppermost in every doctor's mind while handling industrial patients with pulmonary tuberculosis is the absolute helplessness in checking the spread of this disease in open cases.

While treating bad cases at their houses some doctors succeed in getting them admitted in the hospital after repeated attempts and take the patients along with them for admission. They often want to remain in touch of these patients while at hospital and to know all about their treatment so that when they are discharged they may take over and follow up. But in the majority of cases instead of getting cordial treatment and co-operation from the hospital doctors they get very cold responses and treated just as ordinary outsiders without any access to their way of treatments (facts should be stated) with the result that the private practitioner, after discharge of his patient from hospital remains in the dark regarding the pathological and other findings and the treatment done in hospital and it becomes for him extremely difficult to carry on the further treatment of this patient in his convalescent state and also for purposes of reference if he falls ill in future.

The treatment of an industrial worker is not an isolated factor but concerns several parties, viz the labourer himself his employer, his labour Union, the Chief Medical Officer of the company, the private practitioner treating the patient, the hospital where he is treated. Unless all these parties combine and work in closest co-operation and concord and in a helpful mood for the same purpose of affording relief to the patient, the chances of his recovery becomes remote and difficult. The main burden, however, lies on the Chief Medical Officer of the company who is ultimately held responsible for the proper conduct of the case; but unless he obtains full support and complete co-operation from all the parties concerned, to act in a manner as he thinks best, it is extremely difficult to expect substantial results. But things, at the present time have come to such a pass that this is not possible and the difficulties of the Medical Officer in charge of an industrial firm in treating the labourers are many. These cannot be detailed in an article like this and I shall confine myself only to those that affect the various medical men concerned in their treatment.

Certificates from the majority of Private Practitioners are often found lacking essential points that are necessary to be stated. They seldom follow any standard form of certificate as is used by the Government for medical leave of their employees. This creates difficulties in various ways. Certificates are often found recommending leave for a disease for such periods as are out of all proportion to that which are generally and normally needed for the recovery of such diseases. There may be variations in certain cases but how is it possible to pre-

sume at the beginning of a disease like Influenza that it would take 20 days and for a case of Diarrhoea 15 days for recovery? It becomes extremely difficult for the company's Medical Officer to agree in such cases. There should therefore be a scheduled list of the general diseases with their normal periods of recovery prepared by some competent Medical Board approved by the Government to be followed by the Medical Practitioners while recommending leave except in rare and abnormal cases and also to stick to a definite standard form of certificate as are used for Government employees.

Another kind of difficulty met with by the Medical Officers of a firm. Many employees who have no further medical leave due to them come to join with a fit medical certificate from their doctors and are found to be still suffering, some of them acutely with such diseases as Pleurisy and Tuberculosis. It is the latter disease which causes the greatest difficulty in being dealt with. It is very difficult to agree with such certificates for the Medical Officer of the firm and allow them to join duty.

In most of the Govt. hospitals in and around Calcutta there now exist facilities for examination and treatment in the outdoor by specialists for different diseases. Whenever any worker is suspected to be suffering from any such diseases V. D. Leprosy, other infectious skin diseases, tuberculosis etc., he is allowed to avail of these advantages and sent to the hospital for necessary examinations and treatments. But it is difficult and sometimes impossible to obtain any reply to our letters of enquiries regarding the progress and recovery of these patients, except in the form of a certificate with a bill attached to it from the hospitals. In the absence of any knowledge as to whether the case is still infectious or not it becomes very difficult to decide for the Medical Officer if he should be allowed to join work or not. Many cases of injuries due to shop accidents specially those of a serious nature are sent to hospitals for admission for necessary examinations (Radiological etc.) and treatments. Sometimes such cases which require hospitalisation and cannot be properly treated outside, are refused admission and it becomes extremely difficult for the company's Medical Officer to manage such cases. Many cases of injuries

after being kept in the hospital for some time are discharged long before they are fit in order to make room for other cases, and their conditions often become worse after such discharge. The Medical Officer of the firm has to seek re-admission for these patients and it becomes very difficult for him to manage such cases when they are refused re-admission. It is often very difficult for the factory Medical Officer to obtain proper information regarding the condition and progress of his patients while admitted in the hospitals. There is sometime a complete lack of desire by the hospital doctors to co-operate with the factory doctor who wants to be in touch with his patients and to follow their progress. It is considered that to give any information about the patient is an act of condescension which he may withhold at will. This creates not only a very difficult but embarrassing position for the factory doctor. I have already mentioned about the difficulties of getting the industrial patient suffering from an open case of tuberculosis admitted in a hospital. It is almost an impossible affair and the doctor becomes despaired not only for being unable to isolate the patient to a hospital for his proper treatment but also for not being able to stop the spread of the infection to, other people who may come in contact with him in spite of all precautionary measures and instructions to the patient.

I have mentioned some of the main difficulties confronting the members of the Medical fraternity while treating the industrial workers. It must be assumed that I do not put the blame on anyone for such difficulties. These may be circumstantial or due to some policies followed by individuals or parties for reasons of their own.

But for the welfare and better conduct of treatment of the industrial workers and for an all-round improvement of the situations mentioned above, it is necessary that these difficulties should disappear.

I am sure that there are many who are interested in the welfare of the industrial workers and in their treatment in diseases and injuries and have valuable suggestions to make. I have my own suggestions to make however, which I shall give in a later issue of this magazine.

EMPLOYEES STATE HEALTH INSURANCE SCHEME INAUGURATED IN BOMBAY

Dr. CHAMANLAL MEHTA'S CALL TO THE MEDICAL PROFESSION

This important Social Security Scheme has been inaugurated in Bombay State on the 2nd day of October,

1954 which coincides with the 86th birthday anniversary of Mahatma Gandhi. This is a step forward in ensuring the Industrial health of Greater Bombay and other outlying areas. The success or failure of the scheme in Bombay, the nerve centre of the Industrial India and

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Priorities and Life Saving Measures in Multiple Injuries Cases

AN ABSTRACT AND COMPILATION BY B. SUBBARAMIAH, B.SC., M.B.,B.S.
District Medical Officer, Chikmagalur

MODERN civilisation has its compensation and concomitant penalties. With increase in Industries, accidents and injuries have become very frequent. These injuries are often multiple and may be simple in nature, serious or fatal. Over 90% of the injuries are simple in nature. As per report of the Royal Society for the prevention of accidents over 20% of the accidental injuries are due to machinery including transport and nearly 80% are not caused by Machinery. These larger number occur from handling goods, electricity, fire, fall of persons, fall of objects, hand tools, moving parts, machinery, traffic in crowded streets, spontaneous combustion, inflammable liquids, poisonous gases, dust violence and other causes.

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one of the country's greatest Industrial regions, will contribute to its future pattern and also to its further introduction in other industrial regions of the country. The psychological effect on the industrial workers will of course be the main concern of all the interests connected with the scheme.

Authentic circles in the medical world are of the opinion that the scheme might prove irksome rather than beneficial in the actual working due to the paucity of beds in hospitals, closure of some of the existing factory dispensaries and the Panel System of Medical Officers.

Another important factor is that the publicity given so far to the scheme is not adequate and much more efforts should be made to explain the various features of the scheme to the workers concerned. Of course the Bombay Labour Ministry have done what they can so far in this direction but it would be worthwhile to intensify the publicity plans in this respect.

It is, however, to be hoped that prompt attention will be paid to all complaints and steps taken immediately to remedy the defects as and when they come up to the surface in the actual working of the scheme. The day chosen for the inauguration of the measure is very important and every one must co-operate to make it a thorough success in the larger interests of the nation.

Death following acute injury results from alterations in physiological processes which, if promptly recognised, can often be obviated by appropriate procedures or replacement therapy. Every Surgeon who treats the severely injured should be prepared to institute emergency life saving measures in any part of the body.

In the management of the severely injured, the preservation of life takes top priority. Life-endangering qualities of an injury or injuries demand quick recognition and the institution therapy. It is the purpose of this presentation to present from the clinical standpoint a discussion of the possible causes of death following acute trauma and some measures which may counteract these poten-

Addressing a meeting on the eve of the implementation of the scheme in Bombay, Dr. Chamanlal Mehta, former President of the Indian Medical Association, Delhi, called upon the medical profession to prove to the Government that it was only under the panel system that the maximum medical relief could be given to Industrial workers.

Having accepted to co-operate with the scheme, he continued, they should do their duty as laid down by the rules and regulations, putting up with the difficulties and show Government that the panel system was more efficient and more satisfactorily worked.

If members co-operated the Government's belief that the worker got the maximum relief under the service system could be disproved, he added. He called upon members of the profession to be sympathetic towards the industrial workers.

The meeting was organised under the auspices of the Indian Medical Association, Bombay Branch, to explain the working of the scheme in Greater Bombay.

Dr. C. S. S. Thakar explained the rules and regulations and Dr. S. S. Ugrankar, Honorary Secretary, proposed a vote of thanks.

tially lethal conditions.

The causes of death relatively soon after acute trauma are :—

1. Asphyxia (carbondioxide excess and anoxia),
2. Hemorrhage and
3. Damage to vital centres of brain.

(1) *Asphyxia* :—Causes of asphyxia soon after acute trauma may be classified as obstruction of airway, as with mandible or neck injuries or in unconscious patients, tension pneumothorax, hemothorax, flail chest segment, and cardiac tamponade.

These conditions are not difficult to recognize if they are considered and the injured patient is carefully examined. It is reasonable that they should be recognized by any surgeon who expects to treat badly injured persons. Few diagnoses of any kind will be missed if the patients are thoroughly examined.

Possible life-saving therapeutic measures to prevent death from asphyxia include :

Endotracheal Tube : This may be life-saving in mandibular and oral injuries. It is inserted as an anesthesiologist places such a tube for endotracheal anesthesia. Local anesthesia of the pharynx is usually required. With the tube in place aspiration of the main bronchi is easy.

An ordinary oral airway often may be an adequate substitute for an endotracheal tube in these injuries. It is always available, is easily inserted and may be life-saving.

TRACHEOTOMY :—This is the most certain way of maintaining an open airway and often can be life-saving in injuries of the jaw and neck. It often is needed in unconscious patients whose airways tend to become obstructed. When there is the slightest doubt about the airway, tracheotomy is indicated. It has been said, *when tracheotomy is being considered it should have been done two hours previously*.

INTERCOSTAL BLOCK :—When the bronchial tree is filled with blood and secretion which cannot be coughed up because of intense pain from chest wall injury, usually including broken ribs, posterior intercostal nerve block with procaine may be life-saving. With chest wall pain relieved and the patient positioned and aided by manual costal compression, the bronchial

tree can be emptied by coughing. Without this simple procedure, the patient may drown in his own secretions.

ASPIRATION OF THE CHEST :—Compression of the lungs by air or blood to the point of dyspnea demands speedy aspiration of the chest. For a tension pneumothorax, the point of aspiration is the second interspace anteriorly. For a hemothorax, the eighth or ninth interspace in the posterior axillary line is chosen. Quick relief may be obtained with a large syringe and a large needle to which a rubber tube and an adaptor are attached. A hemostat is used to clamp off the tube while the syringe is detached. After the pressure has been partially relieved, continuous drainage is provided by a catheter inserted through a trocar and attached to a tube leading under a water seal.

Stabilization of a flail chest segment may be obtained by a compression bandage if the segment is small or by skeletal traction employing a towel clip passed about a rib of the large flail segment. Stabilization eliminates paradoxical breathing and improves respiration thereby permitting better CO₂-oxygen exchange in the lungs. This, too, can be life-saving.

Aspiration of the pericardium is the treatment of choice for cardiac tamponade. Through a large needle inserted at the xiphoid process and passed upward at 45 degrees and toward the left at 45 degrees, the blood in the pericardial sac can be aspirated and the cardiac compression relieved. Adequate blood replacement by transfusion expands the heart and is a valuable adjunctive measure.

(2) *HEMORRHAGE* :—The second cause of death soon after acute trauma is listed as hemorrhage, which, of course, really leads to anoxia. The therapy for hemorrhage, therefore, is really designed to prevent an anoxic death.

Possible life-saving measures for hemorrhage following acute trauma include: Arrest of Hemorrhage: by compression bandages, clamp, tourniquet or surgical intervention. In the majority of wounds, hemorrhage may be controlled by a good compression bandage. In some instances, however, other measures must be employed to arrest hemorrhage. Occasionally in extremity wounds, a hemostat may be applied to a bleeding major artery in a wound and left in place until the patient comes to definitive surgery. This method is not without complications. Often two or three clamps must be applied blindly in a sea of blood to clamp both the bleeding artery and vein. The arterial tissue destroyed by the

clamps may preclude an otherwise possible repair by suture later. Moreover, major nerve trunks usually accompany major arteries and a previously undamaged trunk may be crushed in a clamp.

The tourniquet is the time-honored measure for control of major peripheral arterial hemorrhage and it remains a most valuable agent. It, however, requires precise application so as to preclude all arterial flow to the extremity. To obstruct venous return and permit some arterial blood to go through will result in the sequestration of a major portion of the patient's blood distal to the tourniquet with rapid deterioration in his general condition. *A tourniquet is never applied below the knee or elbow as it will not be effective.*

Once the need for a tourniquet has been established and it has been applied, it seldom if ever should be removed until blood replacement has been started and the patient has reached the operating room for definitive management of the arterial laceration.

The old concept that a tourniquet should be released for five minutes every half hour or even every hour is no longer tenable. The objective of the temporary release of the tourniquet was the prevention of gangrene but the practice, as demonstrated during World War II, is as unwise as it is unnecessary. Possibly an occasional limb may be lost because gangrene develops after a tourniquet has been left in place too long but it is even more certain that some lives may be lost because removal of a tourniquet at regular intervals permits the repeated loss of quantities of blood which may be lethal. A wounded man to whose extremity a tourniquet has been applied must be assumed to have lost already a considerable amount of blood, and the additional loss of a few hundred cubic centimeters which would be insignificant in an unwounded man, may be fatal. Moreover, it was shown during World War II that it is possible to leave a tourniquet undisturbed for several hours without ischemic gangrene developing especially when the limb can be kept reasonably cool.

Finally, surgical intervention may be necessary to arrest a life-endangering hemorrhage. This is particularly true in intra-abdominal and intrathoracic hemorrhage. In known injuries in these cavities, when the usual resuscitative measures including adequate blood replacement do not achieve and maintain resuscitation, there must be continuing depleting hemorrhage and surgical intervention must be provided promptly as a life-saving measure.

WHOLE BLOOD TRANSFUSION :—This ranks all of the measures in the resuscitation of the wounded from the effects of severe hemorrhage regardless of whether the blood is given by vein or the controversial intra-arterial method is employed. The advantages of this route are claimed recently in several papers. The blood supply to the vital cerebral centres and to the coronary arteries is directly dependent on the pressure in the aorta and intra-arterial infusion raises this pressure more quickly than does intravenous infusion. So choose this route in (1) exsanguinating hemorrhage, (2) profound hypotensive shock and (3) cardiac arrest avoiding with care air embolism. The important thing is to get it into the circulatory system fast and in adequate quantities. If anesthesia and definitive surgery are contemplated then there must be not only sufficient blood available for resuscitation but additional blood must be at hand to compensate for the operative loss.

PLASMA EXPANDERS :—These may be life-saving while whole blood is being obtained and made ready for transfusion. From the standpoint of resuscitation, plasma, dextran, polyvinylpyrrolidone and lactate-Ringer's solution may be used. Of these, at this writing, dextran is preferable. It is now being employed in preference to plasma in the Armed Forces. It is equally good as a resuscitative agent and it is without the risk of homologous serum jaundice prevalent following the use of pooled blood plasma.

Adjunctive measures in the almost bled-out patient may be life-saving. These include several measures which are presented in the order in which they may be provided as soon as the patient is seen.

The head-down position provided promptly may be life-saving. The arterial blood pressure has been observed to rise 20 points after merely elevating the foot of a litter 18 inches. This position is a measure which can be provided in a moment while whole blood is being obtained. It should be pointed out that the head-down position is usually contraindicated in the presence of a significant intrathoracic or intracranial injury for obvious reasons. It also may be contraindicated in the obese individual. In such a person, the heavy abdominal contents pressing against the diaphragm may, in obstructing full excursion of respiration, increase anoxia more than the head-down position can decrease it by raising the arterial blood pressure.

Adequate splinting of broken extremities is a valuable measure tending to aid in resuscitation from shock.

The British history of World War I records that the provision of the Thomas splint for the emergency battle field splinting of compound fractures of the femur and nothing else resulted in a lowering of the mortality from this injury by 25 per cent.

Oxygen therapy on a clinical improvement basis appears to be valuable in the resuscitation of the wounded following severe hæmorrhage although on a theoretical basis it is not indicated unless there is cyanosis.

(3) **DAMAGE TO VITAL CENTERS OF BRAIN**:—Very little can be offered soon after injury to the unfortunate individuals who have sustained sufficient injury to vital centers of the brain to cause death.

Causes of death occurring somewhat later following acute trauma have been classified as: loss of extracellular fluid, which is synonymous with Secondary or traumatic shock, anuria, sepsis or infection, asphyxia, hæmorrhage, and brain damage.

Possible life-saving measures for these later causes of death include: restoration and maintenance of fluid and electrolyte balances, replacement of whole blood losses, operative intervention in abdominal injuries to prevent peritonitis or control hæmorrhage or both, debridement of extremity or trunk wounds to prevent sepsis including gas gangrene, and proper antitetanus therapy.

The clinical syndrome of secondary or true shock not resulting from excessive loss of whole blood develops from the loss of extracellular fluid. This fluid from both the blood stream and the extracellular spaces sequesters into traumatized areas which may be in the extremities, trunk or abdominal cavity. In these instances, there is some whole blood loss into the tissues but the principal circulatory deficits are fluid and electrolytes. In this situation, elevation of the hematocrit and plasma protein levels are characteristic laboratory findings.

The amount of fluid which may be lost into the tissues from the circulation is not to be underestimated. For example, with a closed fracture of the femur in a thigh of average length which measures 16 inches in circumference at the midpoint before injury and which swells after injury so that the average circumference increases by 2 inches, the amount of fluid lost in the thigh may be calculated as approximately 2,200 C. C. If there is an associated fracture of both bones of the leg with heavy swelling, another 1,300 cc. is lost from the circulation. Such skeletal injuries usually have associated

elsewhere on the body lacerations from which whole blood is lost and contusions into which both whole blood and extracellular fluid are lost. The total fluid depletion can easily be 4,000 to 5000 C. C. which is approximately 35 percent of the extracellular fluid of a 70 kg. Man. This loss of fluid produces the syndrome of traumatic shock. This is what may lead to death unless it is promptly corrected.

The repair solutions then are whole blood to compensate for blood loss, and fluids and electrolytes in proper concentration to replace those losses from the blood and extracellular spaces. For this form of secondary shock including burn shock the indicated repair solution after whole blood losses have been replaced is a sodium containing fluid in the same concentration as in blood plasma. This is best supplied by $\frac{1}{4}$ molar lactate-Ringer's solution. So-called normal saline is a poor repair solution in this situation. It supplies fluid but the wrong electrolyte concentration. To use only whole blood risks an excessive hematocrit reading and increased blood viscosity which may result in heart failure and pulmonary edema before the fluid deficit is restored.

The restoration and maintenance of fluid and electrolyte balance are certainly the most important if not the only prophylactic measures against anuria.

The importance of prompt surgical intervention in intra-abdominal injuries in preventing peritonitis is well understood. The importance of thorough debridement of trunk and extremity wounds in the prevention of life-endangering sepsis including gas gangrene is less appreciated. In this connection, it may be pointed out that the most important preventive measure against the development of gas gangrene is prompt and complete wound debridement. Adjunctive measures are antibiotic therapy and whole blood replacement. Gas gangrene antitoxin prophylactically is of no value and is condemned.

Proper prophylactic antitetanus therapy may be essential to prevent this disease which carries a high mortality. In those previously immunized with toxoid a booster injection of toxoid is given. If the basic series was received more than four years previously and the wound is contaminated with material likely to contain tetanus organisms, tetanus antitoxin, prophylactically also should be given with a separate syringe at a separate site.

To those not actively immunized, prophylactic tetanus antitoxin must be given. Fifteen hundred units will

probably suffice for the average wound seen early. The prophylactic dose should be increased 5,000 to 10,000 units for wounds which are more than 24 hours old or which are contaminated with material likely to contain tetanus organisms. Passive immunity is short-lived and is unlikely to persist more than 7 to 14 days. If an unhealed wound still contains dead tissue, repeated prophylactic injections of tetanus antitoxin are indicated after seven days. If a later operation is to be performed on a healed wound in which tetanus spores may have been implanted, or even the part manipulated without incision, additional prophylaxis is indicated. Preferably, secondary surgery on a healed wound will be delayed until an active immunity has been established.

The causes of asphyxia and their management soon after injury, as outlined previously, are the same at a later time. Likewise, secondary hæmorrhage so severe as to cause death may occur at any time and the same measures for it are applicable.

Damage to vital centres of the brain sustained at injury sufficient to cause death is not amenable to neuro-surgical therapy. It is often possible however, by promptly recognizing signs and symptoms of increasing intracranial pressure and any focal neurological signs to institute the appropriate operative or non-operative measures to overcome them and prevent additional brain damage and thereby possibly save life.

The relative urgency of the life-endangering physiologic derangements—sets the priorities in acute multiple injuries. In all situations, those causes of asphyxia take first priority in efforts to save life. Known hæmorrhage ranks high for measures to arrest it and to replace the blood loss. In conscious patients, hidden hæmorrhage or hollow abdominal viscus injuries may be diagnosed and they are the next urgent. Debridement of extremity and trunk wounds comes last but even in last place, it remains a life-saving preventive surgical measure. In unconscious patients, intra-abdominal life-endangering injuries may be suspected but diagnosis is difficult although not impossible. The unconscious state does not temper the demand for a life-saving laparotomy if the indication can be determined.

Only when there are signs and symptoms of an increasing intracranial pressure does a head injury assume tremendous relative importance in determining therapeutics. Of course, such a situation will enter the setting of priorities. It cannot, however, demand attention until the dangers of asphyxia and massive hæmorrhage have been obviated.

Mention, may now be made of certain details in attending to a few regions of the injured person:—

Thoraco-abdominal wounds

(1) Arrange quick removal to a Hospital, (2) use plenty of blood for resuscitation before surgical intervention, (3) give 3 lac units of penicillin I. M. thrice a day until wound is inspected and assessed.

A full examination of the abdominal viscera is essential in perforating wounds of the abdomen. In combined thoraco-abdominal wounds, as a thorough examination cannot be carried out through the chest, treat the chest by aspiration and the abdominal lesion by laparotomy. "*Stitches and journeys are INCOMPATIBLE*" as ileus infection and burst abdomen occur.

Haemothorax is treated by repeated aspiration under local anaesthesia until the blood has been completely evacuated or absorbed and the lung expanded. This is preferred to thoracotomy and drainage.

(A) Scout X Ray films in (1) front position and (2) A. P. view in left lateral decubitus will be invaluable. In these look for lesions in (1) Bony structures (2) Extra-abdominal soft tissues and (3) in the abdomen itself see carefully five regions:—

- Subdiaphragmatic for elevation of diaphragm, free air or gas (indicating ruptured hollow viscera)
- Liver or gall-bladder region,
- Spleen, pancreas and suprarenals for ruptured spleen, etc.,
- Genito-urinary organs and proas area. A general opacity around renal area would indicate a ruptured kidney and
- Gastro-intestinal organs.

JOINTS

The principles to be followed are:—

(1) Excision of the wound, irrigation of the wound and suture of the capsule, *the skin wound being left open* as joint injuries are the only exception to the principle of early skin cover of wounds. In some cases aspiration of the joint an instillation of the appropriate antibiotic is necessary later.

Dural injuries and escape of C. S. F.

The risk of pneumococcal meningitis is very great and so the dural tear should be closed as soon as possible either by intramural or intracranial repair.

Burns

The exposure treatment is useful for first and second degree burns but early skin grafting is advisable for full thickness burns.

Spinal Injury

J. Cosbie Ross and M. Damanski have reported that the bladder sphincter spasticity can be abolished by

pudendal neurectomy by which the pudendal nerve is traced to the sacral margin from the Alcock's canal, under local anaesthesia and a short length resected.

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MECHANICAL COUGHING MACHINE REMOVES FOREIGN BODIES FROM LUNGS

A new device has been developed for removing small objects which have lodged in the lungs. It is called a mechanical coughing machine and was developed by Physicians at Columbia University, New York City recently.

The mechanical coughing device was developed originally to aid infantile paralysis patients and others who cannot cough up mucus that collects in and blocks the bronchial tubes in the lungs. Technically known as an excufflator, it will now be used to save babies and older Children or adults who accidentally inhale buttons, pins, peas and other small objects which might prevent their breathing.

At the present time, the bronchoscope is used for such cases. This is a long tube with a light and mirror attachment. It is put down the throat into the lungs, and a Surgeon can then remove an inhaled object with instruments put through the tube.

Excellent as the bronchoscope is, however, it does not reach all parts of the tubes that extend into and through

the lungs, particularly those that branch off at right angles to the main stem. In such cases, an operation must be performed in order to reach the foreign body.

The mechanical cougher operates like two vacuum cleaners which alternately blow air into the lungs and suck it out. In using it, the Physician places a mask or mouth piece over the patient's mouth. A blower similar to that in a vacuum cleaner, then creates positive pressure in the mask and thus in the airways leading to the lungs.

When the lungs are inflated with air in this manner, an automatic switch abruptly connects the mask to the suction outlet of the blower. This creates a change from positive to negative pressure in a fraction of a second, resulting in a velocity of air movement that is considerably higher than the patients can develop by a natural cough.

The device has already been thoroughly tested on animals and has demonstrated its ability to draw out foreign bodies lodged in the lungs.

X-RAY MICROSCOPE

The General Electric Company in the United States has developed a microscope that not only magnifies tiny objects but also "looks inside" them.

Unlike ordinary microscopes, which can be used only to peer at the outside of minute objects, the new device uses X-rays that permit scientists to observe changes in internal organs of tiny live specimens. The company believes that the new X-ray microscope will find a wide use in medical science, biology and industry.

The General Electric instrument, which magnifies up to 1,500 diameters, is expected to aid in the development of new alloys and in studies of such things as corrosion and welding of metals; help researchers learn

more about tooth decay, diseases of the bones and such other human ailments as mineral deficiencies and hardening of the arteries; assist in the study of such things as the covering or bonding quality of paints, adhesives and finishes; and in some cases provide a speedy substitute for detailed chemical analysis.

For example, the company explains, scientists like to study heredity by experimenting with the tiny fruit fly, because several generations can be studied in a short time and the results of cross-breeding can be determined quickly. With the X-ray microscope, changes in internal organs can be observed—and can be seen in three dimensions.

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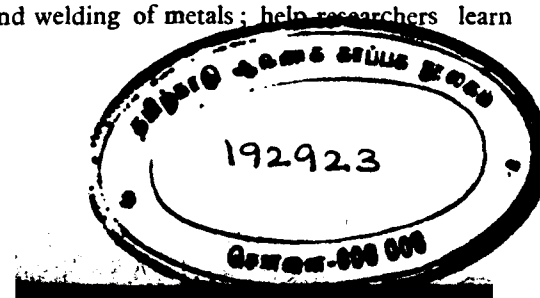
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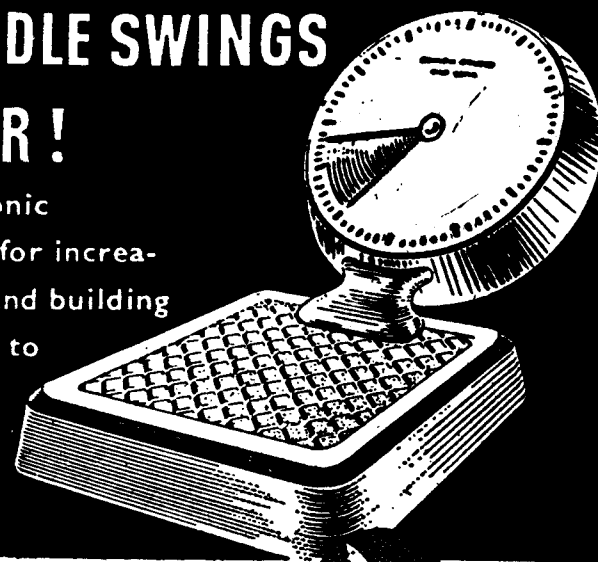


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