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were collated and will be published by WHO early in 1957. As a result of this work, the Organization is now in a position to give information to governments on the best methods to be used to control typhus fever in those areas where resistance has occurred as well as in those in which the insect is still susceptible. The Organization is also able to stimulate research on other insecticides to those normally used in typhus control programmes, which might be employed when complete resistance is met. An extensive system of exchange of information has been established on problems of resistance in general. This system now involves more than 300 workers in the field and makes it possible for many laboratories to plan specialized research concentrating on those questions for which they are particularly suited. There is no doubt that the cross-fertilization of ideas which resulted from the stimulation and co-ordination provided by WHO in this field will generally increase the knowledge of this vitally important problem of resistance to insecticides.

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WHO's antirabies activities highlight the primary role expert committees play in the promotion of essential research work. In 1950, an expert committee defined the many avenues which lay open for the investigation and study of problems involved in rabies prophylaxis and control in man and animals. Since none of these problems can be attacked successfully by any single institute in any country a series of co-ordinated projects was initiated, aided by small financial grants from WHO, in laboratories situated in five different countries. There were for instance field trials in Iran on the use of serum in persons seriously exposed to rabies, in Spain on the local treatment of the wounds, in Malaya and Israel on new vaccines in the control of the disease in animals, and in France and the United States of America on the standardization of potency tests of vaccines and sera. The results of these trials and of further studies carried out over the last six years were evaluated by an expert committee which met in 1956. All this cumulative research work has clarified several aspects of rabies control relating among other things to the modification of dosage schedules of vaccines and sera in prophylactic treatment after exposure, to the minimizing of side reactions to serum and vaccines and to the prior basic immunization of persons likely to be exposed to risk of bites by rabid animals. Another important step taken recently was the setting-up, in co-operation with an expert committee on biological standardization, of an international standard serum and of a reference vaccine.

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The latter achievement is part of WHO's fundamental task of providing the various branches of medical science with units of measurement which have always been a basic need for their progress. Most of the time these units can only be established by reference to standard preparations. Almost invariably the creation of such standards, whether they are for pharmaceutical preparations, for sera or for vaccines, is preceded by intensive research carried out in laboratories all over the world under the guidance of expert committees, and mainly of those responsible for biological standardization and for the preparation of the International Pharmacopoeia.

In the case of vaccines, strictly controlled field trials are often indispensable to determine the relationship between the results of laboratory tests made on animals and those expected when the vaccine is applied to man. This relationship has been successfully established for smallpox vaccine, as the result of a long series of studies initiated by WHO in 1952 and completed in 1956. These studies have also shown that it is possible to prepare a dry smallpox vaccine, stable at 45° C for

a duration of at least two years. The method of production of the new vaccine has been made available by WHO and its adoption should greatly improve the prospects for the control of smallpox in hot countries. Furthermore, an expert committee on biological standardization which met in 1956 considered the vaccine sufficiently stable to warrant the establishment of an international reference standard, on which preliminary work has already begun. Similar investigations are being conducted by WHO on other vaccines in order to ensure that they can play their proper role in public-health programmes.

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Research, we have seen, is essential to WHO's effort to control and prevent the communicable diseases which still plague the major part of the world. It is also a basic factor in most of the programmes WHO has undertaken to promote world health by all those positive means which are today at the disposal of medical science.

The study of the psychobiological development of the child is, I believe, a good example of what co-ordinated research can achieve in the understanding of complex problems in the field of mental health. There exists obviously a great deal of scattered knowledge on child development, but such information remains largely within the separate compartments of scientific disciplines. It was precisely to break down the barriers between the various specialists and to stimulate inter-disciplinary research on the various aspects of the problems that the study group for the psychobiological development of the child was convened by WHO four times during the period from 1953 to 1956. These meetings were attended by experts in anthropology, psychology, psychoanalysis, electro-physiology, human biology and ethology and yielded some useful information on the biological, psychological and cultural factors influencing the development of children and of adolescents.

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The study of protein deficiency in young children provides an excellent example of inter-agency co-ordination in research work devoted to major nutritional problems. Protein deficiency disease in infants and children has been the cause of high morbidity and mortality in many countries. In the majority of cases there is no total lack of protein but rather inadequacy of protein in a form suitable for the young child, especially when milk cannot be made available. The obvious solution is of course to find methods through which the vegetable and fish sources of protein available in a given country could be used to the fullest possible extent. However, before this can be done, more must be known about certain dangers which exist in using such foodstuffs and about the means whereby their optimum value can be obtained. These problems, which concern all parts of the world, were discussed at the meeting convened in the United States of America in 1955 by FAO and WHO, with financial aid from the Josiah Macy Jr Foundation. Experts in protein nutrition met experienced workers from the United States and Europe, such as biochemists engaged in the experimental feeding of animals, scientists studying the most efficient methods of feeding stock, as well as paediatricians and general medical nutritionists.

The final decision regarding the safety and suitability of any food is a very highly specialized matter. Therefore a small advisory group, drawn from members of the WHO Expert Advisory Panel on Nutrition, was formed. This group met twice in 1956 and both meetings were attended by FAO and WHO staff members, and by representatives of UNICEF, which has a great interest in the prevention of malnutrition. A satisfactory agreement was reached on the programmes of

CHAPTER 1

COMMUNICABLE DISEASES

The work of WHO on communicable diseases in 1956 reached a stage at which it became possible to view the activities of the last several years with a sense of perspective, and to look into the future with the hope that by using similar methods of approach, results can be attained in the fight against many communicable diseases as important as those achieved in malaria and endemic treponematoses. These infections and smallpox single themselves out by the fact that for all of them there are now available public-health techniques of eradication.

In malaria, the work of WHO in the last eight years has shown that if transmission is interrupted for a sufficient length of time, by breaking the cycle at the level of the vector over a wide enough area, the infection dies out and costly control measures can be replaced by the much cheaper routine supervision. As is well known, the systematic application of residual insecticides made such interruption of transmission possible. Indeed, the development of resistance to the insecticides by the vector has made this technique imperative, and the policy of eradication advocated by the World Health Assembly has been adopted by many governments.

The endemic treponematoses (endemic syphilis and yaws) were the first group of diseases to be controlled by case-finding and treatment. But eradication only became possible when in the course of WHO-assisted field studies it became clear that case-finding was not sufficient and that contacts must also be treated, because they provided a reservoir of infection which would vitiate the results of a mass campaign. Further, unless the search for cases was carried out methodically, house by house and family by family, cases would be missed and sooner or later the infection would again spread. The development of long-acting penicillin preparations and attention to these principles have been shown to make it possible virtually to eradicate these diseases, although the possibility that hypersensitivity reactions (and, though not yet observed, the development of penicillin resistance in the treponeme) may interfere with treponematoses control in the future emphasizes the need for the continued interest of WHO in other possible approaches to the eradication of endemic treponematoses.

It has been known for a long time that it is possible to eradicate smallpox from a country by preventive vaccination. Yet in many parts of the world the disease still persists. A principal reason for this is that the usual lymph rapidly loses its potency when exposed to the high temperatures encountered in the tropics. Dried vaccines with increased stability have been in use for many years but the results have often been unsatisfactory. Now, as the result of studies promoted by WHO, it is possible to indicate a method of preparation which produces consistently a vaccine stable for months at the temperatures met with in the tropics. With such a vaccine available, eradication of the disease becomes possible by its systematic use. Eradication programmes have started in some countries, particularly in Latin America.

Nevertheless, it would indeed be unwise to minimize the problems which remain to be solved before the world-wide eradication of any of these diseases can be achieved. But with the technical knowledge and the public-health methods now available success can be attained if the opportunity is taken by health administrations. Success now depends on administration, training of personnel, sound technical application, and adequate financial support.

It has been encouraging, looking back on this first year after the Eighth World Health Assembly resolution on malaria eradication, to see that so many governments have accepted the policy and are attempting to reach the goal of malaria eradication (see Maps 1-4), and that the various meetings of experts from all parts of the world, convened in 1956, endorsed the technical justifications for the policy of replacing routine malaria control by malaria eradication programmes. As the Inter-regional Malaria Conference for the Eastern Mediterranean and European Regions, held in Athens, pointed out, the first year's experience in the implementation of some of these programmes shows already that failures are more likely due to a lack of preparation or to some fault in the administrative machinery than to technical reasons. It has been found that, in some countries where

animal to man might be through the ingestion of insufficiently cooked pork, and co-ordinated research was continued on the production and testing of various antigens for the complement-fixation test of toxoplasmosis in human beings and various animals.

Limited work was also carried out on Q fever surveys in various countries, on anthrax and on bovine tuberculosis.

A monograph on meat hygiene was prepared for publication early in 1957.

Work on milk hygiene is described in Chapter 3.

Virus and Rickettsial Diseases

A seminar on virus public-health laboratories was organized in Madrid under the auspices of the Regional Office for Europe. A number of problems facing these laboratories came to light, perhaps the most important being that of obtaining antigens and sera. Smaller laboratories cannot undertake their preparation, and commercial sources are limited and the reagents expensive. This problem is under study.

Rapid progress in the application of tissue culture techniques for virus isolation has opened the way to a much more rapid diagnostic service than can be attained by serology. Valuable though this development is, it has resulted in complications which are not easy to solve. The isolation of a new virus and its identification used to be a technical achievement of considerable difficulty, but it has now become almost a daily occurrence. The role of many of these viruses as causes of disease is still unknown, but their presence makes it very difficult to isolate and identify known pathogens.

The problems presented by these viruses were discussed at an informal meeting convened by WHO at the time of the New York Academy of Sciences symposium on the subject in May. It was agreed that international co-ordination of research could greatly expedite progress and the meeting proposed activities which could with advantage be integrated with existing programmes on influenza and poliomyelitis. The meeting also outlined laboratory techniques suitable for general use, and indicated sources of specific sera essential for the study of these problems.

The influenza and poliomyelitis programmes have been continued as in previous years.

In influenza, for the second year in succession, a new antigenic variant of influenza A virus was detected, first in the Netherlands, and shortly after in India, Tanganyika and Canada and in Berlin. The new variant isolated in 1955 did not cause a major epidemic last winter when there was little influenza,

and it is impossible to predict whether the 1956 variant will cause one. This strain has been incorporated in the laboratory reagents supplied to co-operating laboratories to ensure its rapid identification.

As recommended in the review on poliomyelitis vaccination published early in the year (*Technical Report Series No. 101*) a number of countries with a high incidence of poliomyelitis are developing and extending vaccination programmes as more vaccine becomes available.

WHO regional poliomyelitis laboratories continued their programme of assisting national laboratories, studying prevalent viruses, and undertaking or assisting in serological surveys. A study on the prevalence of poliomyelitis in 1954 and the types of virus prevalent in recent years was published in the *Bulletin*.¹

Vaccine Studies

The reports of the WHO-sponsored studies on dried smallpox vaccine were prepared for publication in the *Bulletin* early in 1957.² The findings were submitted to the Expert Committee on Biological Standardization so that the possibility of establishing an international standard might be considered. The studies on the most stable vaccine have been continued. It has now been exposed to 45° C for two years and is still giving 100 per cent. successful vaccinations in man.

The results of the extensive studies by the British Medical Research Council on pertussis vaccines were published in August. WHO gave some support to the second series of trials.

The report of the field trial of typhoid vaccines carried out with WHO assistance in Yugoslavia has been received. It has been demonstrated that one

¹ *Bull. Wld Hlth Org.* 1956, 15, 43-121

² *Bull. Wld Hlth Org.* 1957, 16 (in press)