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# ENVIRONMENTAL MEDICINE IN RELATION TO RURAL HEALTH*

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## ABSTRACT

The health of the world rural community has become the focus of attention during the past several years. Realizing the future of the traditional system of medical practice many countries have initiated specific public health programmes in order to alleviate the plight of this group of people. However, in their effort to establish such programmes the medical community must not be oblivious of that all important facet of rural life, that is their environment, both physical and socio-cultural, in which these people live and work. This is because the group of diseases which most affect the rural community are very often induced by environmental causes rather than pathogenic agents.

This class of diseases constitutes the field of environmental human medicine and drawing upon the experiences gained in the field of environmental veterinary medicine, medical practitioners should be in a better position to affect public health measures in rural areas where envionment still exerts a significant role in the health status of the community.

The advantages of an effective treatment of these endemic, environmental diseases as a group should be abvious for the rural community and also for increasing food production by improving livestock productivity and preventing waste. A research model for determining the concepts and techniques of dealing with these diseases as a group is proposed.


Rural health is, to a great extent, governed by a group of diseases which are due more to environmental causes than specific pathogenic agents. The treatment of each individual endemic disease on its own will not really solve the problem of rural health nor will it lead to any significant improvement in the health status of the rural community. Therefore, these endemic environmental

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diseases will have to be dealt with as a group which however is rather difficult with the present concepts and techniques and will require the development of new ones specifically designed to tackle these diseases as a group. If this should prove possible, then the advantages accrued to the health of the rural community should be obvious and also great strides will be made in increasing food production by improving livestock productivity and preventing waste.

It is important to realize that the spread of such diseases as influenza in man, foot and mouth in cattle and smut in cereals and others is due to random processes which are governed mainly by activities of man and although usually nonlethal they may under epidemic conditions, lead to a great deal of mortaility. This class of diseases including infant pneumonia and infant diarrhea acting as agents of natural selection and which are stochastic rather than deterministic in nature is the field of environmental human medicine. It is based on the premise than for this class of environmental diseases measurable parameters are phenotypes with a significant genetic environment interaction.

In their effort to treat the sick, the medical community has overlooked the important role of disease in natural selection and the evolution of populations. The well-being of an organism is in reality nothing but an indication of the degree of its adaptiveness to its environment because, "states of health or disease are the expression of the succcess or failure experienced by the organism in its efforts to respond adaptively to environmental challenges" (1). As Haldane (2) has suggested infections diseases could have acted as a very powerful evolutionary tool until recently and therefore it may be surmised that different diseases have different impacts on natural selection. Since man and domestic animals are no longer inundated by predation, these diseases are exhibited to the full and with measurable intensity and frequency.

It is a fact that the most important advances in preventive medicine is the result of non-specific influences such as better housing and improvement in nutrition inherent in the improvement of the quality of life. This has been clearly stated by Stallones (3) "most of the decline in disease incidence and mortality and therefore most of the increase in average life expectency, has resulted from influences other than efforts aimed at controlling specific diseases". This, of course, is not to belittle the significant progress made in the identification of etiologic agents of disease. But it is a fact that the impressive reduction in infant mortality from the pneumonia-diarrhea complex in the early twentieth century occurred without drugs and at a time when there were no vaccins.

A most interesting example is the case of tuberculosis in man and poultry. Poultrymen used to keep their hens for two laying periods until it was shown that this practice was uneconomical. The incidence of avian tuberculosis decreased significantly as soon as this practice was abandoned. The incidence of tuberculosis in man has been decreasing slowly but appreciably for the past century too (4). The reason likewise is not due to any specific effort to eliminate the disease as the suberculin vaccine was not even available until early twentieth century. Therefore, based on the experience of avian tuberculosis it may be suggested that the decrease in the incidence of human tuberculosis is most probably due to non-specific causes such as the replacement of the extended family by the nuclear family.

Another example is the production of different varieties of chickens for maximizing egg production and meat production in the poultry industry. This development has created a new set of diseases due to different environments acting on new gene pools. However, some old pathognic diseases caused by cestodes have almost disappeared mainly due to unsuitable environment for the intermediate host while other diseases such as coccidiosis has remained the same and chemical treatment has had but little and temporary effect.

If a range of phenotypes are removed by these environmental diseases, then it follows that these phenotypes are unadapted to the environmental conditions. However, under such conditions as producing maximum challenge to the phenotypes, the coupling of two phenotypes may result in greater homeostasis than any one alone. An excellent living example of this coupling concept is the mode of life of the Indians in the Andean region of South America, a mode of life characterized by very low caloric intake (5). Adaptation to this low caloric intake has been achieved by means of a spatially-dispersed and efficient cropping system and domestic animals, child labour and exchange of surplus resources for high energy food with lower regions. To try to improve their life by changing their integrated system of agriculture, reducing infant mortality or putting children to school would jeopardize the links in their equilibrated ecosystem with catastrophic results for their race and culture.

Innovations in a traditional, steady-state society may do it more harm than good as they may be carrying the seeds of destruction of that society. Transmission of information through succeeding generations may be achieved biologically by means of the hereditary material and culturally by means of traditions. Mutations are genetic innovations which are moystl harmful and are thus discarded by natural selection. However, cultural innovations, unlike genetic innovations, have no intrinsic selection mechanism and are therefore quite likely to spread through population very quickly and lead to its destruction.

The concept of coupling two systems, biotic or abiotic, is based on the propositions of Von Foerster (6) that to form coalitions is a basic and fundamental property of biotic world whereby the coalition becomes capable of performing certain tasks not possible for each of the individual parts alone. Furthermore, he has shown that coalitions in living world increase the stability of their systems by conforming higher survival value on individual parts whereas coalitions in abiotic world would lead to greater instability of the individual components. It is therefore implied in this propostion that larger animals are more stable than smaller ones and thus much may be learned by designing on experimental animal model for testing the common environmental diseases of man using a type of animal with similar infant and adult characteristics as man.

It appears that the animal most suited for this purpose is the common domesticated animal, sheep (7). This animal has almost the same adult weight as man and whose lambs at birth have almost the same weight as babies. Also both lambs and babies share some common diseases such a pneumonia and diarrhea and in addition sheep have the great advantage of a short generation time.

An experiment utilizing the sheep model would consist of subjecting lambs to ewes of different ages and to environments with different endemic diseases in order to determine the genetic environmental indices most crucial for the occurrence of endemic environmental diseases. The knowledge thus gained should also enable us to identify the individuals most likely to contract this class of diseases and therefore to be able to adopt the necessary preventive measures. Also, if the sheep model should prove successful in simulating various environmental diseases of man, then the model could be extended for the ultimate goal of determining which societal and managerial practices in accordance with the traditions of any society could be modified, changed or new ones adopted to influence the incidence of these diseases in man.

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