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## Water Pollution Research.

IN India Science still remains a blushing young virgin, and industries, an unfilled stripling. They must firmly grasp each other's hands before the public can expect the fulfilment of the promise they hold to each other. Comparing the attitude of industry to-day with that of ten years ago, there is a definite indication of its increasing readiness to make use of scientific method and scientific knowledge. But it is still difficult to assess the change that is taking place in the attitude of industry in India. It seems to us that it is time for the Government of India to consider the necessity of establishing under their auspices a Department of Scientific and Industrial Research. We are convinced that, without the inspiration and influence which such an authoritative organisation can exert on the corporate and mutually dependent life and activities of science and industry, both of them will suffer from the withering atmosphere of isolated existence. Every school-boy knows that the main purpose of science is to discover facts, and that of industry, to use these facts for the purpose of pro-

viding civilised standards of existence, so as to ensure the health, comfort and prosperity of the people. We can conceive of no factor in the modern conditions of life, more potent in promoting these desirable objects than a generous supply of pure and wholesome water for consumption in the homes of people, and in the numerous factories which minister to their daily wants. The ingredients which compose civilization sometimes form a baleful source of contamination of water, and science exerts to restore its purity. Is there in India an organisation like "Water Pollution Research" which is devoted to investigate the physical, chemical and bacteriological impurities of water for which there is greater demand in this country than perhaps in Europe? It is true that in the larger cities water used for drinking purposes is examined periodically by bacteriological institutes, and the municipalities exercise supervision of water reservoirs and catchment areas through their sanitary departments. So far as the needs and interests of the urban population are concerned, we may presume that

they are fairly satisfactorily served. But we are thinking of the condition in the towns and rural areas.

We confess that the problem of supplying wholesome and adequate supply of water to the increasing population of India, is both complicated and difficult, but it ought not to be beyond the wit of man to devise satisfactory means for providing the people with this elementary, but nevertheless vital necessity. It is common knowledge that the general habits and the religious practices of Indian people consume far more water than what is actually required for domestic purposes. When people congregate in large numbers at places of pilgrimage for purificatory baths, we can imagine the amount of damage inflicted upon the purity of water in the rivers and tanks, which without the least compunction is swallowed by man, woman and child with the most touching devotion and defiant disregard to consequences. In the rural areas, men and cattle in a spirit of absolute abandonment defile the slender sources of water supply, and if the population manages to survive such gross offences to sanitary principles, it is entirely due to the sterilizing influence of the tropical sun. The large cities are establishing industrial factories, with the consequence that the hygienic conditions of life both among the labourers and among the general population, are causing anxiety to the authorities. It is well known that rivers and tanks in the vicinities of towns are polluted in all conceivable ways and generally speaking the attitude of the ordinary run of Indian communities is that however much they may defile the air, water and earth, the business of the Deities presiding over these elements is to cleanse them and maintain their purity. Frequently the Deities neglect their duty and when epidemics break out, the only way of ridding the places of their ravages is to offer propitiatory sacrifices of goats, fowls and sheep which will restore to them divine favours. Rural India has yet to learn that epidemics and diseases are the outcome of insanitary habits, and that cleanliness of person and surroundings, abundance of pure water and air, proper disposal of refuse, and consumption of wholesome and uncontaminated food are some of the elementary rules of health ordained by the Divinity, and infringement

of such rules involves dire consequences. The sanitary sense among the people is still subconscious, and it is most distressing to witness the commission of nuisance in the public thoroughfares, and it is scarcely realised that all the filth must ultimately find access to the local tanks and streams from where drinking water is supplied.

The proper disposal of sewage, street refuse and night-soil is the first step to ensure the public health, and once a service is organised towards achieving this end, the problem of supplying pure water becomes comparatively easy of solution. The public and governments are slow to recognise that there are heaps of gold in the condemned filth, which after careful chemical treatment must be returned to the soil. In nature there is no such thing as waste, and it is only our ignorance which blinds us to its value and importance. The experimental work on the investigation of the activated sludge process of purification of sewage, conducted at University College, London, has yielded important results, both in regard to the primary stage of clarification or removal of organic matter by absorption by the sludge, and also in regard to the secondary stage of slow biological oxidation. In India the researches of Dr. Gilbert Fowler, an eminent authority on the subject, has led to the devising of various methods of obtaining sterility of sewage, besides pointing to the process of the application of the treated material to the soil. The results of his experiments carried out on the influence of certain factors, such as temperature, pH value, concentration of carbon dioxide on the rate of oxidation of sewage and activated sludge are of great practical importance in so far as they establish the conclusion that the greater part of the oxidation of sewage by air is dependent on the presence of certain enzymes, whose most potent source of oxidising activity appears to be bacterial cells. When there is such a wealth of information easily available for ready application, the tardiness of municipal administrations in taking advantage of the town refuse being converted into wealth is unaccountable. It seems to us that researches should be undertaken in the chemical laboratories which possess sufficient equipment for them, to investigate the enzyme

activity of activated sludge also towards pure substances, and we have no doubt that the results of such investigations will have far-reaching practical importance in almost all the industrial processes.

When a Water Pollution Research Board is established in India, we can easily conceive the vast amount of difficulties and complicated problems confronting its members, and those of the rural population should engage their immediate attention. It is, however, conceivable that the efforts of the Board to introduce improved and sanitary arrangements will become infructuous if the people have not been sufficiently educated to appreciate and practise hygienic methods in their daily life. The education of village should have a direct bearing on the realities of life, and health education should form a large part of their programme of studies. The fresh-water Biological Sections, which must be a department of the Board and whose studies will be to investigate the biology, chemistry and physics of fresh-waters in relation to their behaviour of the fauna, ought to be able to convince the adult members of the rural population by means of demonstrations that contamination of drinking water is the direct cause of most of the preventable diseases to which ignorance victimises them. The villager must realise that whatever may be his affection for the cattle in his service, it is positively dangerous to both to have a common source of water supply, and that the tank used for taking drinking water is terribly contaminated if used by him and his herd as a bath tub. Polluted water in the villages undermines the health and efficiency of the people and their contribution to the public revenues, and till better conditions are introduced, they must necessarily be unsatisfactory.

In the towns and cities, the first consideration of the Board ought to be to convince the municipalities about the paramount urgency of providing water closets in suitable places in all the principal streets so as to prevent people from committing nuisance in open defiance of all the rules of sanita-

tion and decorum. Without such provision for the convenience of the users of public thoroughfares, it is meaningless to enact measures for the prevention of pollution of the roads, and it is surprising how under such circumstances the administrators of justice can take cognisance of offences. In the towns the sewage problem becomes complicated by the most baleful intervention of men and stray animals, and unless the municipalities acquire some active control for the mitigation of pollution from these two sources,—which is a prerequisite for any comprehensive programme of research studies,—the evils arising from the use of contaminated water must continue to afflict the urban population. Closely connected with the organisation for the treatment and disposal of town refuse, is the imperative necessity of rebuilding most of the towns according to sanitary principles. Old towns will automatically cease to exist, if the municipalities acquire building sites and create modern facilities and amenities of civilised life for the people in areas in the neighbourhood, and if an active programme of town planning is launched it will immediately solve some of the more acute sanitary problems which distress the towns at the present moment.

The population of India, when the census of 1941 comes to be written, will certainly reveal a most disconcerting increase, and if no machinery is set up in time to investigate and solve the health problems of this stupendously large community, beyond the provincial public health departments, we fear that conditions of existence will soon become appalling. The problems as they are, have assumed continental proportion, and the machinery to deal with them must be correspondingly comprehensive. The establishment of a Water Pollution Research Board under the Central Government, working in collaboration with the provincial health departments may provide the necessary palliative, and if the necessary funds and research workers should be forthcoming, India will be a paradise of sweetness and light.