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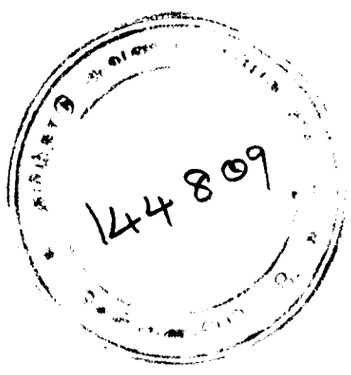

EDITORIAL:

RADIATION HAZARDS

The dawn of atomic era was ushered in by the bombing of Nagasaki and Hiroshima in 1945. Since then nations have been engaged more and more seriously in nuclear and atomic fissions and in taming the energy thus released for use of mankind. The fission products can be used for annihilation as well as for peaceful purposes in the service of man. Nuclear explosions are taking place periodically—the question naturally arises what injurious effects their fall-outs have on humanity. In the peaceful use of fission products, there is also the radiation hazard for the men who manufacture and handle them, and also those who receive them in their bodies, *e.g.*, patients receiving isotopes during treatment. There are also the natural radiation of cosmic rays and radiation of X-rays used so extensively in medicine and engineering.

Since that fateful day in August 1945, public mind has been constantly agitating on the effects of fall-outs of nuclear explosions. Apart from the immediate appalling destruction of human lives and properties, what remote ill effects has it on the present generation and posterity?

An American Committee[1] trying to anticipate the requirements for defence, visualised a nuclear attack in which some 224 military and civilian targets in the U.S.A. are hit by 263 hydrogen bombs with an explosive force of 1,446 megatons of T.N.T. According to calculations, about 23 million people would be killed on the first day, some 26 million would die of wounds and about 20 million would be expected to recover.

Many reports on radiation hazards have appeared in recent years, such as those of the International Commission on Radiological Protection, the Adrian Committee and Medical Research Council in Great Britain, and similar bodies in the U.S.A. and of the United Nations. The Prime Minister[2] of Great Britain made a statement on April 28 this year in the House of Commons on the reassessment of radiation dangers. Among the radio-active materials in the debris in the stratosphere resulting from test explosions of nuclear weapons Strontium—90 is the most important. It has been pointed out recently that the residence time of radio-active materials in the stratosphere is less than was estimated before. This means that radio-activity would have less time to decay before the fall-out is deposited on earth. Once the radio-active materials have left the stratosphere and entered the troposphere the local rate of deposition depends largely on rainfall. Heavy rainfall tends to produce increased fall-out. So in any year

if the rainfall is heavy, and the troposphere is surcharged with radio-active materials there will be much enhanced fall-out. But Strontium—90 decays so slowly that its residence time in the stratosphere does not make much difference. In U.K. regular measurements are made of Strontium—90 in food, milk, drinking water, air, soil and vegetables. Milk is important for most of Sr. 90 in diet comes from this source—of less importance are cereals and vegetables. When Sr. 90 falls out, it is deposited on herbage first—and therefore milk, from the cattle which eats this herbage, forms the chief source of this radio-active material in diet. It was for this reason that the milk in the neighbourhood of an atomic plant in Britain was bought out and spilt when there was a leakage in this plant. The Sr. 90 is also washed into and deposited in the soil, and may still be absorbed through roots of grass and other crops. But the amount thus taken up is comparatively small, and the amount in the food at any time is dependent on the rate of deposition in the immediate past, and is thus variable and cannot be predicted. The results of measurements of Sr. 90 in human bones (children) in 1958 are only slightly higher than corresponding results in 1957, and this is in accord with Sr. 90 level in the diet of corresponding periods. Further the irradiation attributable to Sr. 90 is much smaller compared to natural radio-activity to which the bones are exposed.

Three other radio-active materials Caesium–137, Plutonium and Carbon–14 are also present in the fall-outs. Caesium–137 has genetic effects, dependent on the gonad dose delivered. But this is small usually, as this is only slightly absorbed through food. All radio-active materials enter the human body through ingestion or inhalation—the major part enters through the first portal—absorption through inhalation is negligible. C-14 is a constituent of the atomic fall-out, but the main source is cosmic radiation. It persists longer in the human body, but its radiation rate is low and is therefore less dangerous.

So far the fall-outs from nuclear explosion tests have not been proved to be of sufficient quantity to endanger human lives—but if the rate of explosion increases considerably or if more dangerous fission products bombard the atmosphere, their cumulative and immediate effects may prove dangerous and destructive.

Besides radiation from nuclear explosions, the human body is exposed to radiation from two other sources[3]—natural radiation and from other man-made radiations. The natural radiation is again derived from two sources external and internal. The external sources include terrestrial radio-activity and cosmic rays. Terrestrial radio-activity includes local gamma rays from traces of radio-

activity in the earth's surface and in building materials. Inside a building, the radiation dose is low if wood is used in construction, high with brick or granite, and still higher as in India where usually radio-active shales or sand have been used. Cosmic radiation originating beyond the earth has greater penetration power than terrestrial gamma rays, but it gives much less dose. Thus local gamma radiation is less out-of-doors than indoors, but the intensity of cosmic radiation is almost the same both indoor and outdoor.

Inside the body radiation is received mostly from the potassium of the body among which is present K-40, a naturally occurring radio-active isotope—also from radium and thorium (alpha-rays) which are stored in the bone along with calcium, all derived from the food. Yet another source is C-14, which is a naturally occurring radio-active carbon present in all tissues in minute traces, and is derived from food.

The normal radiation[3] to which the human being (U.K.) is subject to, is 100 milliroentgen (mr) per year. Of this 28 mr is contributed by cosmic rays, 20 mr by body potassium, 48 mr from local gamma rays, and the remaining 4 per cent from luminous paints (watch) and other small sources. It varies in different localities depending on the local composition of the earth's crust and the building materials used. Thus in a lime-stone district it is 20-40 mr per year—in a granite area it is 85-105 mr per year. Again the cosmic ray radiation increases with altitude—at 15,000 ft. it is about 6 times as great as at sea level. In U.K. it is estimated that use of X-ray and other man-made radiation sources including nuclear test explosions will add to natural background radiation by about 25 per cent—of this 22 per cent is by use of X-rays, 1 per cent from radio-caesium from fall-outs and about 2 to 3 per cent from Sr. 90.

The effect of radiation has three main manifestations one on the gonads (mutation, fertility), one on the bones (sarcoma and cancer) and lastly on bone-marrow activity (leukaemia). It also affects the eyes (incipient cataract) and skin (cancer).

Many of the biological effects of radiation have been studied on small animals—mutation of gene, leukaemia, bone sarcomas have all been produced in them through irradiation. It is doubtful whether the same results can be reproduced in man. Available data on human subjects belie the too fatalistic or pessimistic approach that is often pronounced. Such data[4] include the extensive study reports by (1) the Joint Commission for the Study and follow-up of the atomic bomb victims of Hiroshima and Nagasaki, (2) on the 267 Marshallese and Americans exposed to fall-outs from Bikini Atom explosion, (3) on 23 Japanese fishermen who were co-victims of the

last, (4) on 15 persons who suffered from nuclear accidents, and (5) on whole body irradiation of 263 cancer patients. The 568 individuals in the last four categories were subjected to radiation doses varying from 50 r to 600 r, and have been carefully studied for assessment of effects from soon after the exposure. The acute radiation sickness involves (1) the brain—threshold dose is 200 r, and death occurs within 48 hours, (2) gastro-intestinal—threshold dose is 500 r—death occurs in two to three weeks, and (3) hemopoetic —threshold dose is about 100 r, death is not common—and then also it does not occur before 2 to 3 months. The remote effects of radiation such as cancer, leukaemia and the effect on the offspring, have very long latent periods of development and will take time to crystallise.

Recently radiation and leukaemia[5] as cause and effect have aroused great interest. A sharp increase in the death rate from leukaemia has been observed among the survivors of the atom bomb victims of Japan in 1945. Court Brown and Doll in U.K. have demonstrated that cases of leukaemia have occurred more commonly in patients treated by intensive radiotherapy. And thirdly, the occurrence of leukaemia among American radiologists is much more than among their non-radiologist colleagues. In all these cases the radiation dose has been high—20r per minute and above, and the total dose has been 100r or much more above it. The forms of leukaemia which are attributed to radiation are the acute leukaemia and chronic myeloid leukaemia, but not the chronic lymphatic leukaemia.

Does diagnostic radiology predispose to radiation disease? It does. The dose from natural background radiation is 2 x 10-^{6}r per minute, while that from diagnostic radiology is 50 to 100r per minute. The British Medical Research Council[6] in 1956 drew attention to such risks. The Adrian Committee was thereupon appointed and its interim report on mass miniature radiography is now available (1959)[7]. The report says that its value is great and it should not be curtailed without good cause and that this examination makes a negligible contribution to the total radiation to which the population is exposed. The report further clarifies the term negligible as follows: "We do not however, know enough about the effects of very small doses, and in stating that the danger of a particular form of examination is negligible we mean that the potential harm is negligible in comparison with the benefits". In coming to this decision the Adrian Committee weighed the risks which were of two kinds—to the race through harmful gonadal radiation and possible genetic mutation, and to the individual by inducing predisposition to leukaemia by radiation of bone-marrow. The Committee estimated that the gonadal irradiation by mass

miniature radiography was even smaller than previously calculated, and that chance to develop leukaemia was increased from 50 in a million to at most 51 in a million, even after ten mass miniature radiographic exposures spread over a number of years. It however recommends that children and pregnant women should not be subjected to this examination, and that also when they are examined with X-rays the field should be limited strictly to chest. Thus indiscriminate recommendation of doctors for radiological diagnosis of foetal status in pregnant women should be curtailed. The attention is also drawn to the fact that higher radiation dose is needed for fluoroscopy than for radiography. Thus too many X-ray examinations are potentially dangerous, and too many fluoroscopies still more so.

The atomic age is dawning. Atom will be used in peace and war. Can we ban nuclear weapon in the future? Can we channelise nuclear energy solely and completely in peaceful use for the benefit of humanity at large? Is the atomic age a prelude to planetary travel and conquest of space? Even in peaceful use of nuclear energy men handling them will need extra protection against radiation—in the form of protective clothing, goggles, lead or other shields against small radiation and concrete blocks against nuclear reactors and periodic medical checkup. Automaton handling will further reduce direct exposure. General population will also be subjected to more and more radiation with increasing use of nuclear energy in the service of man—unnecessary exposures have to be avoided, shields or protective clothings have to be worn, and substances which are known to augment the excretion of radiation products have to be taken. Such substances as zirconium citrate and sodium calciumedetate are known to exert such an action. Recently the Japanese have claimed tannin as such a substance[8]. Their attention was drawn to the fact that Japanese atom bomb victims felt better by drinking tea. On animal experimentation they found that tannin increased excretion of radioactive substances, and was therefore very useful. If this knowledge is substantiated by other observers, a cheap and ready method of reducing radiation hazards will be available. We are on the threshold of still newer discoveries, and human ingenuity and balanced judgment can yet avert a catastrophe which lurks large in the peoples' mind of all lands.

P. K. G.

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A STUDY OF DISABLEMENT BENEFIT (UNDER E.S.I. ACT) IN THE REGIONS OF BOMBAY AND CALCUTTA FOR THE YEAR 1957—58

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Employees State Insurance Scheme provides five types of benefits to the insured persons. Of these five benefits four are paid in cash and these are: (i) Sickness Benefit (ii) Disablement Benefit (Temporary and Permanent) (iii) Dependants Benefit, and (iv) Maternity Benefit. The fifth benefit which is not paid in cash is the Medical Benefit.

Temporary disablement benefit becomes due to an insured person when he is certified as one needing abstention from work due to his suffering from an employment injury. By section 2 of Employees State Insurance Act 1948, "employment injury" means a personal injury to an employee caused by accident or an occupational disease arising out of and in the course of his employment in a factory or establishment to which this Act applies.

Every insured person who sustains an employment injury gives notice of such injury to his employer. The employer enters all the particulars about the accident in a Register (Accident Book) maintained for this purpose. Immediately and in no case after 24 hours, the employer sends two copies of Accident Report, one to the Employees State Insurance Local Office and another to the Insurance Medical Officer to whom the insured person is attached. The injured insured person reports to the Insurance Medical Officer who renders necessary treatment to the patient and issues certificates of absence as per regulation. In severe cases of injury, the insured person may be admitted to hospital for necessary treatment. As long as the insured person needs medical treatment and absence from work for his recovery, he will be entitled to temporary disablement benefit.

In certain percentage of cases of employment injury, some permanent disability is left even after all the necessary treatment has been rendered. Such cases are sent to the appropriate Medical Board constituted under Regulation 75 of the Act for payment of permanent disablement benefit. The Medical Board after examining the insured person sends the report with the assessment of the proportion of the loss of earning capacity sustained by the insured person. The assessment may be provisional or final. In case of provisional assessment, the period for which such assessment shall hold good is also informed by the Medical Board. Permanent

disablement benefit is paid during the life time of the insured person. In non-implemented areas this sort of benefit comes under Workmen's Compensation Act, 1923.

Statistical figures about disablement cases for the year 1957–58 from the Official records of the Employees State Insurance Corporation have been studied and presented here. In this article, by Calcutta region is meant Calcutta City and Howrah District and by Bombay region is meant Greater Bombay only. It is well-known that a large percentage of workers in Calcutta region is employed in Jute Mills and similarly a large percentage of workers in Bombay region is employed in Textile Mills. In both the regions medical treatment to the insured persons is rendered by panel system.

At the end of March 1958, total number of Insured Persons (in areas covered under the scheme) in India stood at 14,73,000 (some areas of India have not yet come under the scheme). Of these 5,54,000 Insured Persons were in Bombay region and 2,70,000 were in Calcutta region. So it may be noted that 37.71% and 18.3% of total insured persons of India are in Bombay and Calcutta region respectively. So Bombay and Calcutta claim 56% of insured persons of India and Calcutta has about half the number of Insured Persons of Bombay.

It may be mentioned here that 72% of total Employers Contribution and 68% of total Employees Contribution in whole of India are collected from these two centres of India.

Total number of spells for temporary disablement benefit (roughly cases of employment injury taking leave) admitted throughout India in the year 1957–58 were 34,946, of which 13,621 were from Bombay and 8,005 from Calcutta. So it may be noted that out of all T.D.B. cases of India 62% were from these two regions. No. of spells per employee for India was 0.03 and the same number was for Bombay and Calcutta. Amount in rupees paid per annum per employee was 1.22 in India and the figures for Bombay and Calcutta were 1.43 and 1.27. T. D. benefit is paid at the rate of half (approx.) of the daily average wage of the employee. So from these T.D.B. figures it may be noted that the average wage paid to a worker in India is Rs. 2.44 a day. These figures for Bombay and Calcutta are Rs. 2.86 and Rs. 2.54 respectively. So Bombay pays better wage than Calcutta and Calcutta pays better wage than All-India figures. In India T.D. Benefit days per spell was 20. In Bombay and Calcutta these figures were 21 and 22 respectively. So it may be noted that in Bombay and Calcutta total No. of days required for cure in cases of temporary disablement were slightly more than All-India figures. It may also be that more severe cases of injury occur in Bombay and Calcutta region.

Temporary disablement cases (Spells etc.)

	India	*Bombay*	*Calcutta*
No. of spells admitted ..	34,946	13,621	8,005
No. of spells per employee per year	0.03	0.03	0.03
Amount paid per annum per employee	1.22	1.43	1.27
Benefit days per spell ..	20	21	22

Number of beneficiaries drawing permanent disablement benefit (in implemented areas under E.S.I. Scheme) in India upto the end of 1957–58 were 4,046. Of these 1,574 cases were admitted in the year 1957–58. In Bombay the no. of beneficiaries upto the end of 1957–58 were 2,057 and in Calcutta 372 (the scheme was started about 1 year earlier in Bombay). Total cases of P.D.B. admitted in the year in Bombay were 804 and in Calcutta 241. P.D. benefit cases per 1,000 employees in India were 1.3, in Bombay 1.7 and in Calcutta 1.0 only. (This figure is highest in Delhi area—3.6%).

Major P. D. cases (1957—'58) according to nature of Industry.

	Nature of Industry	*India*	*Bombay*	*Calcutta*
1.	Cotton spinning and weaving mills ..	563 (35.77%)	331 (41%)	6
2.	Light metal industries ..	149 (9.47%)	60	50
3.	Jute Mills ..	104 (6.61%)	0	92 (38%)
4.	General and Job Engineering ..	58 (3.68%)	27	14
5.	Ship Building. ..	45 (2.86%)	38	6
6.	Motor ..	41 (2.60%)	24	5
7.	Others ..	594 (40%)	324	68

Heavy industries like Iron and Steel have not yet been covered under the scheme. So it may be noted that 35.77% of P.D. cases of India and 41% of P.D. cases of Bombay come from Cotton Spinning and Weaving Mills. In Calcutta area 38% of P.D. cases come from Jute Mills.

An analysis of causes of accidents resulting in Permanent disablement reveals the following picture:—

Causes of accident resulting in permanent disablement.

	Causes of accident	*India*	*Bombay*	*Calcutta*
1.	Working machinery ..	60.10%	48.6%	79.8%
2.	Falling objects ..	11.25%	13.3%	11.6%
3.	Falls of persons ..	6.23%	9.9%	0.4%
4.	Stepping on or striking against objects ..	3.56%	5.3%	1.6%
5.	Hard tools ..	2.54%	3.4%	1.2%
6.	Other causes ..	16.3%	19.5%	5.4%

From the above figures it is evident that most of the accidents occurring in factories result from working machineries. In Bombay accidents from this cause is much less and an inference can be made that in Bombay most of the machineries do not require manual handling or that there is better guarding of the machine parts in this part of India. In Calcutta about 80% of the accidents resulting in permanent disablement occur from working machineries. This difference of percentage between the two areas is most glaring and it may not be unjustifiable to infer that less care is being paid to this hazard of working condition in Calcutta area. Percentage of accidents due to "falls of persons" and "stepping or striking against objects" are conspicuously less in Calcutta area which might mean better "house-keeping" in this area.

Study of the nature of injuries which involve in permanent disablement cases reveals the following figures:—

Nature of injuries causing permanent disablement

	Nature of injury	*India*	*Bombay*	*Calcutta*
1.	Cuts and Lacerations ..	27.89%	25.1%	35.9%
2.	Amputations ..	27.13%	25.5%	33.5%
3.	Fracture ..	21.16%	23.9%	10.3%
4.	Burns ..	2.86%	2.5%	4.1%
5.	Others ..	20.96%	23.0%	16.2%

The above figures reveal that Bombay region has got a more or less similar figure as India but in Calcutta region percentage of amputation cases are more and percentage of fracture cases are very much less.

Study of P.D. cases (finally assessed) according to percentage of Assessment reveals the following figures:—

Percentage of assessment by Medical Board of P. D. cases

	Assessment	*India*	*Bombay*	*Calcutta*
1.	Upto 10% ..	673 (43%)	310 (37%)	148 (4%)
2.	Above 25% ..	196 (12%)	86 (11%)	37 (15%)
3.	Above 50% ..	43 (3%)	16 (2%)	4 (2%)

From the above figures it may be noted that most serious types of accidents involving disability of above 50% are less frequent in Bombay and Calcutta than in all India figure. Minor types of disability involving assessment upto 10% are more frequent in Calcutta area *i.e.* 61% of all disabilities. So even though percentage of amputation cases are more common in Calcutta, it may be presumed that most of these amputations involve one finger only. These types of accidents occur mostly in Jute Mills. Considering the number of insured persons, P.D. cases are more in Bombay than in Calcutta area.

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NUTRITION IN INDUSTRY IN INDIA

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Nutrition is one of the many factors to which attention is necessary for promotion and maintenance of health of workers. It is, however, a basic factor, whose importance increases with the average age of working population. Optimum nutrition is essential for industrial worker.

Major causes of mal-nutrition for workers are poor food habits, economic factors and metabolic stress. Illness, long working hours, extremes of temperature, physical stress and strain, insufficient rest, occupational diseases and similar other conditions increase nutritional requirements. The effect of nutritional deficiency may be cumulative. The nature and uncertainty of employment, economic and social status, shift duty, urbanisation all make it difficult for the industrial worker to ensure proper nutrition or to develop healthy dietary practices.

Nutrition is the end result of the processes by which living organism receives and utilises the materials necessary for the maintenance of life. This includes growth, repair of wear and tear of body, and the liberation of energy. For this, a balanced combination of the essential constituents of diet in adequate quantity is necessary. These are protein, fat, carbohydrates, vitamins, inorganic salts and water. The union of oxygen with the organic foodstuff and their breakdown products help to maintain life and warmth of cells. The organic food-stuffs, protein, fat and carbohydrate contain stored energy which is liberated in the body. The energy contained in any food-stuff can be accurately determined by a calorimeter. The energy liberated is expressed in unit of heat known as calories. A calorie is the amount of heat necessary to raise the temperature of 1 kilogram of pure water through 1°C. It is sometimes called large calorie. For an average mixed diet, standard values are taken as 1 gm of carbohydrate liberating 4.1 C, 1 gm of fat liberating 9.3 C and 1 gm of protein liberating 4.1 C.

Proximate Principles:

Protein, fat and carbohydrates are called proximate principles. They are also called energy yielding food factor, since they are burnt or oxidised in the body to provide energy for life. Vitamins and mineral salts do not supply energy but play an important part in the physiological function of the body. Water is also necessary and vital. A well balanced diet should contain all these in correct

proportion. Each of the three major foodstuffs plays its own part in nutrition.

Proteins serve to build and maintain the great variety of body tissues. It is an organic nitrogenous substance. It is one of the most important food factor. It can also be used as a source of energy. Most foodstuffs contain protein but the amount is variable. Animal food such as meat, fish, eggs and cheese are very rich in protein. Among vegetables, pulses and nuts are rich in protein. Since protein supplies building material for the body, the requirement of protein for children and adults upto 25 years of age is high. For the same reason, pregnant and lactating women require more protein. Roughly it is calculated that 1.5 gm of protein per kilogram of body-weight should be supplied. In pregnancy and lactation 2.5 gm/kg should be supplied, for the growing child 3 to 3.5 gm/kg of protein is necessary. Of the total protein, one-third must be from animal source, to ensure that it contains the essential amino-acids such as Arginine, Histidine, Isolencine, Lencine, Lysine, Methionine, Phenylalanine, Threonine, Tryptophane, Tyrosine, Valine.

Fat, like protein is a necessary ingredient of a diet. Fat on oxidation liberates heat and thus contributes to maintenance of body warmth. It also furnishes energy for muscular work. Optimum requirements of fat for human body is not known with certainty. It is desirable, however, to provide 45 to 60 gm of fat of which one-third must be from animal sources. Indian diets are very low in fat. Majority of Indians do not get animal fat. Vegetable oil is the main source. Recently hydrogenated vegetable oil (Vanaspati) is supplying nearly half of our requirements of fat.

Carbohydrates form the most important source of energy for heat and mechanical work. They are the chief as well as the most economical and readily available source of energy.

Accessory Factors :

The group of essential organic food factors known as vitamins are sometimes classed as "accessory substances". They are required in the dietary in quantities measurable in microgram (0.000001 gm) to milligram (0.001 gm). The vitamins embrace a heterogenous group of chemical substances, the function of which appears essential to one or another metabolic enzyme.

The vitamins are broadly divided into 2 groups, fat-soluble and water-soluble. Vitamins A, D, E and K belong to fat-soluble groups and B-complex, C and others water-soluble groups.

Vitamin A—is chiefly present in some animal fat like butter and ghee, in milk, curds, eggs, liver, fish, etc. Carotene, the precursor

of Vitamin A exists in green vegetables. The daily requirement is about 3,000 to 4,000 international unit.

Vitamin D—is chiefly present in liver and liver oils, eggs, milk fat. Daily requirement is about 400 to 500 international units.

Vitamin E—is chiefly present in vegetable oil, unrefined cereal and eggs. Exact requirement is not definitely known.

Vitamin K—is chiefly present in liver, fish, eggs, animal fats. Exact requirement is not definitely known.

Vitamin B-complex—contains many known fractions such as thiamin (B_1), riboflavin (B_2), niacin, folic acid, Vit. B_{12}, pyridoxine (B_6), panthothenic acid, choline, biotin, insitol and para-amino-benzoic acid. There are some other fractions still unknown.

Thiamin (B_1) occurs in cereals, pulses and nuts, and vegetables. The daily requirement is about 1.5 to 2 mg. Requirement increases with the increase of calories expenditure.

Riboflavin (B_2) occurs in milk, liver, eggs and green leaves of plants. Daily requirement is not definitely known but has been estimated to be 2 to 3 mg.

Niacin is found in liver and groundnut or peanut oil. Daily requirement is not definitely known but has been estimated to be 15 to 20 mg.

Folic acid occurs in green vegetable and liver. Daily requirement is 1 mg.

Vitamin B_{12} occurs in liver and kidneys. Exact requirement not known.

Pyridoxine (B_6)—exact requirement is not known.

Panthothenic acid occurs chiefly in liver, milk, cereal and meat. Exact requirement is not known.

Choline occurs mainly in milk, eggs and meat.

Insitol and Biotin—The exact significance of insitol or biotin in human nutrition is not well defined yet.

Para-amino-benzoic acid—Some say that it takes part in structure of folic acid group. Its role in human nutrition is still not definitely known.

Ascorbic acid (C)—The foods which are rich sources of Vitamin C, are oranges, lemon, grapes, tomatoes, cabbages, green vegetables etc. Daily requirement is 75 to 100 mg. for an adult. Higher allowances should be made for heavy manual worker or worker exposed to toxic hazards.

Mineral Salts :

Mineral element of importance to man includes calcium, phosphorus, iron, iodine, flourine, sodium, potassium. In addition to this certain other elements such as copper, zinc, cobalt are necessary to man in traces. The mineral elements serve a great variety of functions in human body. Calcium and phosphorus are necessary for bone formation. Iodine is an active compound of thyroid gland. Iron prevents anaemia and is an essential component of haemoglobin. Sodium and potassium are necessary to maintain blood PH and acid alkali balance of body. The trace elements are necessary components of enzyme systems. Iron is found chiefly in eggs, liver, meat, legumes, leafy green vegetables, cereals and molasses. It is estimated that 12 to 15 mg. of total iron in food is necessary to ensure assimilation of the daily requirement of 1.5 to 2 mg. of iron. Principal source of calcium is milk, cheese and other milk products and green leafy vegetables. It is roughly estimated that 1 gm. of calcium is needed as daily requirement. Cereal and pulses are rich in phosphorus. It is stated that 1 gm. of phosphorus is our daily requirement. Iodine occurs chiefly in sea-fish and vegetables. Daily requirement is .15 to .30 mg.

Flourine—occurs chiefly in drinking water. 1 part per million of flouride in drinking water is sufficient for nutrition. Copper—daily intake of 2 mg. of copper is sufficient. Zinc—needed in traces. Wide distribution of zinc in various kinds of food makes it impossible for any zinc deficiency to occur in human nutrition. Cobalt—is contained in Vitamin B_{12} and the foods which are rich in Vitamin B_{12} are also rich in cobalt. The exact requirements have not been determined.

Water is a vitally important factor in nutrition. Its importance is second only to oxygen. It is the vehicle which transports the nutritive elements to the cells and carries away the waste product of metabolism. Its evaporation from the lungs and skin is one of the chief factors in the regulation of body temperature.

The daily requirements of water is about 2 to 3 litres, subject to environmental temperature, hours of work, nature of work, humidity etc. For industrial worker, the need of water is more.

Energy Requirements (Calories) :

For estimation of energy or calorie requirements of an individual, it is necessary to take into account several factors, the most important amongst them being:—(*a*) basal metabolism (*b*) specific dynamic action of food (SDA) (*c*) work (*d*) temperature regulation and (*e*) growth.

When a person is awake, at complete physical and mental rest, in an environment at a comfortable temperature the calorie requirement is relatively constant and low. This level of energy production is called basal metabolism. Basal metabolism is very high in children and adolescents than in adults. In female, it is less than in males. Basal metabolism depends on height, weight and age. Approximately an average adult worker of 5 ft. 6 inches in height, with 120 lbs. of body weight, with age ranging between 25 and 40 years will require about 1,550 calories (basal metabolism).

Specific dynamic action of food: Since the mere ingestion and assimilation of food, specially protein, increases the metabolic rate, the estimated amount of this increase must be added to total metabolism. It is roughly taken as 10% of basal metabolism.

Work and Exercise: In estimating a person's total energy (calorie) requirements, calories necessary for work or exercise should be added to his basal metabolism. Mental work can be ignored as, it is estimated, that only 3 to 4 percent increase in basal metabolism is necessary for mental work. Many workers such as Bill, Kestner, Rose, Becker and Hamalainen, have estimated requirements of calories in ordinary, moderate or heavy work for 8 hours of work in a day—for an adult of 120 lbs. of body weight with 5 ft. 6 inch height.

Temperature: Energy requirement is affected by changes of climatic temperature; in low temperature more calories are necessary than in higher temp. For instance, it is estimated by Johnson and Kark that average calorie consumption is 5,000 in the arctic region where mean temp. is –20° F. whereas, it is 3,500 where mean temp. is +70° F.

Growth: In the growing period, more energy (calorie) is required. The average growing period for boys is from birth to 25 years and for girls from birth to 18 years.

Special Problems related to industrial nutrition:

Generally speaking food required for industrial worker is the same as that necessary for any other person engaged in equally active occupation and can be estimated from the table of recommended Dietary Allowances of the Food and Nutrition Board of the National Research Council, or can be independently worked out.

Men working under condition of high temperature may require certain food factors in increased quantity but not calories. The nature of this increased need has not been well-defined. It has however been seen that ill-effects of working in high temperature are least noticed among those who are in good physical condition and who eat a good diet, and take extra amount of salt to compensate

for salt depletion by profuse sweating. The best course lies in replacement of sodium chloride and water lost by the body. A saline drink consisting of 96 gr. of potassium chloride and 144 gr. of sodium chloride in a gallon of water proves very useful.

As Vitamin B and Vitamin C are lost in sweat, these Vitamins should also be supplied to those working in higher temperature.

Toxic hazards in industry:

Exposure to aniline, T.N.T., lead tetraethyl, lead, arsenic, mercury, halogen groups, benzene, toluene, carbon tatrachlor, carbon bisulphide and other allied chemicals generally cause liver and kidney damage. Excess of Vitamin B, Folic acid, B_{12}, Calcium, Glucose and Vitamin C, Choline and methionine in diet are necessary in these cases as prophylaxis and treatment.

Workers exposed to lead hazard should have sufficient amount of milk, calcium and Vitamin C in their diets.

Mid-shift Meal:

Workers should be provided with mid-shift meal and one or two light refreshment, before and after mid-shift meal.

The Committee on Nutrition in industry of the National Research Council and the United States Public Health Service have recommended that mid-shift meals should supply at least one-third of daily nutritive requirements. In India, where housing and dietary condition is bad, it is better to provide one-half of daily nutritive requirement in mid-shift meal for industrial worker. A mid-shift meal should also be provided to night-shift worker.

Mid-shift meal fulfilling one half of daily nutritive requirement:—

(National Research Council Standard for moderately active man)

Calories	Protein	Calcium	Iron	A	B_1	B_2	C
1,500	35 gm	–4 gm	6 mg	2,500 I.U.	0.7 mg	1 mg	37 mg

Fat and carbohydrate by difference.

Summary

(1) Problems of Industrial nutrition has been discussed.

(2) Main importance should be given to energy requirements of industrial workers.

(3) Some principles of metabolism and bio-chemistry have been incorporated.

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THE GAP BETWEEN TREATMENT AND RETURN TO THE JOB

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I have selected this subject because I feel it is important in the light of present events, particularly in the light of the introduction of Employees State Insurance, enforcement of better laws, rules and regulations, and more particularly because the better way of doing things is more and more evident. Facilities and personnel are increasingly available and must be used to the best advantage. Some types of disabling conditions are still comparatively few, especially when compared with the West but that will not continue and we must be prepared for increase. These are the orthopaedic conditions, cardiacs, arthritics, and epileptics. I would have put visual disabilities also in this first group but am beginning to think that they may be more than first suspected. The most pressing problem is certainly that of the tuberculous industrial worker, not only because he is a problem to himself and his family but is a hazard to his fellow workers.

I have spoken of the gap between medical treatment and return to the job. I believe there is a gap and also that many who could go back to work are not doing so or are going back into a job which is named "light work" but which is uneconomic to the industry concerned and both physically and psychologically unsuitable to the worker. I believe in two things—

1. It is better and more economic in the long run to the man, to the industry and to the nation, to rehabilitate the man and get him back into production than to cast him out as a burden to his family and society and possibly swell the already too large group of beggars.
2. The worker must be worth what he is paid for his work—no charity must enter into the job relationship. Charity if there must be and I would rather call it investment toward making him into a producing worker, should be carried out separately and not in a department of your mills.

The gap for the orthopaedic case can usually and should be filled by improved treatment which is part of a total rehabilitation programme. It is medical care which sees that the disability is kept to a minimum. Let us take an orthopaedic upper extremity case as an example, a crushed hand. This will require skin coverage very

early, seeing that joints are mobile and tendons can function, that various needs of the palm, dorsum of joints and ends of the digits are met, that there is maintained the good vascular supply with which the hand is blessed. From the annual reports of the King Edward Memorial Hospital in Bombay you will see that the whole approach of the orthopaedic department has changed in recent years. The number of total hand amputations is very much less and instead we find increase in the number of one finger amputations, part finger, in disarticulations of finger joints and that more and more of the hand is being saved. How has this come about? One reason is certainly that the surgeon now has the antibiotic "umbrella" under which he can work. There is plastic surgery and to aid the surgery and obtain maximum results there are physiotherapy and occupational therapy departments in the K.E.M. Hospital. There is also, I believe, a trend to accept the principle stated by Robert E. Carroll, M.D., Orthopaedic Surgeon, in charge of Hand Clinic Presbyterian Hospital, New York City that, "In no other section of the body can minor surgery by minor surgeons be so disastrous". Any injury to the hand should be called "major".

The orthopaedic case whether upper or lower extremity is too often plastered or splinted and left. When the plaster is removed, he cannot go back to work for some time, but if he had had occupational therapy and physiotherapy during this period to see that all mobile joints were moved, his general body tone maintained and his mind healthily occupied, he could go back much sooner and with far less residual disability. This I believe to be non-controversial, we are proving it every day but we no longer get the industrial accident cases and the scheme for providing such facilities at once on a small scale has been turned down.

The same principles apply to the lower extremity fracture and crush injury cases. Recently because of pressure on beds and overcrowding of the floor, the physiotherapy and occupational therapy departments were called in to co-operate on a "Crutch project" and I am personally convinced that although the heads may not have considered this, the men under this project will be ready for work much sooner than if they had lain in bed until the cast was removed. For some time the occupational therapy department has been making the cheap crutches (Rs. 2.50) instead of the hospital carpenter. They are prepared by patients and staff in our workshop. In place of the single bamboo stick with a slightly curved arm rest on the top, we are providing at the same price a crutch with a padded top (tow under oil cloth), a rubber tip, and a handle placed at the proper height so that the patient may walk on his wrists instead of the brachial plexus. The patient is carefully measured and the length checked before he is sent to the physiotherapy department for walking training which includes stair climbing and street travel. Some of these men could go back to work for a period and then return for occupational therapy and physiotherapy after the cast is removed and you would have a healthier leg with less chance of osteomyelitis or arthritis developing later in life.

Other problems of the orthopaedic patient are suitable braces, prosthesis, splints, adapted equipment. If all these factors in rehabilitation can be provided, your workman will go back to work sooner or at least in a better condition, more likely to stick on, go more frequently to his former job instead of being trained for another, or if he must be trained for another, he will have developed skills and strengths which will be valuable for that training.

Cases of arthritis should be under a special team of experts in this field from the first symptoms. Judiciously used occupational therapy and physiotherapy will maintain function and when infection is reduced, slowly help to regain lost function. Simple training in posture during the illness can make a big difference. If the patient must take up other work, the occupational therapy can do the early part of training and assessment, as they do at the Canadian Workmen's Compensation Centre at Maltan.

I would like to mention the epileptic. Probably no one knows how many there are or how many develop in the course of a year in a mill but there must be some. They need early medical treatment, psychological assistance and possibly job re-assignment to reduce hazards. With increased knowledge undoubtedly large numbers can have their seizures brought under control and continue to work. There is, however, a need for special sheltered workshops for many of these people.

Cardiac cases are another problem and it seems that they are either on the increase or are being more quickly recognised. Certainly with a programme of treatment, training and job reassignment they may continue to be productive. The training is in how to live with their heart condition, ways of working without strain, home life. and where necessary a new vocation. They may be brought into the special type of sheltered workshop which I shall discuss under the subject of tuberculosis.

Before discussing the tuberculous patient I should like to sum up the other conditions. To shorten the time between the accident or illness and return to employment we must—

1. Improve and augment the care of orthopaedic cases by physiotherapy and occupational therapy and full rehabilitation services are required. This should include the medical social worker, psychologist (sometimes psychiatrist), prosthesis expert and a voca-

tional guidance adviser if available. It would mean re-training or a new vocation in some cases, but if the care is improved, the number for re-assignment should be less.

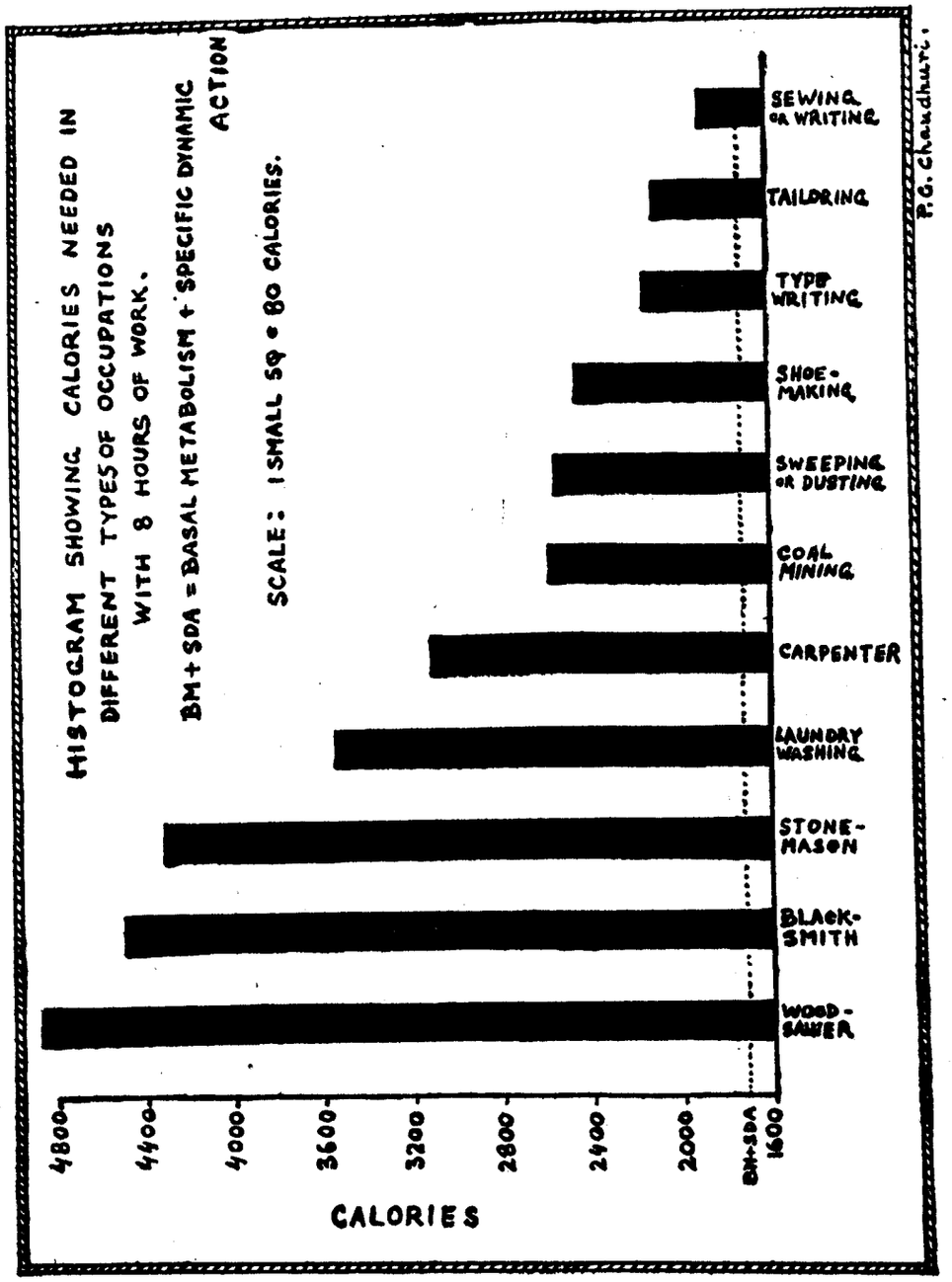
2. Arthritics, if taken up early enough, will also require only re-training and less of new vocations.

3. Epileptics should have special attention.

4. Cardiacs may be kept on but after a coronary thrombosis or other episode may need a period in a sheltered workshop to develop work tolerance and be trained in daily living with their disability, or in some cases a new job.

The visually handicapped, whether blind in both eyes, blind in one, or having other lesser degrees of vision impairment are a big and special problem and although space does not permit me to give much consideration to their problems here, I would only like to indicate that this is a problem which requires study and that I believe much can be done for this group and that there is a place for them in industry. We have a blind malie in our garden in Bombay and he is a better worker than the other one who is totally deaf. A company with which my husband is connected has purposely employed a blind man to operate a very delicate machine because they must have an operator who will not "play" with it, turn screws and try to find out how it works. The blind man is content to operate it carefully.

And now we come to a different type of problem, tuberculosis, a disease with many aspects which are important and even serious to the large numbers in industry, the man with the disease and his fellow workers. Early discovery is very important and only by finding the cases, giving treatment and protecting the contacts can we even begin to think of controlling the disease. We must find ways and means of discovering early cases—mass x-rays, attendance study, periodic check-ups and so on. Then having found our cases, how are we going to treat them? Personally I think that we are over hasty to talk so much of domiciliary treatment alone and by-pass the sanatorium. I also am not happy about the dependence on chemotherapy. I believe that we need a judicious combination of these aids. To explain my attitude I would like to present briefly material from "A Commentary on the Tuberculosis Problem in Scotland" by Dr. Christopher Clayson, Physician-Superintendent of a hospital in Scotland. This paper was presented to the World Federation of Occupational Therapists at Edinburgh in August 1954. Dr. Clayson clearly shows how, in Scotland, the reduction in death rate by 51% does not indicate genuine progress. He says, "Mortality no longer gives any guide for future progress, and it is time we paid more



attention to the number of living patients and less to the number of deaths." He shows how the number of tuberculosis sufferers is actually on the increase, that although the cases among children is less, the number in the 15–34 year old group is on the increase, that it is 60% of their total notifications, an 80% increase over 1930. In 1930, 48% of persons on the register were in the 15–34 year old group and in 1952, 60%. He finds that morbidity after primary infection is greater among young adults than in children and prognosis of primary tuberculosis in young adults is more serious. This picture is bad enough but the relapse picture is worse, more are returning after a second or even third relapse. He gives the re-admissions account of relapse figures for two periods, the first 1944-48 when the total admissions were 355 and the average duration of treatment 310 days and the re-admissions for relapse were 75 in number or 21%. Then due to many causes including increase of cases there was curtailment of stay in the hospital and so for the period 1949-53 there were 554 admissions with an average stay of only 227 days but there were 148 relapse re-admissions or 28%. It is significant that this second period was the period when extensive chemotherapy was introduced, as from Jan. 1949. He says that the effects were not enough to offset the deleterious effects of reducing the period of sanatoria rest and says there must be prolonged use of chemotherapy and more frequent use of major surgery, and of course adds that it is premature to speak of reduction of sanatorium beds.

How does this apply to our problems in India. My feeling is that we must demand as many beds as we can and have our patients spend as much time as is possible in them, that all patients should have some period of bed rest no matter how mild or how advanced his condition. During this time I would educate him in an understanding of his condition, I would give him light activities, that is occupational therapy, on a graded basis for both physical and psychological reasons, then let him have the domiciliary treatment, and as part of his treatment start him off in a Sheltered Workshop when he is sputum negative to build up work tolerance under supervision. The Sheltered Workshop should have arrangements for rest periods, temperature taking, etc. I believe that such a Sheltered Workshop could be run by a group of industries or companies in any given area. They should put into it some parts of their own production work processes which can be done separately. The patients should be paid for what they do and on a piece work basis only. As they maintain their health, their work time should be increased.

At the same time we must study our jobs. Undoubtedly in many mills the engineers have job analysis ready to be reviewed by

the medical staff in terms of what is suitable for various types of patients. Some jobs may need to be further broken down and given to 2 or 3 men. With the Sheltered Workshop and the job analysis in terms of health problems, we can set up suitable machinery to fill each mill vacancy as it comes. This should do away with the over crowding of the so-called "light work" departments and allow the mill manager to run all his departments at an economic level. The "charity" is kept to a minimum and the ill workman has a sense of security which is highly beneficial psychologically. I do not know what the costs will be but would like to see, as suggested above, a co-operative effort of this sort from a group of mills.

Before closing I must refer to a Report of the Committee on Rehabilitation of the Disabled of December 1956, prepared by the Indian Institute of Personnel Management, Bihar Branch, at Jamshedpur. It is an excellent report but I have two main criticisms.

1. Although they do recommend expansion of the facilities of the Rehabilitation Centre at Tata Main Hospital to include occupational therapy, they do not seem to fully appreciate the work of an occupational therapist nor how many more men should be able to return to work in their own mills after good rehabilitation rather than be sent out into the Rehabilitation Centre.

2. Their scheme is too costly and too "fancy" with reading rooms, gardens, etc. For what are they training these men—to go back to jobs in the mills, to be kept indefinitely in their workshop or to go back to their villages? These luxuries will not fit them for anything. Also from the list of activities in the Handicrafts Section I have more doubts of just what is their purpose. For instance they have listed sheet metal work and embroidery, cane-work and glove making. (What kind of gloves and who wears gloves in India?) The scheme as a whole is excellent and could include tuberculosis and other types of cases, but I would like them to clarify the objectives to obtain a better turnover and streamline their reports and forms.

It is most heartening that so many are thinking along these lines and I would like to take this opportunity to pledge the assistance of myself and the All India Occupational Therapists' Association to give whatever help we can in helping you work out solutions for the total rehabilitation of your handicapped workers whatever the cause of their handicap.

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FUTURE OF INDUSTRIAL MEDICINE IN INDIA

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SUMMARY

According to modern concept of Industrial Medicine, an employee is considered as a human being and not just a check number. His personal problems must, therefore, receive equal recognition as his work problems. The aim and object of Industrial Medicine is to maintain good employee health and to ensure optimum environment. This can only be achieved through positive health programme, which comprises of:

1. Periodic Health Inventory
2. Preplacement and Pre-employment Examination
3. Environmental Sanitation
4. Educative Medicine

Benefits of positive health programme both to the employer and employee have been stressed.

It has been clearly shown that the Employees State Insurance does not replace what is known as Industrial Medicine, rather acts as a complement to it.

It has been discussed how the broad programme in its entirety or in part can be implemented in different organizations, large or small.

Finally, it has been shown how the difficulties that are likely to be encountered in selling the idea to the Management can best be overcome and how best the employees could be convinced of benefits they can expect from such a programme.

In centuries past Medical Science has been applied to the prevention or treatment of disease and to the relief of those who are ill. But sorrows and troubles which arise from causes other than disease have received little attention. Rapid industrialisation, however, has shown for the first time that Medical Science has its social and economic obligations as well. This sudden realisation was conclusively brought about by World War II when it became apparent that man's industrial productivity is strictly related to his mental and physical well-being. This discovery was not made by medical men alone but was the joint observation of Industrial Management representatives and Medical representatives.

The modern concept of Industrial Medicine is that we must cease looking upon the working man as an eight-hour-a-day problem

in which only his occupational environment is of concern. No longer can we consider the industrial labourer as a check number and a mechanical component of the machinery of industry. We must realise that the worker has his own living and working problems. Industrial Medicine, therefore, recognises that man's health and happiness are affected by many factors other than diseases such as nutrition, mental hygiene, sanitation, lighting, ventilation, humidity, recreation, noise, vibration and plenty of other influences. The responsibility for the well-being of the industrial worker is, therefore, the obligation of trained physicians.

The whole aim and objective of Industrial Medicine, therefore, is directed to the improvement and preservation of high standard of health of the individual and of the group, and to the maintenance of optimum of Industrial environment. In order to achieve this objective, a medical team should be integrated into general management so that the doctor with his specialised knowledge may contribute towards the efficient management. It has to be fully realised that in order to improve personnel relations, raise production schedules, to elevate morale, to reduce man-hour lost and to increase and spread incentive to do better work, the modern concept of Industrial Medicine must be put into practice in its entirety if possible. The future of Industrial Medicine depends largely, if not entirely upon the employers, large and small, being acquainted and convinced of the basic truth that medicine can make valuable contribution towards efficient management, and I am certain that we, the industrial doctors should be primarily responsible to give better impetus in this regard. Conferences of employers and articles in various trade papers may be two of the methods by which this may be achieved. I urge our Association to give considerable thought to this urgent matter which brooks no delay.

Socialised medicine in the shape of the Employees State Insurance Scheme has been enacted with the limited purpose of rendering curative medicine and can never be equated with the modern concept of Industrial Medicine which is essentially preventive and constructive. It is well known that there are 2 different approaches to medical service in industry, namely:

1. Application of constructive medical procedures or positive health programme.
2. The curative symptomatic approach without any consideration to positive health.

The ideal is the synthesis of the two with greater emphasis on positive health. The two together, therefore, make the complete whole and one without the other leaves the medical programme incomplete. The Employees State Insurance, therefore, takes care

of a part only and a minor part at that of a whole programme—the major portion of which still remains to be implemented by the private employers themselves. The employer must be made to realise that the Employees State Insurance does not replace what is understood by Industrial Medicine but rather acts as a complement to the latter. I am constrained to observe that without realising these basic facts, the employers are dispensing with whatever medical services they used to have since their respective industries came under the purview of the Employees State Insurance Scheme, thus driving nails so to say, on the coffin of Industrial Medicine in India. The future of Industrial Medicine in India is bleak as I visualise it, unless Government steps in, enacting legislation requiring continuance of efficient medical service in industry. I would very much like to see employers voluntarily agreeing to promote Industrial Medicine by retaining the medical services directed towards positive health programme inspite of the Employees State Insurance—a wise act which no doubt would ultimately prove to be a sound investment.

I repeat that the matter is urgent and the Association must endeavour to do its best to make the future of Industrial Medicine safe in India. I will now discuss briefly the principles of positive health and how best it could be implemented. Curative aspect of the medical programme is in the process of being taken over by the E.S.I., and the industry would, therefore, be justified in maintaining only the bare minimum like, First Aid to take care of emergencies, both surgical and medical. The future development of Industrial Medicine, therefore, must be directed towards not only realising fully what is exactly understood by preventive medicine but to enlarge its scope further. The preventive medicine can be divided into two parts:

(*a*) General preventive measures

(*b*) Personnel preventive medicines or constructive medicines.

So far as the first is concerned, the industry generally has accepted its obligations to protect the health of employees by suitable methods, to reduce or remove environmental hazard, to improve lighting/ventilation, to reduce noise, to offer protective gear and improve canteen facilities. In other words, steps have been taken to tackle the problems of industrial accidents and occupational hazards, but we as industrial medical men know that the greatest cause of absenteeism, inefficiency and early death are nonoccupational diseases. It stands to reason, therefore, that if for nothing else, at least from sheer business point of view, more effort must be put in to reduce the instances of such diseases to the very minimum by

promoting better health among the employees themselves. This can only be achieved through what is known as "personnel preventive medicine" or "constructive medicine"; yet it is rather strange that this important branch of medicine is still in its infancy and so little thought is given to it.

The "constructive medicine" can be said to be the application to the individual of medical science as a whole, which by carrying out complete studies, brings to light the presence of disease in its potential stage, diagnose the incipient or fully developed conditions and carries out treatment with the object of obtaining an optimum health condition; maintaining this through permanent medical supervision so as to prevent the appearance, or stop or slow down, the evolution of degenerative diseases, and consequently increasing the individual's capacity to work and prolonging his intellectual and physical life.

It would be evident therefore, that there exists the potentiality of developing a personnel form of health improvement. Although man has many attributes common to all, there exists considerable variations in individuals. These individual differences are ignored in any wholesale or public measures. The control, prevention and retardation of the common disease can only be accomplished by such individual attention. Each and every instance presents an individual diagnostic and therapeutic problem.

Therefore it becomes obvious that the primary requisite to individual guidance to greater health is analysis of the status of health of the person involved. This is achieved by what we have termed constructive medicine or personnel preventive medicine. The foundation of constructive medicine is the periodic health inventory. The measurement of health is much more difficult for it involves search for and recognition and evaluation of very minor and subtle deviations from normal. We cannot rely upon obvious signs and symptoms.

The term "health inventory" instead of "periodic examination" is applied deliberately for a properly conducted study is far more than a routine clinical physical examination. The objectives of the health inventory are several.

First and foremost is analysis of the health status of the patient and interpretation of the probable effects of his previous life upon the physical organism.

Second is prompt correction of remediable defects.

Third is advice and guidance regarding habits which may be detrimental to specific individual.

The fourth objective is a determination of the capacities and limitations in connection with work.

The last but not the least, important objective of the periodic inventory is personally applied education on hygiene.

These inventories should not be too hurried, too superficial and definitely not too routinised. Thoroughness in the search for information by all possible avenues is requisite. The past and present history of the individual, laboratory data, X-ray examinations and special functional tests are equal in importance to the actual clinical physical examination.

Constructive medicine is concerned not only with prevention of disease but also with the active construction of greater health.

Constructive medicine is not a panacea which can prevent all ills. Even though a man may be in excellent health he may still acquire a serious acute illness or he may meet with a serious accident. But if the individual was in vigorous health prior to the acute episode his chances of recovery and his speed of recovery are definitely enhanced.

The potential benefits of well-conducted constructive health programme may be enumerated as follows:

1. Greater vigour, productiveness and happiness in more nearly optimum health leading to better morale.
2. Increased longevity.
3. Shortened disablement from unavoidable acute illnesses or traumatic accidents.
4. Retardation of chronic and progressively disabling disorders like cancer, and other degenerative diseases. Early discovery of certain disorders permits of earlier and therefore more effective therapy. Diabetes, hypertension, nutritional and endocrine disorders come under this category.
5. Definite prophylaxis against certain specific diseases.

In addition to the periodic health inventory the following also come under the purview of constructive medicine, namely:

1. Pre-employment and preplacement examinations of employees. These examinations should be similar to those of periodic health inventories.
2. Special examination of employees exposed to occupational hazards.
3. Reassignment of duties for medical reasons.

Lastly, what may be termed "educative medicine" forms another important branch of the positive health programme. Within this phase Company should provide medical guidance to employees. Such guidance may be in the form of medical information in prevention of diseases and correction of existing defects.

I believe I have made it perfectly clear that by implementing the most important branch of the positive health programme as outlined, the employees in general will be directly benefited and the employers indirectly, in the shape of minimal absenteeism, better work efficiency and reduction in the number of chronically ill patients. The management should realise that employees are its greatest asset and members of the management staff and executives represent a considerable capital investment to the Company and yet it is surprising that when all possible steps are taken to maintain a machine in perfect working condition, no effort is made by the employers to keep their most important investment and greatest asset (*i.e.* their employees) in perfectly good shape by periodic health inventory.

Many may raise the question—how an industry employing only 1,000 or 1,500 or even only 100 or less employees can carry out such a programme?

I have already described briefly the main components which together conform what is known as the positive health programme. Part of each of these components can be and should be effectively carried out in any industrial organization no matter how large or small. The number of professional and semi-professional medical personnel required to conduct such a programme is dependent on 2 major factors: 1. the size of the working group, 2. the extent to which such a broad policy is to be extended.

In order to carry out this programme in its entirety, one full time doctor per 1,000 employees will be necessary—1½ sq. ft. per employee as the floor space is required. A modern diagnostic unit with a suitable staff of nurse/compounder is all that is necessary. A limited supply of drugs is also needed. In small plants upto 500 employees, a part time physician with suitable staff will suffice—X-ray and laboratory examinations may be accomplished by outside agencies.

Industries with less than 500 employees and closely situated could combine their health programme efforts, sharing the full time physician and assisting staff of the said order.

I must confess that we, the industrial medical men, have an onerous job to perform in this regard. We shall have to sell the idea to the employers first, and to convince the employees later after

the broad policy is adopted by the Management. There is considerable misgiving and fear in the minds of the employees and they try to oppose any novel procedure in which they invariably sense danger. This can be overcome by making the medical check up voluntary and issuing a statement of assurance from the Management in regard to the confidential nature of all medical information, except in cases of industrial injury/diseases, and where public health hazard is involved. This statement shall also include the Management's assurance concerning reasonable leave and medical facilities for individuals found to be suffering from disease during the annual physical check up requiring prolonged convalescence based on individual merits. The employees must also be made health conscious and I am sure that the whole programme will succeed ultimately.

I come from an organization which has adopted this programme in its entirety and after the initial difficulty in its implementation, we are receiving increasingly encouraging response from the employees themselves, I therefore, see no reason why with goodwill and sympathy, similar programmes cannot be successfully implemented elsewhere.

THE ROLE OF INDUSTRIAL MEDICAL OFFICER VIS-A-VIS GENERAL PRACTITIONER*

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A. *Role of an Industrial Medical Officer.*

(1) The Primary function of an Industrial Medical Service is to fit work to man and man to his work.

(2) Industrial Medical Service must be so organised as to treat accidents and illness at work without much time lag.

(3) The key-note of Industrial Medical Service should be prevention of accidents and illness at work, as also promotion and maintenance of health by education and other practical means.

(4) Pre-employment Medical Examination—to advise on job selection and job placement.

(5) Check-up examination for cases returning to work after accident or illness—rehabilitation of the disabled persons.

(6) *Periodic medical examination to assess—*

(*a*) Risk to the workers—in certain industrial processes.

(*b*) Risk to his fellow workers—*e.g.* Railway engine drivers, crane drivers, lorry and car drivers, etc.

(7) To study various factors involved and to advise the Management on healthy working environment, *e.g.*

(a) *Physiological requirements—*

Temperature, Humidity, Ventilation, Lighting (natural and artificial), Proper nutrition and Canteen facilities.

(b) *Psychological requirements—*

To avoid mental and physical fatigue, proper sanitary and hygienic requirements, Recreational facilities, etc.

(c) *Protection against infection—*

Wholesome food and drinking water, sanitary and washing facilities, proper spacing and general cleanliness of surroundings, prevention and treatment of carriers of vermins and diseases.

(d) Protection against accidents of various types—due to machinery, toxic processes, electricity, fire and traffic movements, etc.

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(8) To study hours of work, rest pauses, night shifts and study of facilities within industry to make working environment cheerful and attractive.

(9) Study of sickness absenteeism and accident statistics by maintenance of good medical records.

(10) To help and promote better human relations within the industry.

(11) To propagate "Family Planning Methods" amongst industrial population.

(12) Study of conditions and factors involved in the relationship of Industry with the community at large.

B. *Role of a General Practitioner.*

(1) To strive for being popular Family Physician to as many families as possible.

(2) To diagnose and treat various illnesses or accidents mainly at home, as well as outside.

(3) Medical examination of cases as and when occasion demands and issue of medical certificates.

(4) To perform some preventive inoculations and vaccinations.

(5) To maintain good and cordial relations with his patients and relatives.

(6) To maintain a link or liaison with other medical practitioners, doctors attached to local hospitals and local municipalities, etc.

(7) To keep a link with other social activities in his immediate environment.

A comparative study of the above 2 different roles shows that the Industrial Medical Officer is called upon to perform various functions which do not come within the domain of the G.P., or rather the G.P. is not supposed to be so comprehensive in his role as an Industrial Medical Officer should be.

An Industrial Medical Officer can do what the private practitioners can never do—he can know (and perhaps influence) the patients' working conditions. It will be his endeavour to help the patient to find work most suited for him, and to assure that he is not harmed by industrial conditions. The G.P. gives treatment to the patient when he is ill, but the Industrial Medical Officer is often first able to detect departures from health. This is because of his knowledge of the patient's work, and the opportunity only available in industry for close observation of a group of individuals at work.

A workman gets frequent attacks of fever with shivering, headache, pains in chest and body etc., takes leave, goes home and is treated by his G.P. by antimalarial drugs. He gets better and resumes work but gets similar relapses of fever and especially on mondays. The G.P. is at a loss to understand what it is. The Industrial Medical Officer on enquiry comes to know that he works in the foundry department. He at once correctly diagnoses it to be 'Brass Founder's ague' or 'metal fume fever'. He goes to the department and contacts the foreman or works manager and arranges for exhaust or cross ventilation etc. and the workman is permanently free from that fever simulating malaria. Electric arc welders may also suffer from 'metal fume fever'.

A workman gets an attack of conjunctivitis and is treated by his G.P. at home. He gets better, resumes work but gets relapse of the same trouble. The G.P. treats him again and again without being able to go to the root of the trouble. The Industrial Medical Officer when approached finds him to be working in the welding department. He correctly diagnoses it to be "arc flash", arranges for protective goggles and better ventilation and wider welding booths and the trouble disappears like magic.

The Industrial Medical Officer is better equipped by his knowledge and experience to anticipate certain dangers amongst certain type of workmen and advise on these matters—*e.g.*

(i) CO gas poisoning amongst boiler workers and furnace workers.

(ii) Hyd. Sulphide poisoning by sewer gas amongst sweepers, also Weil's disease amongst sewer workers.

(iii) Chlorine gas poisoning amongst those handling Bleaching Powder.

(iv) Dead hand or white fingers—occurring amongst those buildings mistries handling vibratory tools (Pneumatic type).

(v) Disc injuries (lumbar disc) amongst workers carrying very heavy articles manually—this had been common amongst jute coolies for which mechanical handling is now in vogue in jute industries. Previously it was wrongly diagnosed as simulating sciatica and lumbago and treated without cure.

(vi) Various industrial eye injuries (chemical and mechanical) can be prevented and cured efficiently by an Industrial Medical Officer having a comprehensive knowledge of the subject.

(vii) Workmen losing one eye as a result of industrial accident and being practically 'one eyed person' may be profitably placed in some other suitable departments in the same industry by the management on the advice of the Industrial Medical Officer—thus both the worker and management are benefited.

(viii) Knowledge of visual standards in industry—5 different grades of vision—'Job Analysis' for visual requirements in various types of industry—Occupational Spectacles, etc.—are highly technical things coming within the domain of trained Industrial Medical Officer in modern industrial establishments.

(ix) Obviously, a patient with aortic regurgitation cannot be employed as a lorry driver, nor a diabetic as a crane driver, nor an asthmatic in the asbestos industry, but all may be able to fit for work as Storemen—the Industrial Medical Officer's considered advice is here beneficial to both the worker and management.

Lastly, for the benefit of the community those 2 roles should be complementary. There should be a close liaison and effective co-operation between the G. P. and the Industrial Medical Officer.

In the present set-up, in most of the industries, the Industrial Medical Officer has to look after both the curative and industrial aspects. With the introduction of E.S.I. Scheme, those 2 roles are being abruptly separated, and unfortunately the Industrial Medical Service is being relegated to the back ground.

Our National Government has embarked on their ambitious 2nd Five-Year Plan and there has been definite shifting from agricultural to industrial economy. Concepts are fast changing, and becoming all pervading. Until lately the conception of medical relief had been that of 'Negative Health'. Today we define, "Health is a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity". Now, we talk of Industrial Health and not of Industrial Medicine. We work to maintain and promote the health of all workers—men and women, young and old, in industry, mines, agriculture and plantations. During the 2nd Plan Period, side by side with the feverish activity for rapid industrialisation of the whole country, our planners should have developed the Industrial Health Services in a planned way. In these affairs, our planners should have been guided by the experience of other seasoned Welfare States which have progressed along the concept of Social Medicine. Even after comprehensive National Health Service was introduced in U.K., the Dale Committee Report

has been very significant indeed. The Dale Committee reported that the existing Industrial Health Services were most important to industry in spite of the National Health Service, and the Committee advised that the former should not only be maintained, but encouraged to expand.

As per our Indian Constitution, divisions, caste and creed etc. have been done away with. Similarly, in case of National Health, this division of Industrial and Non-Industrial population with regard to health matters should be scrapped. Men with vision and farsightedness should visualise one comprehensive National Health Service for our whole country manned by one single cadre of All India Medical Services (in the line of I.A.S. or like) and planned in active collaboration with Indian Medical Association and Society for Study of Industrial Medicine, India.

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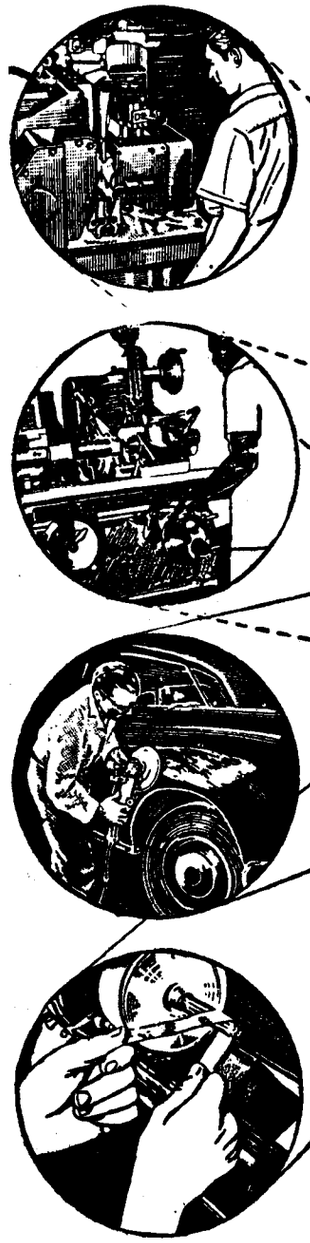

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