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STUDIES AND STRATEGIES TO REDUCE MORBIDITY AND MORTALITY FROM ENTERIC
INFECTIONS

THE LABORATORY IN ENTERIC DISEASE
CONTROL PROGRAMS

by

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INTRODUCTION

The magnitude of the problem of enteric diseases in Latin America is not accurately known, at least as far as the morbidity they cause is concerned.(6) These diseases usually run their course without medical attention, are poorly reported and, what is more, their etiology is not usually confirmed. Because of this, the role of the laboratory in enteric disease control programs should be clear, precise, and essential.

The work of the laboratory is not only of present, but also of historical value, since the etiological agents of the various diseases were discovered by the laboratory. But if we do not know how to use the technical resources available, every attempt to reduce morbidity and mortality rates will be limited. It is not to be denied that in our developing countries epidemics are identified and control measures taken without the assistance of the laboratory. If this happens in epidemic situations, its absence is even more noteworthy in the identification of endemic diseases since they call for continuing attention by the laboratory.

The progress made in recent years on the problems and methodology of enteric diseases has pinpointed the laboratory as one of the elements playing an essential role in the modern control of intestinal infections. Its activity is not limited to administration alone, or to diagnosis, but extends to the field of research, for example, pathogeny, immunity, multi-resistance, and many other still unsolved problems.

The laboratory is the keystone of surveillance programs, as may be demonstrated by many examples. For example, by keeping a continuing record of findings, it is easy to show that a serotype has not been previously detected. When this monitoring indicates an increase in a given serotype in a given locality, it is time to undertake research aimed at identifying the vehicle and, consequently, to take the appropriate control measures. This was what happened with the Derby serotype in 1963, which was isolated from raw eggs, and with the Typhimurium serotype, which was isolated from turkeys in 1971.(1)

In recent years, an epidemic of dysentery caused by the Shiga bacillus (7,8) has occurred in various Central American countries. The bacillus is multiresistant and produces a high rate of mortality and morbidity. Perhaps the fact that, for 70 years, an epidemic of this type had not occurred in the world explains why the laboratory was bypassed and why it was only after 9,000 deaths and more than 100,000 cases that the bacillary nature of the dysentery was determined and control measures based on the drug indicated by the antibiogram were taken.

In 1973 an international epidemic of salmonellosis due to the Agona serotype (3,11) was reported. The source of this serotype is fishmeal and its vehicle is barnyard eggs and kitchen utensils. These are examples which, as we said above, justify the role of the laboratory in intestinal disease control programs.

The role of the laboratory in those programs may be discussed from two standpoints: the theoretical and the technical. In either case, the officials responsible for planning control programs and those responsible for taking the measures must be fully aware of these aspects.

Theoretically, the role of the laboratory in intestinal disease control programs may be summarized as follows: there can be no determination of an intestinal disease unless the causative agent is isolated and identified.

In accordance with this principle, the laboratory must be considered an institution whose organization should be based on two factors: one depending on the infection itself and the other on the environment in which the disease occurred. Since we regard intestinal diseases as ecological entities, research on them must take into account not only the etiological agent but also the geographical environment, social, economic and cultural conditions, and the age groups involved.

The etiology of enteric diseases varies. They are produced by enterobacteria, vibriions, clostridium, viruses, etc. The methods and techniques for isolating and identifying those etiological agents also vary. (2,4,5) This means that laboratories must be organized at various levels (Figure 1).

ORGANIZATION OF ENTEROPATHOGEN LABORATORIES

For the organization of laboratories supporting programs for the control of enteric diseases, various levels must be taken into account. Figure 2 shows an organizational chart of laboratories which takes into account the human and nonhuman sources of the enteropathogens--the human source, represented by patients detected in base clinics and laboratories and carriers detected by the reference laboratory.

Patients first attend hospital, public health, or private clinics for medical care, and therefore these institutions are the first detecting centers. Only 10 per cent of the ambulatory health services have laboratory services. (10) Of these, however, none is or needs to be equipped for the isolation and identification of enteropathogens. The important thing in these clinics is that they must be prepared to collect specimens, especially before the prescription of antibiotics.

Once obtained, the specimens should be sent to the health or hospital laboratories. In Latin America, between 70 and 95 per cent of the hospitals have some type of laboratory, (10) but this percentage is halved when we take into account bacteriological examinations such as stool culture or blood culture. However, these laboratories, when duly coordinated in enteropathogen work, are valuable support for control programs.

Private laboratories may make a useful contribution towards public health if they communicate their findings to the zone concerned.

The specimens sent by the clinics could be processed in health or hospital laboratories in accordance with a plan for dealing with suspected enteropathogens; as an example, the procedure for dealing with stool cultures is shown in Figure 3. Up to this point, public and private laboratories fulfill their medical care function through diagnosis. The reference laboratory would perform other functions in support of the surveillance programs of the epidemiological services.

REFERENCE LABORATORY

This laboratory should be national in scope and perform, as a minimum, the functions indicated in Figure 4. This laboratory should break out of the classical mold, that is to say, the purely biological mold, and be connected with clinical medicine. The lack of this link is, perhaps, one of the reasons why today we know very little about the pathology of these infections, especially in children under five years of age. The ideal would be for the reference laboratory to have its own clinical services; however, the above-mentioned lack of connection may be overcome by the physical integration of the reference laboratory into a general hospital.

The minimal functions which it is believed the reference laboratory should perform are set out in Figure 4. In the first place should be planning, based on national needs and a more efficient utilization of its resources. In planning, a deadline should be specified for the achievement of short-, medium- or long-term objectives or goals. Internally, planning enables us to achieve better coordination and more efficient use of the human and material resources available, and to pre-establish overall national goals.

Another function of the reference laboratory is the bacteriological diagnosis of enteropathogens up to the serotype. In this regard, the findings made by the health and hospital laboratories will be amplified by specific biochemical and serological methods, since these would enable the genus to be diagnosed in most cases.

The purpose of the training function will be to train specialized personnel for health and hospital laboratories. Subsequently, when laboratory hospitals and properly evaluated personnel are available, training may be undertaken at two levels. The hospital or health laboratories will train personnel from the collection of the specimen to the antibiogram (Figure 3). The reference laboratory will provide training in more sophisticated methods and techniques. Another part of this function consists in the organization of courses and seminars on the isolation and identification of enteropathogens and the publication of manuals.

The research programs undertaken by the reference laboratory will be determined by the essential needs of each country. Their relationship to clinical medicine and epidemiology is basic. Secondarily, research programs will deal with continental or world problems.

One of the goals the reference laboratory should establish for itself is to ensure uniformity of methods and techniques at the national level. Coordination with health and hospital laboratories is an effective way of achieving a good result. Coordination should be extended to the epidemiology services and to the continental reference laboratory. Coordination with the programs of national universities or with their schools of public health is also an important and necessary step.

As regards production, consideration should first be given to the preparation of antigens and immune sera. Those to be prepared will depend on the prevalence of serotypes in each country, and the pertinent polyvalent sera will be provided to local laboratories.

Another function of the reference laboratory is the quality control of biological products. Vaccines and diagnostic antigens will be evaluated by this laboratory.

Finally, evaluation will be one of its primary functions, and evaluation will be made of all laboratories it coordinates.

The importance of nonhuman sources in the epidemiology of intestinal diseases is well known. Bacteriological control laboratories should be coordinated with the reference laboratory and through it with the epidemiological services.

Intestinal disease control programs involve still other problems for the organization of laboratories. Those problems cannot be solved unless consideration is given to the establishment of a continental reference laboratory. One of the recommendations of the Ten-Year Health Plan for the Americas(10) is to improve and establish support services, especially laboratory services. A good beginning might well be made with that laboratory since, in addition to coordinating the work of the national reference laboratories, it would have other specific functions; for example,

the determination of certain phagotypes such as that of the well-known fatal case due to *Salmonella enteritidis* phagotype 8;(9) this determination could not be made by a laboratory other than that of the magnitude we are proposing. In the same way, the weekly or monthly reports of the national reference laboratories should be channeled through the continental agency.

SUMMARY AND RECOMMENDATIONS

The role of the laboratory in intestinal disease control programs is justified. The organization of laboratories specialized in enteric bacteriology at different levels is argued. The establishment of reference laboratories at the national level and of a continental reference laboratory is recommended.

Figure 1
METHODS OF ISOLATION AND IDENTIFICATION OF ENTEROPATHOGENS

ENTEROPATHOGENS	ISOLATION				IDENTIFICATION			
	St.	Bl.	F.C.	Bio.	Ser.	Ph.	FA	
<i>Salmonella</i>	XXX	-	XXX	XXX	XXX	X	X	
<i>S. typhi</i>	XXX	XXX	-	XXX	XXX	XX	-	
<i>Shigella</i>	XXX	-	-	XXX	XXX	-	-	
<i>E. coli</i>	XXX	-	-	XXX	XXX	-	X	
<i>V. cholerae</i>	XXX	-	X	XXX	XXX	X	-	
<i>V. parahaem.</i>	XXX	-	X	XXX	XXX	-	-	
<i>Staphylococcus</i>	-	-	XX	-	-	X	-	
<i>Clostridium</i>	XX	-	XX	XXX	XXX	-	-	

St. = Stool culture
Bl. = Blood culture
F.C. = Food culture
Bio. = Biochemical methods
Ser. = Serological methods
Ph. = Phage method
F.A. = Fluorescent antibody method

Figure 2

LABORATORY IN INTESTINAL DISEASE CONTROL PROGRAMS

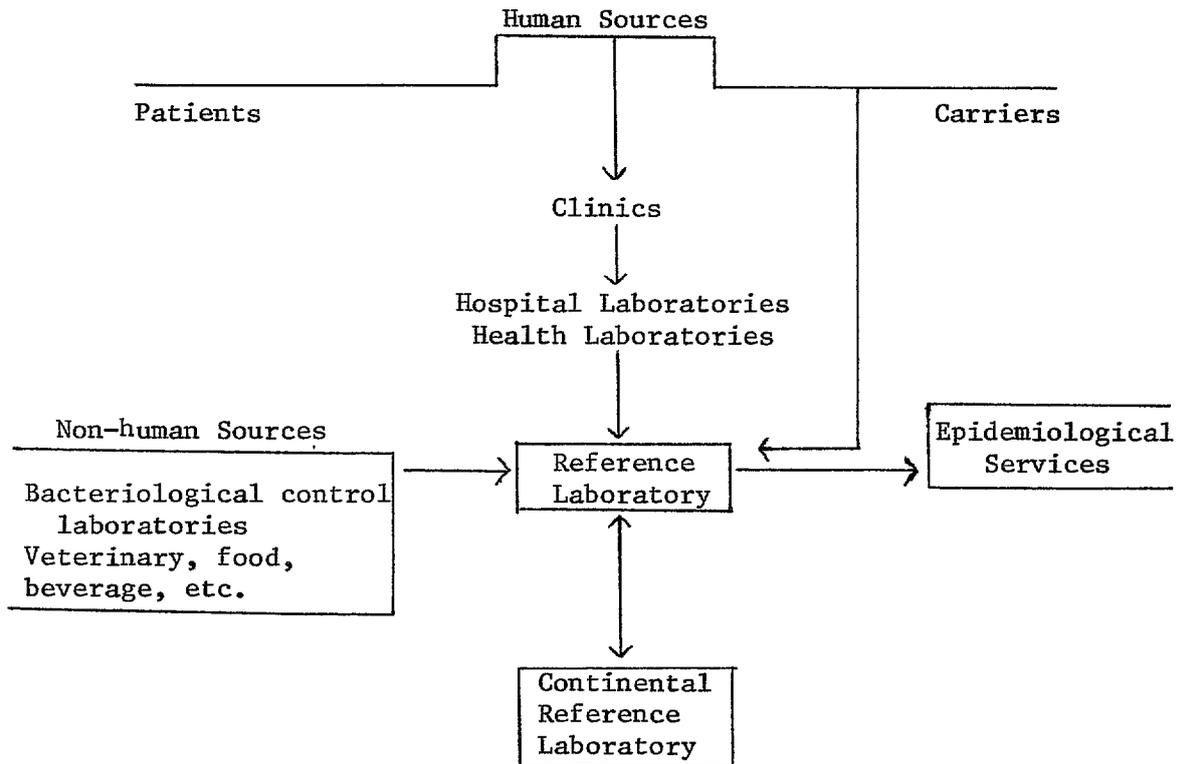


Figure 3

WORK PLAN OF ENTEROPATHOGENIC LABORATORY

Stool Culture

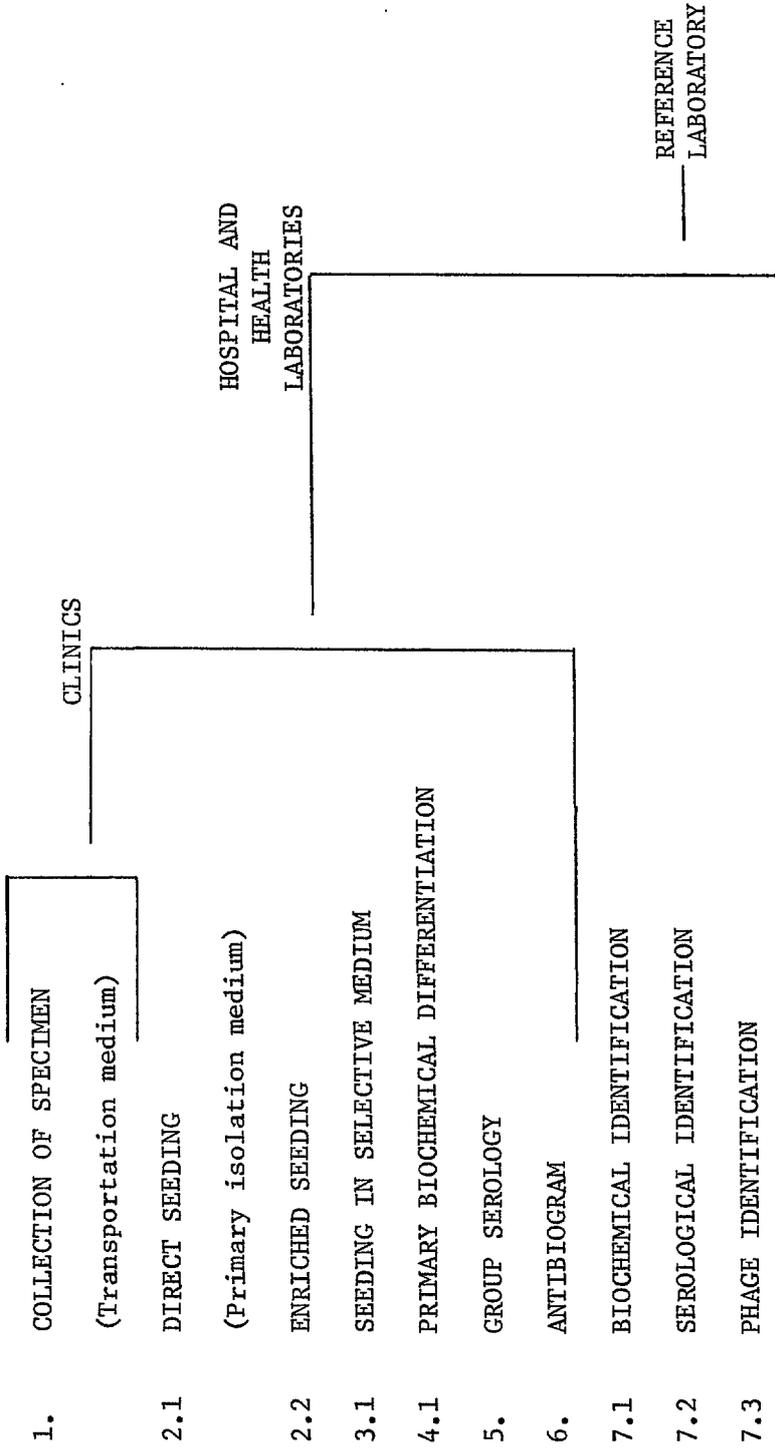
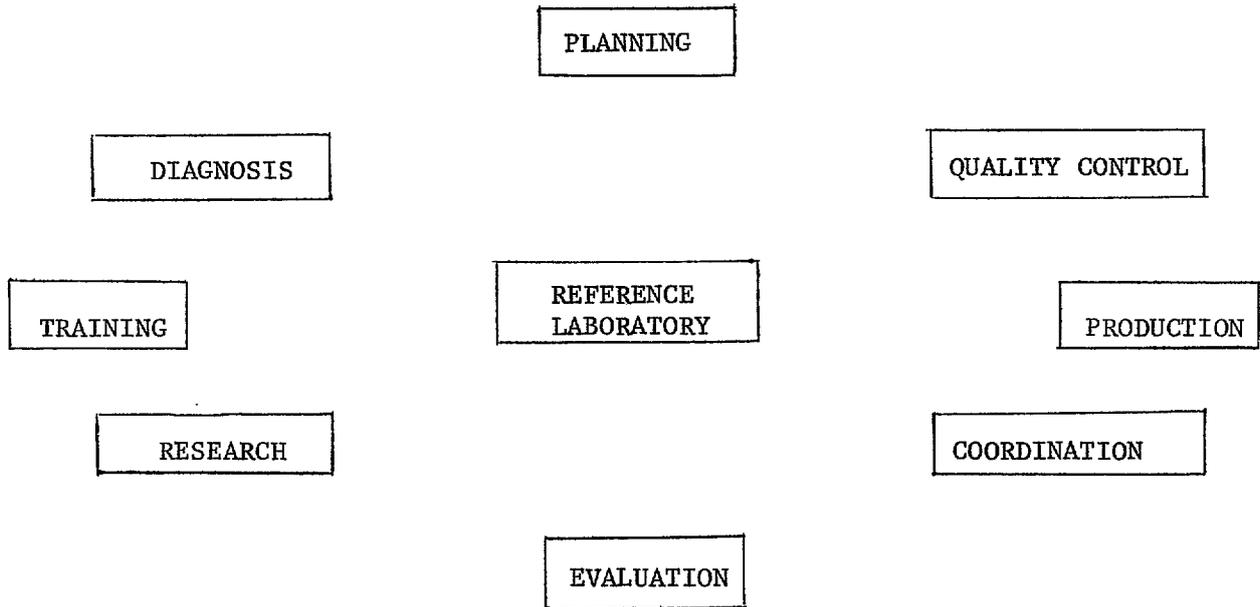


Figure 4

FUNCTIONS OF THE ENTEROPATHOGEN REFERENCE LABORATORY



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