

INTERNATIONAL MICROBIOLOGICAL STANDARDS FOR FOODS¹

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Interest in the development of microbiological criteria for foods and food products is by no means a new development, and within the last 5 yr, it has become an increasingly important topic at many formal conferences. The number of groups involved, and the multiple conferences and meetings held by each of them, attests to the importance attached to the public health need for effective control of the microbiological content of foods.

In addition, it emphasizes the difficulties encountered in arriving at microbiological parameters of safety, agreeable to the many and varied groups. They have recognized not only the different points of view held by industry and by regulatory officials, but as well, the variation in methodology which exists among scientific groups from different countries and also within the same country.

Between countries, the problems are all too frequently further complicated by fundamental, and often unrecognized, lack of complete understanding of basic goals and by suspicion. Agreement on methodology and on attainable bacterial levels can not and should not be attempted until rapport has been established.

NEED FOR AND BENEFITS FROM MICROBIOLOGICAL STANDARDS

The overall problem of the need for microbiological criteria and the benefits that may accrue from them will first be considered. Probably the question of need does not require extensive elaboration, for it is well known that the rapid expansion in the production and distribution of commercially prepared ready-to-eat foods has created concern on the part of regulatory officials and responsible industry alike. This concern is emphasized by the very apparent lack of reduction in the incidence of illnesses generally associated with food products. This is in sharp contrast to the marked decrease in those illnesses attributed to milk and water, where control has been

applied for many years along with well enforced standards.

Thus, protection of public health through reduction of food-borne illnesses is the first and most important goal. It is, of course, not to be expected that the adoption of realistic microbiological limits will ensure complete safety of a food any more than it has done in milk and water. In fact, it is possible that the record would be much less perfect considering the homogeneity of the liquid products and the greater ease with which they can be processed, packaged, and distributed.

The second objective sought is to improve and control the sanitation under which foods are processed. Here the likelihood of success is much greater if the limits are properly conceived and properly applied. If in this fashion the hygienic level of food products is raised it will, in all probability, reduce the hazards of food poisoning to a marked degree. Such has been the experience, even in those instances where the limits were set in a more-or-less arbitrary fashion.

PROBLEMS IN ESTABLISHING MICROBIOLOGICAL STANDARDS

There are, however, many problems that must be recognized in an attempt to establish meaningful and useful bacteriological limits. There must be complete and thorough knowledge of production, processing and distribution of the food in question. Limits for each type of food must be derived depending on the type of raw materials used, processing procedures employed and the stage in production at which lethal processes, if any, are applied. Also, and of utmost importance, the influence of storage upon the different microorganisms in each food must be recognized and properly accounted for.

These problems have led many in industry and health agencies alike to propose that limits be preferably applied at production source and that their most useful purpose is to supplement rigid processing controls and thorough inspection procedures. In this fashion they would serve to ensure that a particular plant or industry was operating and continues to operate at a high level of sanitary excellence.

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ORGANIZATIONS ACTIVE IN SETTING STANDARDS

All of the foregoing have been previously emphasized by many writers and are doubtless well known. They have been emphasized on numerous occasions by the many groups concerned with the development of microbiological limits. Among the organizations in the United States active in this area, probably the first was the Association of Food and Drug Officials of the United States (AFDOUS) which in 1956 expressed concern over the quality and handling of frozen foods and undertook studies of the microbiology of frozen foods at production levels. In this they were joined by the National Association of Frozen Food Packers and by Federal and local regulatory agencies. In 1963 a subcommittee on Food Microbiology of the Food Protection Committee of the National Academy of Science/National Research Council was established with one of its charges being to "formulate principles on which microbiological criteria could be based." Both of these groups are currently active.

In the international field there are presently many groups that have expressed a concern with, or who have entered or plan to enter, the field of microbiological standards. One of these, the one in which the author is involved, had its beginning in 1962, when the Committee on Food Microbiology and Hygiene of the International Association of Microbiological Societies (IAMS) arranged a conference in Montreal to discuss microbiological content in food. This resulted in the establishment of an International Committee on Microbiological Specifications for Foods under the IAMS.

COMMITTEE ON MICROBIOLOGICAL SPECIFICATIONS FOR FOODS

As presently constituted this Committee is limited to 20 members and has representatives from 12 countries, including Sweden, France, Netherlands, Denmark, Japan, Italy, Peru, USSR, England, Canada, and the United States. While governmental and industry groups are represented, all members serve as individuals, not as representatives of their respective organization.

The stated purpose of the Committee is to appraise the public health aspects of the microbiological content of foods, particularly those of international interest; to offer guidance in interpretation of the significance of microorganisms in foods; to recommend microbiological limits for specific types of foods; and to recommend methods for isolation of microorganisms and toxins from foods. The Committee has clearly stated that its objective was not one of formulating legislation, but to seek agreement on realistic limits for the bacteriological content of specific class-

es of foods as a preliminary step in appraising ways to improve microbiological safety, whether by processing procedures, improved sanitation, or by laboratory testing.

The report of the first meeting of the Committee was published by its Chairman, Dr. F. S. Thatcher, in the *Journal of Applied Microbiology*, Volume 26, August 1963. It covered a broad range of subjects from sampling schemes in current use, rationale of microbiological limits and their interpretation for specific foods, and research needs. The Committee found wide variation in methods currently being employed and recognized that this topic would require much greater studies and deliberation.

New committee report.

The Committee met again in 1965, and among other items established recommendations on microbiological methods for the already agreed upon food categories. These agreements were further discussed at a meeting in 1966, and a draft prepared for review and discussion. This draft was reviewed in 1967, and currently is in the final stage of revision, prior to publication.

Basically, the report, entitled the "Significance of with a discussion of factors to be considered in the Microorganisms in Foods and Methods for Their Enumeration," will be in two parts. The first deals selection of methods and the interpretation of the significance of microorganisms in foods. The second part will cover recommended methods for isolation and identification of indicator organisms and of pathogens.

Whereas in the report of its first meeting, the Committee touched on bacteriological levels broadly, and will, in its published report, discuss the significance of particular species or groups of microorganisms, it has made no further attempt to suggest numerical values for individual or classes of foods. It has, however, enunciated certain basic concepts which it is hoped will serve as a guide for those countries with sophisticated facilities for control and for developing countries.

Pathogenic organisms.

In the case of the pathogenic organisms the Committee has stated a firm position that no tolerance shall be established for significant, infectious pathogens. *It is recognized that absolute absence of pathogens is both difficult to attain and to determine, and that a standard based on the sensitivity of a reasonable method and on a reasonable sampling plan can be both realistic and productive in reducing hazards to the public health.*

It is further recognized that what constitutes a significant pathogen is not always obvious and that judgment based on experience is essential. Thus, the

mere finding of toxigenic organisms, as distinct from an infectious pathogen, does not necessarily call for removal of food from the market. Consideration must be given to such factors as further processing procedures, the nature of the food, storage conditions, and the role of natural competitive flora in inhibiting the growth of the specific pathogen or in producing obvious decomposition before toxin can be formed.

In applying these considerations the role of the specific microorganisms must not be overlooked. Thus, *Staphylococcus* may in specific circumstances be a specific pathogen, a source of food-borne toxin, an indicator of insanitary practice, or of little significance and concern. Unless these different roles are clearly recognized and understood, considerable confusion will result.

With the infective enteric pathogen, some consideration should always be given to the potential for multiplication in the food. However, secondary contamination of other foods and of the environment must never be disregarded. We must not become so preoccupied with *Salmonella* that we ignore the other enterics—*Shigella*, virus, *Vibrio*, and zoonotic parasites.

Non-pathogenic organisms.

The Committee recognized that limits or criteria for non-pathogenic microorganisms must be based on data, derived from surveys for like foods, which demonstrate the values obtainable under acceptable commercial conditions. This is not always readily accomplished even within a single country and is much more difficult when broad geographic areas are involved. It is the hope of the Committee that all groups—industry and public health officials—will supply the data for this task. Both groups have a vital interest in the establishment of meaningful and realistic international limits and it is only through joint effort that these can be obtained.

Space does not permit a full discussion of the Committee's deliberations concerning specific pathogens or the various indicator organisms. The discussions leading to agreement on the statements to be contained in the report have resulted in mutual respect and understanding among the members of the countries represented. It is hoped that this feeling will be extended, through the report, to others.

Methodology.

In considerable measure much the same understanding has been generated in the area of methodology. Where comparative tests have been made, on an international scale, of some of the methods set forth by AOAC or AFDOUS, whole-hearted acceptance has generally resulted. However, the Com-

mittee found that, in many instances, sufficient comparative data does not presently exist on which selection of any one method could be made. In these instances multiple methods have been selected on the basis of satisfaction obtained by many laboratories or on comparisons made at regional or local levels.

In order to stimulate additional comparative testing of different methods at the international level, the Committee has obtained the services of a professional coordinator who plans to set up protocol for such tests and to obtain and distribute samples. It is anticipated that initial efforts will be concentrated on methods for the isolation of *Salmonella* and for other specific pathogens.

Throughout its deliberations the Committee has recognized many areas where research was needed in order to devise more reliable methods or to establish microbiological criteria for foods in international commerce. These needs will be included in the report without any attempt to establish order of priority or to cover all areas in depth, in the hopes that necessary investigations will be stimulated.

OTHER GROUPS

These comments have dealt at length with the activities of a single international Committee. There are many others, which are either international in scope or which represent broad geographic areas, that should be recognized. In most instances these groups are represented on the IAMS Committee and in all instances their activities and especially any methods they may have adopted were considered.

Among these groups were: the Microbiological Committee for the Benelux Countries, the Scandinavian Committee for Standardization of Foods, the International Standards Organization, Food Hygiene Committee of the Codex Alimentarius Commission, the International Institute of Refrigeration, the Association of Official Analytical Chemists, specific subcommittees of the American Public Health Association, Association of Food and Drug Officials of the United States, British Food Manufacturing Industries Research Association, and specific industrial Committees in the United States, Canada, and the United Kingdom. Many of these are primarily interested in methods but others such as those associated with the Codex Alimentarius Commission are also broadly concerned with microbiological standards. It is hoped of the IAMS Committee that it can serve in an advisory capacity to these others with like interests.

This report has covered only the high points but it will hopefully demonstrate that microbiological limits are truly receiving international consideration.