

codex alimentarius commission

FOOD AND AGRICULTURE
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REPORT OF
THE THIRTEENTH SESSION OF THE
CODEX COMMITTEE ON PROCESSED MEAT AND POULTRY PRODUCTS

Copenhagen, 22-26 October 1984

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INTRODUCTION

1. The Codex Committee on Processed Meat and Poultry Products held its Thirteenth Session in Copenhagen from 22-26 October 1984 under the chairmanship of Mrs. Anne Brincker, Assistant Director, Danish Meat Products Laboratory. The session was attended by representatives and observers from the following countries:

Argentina	Finland	Italy	Tanzania
Australia	France	Netherlands	Thailand
Belgium	Gabon	New Zealand	Tunisia
Botswana	Germany,	Nigeria	United Kingdom
Brazil	Fed.Rep.of	Norway	United States of
Cameroon	Greece	Poland	America
Canada	Hungary	South Africa	Zimbabwe
China,	Iran, Islamic	Spain	
Pep.Rep.of	Rep.of	Sweden	
Denmark	Ireland	Switzerland	

The following international organizations were also represented:

- Confédération Européenne de l'Agriculture (CEA)
- Centre de Liaison des Industries Transformatrices de Viandes de la Communauté Européenne (CLITRAVI)
- European Economic Communities (EEC)
- European Vegetable Protein Federation (EUVEPRO)
- EC Wheat Starch Manufacturers' Association (EWSA)
- International Commission on Microbiological Specifications for Foods (ICMSF)
- Association Mondiale des Industries de Traitement des Algues Marines (MARINALCO)

The list of participants including officers from the Secretariat is set out as Appendix I to the report.

OPENING OF THE SESSION (Agenda Item 1)

2. The Committee was welcomed by Mr. J. Madelung, Head of Division, Danish Ministry of Agriculture and also chairman of the Danish National Codex Committee. He expressed his satisfaction with the attendance of the many representatives of countries which are members of the Codex Alimentarius Commission and the interested international organizations, this total attendance being a clear proof of the international interest attached to the work of the Committee. He referred to the recent issue by the Danish Ministry of Environment acting on the request of a committee of the Danish Parliament of an Order on Quality Requirements for Meat Products for the Danish home market. He commented that in his view the experience gained as a result of the Danish participation in the work of Codex was of great value in the preparatory work with the Order.

3. The Committee was also welcomed by Dr. E. Leparski, Director, Disease Prevention and Control of WHO Regional Office for Europe, on behalf of the Regional Director, Dr. Leo A. Kaprio. He referred to the WHO regional strategy "Health for all by

the year 2000" the achievement of which depends on a supply of safe food to the population. Dr. Leparski stressed the importance of the Codex Committee of Processed Meat and Poultry Products from the viewpoint of protection of health of certain population groups.

4. The chairman, Mrs. Anne Brincker, welcomed the delegates and in particular representatives from those countries, who were participating for the first time. She informed the Committee that China has become a full member of the Codex Alimentarius Commission and expressed her congratulations to the Chinese authorities.

ADOPTION OF PROVISIONAL AGENDA (Agenda Item 2)

5. The Committee adopted the Provisional Agenda (CX/PMPP 84/1) with a change in the order of discussion of the agenda items 7 and 8.

APPOINTMENT OF RAPORTEURS (Agenda Item 3)

6. The Committee appointed Mr. R. Sawyer (UK) and Mme Catherine Bouvier (France) as Rapporteurs of the Session.

7. The delegation of Argentina took the opportunity to mention the inconveniences that the Spanish speaking developing countries have suffered due firstly, to the fact that Spanish translation was not available during the meetings and secondly, to the late arrival of documentation. He emphasized that those difficulties were further compounded by the fact that the documentation is available only in English and French. He appealed on behalf of the Spanish speaking countries to the Danish authorities to introduce Spanish as a working language and regretted that previous appeals had not succeeded. The result being that very few countries from the Spanish speaking regions could participate in the meeting to defend their own economic interests. He repeated his request to the Danish authorities to take a decision on this issue for future sessions.

REVIEW OF MATTERS RELEVANT TO THE CODEX COMMITTEE ON PROCESSED MEAT AND POULTRY PRODUCTS (Agenda Item 4)

8. The Committee had before it document CX/PMPP 84/2 containing matters of interest to the Committee arising from (i) the 15th Session of the Codex Alimentarius Commission, and (ii) reports of other Codex Committees.

9. The Committee noted that some matters of interest reported appeared later in the agenda and agreed to defer their discussion.

Matters arising from the 15th Session of the Codex Alimentarius Commission (ALINORM 83/43)

10. The Committee noted that items of interest previously considered by the Commission related to (i) acceptances, and (ii) length and content of Codex reports.

The Committee noted that the Commission continued to place emphasis on acceptances and deferred discussion of the subject to agenda item 5. The Commission had instructed the Codex Committees to keep their reports concise and underline in all reports keywords indicating decision taken or action planned. The Secretariat will take action accordingly starting from the report of the present (13th) session of the Committee.

11. The Committee noted that the Code of Practice for the Production, Storage and Composition of Mechanically Separated Meat intended for Further Processing was adopted by the Commission at its 15th Session at Step 8 of the Codex procedure (ALINORM 83/43, paras 383-386). The Code has now been published in Vol. C of the Codex Alimentarius as CAC/RCP 32-1983.

12. The Committee noted the wish expressed by the Commission at its 15th Session (ALINORM 83/43, paras 388-391) that the development of the Guidelines for the Use of Vegetable Protein Products in Processed Meat and Poultry Products should be in close cooperation with the Codex Committee on Vegetable Proteins and agreed to discuss the subject under agenda item 9.

13. The Committee noted that the Commission having recognized the need for elaboration of a Code of Hygienic Practice for Production, Handling and Treatment of Spices with a view to international harmonization had requested the Codex Committee on Food Hygiene to consider undertaking such a task (ALINORM 83/43, para 392). (For further developments, see paras 32-41).

Executive Committee of the Codex Alimentarius Commission, 31st Session (ALINORM 85/3)

14. The Committee noted that the general matters of interest to it, from the above session related to (i) residues of veterinary drugs in foods (ii) recent developments concerning food irradiation, and (iii) a meeting on Islamic requirements for food of animal origin.

Joint FAO/WHO Expert Consultation on Residues of Veterinary Drugs in Food

15. The consultation will be held in Rome from 29 October - 5 November 1984 with terms of reference as below:

- i) To examine the problems associated with residues in foods arising from the use of veterinary drugs in food producing animals,
- ii) to advise the Codex Alimentarius Commission on how to consider these problems,
- iii) to examine the ways and means of regulatory control, and
- iv) to suggest priorities for substances to be considered.

Recent Developments concerning Food Irradiation

16. The Committee noted that the International Committee on Food Microbiology and Hygiene of the International Union of Microbiological Societies at its meeting held in Copenhagen in December 1982 had expressed the opinion that irradiation-induced genetic mutation of pathogens in food did not create an increased hazard to health and that there was no qualitative difference between the mutation induced by ionizing irradiation and that induced by any other pasteurization/partial preservation methods such as heat treatment or vacuum drying. The report of the meeting was available as Codex document CX/FH 83/9.

17. The Committee noted that the Directors-General of FAO, IAEA and WHO had sent a joint circular letter on 21st June 1983 to their respective Member States, proposing the establishment of an International Consultative Group on Food Irradiation. The functions of this Consultative Group would be to (i) evaluate global developments in the field of food irradiation, (ii) provide a focal point of advice on the application of food irradiation to Member States and International Organizations, and (iii) furnish information as required through the organizations to the Codex Alimentarius Commission. The Consultative Group has become operational in May 1984.

18. The Committee also noted that WHO is planning to issue a publication on food irradiation. While the exact scope of this publication still needed to be decided, it would be a continuation of the last report of a Joint FAO/IAEA/WHO Expert Committee on

Wholesomeness of Irradiated Food describing the pros and cons of different food preservation and decontamination technologies including irradiation.

Islamic Requirements for Food of Animal Origin

19. The topic had first been raised at the 2nd Session of the Codex Coordinating Committee for Asia. The Committee noted that the WHO Regional Office for the Eastern Mediterranean will be organizing a meeting scheduled for tentatively in February 1985 in Jeddah of an International Group of widely recognized Muslim Scholars which was expected to cover:

- i) Requirements concerning slaughter of common food animals,
- ii) judgment of meat,
- iii) requirements of aquatic food,
- iv) requirements of products entering international trade, and
- v) requirements regarding the consumption of food of animal origin by Muslims living in (or visiting) predominantly non-Muslim countries.

The representative of WHO informed the Committee that the meeting would be open to observer countries, but that the exact date had not yet been fixed. Further information may be obtained from Dr. F.K. Käferstein, Food Safety, Division of Environmental Health, WHO, Geneva.

Other Matters

20. The Committee noted that the Executive Committee considered the question of whether a name established for a food in a Codex standard could be used as part of the name of a product which deviates from the standard because some of the animal protein content has been substituted by vegetable protein. The Executive Committee agreed with the thoughts expressed in para 63 of the Report of the Sixth Session of the Codex Committee on General Principles (ALINORM 79/35), which, in substance, permitted the use of a name laid down in a Codex standard as part of the name of another similar product not covered by the standard, provided that (i) the name was appropriately qualified, (ii) the section entitled "General Principles" in the General Standard for the Labelling of Prepackaged Foods was complied with, and (iii) the scope section of the standard was taken fully into account (ALINORM 85/3, paras 135-139). The Committee deferred discussion of the subject to agenda item 9.

Codex Committee on Food Labelling, 17th Session (ALINORM 85/22)

21. The Committee noted that the Codex Committee on Food Labelling (CCFL) considered the revision of the General Standard for the Labelling of Prepackaged Foods, which will be finalized at the next (18th) session of CCFL to be held in March 1985 (ALINORM 85/22, paras 129-287). The standard included labelling provisions for irradiated foods which stated that "a food which has been treated with ionizing radiation/energy shall include on the label, the statement "treated by ionizing energy";" this provision has been adopted by the Committee. Two other labelling provisions which related to (i) labelling of a food which contained an ingredient which had been irradiated, and (ii) labelling of a single ingredient product prepared from a raw material which had been irradiated will be considered at the next (18th) session.

22. The standard also included provisions on date marking. In this connection it should be noted that the standard now covered prepackaged foods for retail as well as for catering purposes (and the work on guidelines for labelling of non-retail containers

has been discontinued). The Committee agreed to discuss provisions on date marking in standards on Processed Meat and Poultry Products under agenda item 13.

Codex Committee on Food Additives, 16th and 17th Session (ALINORM 83/12A and ALINORM 85/12)

23. The Committee noted that the Codex Committee on Food Additives (CCFA) finalized the revised General Standard for Irradiated Foods and the Code of Practice for the Operation of Irradiation Facilities, the latter of which contained information on the technological conditions for the irradiation of spices and chicken (ALINORM 83/12A, paras 153-165). The Commission at its 15th Session adopted the Standard and the Code (ALINORM 83/43, paras 133-142). The standard and the Code have been published in Codex Alimentarius as Volume XV.

24. The Committee noted that the CCFA had given further consideration to the question of elaboration of sampling plans for verifying compliance with maximum levels for contaminants in foods. The CFFA recognized that sampling for contaminants depended on various parameters and it was for Commodity Committee to indicate the basis on which maximum levels for contaminants should be sampled to check compliance with the maximum levels. A working group was requested to consider a suggestion to develop guidelines on how Codex maximum levels should be enforced in international trade (ALINORM 85/12, paras 189-198). The Committee noted that the sampling plans for verifying compliance with maximum levels for contaminants would become useful once the maximal levels of contaminants in standards on Processed Meat and Poultry Products were established. Discussion on the subject was deferred to item 14 of the agenda.

25. The Committee noted that the CCFA at its 16th Session suspended the work on Guidelines for the Establishment of Food Additive Provisions in Commodity Standards because all information needed was already contained in the CAC Procedural Manual (ALINORM 83/12A, paras 44-53). The various texts in the Procedural Manual of CAC related to the above subject have been collated and distributed by CL 1984/12- FA to Chairmen of Codex Commodity Committees, Codex Contact Points and other interested bodies.

26. The Committee noted that the CCFA had discussed a re-draft of the Principle Relating to the Carry-Over of Food Additives into Foods which combined the various texts adopted by the Commission into a single consolidated statement. It was noted that no substantive change had been made, but that the redraft should be sent to governments for comments at Step 3 (ALINORM 85/12, paras 153-157). Further discussion was deferred to item 13 of the agenda.

Codex Committee on Food Hygiene, 19th and 20th Session (ALINORM 85/13 and 85/13A)

Revision of Codes of Hygienic Practice to take into account the Hazard Analysis Critical Control Point System

27. The Committee was informed that the above topic had been briefly discussed by the Codex Committee on Food Hygiene (CCFH) at its 19th Session (ALINORM 83/13, paras 30-33) and in greater detail by the Executive Committee at its 31st Session (ALINORM 85/3, paras 75-80).

28. The Executive Committee had noted that CCFH had already begun the elaboration of Codes of Hygienic Practice along HACCP lines, and that the CCPMPP

had used the same principles when revising the Code of Hygienic Practice for Processed Meat and Poultry Products. It had agreed that there was a need to review and possibly revise many Codex Codes, especially those which had been published some time ago, with HACCP principles in mind. However, it foresaw a heavy workload and requested CCFH to examine the problem and report to the Commission how the work might be accomplished.

29. During discussions at the 20th Session of the CCFH, delegates made the following points:

- HACCP was a two stage process, the first covering hazard analysis and the second identification for critical control points. The overall system would vary with the products involved and even between factories making the same end product.
- Revision of existing Codes of Practice would be an enormous undertaking and might not be feasible in view of the expertise required.
- In view of the general application of many Codes, the most that could be achieved would be a general classification of critical control points without a detailed hazard analysis.
- HACCP could not be applied to the General Principles of Food Hygiene.

30. The CCFH agreed that the discussion should be brought to the attention of Commodity Committees for their advice on what Codes of Practice could be revised along HACCP principles.

31. It was pointed out that the report of a WHO/ICMSF meeting on HACCP in Food Hygiene (VPH 02/37) was available to Commodity Committees and that ICMSF was preparing a hand-book on the principles and identification of HACCP.

Elaboration of a Code of Hygienic Practice for Production, Handling and Treatment of Spices

32. As a result of discussion at its last session (ALINORM B3/16, paras 217-224), the Codex Committee on Processed Meat and Poultry Products had decided that there was a real need for spices of good bacteriological quality for use in processed meat and poultry products moving in international trade and also for products other than meat products and had sought the advice of the Commission (ALINORM 03/43, para 392) regarding the desirability of elaborating a Code of Hygienic Practice for Production, Handling and Treatment of Spices with a view to international harmonization.

33. The Commission had recognized the need for such a Code and had asked the CCFH to consider undertaking such a task.

34. The CCFH had discussed the request of the Commission at its 19th Session (ALINORM 85/13, paras 34-41) and as a result had agreed that a background document on the manufacture and treatment of spices should be prepared for its next session following which the Committee could decide how best to proceed with the elaboration of a Code or Codes of Practice to ensure good manufacturing practices and adequate treatment of spices. At its 20th Session the CCFH had available such a document prepared and presented by the delegation of the Netherlands (ALINORM 85/13A, paras 122-138).

35. The CCFH noted the comments of delegations that there had been problems with spices not only in international trade in Processed Meat Products but also in the home. It

was pointed out that there was a need for spices with a low microbiological load for the food industry in general and that the matter was one of some urgency since the use of ethylene oxide was not permitted in some countries and that a final position on the use of irradiation had not been taken.

36. The chairman of the CCFH had expressed the opinion that besides microbiological contamination the elimination of filth was an important health and commercial requirement.

37. After further discussion during which the opinion was expressed that many aspects dealing with the handling of spices were covered by the Code of General Principles of Food Hygiene, the Committee decided that in view of microbiological contamination affecting both health and commercial quality a Code of Hygienic Practice for Spices should be developed.

38. It was further decided that all spices should be covered independently of whether they were ingredients or sold as such. The Code should also cover production and processing and should recognize the HACCP system.

39. The Committee agreed that in view of the complexity of the matter, the Secretariat should be requested to engage a consultant to prepare a detailed background paper and the outline of a first Draft of a Code of Hygienic Practice covering the production, processing and microbiological criteria for spices and herbs and to include guidelines for treatment if possible with maximum levels, for example for ethylene oxide.

40. The Committee expressed its satisfaction at the decision of the CCFH.

41. The delegation of Denmark drew attention to the discussion at the last session of the Committee and requested that in the preparation of the background document and the Draft Code of Hygienic Practice, the consultant should be informed of the urgent need for a Code of Practice that could contribute to international harmonization of ways of sterilizing spices with special attention to the international trade of meat products containing spices and take account of different national legislation with regard to the sterilization treatment of spices and make proposals which would lead to internationally harmonized methods for sterilizing the final spice product.

Codex Committee on Methods of Analysis and Sampling, 13th Session (ALINORM 83/23)

42. The Codex Committee on Methods of Analysis and Sampling (CCMAS) discussed the question of obligation falling on governments in accepting Codex standards containing methods of analysis (ALINORM 83/23, paras 26-29). The Committee agreed to discuss the subject under agenda item 11.

Codex Committee on Vegetable Proteins, 3rd Session (ALINORM 85/30)

43. The Committee noted that the Codex Committee on Vegetable Proteins had discussed a progress report on quantitative methods for differentiation of vegetable and animal proteins and it was noted that although there was a good deal of work in progress with regard to several methods, at the present time, however, no single analytical method was adequate for product control purposes (ALINORM 85/30, paras 21-30).

Joint FAO/WHO Committee of Government Experts on the Code of Principles concerning Milk and Milk products, 20th Session"(CX 5/70)

44. The Committee was informed that the Joint FAO/WHO Committee of Government Experts on the Code of Principles concerning Milk and Milk products indicated its willingness to give information on the use of milk proteins to all Commodity Committees who wished to include milk proteins of any kind in their products and if necessary to elaborate general guidelines for this purpose (CX 5/70, paras 94-105). The Commission at its 15th Session agreed to invite the views of the Commodity Committees on the need to elaborate such guidelines, which could be considered at the next session of the Commission (ALINORM 83/43, para 504). The Committee agreed to consider the feasibility for the use of milk proteins in meat products under agenda item 10.

Activities of WHO of interest to the Committee

45. The WHO Secretariat reported that the following items were of general interest to the Committee. The Veterinary Public Health Programme was involved in the coordination of international activities related to prevention and control of foodborne diseases caused by microorganisms many of which are of a zoonotic nature. The organization had convened at the beginning of 1984 a consultation on Veterinary Public Health Aspects of Prevention and Control of Campylobacter infections. The consultation reviewed the problem of campylobacteriosis in different countries and new data on the ecology of C. jejuni, considered the role of animals and foods of animal origin in the epidemiology of this disease, selected the most suitable methods for the isolation of this organism from animals, foods and the environment, and considered the most important and practical veterinary public health measures for the prevention and control of this foodborne disease in humans. The report of this consultation (VPH/CDD/FOS/84.1) is still available on request.

46. WHO Guidelines on Small Slaughterhouses and Meat Hygiene for Developing Countries (VPH/83.56) have been finalized and issued in Geneva. They contain valuable information on the hygienic slaughtering of animals and are well illustrated (15 figures, 12 photographs and 8 detailed plans of the construction of small slaughterhouses).

47. Two WHO guidelines on "Disinfection in Animal Husbandry for Prevention and Control of Zoonotic Diseases" and "Safe and Hygienic Disposal of Dead Animals" are being elaborated. They are destined for public health and veterinary authorities and contain guiding principles for control and adaptation to local conditions and circumstances.

48. The organization finalized and published during 1982-84, WHO Guidelines on Prevention and Control of Salmonellosis, Manual on Food Virology, Summary of Microbiological Specifications for Foods, Guidelines on Organization and Management of Surveillance Foodborne Diseases and a Report of the Joint FAO/WHO Expert Committee on Food Safety.

CONSIDERATION OF ACCEPTANCES OF RECOMMENDED CODEX STANDARDS FOR PROCESSED MEAT AND POULTRY PRODUCTS (Agenda Item 5)

49. The Committee had for its consideration document CX/PMPP 84/3 on Consideration of Acceptances of Recommended Codex Standards for Processed Meat and Poultry Products.

50. The Committee noted that the 15th Session of the Commission had again placed emphasis on obtaining more acceptances. The Commission acknowledged that some

countries faced particular legal difficulties in accepting standards and maximum limits for pesticide residues but encouraged such countries to try to overcome these difficulties in the interest of facilitating international trade. The Commission had in particular considered that those countries which had participated in the development of Codex standards should, in the first place, give a lead to others to encourage a wider degree of acceptance of the standards.

51. The Commission welcomed the steps being taken in the EEC with regard to Codex standards. The Commission thought that the EEC should try to give formal acceptance to as many standards as possible, but recognized that where this was not possible a declaration of free entry would be very useful in the interest of international trade. The Commission endorsed the view of the Executive Committee as regards the importance it attached to formal acceptance.

52. The Commission requested the Secretariat to continue its drive on acceptances. It also urged the Secretariat to continue its discussion with the EEC, and initiate discussions with CMEA and other economic groupings, if appropriate. The Commission expressed the hope that by the next session of the Commission more countries would have accepted many more of the Codex standards and maximum limits for pesticide residues (ALINORM 83/43, paras 47-49).

53. The Committee noted that an up-dated Summary of Acceptances of Codex Standards (as at 1st February 1983) (ref. No. CAC/Acceptances Part I - Rev 2) had been prepared. The English version of the summary had been distributed to all Codex contact points and the French and Spanish versions would follow as soon as possible.

54. The Committee noted that the standards:

- i) Canned Corned Beef (CODEX STAN 88-1981)
- ii) Luncheon Meat (CODEX STAN 89-1981)
- iii) Cooked Cured Ham (CODEX STAN 96-1981)
- iv) Cooked Cured Pork Shoulder (CODEX STAN 97-1981)
- v) Cooked Cured Chopped Meat (CODEX STAN 98-1981)

that it had so far elaborated had been published in Volume IV of the Codex Alimentarius and distributed to governments with a renewed request to examine them with a view to acceptance.

55. The Committee was informed of the following notifications from governments which had been received since holding the last session of the Committee. Canada had notified full acceptance of the standard for Canned Corned Beef and acceptance with specified deviations in respect of the standards for Cooked Cured Ham, Cooked Cured Pork Shoulder and Cooked Cured Chopped Meat. In the case of the standard for Luncheon Meat, Canada had not given acceptance, nor had it given any undertaking concerning distribution of this product. Cyprus had given target acceptance to the standards for Cooked Cured Ham, Cooked Cured Pork Shoulder and Cooked Cured Chopped Meat.

56. The delegation of Argentina informed the Committee that it had notified full acceptance of the standards for Canned Corned Beef, Luncheon Meat and Cooked Cured Pork Shoulders.

57. The delegations of Australia, Switzerland and Brazil informed the Committee of the difficulties they are facing to give acceptance to Codex standards. Australia is

cognizant of the emphasis placed on participation in the work of international standardization bodies and the domestic adoption of these standards wherever possible under the GATT Agreement on Technical Barriers to Trade. However, only one of the Australian States and Territories, which have paramount powers in domestic food legislation, has so far adopted the Federal Model Food Act developed to ensure national uniformity of food legislation and regulation. Switzerland has revised its legislation and is facing problems in reconsidering standards with a view to acceptance. In Brazil, the Ministries of Health, Industry and Commerce are all involved in Codex which makes the acceptances of Codex standards somewhat problematic.

58. The Committee learnt of a review exercise that the Codex Regional Coordinating Committee for Europe would shortly undertake to compare the content and layout of certain Codex standards with corresponding national standards and reasons for non-acceptances of Codex standards. The Codex Secretariat will select 3 standards for a pilot study. One of the standards included for review will be Cooked Cured Ham and the Committee looked forward to the results of the review which it thought would be very interesting.

CONSIDERATION AT STEP 7 OF DRAFT CODE OF HYGIENIC PRACTICE FOR PROCESSED MEAT AND POULTRY PRODUCTS (Agenda Item 6).

59. The Committee had before it ALINORM 83/16, Appendix IV containing the Draft Code of Hygienic Practice for Processed Meat and Poultry Products at Step 5 and document CX/PMPP 84/8 containing the Government Comments on the Code at Step 6. The Committee had also available to it, (i) General Principles of Food Hygiene and (ii) the Code of Practice for Low-Acid and Acidified Low-Acid Canned Foods.

60. The Committee decided to deal with comments which may raise questions of substantial nature at the plenary and leave the remainder to an ad hoc working group.

Section II - Definitions

61. 2.10 (now 2.11) The Committee agreed to delete the reference to impermeability to gas, in order to bring the definition into line with the definition of hermetically sealed containers in the Code of Practice for Low-Acid and Acidified Low-Acid Canned Foods.

62. 2.15, 2.16 and 2.20 (now 2.16, 2.17 and 2.20) The delegation of USA informed the Committee that in its opinion the definition of meat as contained in the above clauses was too wide. The term "Meat" should be limited to skeletal muscle, with accompanying bone, fat and blood vessels. The edible organs such as liver, spleen and kidneys were meat by-products and should be excluded from the definition of meat. The Codex standards for Luncheon Meat and Cooked Cured Chopped Meat define "edible offal" as well as "meat". There would be less confusion if the definition was used to identify edible organs. The delegations of Argentina and Brazil also expressed the same views as USA.

63. The Committee recalled the many debates in CCPMPP and the Codex Committee on Fresh Meat on the definition of meat and agreed that the broad definition of meat as contained in the Code, which was also in the Code of Hygienic Practice for Meat and in many national regulations should not be changed, since it was the most appropriate definition for hygiene purpose. The Committee also agreed that different definitions for meat may be required to meet the requirements for the product standards. Argentina and USA expressed reservation to the decision of the Committee. (See para 253, a broad definition for meat is envisaged when revision is undertaken).

64. 2.17, 2.18 and 2.24 (now 2.18) Some delegations expressed the opinion that definitions as contained in 2.17 and 2.24 for "Packaging" and "Wrapping" were superfluous. The Committee noted that the definition of packaging and wrapping were neither in the General Principle of Food Hygiene nor in the Code of Hygienic Practice for Fresh Meat and the original version for Processed Meat and Poultry Products. The delegation of New Zealand observed that the need for separate definitions for packaging and wrapping comes from 3rd country EEC directives.

65. The Committee decided not to include the definitions for packaging and wrapping in the Code since the matter could be dealt with by appropriate modifications of the main text.

Section III - Establishment: Registration, Design and Facilities

66. 3.4.6 (now 6.2.1) The Committee agreed that the second sentence of the provision needed amendment, the intention of the text being to prevent cross contamination. The view was expressed that the place for the provision was in Section VI - Establishment: Hygiene Processing Requirements. The observer of CLITRAVI proposed to change the wording "inedible material" to "material unfit for human consumption" and this was agreed to by the Committee.

67. The delegations of USA and some others expressed the view that the intention of 3.4.6 was adequately covered by 3.4.5 and could be deleted.

68. A number of delegations including the EEC and Brazil expressed the opinion that there was a need to specify that the separation of "unfit food" and "non-food" materials from "food" should be by means of a wall.

69. The Committee expressed the opinion that the content of 3.4.6 was important, should not be deleted but might be covered by a CCP-note. The working group was directed to consider the suggestion.

70. 3.5.7 The Committee noted that studies conducted by USA indicated that an intensity of illumination of 540 lux might not be adequate at inspection point. The Committee was, however, informed by the delegation of USA that the studies were still in progress and data were not presently available.

Section V - Personnel Hygiene and Health Requirements

71. 5.2.1 The Committee agreed to leave the text on "Medical Examination" as such and not to make any changes. The observer from EEC expressed a provisional reservation since the topic is under study within the EEC.

Section VI - Establishment: Hygienic Processing Requirements

72. 6.1.5 The Committee agreed with the comments of France that the responsibilities of the inspector and manager should be better defined. The matter was referred to the working group.

73. 6.3.3 EEC was of the opinion that to avoid any abuse in the utilization of recirculated water, it should be clearly stipulated which water may be recirculated and for which purpose and which treatment recirculated water must undergo to avoid any public health hazard. The Danish Secretariat suggested that a CCP-note may be included to meet the comments of EEC. The Committee, however, referred the matter to the working group.

74. 6.5.1 The provision which is in square brackets was referred to the working group. The Committee expressed the view that provision 6.5.1 and Annex B (e) should be harmonized.

Section VII - End Product Criteria

75. 7.1.1 and 7.1.2 (now 7.2 and 7.3) The delegation of Poland suggested that the wording "in a concentration believed to constitute a public health hazard" should be deleted from the provision and tolerance limits provided. The delegation of Ireland was of the opinion that the products should also be free from hormones and suggested that the wording "toxic substances" be replaced by "substances of a pharmaceutical nature". The Committee noted that a definition of "toxic substances" was included in the General Principles of Food Hygiene and agreed to retain the original text. The Committee, however, referred the matter to the working group.

76. In accordance with the decision taken by the Committee an ad hoc working group met to review the revised version of the Code in the light of comments received (CX/PMPP 84/8) and prepare a report for the Committee.

77. The ad hoc Working Group included:

- K. Gerigk (FRG) - Chairman
- P. Russell (Australia)
- D. Brown (UK)
- W. Droppers (Netherlands)
- J. Race (Norway)
- N. Kingcott (UK)
- I. McLauchlan (Botswana)
- K. Haaning (DK)
- A. Koulikovskii (WHO) - secretary
- B. Simonsen (ICMSF) - secretary

78. The Committee considered the report of the working group introduced by its chairman K. Gerigk. Based on the recommendations of the working group, the Committee agreed to the following decisions:

Explanatory Preface

79. The Committee noted that in every code, it was customary to include references to other codes and agreed to include references to the following codes as suggested by New Zealand:

- Recommended International Code of Hygienic Practice for Fresh Meat (CAC/RCP 11-1976)
- Recommended International Code of Practice for Ante-Mortem and Post-mortem Inspection of Slaughter Animals (CAC/RCP 12-1976)
- Recommended International Code of Hygienic Practice for Game (CAC/RCP 29-1983)
- Recommended International Code of Practice. General Principles of Food Hygiene (CAC/Vol. A - Ed. 1)
- Recommended International Code of Practice for Low-Acid and Acidified Low-Acid Canned Foods (CAC/RCP 23-1979)

- Recommended International Code of Hygienic Practice for Poultry Processing (CAC/RCP 14- 1976)

80. Preface, C. CLITRAVI pointed out that it was undesirable to single out one of many possible new developments and suggested deletion of the specific reference to rapid methods for production of fermented sausages. On the advice of the working group the reference of sausages was, however, retained since it was considered that it was only an example.

81. Preface, F. The delegate of New Zealand commented that this paragraph was superfluous as the definition of "Meat Product" included "Poultry and Game Meat". The Committee, however, retained it, as the text contained in Preface, F made clear the full scope of the Code.

Section II : Definitions

82. 2.13 (now 2.14) The present definition in the text of "Lot" was replaced by the definition of lot approved by the 20th Session of CCFH. Footnotes to the definition of "Lot" were deleted and it was also agreed to delete the definition of lot in Annex C.

83. 2.17 and 2.24 (now deleted) The working group suggested new wording for definitions of "Packaging" and "Wrapping"; in its view they were considered necessary since references to packaging and wrapping occurred in the text. The Committee, however, considered definitions 2.17 and 2.24 as superfluous and suggested appropriate rewording of the text in 6.5.1. Paragraphs 2.17 and 2.24 were deleted. EEC requested for the inclusion of the two definitions and agreed to reconsider its position.

84. 2.21 The wording "cuts or joints" was deleted. Change was editorial.

85. 2.22 "and/or meat products" was inserted after meat. The change was editorial.

Section III - Establishment: Registration, Design and Facilities

86. 3.4.2 The Committee agreed that the construction of buildings and facilities should be such that no undesirable substances should come in contact with meat. The following wording, "All construction material should be such that it does not transmit any undesirable substances to the meat or meat products" was added to 3.4.2. The addition brought the provision in line with the text present in General Principles of Food Hygiene.

87. 3.4.6 (now 6.2.1) The purpose of this provision was to take adequate measures for prevention of cross contamination. The Committee noted that in the opinion of the working group this was adequately covered by the modification proposed for paragraph 6.2.1. It took the following action: The first sentence of 3.4.6 was added to 6.2.1 at the end of the paragraph. The second sentence was deleted. The third sentence of 3.4.6. with the change to read "If the departments are used at other times for processing....." was added to 6.2.1 at the end. (See paragraphs 66-69 for earlier discussion by the Committee). The delegation of the EEC made a reservation on the deletion of 3.4.6.

88. 3.4.9 (now 3.4.8) The Committee agreed to adopt changes to the text to bring the detail into line with the Code of General Principles of Food Hygiene.

Introduction to read: "In rooms where work on meat and meat products is undertaken:"

Floors. The wording "non-toxic" was deleted; "including grates" was added at the end of the last sentence.

Walls. The last sentence in the paragraph on the requirements for walls was changed to read: "Where appropriate, angles between walls and floors should be sealed and coved, and angles between walls and walls, and ceilings and walls should be sealed to facilitate cleaning." The words "and non-toxic" in the second line were deleted.

Windows. The word "screens" was substituted by "insect-proof screens".

89. The observer from EEC informed the Committee that the appropriate height of washable coating should be at least 2 meters according to EEC regulations.

90. 3.4.10 (now 3.4.9) The Committee was informed about the changes proposed by EEC for this text, but since in its view the proposed changes were covered in 3.6.1 took no action and retained the text unchanged.

91. 3.5.1.1 The title of the WHO publication referred to was changed to read as "International Guidelines for Drinking Water Quality". In the 4th line of the CCP-note the wording "more frequent" was substituted by "usually". Change was editorial.

92. 3.5.1.2 The working group proposed to change the mandatory temperature requirements to advisory ones. The text was amended accordingly to read "For cleaning purposes a temperature of 65 C for water is suitable".

93. The following sentence was changed to read: "For disinfection purposes, hot water at e.g. 80°C for no less than 2 minutes could be used and dispensed in such a way that blades of knives etc. can be submerged in the water for an adequate contact time (no less than two minutes)."

94. The observer from EEC informed the Committee that for EEC purposes, a temperature of 82°C for disinfection is required.

95. 3.5.1.5 A comma was inserted after steam production. The Committee did not agree with the proposal of USA on cross-connections.

96. 3.5.4 The Committee agreed with the proposal of New Zealand to use the wording as in the Code of Hygienic Practice for Game (AL1NORM 83/32, Appendix IV) for paper towels. Accordingly the sentence starting in line 8 would read: "Where paper towels are used, a sufficient number of dispensers with paper towels, and of receptacles for used towels should be provided adjacent to each washing facility".

97. For "Hand washing facilities" the Committee noted that the present text was the same as that in General Principles of Food Hygiene and did not agree to the proposals of EEC and New Zealand to change the text except to change the word "desirable" to "preferable". The Committee did not think that the requirement should be considered mandatory.

98. EEC maintained its reservation. According to its Directive hand towels should be used only once.

99. 3.6.1 The paragraph was substituted by the text from 4.5.1 in General Principles of Food Hygiene except that the word "food" was changed to read "exposed meat and meat products".

100. EEC expressed a reservation, since the provision did not forbid use of wood in areas where work on fresh meat and meat products is undertaken.

Section IV - Establishment: Hygiene Requirements

101. 4.2.3 The Committee retained the text in 4.2.3 unchanged.

102. 4.2.4 The Committee noted that the temperature conditions of 10°C cited was an example. The Committee agreed that the time intervals for cleaning could be extended to 5 hours and changed the text in the 6th line of the CCP-note to ".....be cleaned at intervals of 4-5 hours,.....".

103. 4.2.5 and 4.2.7 Proposals to change "frequent intervals" to "as and when" were made. The Committee, however, expressed the view that since the Code being elaborated was a world wide Code, the wording "frequent intervals" appeared more appropriate since most of the factories do not have equipment for automatic washing and agreed not to make any change in the text.

104. There was some discussion on the terms cleaning, disinfection and sanitization. The word sanitization in English covers both cleaning and disinfection but, however, has no equivalent in other languages. Definition of cleaning does not include disinfection, which according to the Code on General Principles of Food Hygiene should be resorted to only when needed.

101. 4.4 The word "pest" should read "pests".

102. 4.5 The Committee agreed that the text should read: "Animals that are uncontrolled or that could be a hazard to health should be excluded from establishments". This is in line with the text in the Code on General Principles of Food Hygiene. The observer from the EEC made a reservation on this change.

Section V - Personnel Hygiene and Health Requirements

107. 5.4 The following changes were made to bring the provision in line with the Code on General Principles of Food Hygiene. First sentence should read: "Any person who has a cut or a wound should discontinue". The last word in the last sentence of the CCP-note, "inspector", should be substituted by "management".

108. 5.7 The Committee agreed with the comments from Canada that provision should be made for "storing". The 2nd line was changed to "..... used for the preparation, handling, packaging, storing or transportation....."

109. 5.8 The Committee agreed with the comments from USA that the last sentence in CCP-note should be expanded to suggest a visual inspection of metal gloves for open or missing links. The following wording should be added to the last sentence: "and also whenever they become contaminated. Metal gloves with worn or missing links should be promptly repaired or replaced."

Section VI - Establishment: Hygienic Processing Requirements

110. There was a debate on the relative responsibilities of inspectors and managers in respect of condemnation of spoiled meat. Many delegations were of the view that the inspector should always take the responsibility for condemnation.

111. The Committee, however, noted that the relevant text formed a CCP-note, and the contents of the note provided examples of working practices.

112. 6.1.5 On the advice of the working group, the Committee agreed to change the CCP-note to read: "Although passed for human consumption by an inspector the meat may have undergone such changes, e.g. during transportation, that in the establishment producing meat products it is found no longer fit for human consumption. Such meat may be used for other purposes than human consumption or be destroyed. In cases where only superficial contamination has taken place, trimming of the contaminated part may suffice. The decision whether or not the meat is still fit for human consumption may

be guided by microbiological, chemical or physical analysis relative to the changes observed or suspected".

113. 6.3.3 The Committee agreed to use the new text for this provision as agreed to by the 20th Session of the Codex Committee on Food Hygiene.

114. 6.4.2 CCP-note: The last but one line was changed to read: "..... potential or the microbiology of".

115. 6.5.1 The Committee noted that storage of the containers should not take place in the processing area and made the following changes in the provision: The square brackets were removed. The wording after stored, in the last sentence was deleted. The word "unwrapped" was changed to "exposed".

116. 6.5.3 The Committee agreed that no assembly of packaging should be carried out in the rooms where meat was exposed unless it was done in a hygienic and automated way. The following CCP-note suggested by the Danish Secretariat was added: "Packaging material such as paperboard for cartons should not be assembled in rooms where exposed meat or meat products are prepared, processed, handled, packaged or stored, unless it is part of a hygienically performed automated operation".

117. 6.5.7 The Committee did not make any changes since the text is in line with the text in the Code on General Principles of Food Hygiene.

118. 6.6.2.3 The Committee agreed with the comments of USA that warm products should be chilled before packaging into large containers to prevent deterioration of the product because of the trapped heat and prolonged chilling time. The following changes were made:

119. First sentence should read: "Meat and meat products as well as containers holding meat products should not" The CCP-note should read: "Warm products should be chilled before packaging into large containers to prevent deterioration of the central portion of the product. Rapid cooling of all parts or all packages of meat products and maintaining non-shelf-stable meat products at chill temperature are essential". The last sentence was retained.

120. 6.7.1.2 The Committee agreed that the same provisions as for storage contained under 6.6.2.5 were required. The following sentence was added: "Where transportation is under refrigeration it is desirable to install temperature recorders. If no automatic device is installed, temperature should be read at regular intervals and the readings recorded in a log book".

121. 6.8.1 The Committee agreed with the delegate of USA that wherever "meat" or "meat products" occurred in the text that the term "meat" should embrace the types of meat covered by the Code. It was pointed out that section F of the preface covered this problem, however, the Committee expressed the view that a suitable footnote should-be inserted in the definition section.

122. 6.8.2 The first sentence was changed to read: "Laboratory facilities should be available for monitoring hygiene". The change was editorial.

Section VII - End Product Criteria

123. 7.1 The Committee agreed to delete the last sentence.

124. The Committee agreed to make the following changes which it considered were editorial:

7.1.1 was changed to 7.2 and should read: "To the extent possible in good manufacturing practice, the products shall be free from objectionable matter."

7.1.2 was substituted by 7.3 which should read: "When tested by appropriate methods of sampling and examination, the products:

- (a) shall be free of pathogenic microorganisms in numbers representing a hazard to health;
- (b) shall not contain any substances originating from microorganisms in amounts which may represent a hazard to health; and
- (c) shall not contain any other poisonous or deterious substances in amounts which may represent a hazard to health."

The delegate of Italy reserved his position on 7.1.2 in line with the written comment.

7.1.3 This was renumbered as 7.4. Text was not changed.

Annexes

125. Annex A (d) The Committee agreed that the limits (2-5 ppm) for residual chlorine for potable water proposed by CLITRAVI should be accepted since they are in accordance with the WHO guidelines for drinking water quality. The Secretariat was asked to take action to change the figures of residual chlorine present in the text (line 5) accordingly.

126. Annex B. Title. The title was changed to "Preservation of non-shelf-stable meat products heat treated prior to packaging". The change was considered editorial.

127. Annex B (a) The Committee agreed with the written comments of Chile that the place at which the temperature should be measured needed clarification. The last sentence was amended to "... not more than 7°C at the point of slowest refrigeration.....".

128. Annex B (d) The last sentence was amended to "..... and may be recirculated if treated and returned to potable quality."

129. Annex B (e) The first sentence was retained. The rest of the paragraph was turned into a CCP- note. The word "primary" was deleted from the second sentence.

Status of the Code

130. The Committee advanced the Code to Step 8 of the Codex procedure.

131. During review of relevant matters (Agenda Item 4), the Committee was informed that the Codex Committee on Food Hygiene at its last meeting had requested that this Code of Hygienic Practice be presented to that Committee for its endorsement. That would mean that the Code could not be presented at Step 8 to the Commission at its 16th Session (July 1985) and would consequently delay the Code for two full years.

132. The Committee noted that previously the Code of Hygienic Practice for Fresh Meat and the Code of Hygienic Practice for Game had not been considered by the Codex Committee on Food Hygiene before adoption by the Commission.

133. The Committee expressed the view that the revised Code was urgently required by member countries and agreed to recommend the Code to the Commission at its 16th Session for adoption.

134. The Committee expressed its thanks to the ad hoc working group and its Secretariat for its excellent work which had enabled the Committee to advance the Code with minimum delay.

RECONSIDERATION AT STEP 7 OF ANNEX C - SAMPLING AND INSPECTION PROCEDURES FOR MICROBIOLOGICAL EXAMINATION OF MEAT PRODUCTS IN HERMETICALLY SEALED CONTAINERS (Agenda Item 7).

135. The Committee had before it the above Annex attached to ALINORM 83/16 as Appendix III and document CX/PMPP 84/10 containing written comments from the governments of Chile, Denmark, France, Netherlands, New Zealand, Poland, Thailand, UK and USA. This document also contained the recommendations to the Committee from the 19th Session of the CCFH.

136. The Committee was reminded that at its 14th Session the Codex Alimentarius Commission had considered Annex C at Step 8 of the procedure and because substantive comments had been made, it had been held at Step 7 of the procedure. Following revision at the last session of the Committee, the annex had been submitted for comments by the CCFH.

137. The Committee noted that the CCFH, in addition to commenting on Annex C at its 19th Session, had held an FAO/WHO Working Group on Microbiological Specifications and Examination of Canned Foods in conjunction with its 20th Session (1984). This working group had focussed its deliberations on the assessment of commercial stability in canned foods and had not considered sampling plans.

138. The Committee noted that as a result of amendments to the text in Annex C in previous sessions there were disparities between the title and scope sections which should be eliminated. It was agreed to discuss changes in the title and consequent changes in the scope after consideration of the preface.

139. The Committee noted the comment of the CCFH that use of a preface was unique in Codex Codes of Practice, but in the opinion of CCFH the material was important and should be relocated in appropriate places in the body of the Code. As an example CCFH suggested that the contents of paras 1 and 5 could be used to define the scope.

140. Several delegates pointed out that prefaces existed in other Codes of Practice and Codes of Hygienic Practice and that since the text contained important information it should be maintained as a separate section.

141. Other delegations thought that while the body of the text should be maintained as introductory information and advice some of the contents of para 5 could usefully be transferred to the scope section since Annex C contained a defect probability table for application to shelf-stable products rather than sampling and inspection procedures.

142. It was agreed that the main purpose of the Annex was to give guidance on the microbiological investigation of products in which temperature abuse was suspected, and the following changes were made:

Title

143. The title of Annex C was changed to "Procedures for Investigational Microbiological Examination of Meat Products in Hermetically Sealed Containers".

Preface

144. The heading "Preface" was changed to "Explanatory memorandum" and the last two sentences of sub-section 5 replaced by a text, proposed by the UK: "The main reason for suspicion for these products is temperature abuse after processing, during transportation and storage, and so a sampling plan involving a smaller number of samples will suffice. However, this plan should also be used when there is a reason to suspect improper processing."

Scope

145. Sub-section 1. It was agreed to delete "sampling and inspection" and to insert "microbiological" in line 1 before the word "investigational".

146. Sub-section 2. The entire section was deleted and replaced by the following three sub-sections:

"2. For shelf-stable products the number of samples to be taken and the method of examination are assessed by the inspection agency. The document contains probabilities of obtaining defective samples in a lot. Detection of botulism through microbiological testing is unlikely.

3. For non-shelf-stable heat-processed meat products a sampling plan involving microbiological examinations and guidelines is proposed.

4. All these procedures are intended to be used in cases where the controlling authority has reason to suspect that the lot is unsatisfactory and not for routine purposes."

Section III - Definitions (now deleted)

147. "Lot". The Committee noted that a new, more general definition had been accepted by the CCFH at its 19th Session and would be incorporated in a future edition of the General Principles of Food Hygiene. The present definition was therefore replaced by the following: "Lot" means a definite quantity of a commodity produced under essentially the same conditions.

148. "Reject". It was noted that the CCFH had considered the term "reject" too harsh and suggested that it be changed to "detain". The Committee agreed to make the change and consequential changes throughout the text of the annex. Note: It was later agreed to move these definitions to the main code.

Section IV (now Section III) - Procedure

Section A. Shelf-stable meat products, heat-treated after packaging

149. The delegation of the USA was of the opinion that the provisions for examination of shelf-stable products in the section were vague. A basis for selecting sample size was given but the examination to be conducted on the sample was not described. The delegation also thought that incubation tests should be carried out on each shipment.

150. The Committee noted that at its previous session it had been agreed that the usefulness of sampling plans and inspection procedures for shelf-stable canned meats were of limited value and for that reason had revised the section to include the probability table proposed by ICMSF.

151. It also noted the opinion of the CCFH Working Group on Microbiological Specifications and Examinations of Canned Foods (see also paragraph 137) that

although microbiological specifications may provide some additional control of the commercial sterility of thermally processed foods they should not be recommended for the routine examination of canned foods since they gave little assurance that commercial sterility had been achieved through a lot.

152. The Committee made no change to section A.

Section 8. Non-shelf-stable meat products, heat-treated after packaging

2. Technique

153. The Committee noted that in the opinion of the delegation of Poland, the test for anaerobes under (e) should provide a method for the detection of C. perfringens and under (g) should require a limit for this organism of absence in 1 g of product.

154. It was also noted that ISO was developing a method, "General Guidance for the enumeration of C. perfringens-colony count technique at 35-37°C" (ISO-DIS 7937).

155. The representative of ICMSF reminded the Committee that the CCFH had developed General Principles for the application of microbiological criteria to foods which required that internationally agreed microbiological methods required extensive collaborative testing before acceptance and that it would not be appropriate to include a method which was still under development.

156. Other delegations pointed out that the test was intended as an indication of contamination and that the aerobic count referred to in (d) was sufficient for this purpose. The Committee agreed with this point of view and deleted the requirement for examination of anaerobes.

157. The delegations of Poland and Italy expressed their reservations to the decision. The delegation of Argentina wished to reiterate that for shelf-stable meat products as well as for non-shelf-stable meat products heat-treated after packaging there should be a relation between the volume of the sample and the size of the lot and that it did not agree with the distinctions made in sections A and 5. The delegation made the following statement: "Taking into account that the criterion for shelf-stable meat products has been fixed, we maintain that at least the same percentage should be applied to non-shelf-stable meat products, which because of their particular characteristics imply higher risks for the consumers. Therefore, we cannot approve the technique proposed for these products in paragraph 2, sub-heading b."

Status of Annex C

158. The Committee agreed to advance Annex C to Step 8 of the Codex procedure (see also paragraph 130).

HEAT PROCESSING OF SHELF-STABLE CANNED CURED MEATS (Agenda Item 8).

159. The Committee had before it a background paper on the above subject (CX/PMPP 04/9) prepared by FAO Consultant Dr. A. Hauschild (Canada) and a proposal for an Annex D to the Code of Hygienic Practice for Processed Meat and Poultry Products, "Preservation of shelf-stable cured meat products in consumer-size hermetically sealed containers" (CX/PMPP 84/9A), which had been prepared by the Danish Secretariat.

160. In introducing his paper, the author pointed out that the safety and stability of shelf-stable canned cured meats (SSCCM) were governed primarily by the thermal process, brine concentration and nitrite input. The thermal process resulted in the partial destruction of clostridial spores in a range assessed on a logarithmic scale in which

there was no absolute point of safety. In general, the term "botulinum cook" is associated with a scale of destruction of 12 log 10 units. The surviving spores must then be fully inhibited from outgrowth for indefinite storage periods by the salt/nitrite combination; the effectiveness of this combination depended largely on the preceding heat process. The inhibitory action of the three factors has been shown to be synergistic. Therefore, each change of process involving salt, nitrite or the thermoprocess required careful adjustment of the other factors in order to retain an equivalent degree of safety and stability.

161. The author drew attention to a number of points of detail in his paper, which is attached as Appendix VI, and stressed that the range of treatments given in curing meat was wide. For example, the hygienic requirements for shelf-stable canned cured meats were similar to those for low-acid canned foods. Clostridial spores are controlled only in statistical terms and not in absolute terms thus the safety of the final product is a function of the quality of the raw material.

162. Published experimental data indicated that the protection of SSCCM from Clostridium botulinum was considerably below the 12D equivalent (expressed as decimal destruction plus inhibition), but these data were inadequate for proper safety evaluation. Consequently, extensive use was made of industrial experience. On the basis of production volumes of products specified with respect to their essential safety factors, safety units (SU), defined as log No. of cans marketed per cans causing illness from outgrowth of surviving spores, could be calculated. These ranged from >7 to >8. The highest SU values (>9.5) were calculated from export figures for luncheon meats from a major manufacturing country.

163. If contaminating spores were reliably monitored and held to minimum levels, combinations of brine concentrations, nitrite input and thermal processing may be recommended as broad minimal guidelines in the manufacture of safe shelf-stable luncheon meats, ham and sausage. These guidelines were set out as recommendations in the paper (Appendix VI) commencing at paragraph 8.1.

164. In the discussion that followed, delegations acknowledged Dr. Hauschild's work in this important and highly specialized field.

165. The delegation of Ireland pointed out that in the Cooked Cured Ham and Pork Shoulder Standards elaborated by the Committee levels of 500 ppm of ascorbic acid were recommended and asked whether in view of the role of nitrite in heat processing, these should be modified. Dr. Hauschild replied that although levels of ascorbic acid over 200 to 250 ppm will normally counteract the effect of nitrite in canned pasteurized products detailed information was not available for SSCCM.

166. He also pointed out that the brine/heat treatment figure given in recommendation 8.2 did not apply to "three quarter" products and reminded the Committee that the proposed combinations were subject to rigidly controlled levels of bacterial spores in the products.

167. The delegation of the UK noted that the safety data in table 10 covered a period of 30 years but the number of countries was not stated and the reliability of the epidemiological data was not known. It was also mentioned that the effect of pH did not appear to have been considered. The Committee noted that it was not the general practice in the industry to measure pH. Investigations had shown that the normal pH range of SSCCM was from 6.1-6.4 and that this variation did not have a significant effect on processing.

168. Some delegations expressed concern that the recommendations were based on practices in establishments with stringent hygiene standards and, if used improperly, they might create health problems with foods prepared under less stringent controls.

169. Opinions were expressed that there was a danger that the figures, especially those for spore load in raw meat ingredients, might be misused and the conditions for treatment misapplied. The Committee noted that the recommendation stated clearly that only if the microbial load of the raw meat ingredients was less than 3 clostridial spores/g or less than 100 mesophilic bacillary spores/g the proposed treatment contributions could be applied.

Proposal for Annex D to the Code of Hygienic Practice

170. The Committee noted that the above proposal had been prepared as an advisory code on the preservation of shelf-stable canned cured meat products in consumer-size hermetically sealed containers and was largely drawn from the recommendations made in the consultation paper.

171. Some delegations referred to the concern already expressed in paragraph 169. They were of the opinion that the document drew attention to some important issues but that by inserting figures as recommendations there was a danger that they could be misapplied. It was also pointed out that an FAO/WHO working group had *examined* the microbiology of raw meat and had considered that microbiological specifications were not feasible. There was a suggestion that if work on the Annex were to continue a preface should be added to emphasize the precautions necessary when applying the processing factors.

172. In further discussions the Committee noted that information in this field was extremely difficult to obtain but that the consultant's paper documented the safety record of industry and on the basis of the parameters indicated, performance achieved had been good over an extended period of time.

173. The Committee agreed that the Annex might be more appropriately put into the HACCP format and that the processing combinations listed were minimum factors and where possible should be exceeded.

174. The Committee also agreed to amend the text of recommendation "d" (now "b") to allow for more severe heat-treatments and to delete "substantially" from recommendation "i" (now "e").

175. In order to give emphasis to the conditional nature of the requirements for ingredient quality and the need to provide for continuous scales of brine concentration, the Committee agreed to revise the document by reordering the paragraphs.

176. The Committee was requested to consider whether provisions for monitoring water activity (a_w) should be introduced. However, it was agreed that for the products concerned a_w was a function of brine concentration and that this was more readily monitored.

Status of Annex D

177. Subject to the reordering of the paragraphs and the introduction of further information *on* process conditions the Committee agreed to consider the document as at Step 3. The proposed Annex D is attached as Appendix III.

CONSIDERATION AT STEP 4 OF PROPOSED DRAFT GUIDELINES FOR THE USE OF VEGETABLE PROTEIN PRODUCTS IN PROCESSED MEAT AND POULTRY PRODUCTS (Agenda Item 9).

178. The Committee had before it the above guidelines as contained in ALINORM 83/16, Appendix V, comments from the governments and observers of Chile, Denmark, Federal Republic of Germany, France, Netherlands, New Zealand, Poland, Thailand, USA, CLITRAVI and EUVEPRO in documents CX/PMPP 84/11 and CX/PMPP 84/11A together with a reprint of the Proposed Draft General Guidelines for the Utilization of Vegetable Protein Products (VPP) in Foods (ALINORM 85/30, Appendix II).

179. The Committee recalled that at its 15th Session the Commission had noted that the above guidelines were at a very preliminary stage of development and that the possibility of inclusion in the guidelines of non-meat proteins other than vegetable proteins was being considered.

180. The Commission had expressed the opinion that the Committee could benefit significantly if it followed the format of the General Guidelines for the Use of Vegetable Proteins Products presently being elaborated by the Codex Committee on Vegetable Proteins (CCVP). The guidelines should be consistent with such general guidelines with due regard to the specific requirements of individual products and the Commission had expressed the wish that the development of the guidelines should be in close cooperation with the CCVP.

181. The Committee noted that at its third session the CCVP had advanced the General Guidelines to Step 5 of the Codex procedure.

General

182. The delegation of Germany, supported by Switzerland and Italy, expressed its opposition to the elaboration of the guidelines. It was of the opinion that the use of vegetable protein products (VPP) in meat and poultry products as a meat or poultry substitute could not be allowed for reasons of consumer protection against deceit and maintenance of quality of a traditional group of foodstuffs. Products in which meat content had been considerably substituted by VPP could no longer be considered as meat products and marketed with traditional meat product names. These were particular kinds of foodstuffs which had to be clearly distinguished from genuine meat products by their nomenclature. In addition, the delegation of Federal Republic of Germany was of the opinion that the use of VPP for technological or functional purposes did not seem to be necessary since animal proteins, e.g. blood plasma, milk proteins and egg proteins, were available which had been in use for a long time.

183. The delegation of the Netherlands expressed similar views and thought that the use of ingredients should be dealt with in product standards and not in guidelines.

184. The delegation of Poland was of the opinion that VPP should not be used in semi-dry sausages and processed poultry products.

185. Other delegations were of the opinion that work on the guidelines should continue. These were advisory texts and while some countries had legislation on the use

of VPP in processed meat and poultry products, both technology and use was expanding and guidelines were required both to harmonize existing legislation and to advise countries in which national regulations on the use of VPP did not exist. While every effort must be taken to protect the consumer by proper labelling, the availability and use of new protein sources should not be hindered.

186. The Committee decided to continue work on the Guidelines for VPP in Processed Meat and Poultry Products. It noted that it would be considering the question of the use of other non-meat products at a later stage in the agenda and would discuss whether the guidelines should be expanded to include such products at that time. It also agreed to follow the format of the General Guidelines on VPP set out in CX/PMPP 84/11A.

Title and Scope

187. The Committee decided to reconsider the title and scope sections following discussions on the content of the guidelines and in the light of its later deliberations on non-meat proteins (see para 219).

Definitions

188. The Committee agreed to retain only the definition for Vegetable Protein Products and to use the text set out at 2.1 in the original draft (Appendix V, ALINORM 83/16).

Basic principles

189. There was a discussion whether to refer to section 4.1 of the Basic Principles of the General Guidelines which covered testing the safety and nutritional quality of VPP. It was decided that this was not necessary since the definition required that VPP should conform to applicable standards elaborated by the Codex Committee on Vegetable Proteins (CCVP). With regard to the labelling of VPP, the Committee noted that these provisions were also covered in the General Guidelines and under section 4.3 included declaration of vitamins and minerals. There was some discussion as to whether the section should be included in the present guidelines. It was pointed out that specific reference to vitamins and minerals was not appropriate to the Processed Meat and Poultry Products Guidelines since it would not include provisions for nutritional adequacy (see para 204).

Functional and Optional Purposes

190. The Committee agreed that the title should be "Uses of VPP for Functional and Optional Purposes" and adopted the text of 5.1. of General Guidelines suitably modified to refer to meat and poultry. It also agreed not to refer to numerical values for percentages of VPP since, as pointed out by the delegation of Australia, these would be difficult to apply in view of the different types of soy protein currently in use.

191. In discussing 5.2 of the General Guidelines, it was noted that the section referred specifically to Codex standards and there was a discussion on whether the section was intended for Codex standards only or also to national standards.

192. It was pointed out that in the scope of the General Guidelines the intention was to apply them in all standards in which protein derived from vegetable sources are used in foods and it was therefore decided to delete specific reference to Codex standards in section 5.2.

193. The Committee decided to adopt section 5.3 of the General Guidelines referring to declaration of VPP when used as a functional or optional ingredient.

Use of VPP to increase Content of Utilizable Protein

194. The Committee agreed that use of VPP for this purpose, which was covered in section 6 of the General Guidelines, had no relevance to its own Guidelines and made no reference to the section.

Uses of VPP in Partial or Complete Substitution of the Meat and Poultry in PMPP

195. The Committee agreed that the above title which was covered in section 7 of the General Guidelines needed amendment to cover the requirements of the present guidelines. The title was changed to read: "Uses of VPP in Partial Substitution of the Meat or Poultry" and the text of 7.1 was amended accordingly.

196. There was further discussion on the question of partial substitution of meat and poultry products with VPP. The delegations of the Netherlands was of the opinion that such substitution should only be allowed in comminuted or coarsely cut meat products.

197. That delegation and the delegations of UK and Poland, and the observer of CLITRAVI were of the opinion that partial substitution should not be allowed in standardized products with proscribed composition and quality. The delegation of the UK further pointed out that the General Guidelines were designed to cover all foods and could not be closely followed in the special case of meat products.

198. The Committee was reminded that at the 3rd Session of the CCVP there had been considerable discussion on the point of whether substitution could be allowed in standardized products in general and that the matter had been referred to the Executive Committee for a decision on whether, where a name had been established for a food in a Codex Standard, that name could be used as part of the name of a food where some of the protein content of the food had been replaced by vegetable proteins. The decision of the Executive Committee (AL1NORM 85/3 para 139) had been as follows: "After an exchange of views, the Executive Committee agreed with the thoughts expressed in para. 63 of the Report of the Sixth Session of the Codex Committee on General Principles, which, in substance, permitted the use of a name laid down in a Codex standard as part of the name of another similar product not covered by the standard, provided that (i) the name was appropriately qualified, (ii) the section entitled 'General Principles' in the General Standard for the Labelling of Prepackaged Foods was complied with, and (iii) the scope section of the standard was taken fully into account."

199. The Committee noted that this decision would be brought to the attention of the Codex Alimentarius Commission at its 16th Session and further discussed by the CCVP at its 4th Session. At present the General Guidelines developed by that Committee contained alternative texts in square brackets, one which was a general provision for partial substitution in all foods and the other, referred to the Executive Committee, which proposed to exclude the use of names established by Codex for foods where protein content had been replaced by VPP.

200. The delegation of the USA was of the opinion that for countries with legislation on the matter the use of VPP in foods could be left to national regulations. However, the Guidelines under preparation were also intended for countries where such regulations did not exist and some advice would be required. It was pointed out that for substituted products proper labelling, as laid down by the Executive Committee, would adequately protect the consumer.

201. The Observer of CLJTRAV1 expressed the opinion that there should be a distinction between standardized and non-standardized products both with regard to meat replacement and labelling requirements and proposed the following text:

"PROPOSED DRAFT GUIDELINES FOR THE USE OF VPP IN PROCESSED MEAT AND POULTRY PRODUCTS AND THE LABELLING OF PRODUCTS CONTAINING BOTH MEAT AND NON-MEAT PROTEIN"

The following guidelines are proposed:

(a) Standardized products (having a legal minimum meat content however defined).

No replacement would be allowed by VPP of the meat element required by a compositional standard. VPP may be used as functional or optional ingredients (i.e. without detracting from the legal minimum meat content) in these products. In that case the presence of VPP need only be declared in the list of ingredients.

(b) Non-standardized products (having no standard of composition relating to meat content).

The use of VPP shall be unrestricted subject to the product being labelled according to the following requirements:

1) compliance with the Codex General Standard on the Labelling of Prepackaged Foods,

2) the labelling shall be sufficiently precise to inform the purchaser of the true nature of the product and to enable the food to be distinguished from products with which it could be confused.

These guidelines shall apply unless national legislation requires otherwise."

202. In further discussions the Committee agreed that the text proposed by CLITRAVI covered essentially the same points as those under discussion in the CCVP and decided to include in its own Guidelines the alternative provision under 7.5 of the General Guidelines pending the outcome of further discussion at the 16th Session of the Commission and at the 4th Session of the CCVP. Both versions of 7.5 remained in square brackets.

203. It also agreed that further elucidation of the problem could be obtained by seeking the opinions of countries, who did not yet have national regulations on replacement of proteins in traditional foods, on how such foods would be named and labelled. The Secretariat was requested to seek such information through the Regional Coordinating Committees and to advise them of previous discussions on the matter.

204. With regard to provisions for nutritional adequacy, it was pointed out that there was inadequate information on the nutritional composition of existing meat products and, further, that it might vary considerably within the same type of product. The Committee, therefore, agreed not to make any reference to the provisions.

205. An amended text of the Guidelines is attached as Appendix IV (see also paragraph 219).

Status of the Guidelines

206. The Committee advanced the Proposed Draft Guidelines for the Use of Vegetable Protein Products in Processed Meat and Poultry Products to Step 5 of the Codex procedure.

207. The delegations of Norway, Switzerland and the UK expressed their reservation to the decision since the document had been considerably amended and contained important issues for further detailed discussion.

GUIDELINES FOR THE USE OF NON-MEAT PROTEIN PRODUCTS (OTHER THAN VEGETABLE PROTEIN PRODUCTS) IN PROCESSED MEAT AND POULTRY (Agenda Item 10).

208. The Committee had before it documents CX/PMPP 84/12 containing a discussion paper on the above subject prepared by an ad hoc Working Group consisting of Australia, Denmark, UK and the USA (Coordinator) and CX/PMPP 84/13 and Addendum 1 containing government and observer comments from Australia, Canada, Egypt, Federal Republic of Germany, Ireland, New Zealand, Norway, Poland, Thailand, USA, CLITRAVI and EUVEPRO.

209. The Committee recalled that at its 14th Session, the Codex Alimentarius Commission had proposed that the Committee should examine the question of whether there was a need for developing guidelines similar to the VPP guidelines for use of other protein products such as milk powder, casein and caseinate in meat and poultry products.

210. As a consequence, the Committee at its 12th Session had appointed the above working group which had worked by correspondence, it had completed its work in time to obtain government comments on the discussion paper which also contained Proposed Draft Guidelines for the Use of Non-Meat Protein Products (other than VPP) in Processed Meat and Poultry Products.

211. The discussion paper was presented by the Coordinator, Mr. L. Gast (USA), who informed the Committee that the working group had reviewed current sources of non-meat proteins but had been unable to reach agreement on an appropriate definition.

212. The Committee noted on the one hand, that in their written comments, several countries and one observer had considered that non-meat proteins should not include products derived from meat as defined in Codex and various national legislations. On the other hand other countries had expressed the contrary view.

213. One country not present at the session (Egypt), had stated in its written comments that it was opposed to the use of all non-meat protein products except VPP and milk protein in some meat products.

214. The Committee noted that there was general agreement in principle that guidelines should be developed for the use of non-meat proteins other than VPP and discussed which of the products reviewed by the working group should be included in such guidelines.

215. The delegation of Denmark was of the opinion that views expressed in the written comment showed that at present the inclusion of proteins derived from animal by-products would provoke much controversy and that for the moment it would be better to concentrate on products which were definitely of non-meat origin and which could be properly defined.

216. There was some discussion on whether fish proteins and egg and milk protein products should be included. It was pointed out that at its last session, the "Milk Committee" had discussed the use of milk protein in the commodities and had expressed its willingness to provide other Commodity Committees with advice.

217. The Committee examined the three categories of products proposed in the draft guidelines under "Definition". It noted that most delegations favoured the third definition provided reference to blood and blood derivatives and bone extracts was removed. It recognized, however, that even with this amendment, the definition still included sources which by reasons of religion and custom might be unacceptable in some member countries of the Commission. In addition, it noted the opinion of EUVEPRO that there was not sufficient documentation on some of the products as compared to vegetable protein to warrant their use in meat products.

218. It was decided for the moment to confine considerations to the use of milk protein products. It was pointed out that the Codex standard for Luncheon Meat already contained under optional ingredients a list of permitted milk products.

219. The Committee agreed that instead of developing separate guidelines for the use of non-meat proteins, provisions for the use of milk protein products should be made in the Proposed Draft Guidelines for the Use of VPP in Processed Meat and Poultry Products and that the Guidelines be amended accordingly (see also paragraphs 187 and 205, and Appendix IV). The delegation of Federal Republic of Germany referred to its written comments expressing reservation for elaboration of the guidelines.

220. The Committee expressed its appreciation to the member countries of the working group and the Coordinator for the preparation of an excellent paper.

CLASSIFICATION AND REVIEW OF CODEX METHODS OF ANALYSIS FOR PROCESSED MEAT AND POULTRY PRODUCTS (Agenda Item 11).

221. The Committee had before it document CX/PMPP 84/4 on Classification and Review of Codex Methods of Analysis for Processed Meat and Poultry Products prepared by ISO, FAO and the Danish Secretariat, together with Conference Room Document CX/PMPP 84/4 A which contained an abstract of the Report of the 13th Session of CCMAS on acceptance by governments of the various types of Codex methods.

222. Annex 1 to CX/PMPP 84/4 contained references to the methods of analysis for Processed Meat and Poultry Products and their proposed classification under the CCMAS system. The Committee was informed that empirical methods are automatically classified as "defining" methods and that all ISO methods are assumed to have been subjected to adequate collaborative testing. This latter requirement being central to the Codex General Principles for the selection of Codex methods of analysis and sampling.

223. The Committee noted that the assumption that all ISO methods had been collaboratively tested holds true for methods published since 1980, however, methods of earlier date have been subjected to testing but not always in conformity with the present Codex rules. In consequence all existing ISO methods are subject to testing and verification as they are reviewed.

224. The Committee, however, noted that the use of an arbitrary factor such as that used in the conversion of "nitrogen" to "protein content" required that the method for estimation of "protein content" be regarded as a defining method.

225. As regards obligation falling on governments in the application of methods incorporated into Codex standards the Committee noted from CX/PMPP 84/4A that Codex defining methods of analysis (Type 1) are subject to acceptance by governments just as are the provisions which they define and which form part of Codex standards. Full acceptance of a Codex defining method should mean the acceptance that the value

provided for in a Codex standard is defined by means of the Codex method. Non-acceptance of the Codex defining method or acceptances of Codex standards with substantive deviations in the Codex defining methods should be taken to mean acceptance of the Codex standard with specified deviations (ALINORM 83/43, para 208).

226. The Committee noted that the question of obligation falling on governments in accepting Codex Type II (reference) and Type III (alternate approved) methods would be discussed by the Codex Committee on Methods of Analysis and Sampling at the coming session to be held in Budapest during November 1984. It noted also that Codex Type IV (tentative) methods should not be adopted as Codex methods until the Codex Committee on Methods of Analysis and Sampling had recognized the reliability on the basis of the appropriate Codex Criteria (ALINORM 83/43, para 209).

227. The delegation of New Zealand expressed the view that the revised AOAC nitroxylenol method (AOAC, 13th Ed. 1980, 24038-24040) for estimation of nitrate should be preferred to the ISO method 3091 since the effectiveness of the cadmium reducing columns used in the latter method were highly variable. It also indicated that ISO method 1044 for determination of extractable fat should be preferred to the ISO method 1443 for determination of total fat content.

228. The Committee expressed the opinion that it could consider revision of the method for estimation of nitrate at a later date, when the revision of the existing standards was considered. The Committee was informed that the method of analysis was closely linked to the values for fat content included in the standards. It agreed that the method for determination of total fat should not be replaced by the method for determination of extractable fat as proposed by the delegate of New Zealand.

229. The Committee adopted the proposed classification of methods and accepted references to the methods of analysis as contained in Annex 1 of CX7PMPP 84/4 and reproduced in Appendix V. It was noted that the references to the methods were the same as those included in the Codex Alimentarius Vol. IV - Processed Meat and Poultry Products, which had recently been sent to governments for acceptance. Hence no amendment action was deemed necessary at this stage.

CONSIDERATION OF THE APPLICABILITY OF THE PRINCIPLE FOR THE CARRY OVER OF FOOD ADDITIVES TO PROCESSED MEAT AND POULTRY PRODUCTS (Agenda Item 12).

230. The Committee had before it document CX/PMPP 84/5 prepared by the FAD Secretariat. The Committee considered whether the Principle for the Carry-Over of Food Additives would be applicable to the existing Codex standards on Processed Meat and Poultry Products. The Committee noted that paragraph 3 of the Carry-Over Principle generally governed the presence of food additives carried over from ingredients used in the preparation of foods. However, any food additives carried over in significant amounts would need to be listed in the section on food additives (paragraph 4).

231. The Committee agreed that the Carry-Over Principle applied to all standards so far elaborated by it: Luncheon Meat (Codex Stan 89-1981), Cooked Cured Chopped Meat (Codex Stan 98-1981), Cooked Cured Ham (Codex Stan 96-1981), Cooked Cured Pork Shoulder (Codex Stan 97-1981) and Canned Corned Beef (Codex Stan 88-1981).

232. The Committee recommended that the existing standards be amended to incorporate this conclusion and that for these standards the following wording would be

included at an appropriate place: "Section 3 of the Principle relating to the Carry-Over of Additives into Foods, as set forth in Volume XIV of the Codex Alimentarius, shall apply."

DATE MARKING OF PROCESSED MEAT AND POULTRY PRODUCTS (Agenda Item 13).

233. The Committee had before it document CX/PMPP 84/6 on Date Marking of Processed Meat and Poultry Products. The document which reflected previous decisions by the Committee on date marking provisions in Codex Standards for PMPP also included a proposed wording for the standards prepared by the Danish Secretariat (ALINORM 83/16, paras 18-19 and-230) in the light of previous discussions (ALINORM 79/16, paras 68-80, ALINORM 79/22 A, paras 89-90 and ALINORM 81/39, paras 188-195).

234. The Committee recalled the decisions that it had taken at its 10th Session (ALINORM 79/16, paras 68-80). Firstly, that shelf-stable products which had a long storage life did not require date marking and a date of minimum durability would be a contradiction in terms and sometimes misleading. Secondly, for non- shelf-stable products, date marking should be by minimum durability.

235. The delegation of Switzerland expressed the view that date marking provided useful consumer information and should be provided irrespective of whether the products were shelf-stable or non-shelf- stable. The observer from EEC informed the Committee that its decision as expressed above was contradictory to the EEC Labelling Directive and placed a general reservation to such conclusions.

236. The delegate of Argentina made the statement that Processed Meat Products Regulation in Argentina require a declaration of expiry date on the original label using a seal or embossed on the lid or top. Printing the expiry date on tags or seals which are not originally stuck or glued to the packaging is not permitted. The delegate of Thailand said that declaration of date of manufacture or date of expiry is required in her country.

237. The delegation of Denmark expressed the view that date marking of shelf-stable products which are commercially sterile would make problems to the consumer. In its view, declaration of date of minimum durability for shelf-stable products would be a contradiction and sometimes was misleading. The opinion of Denmark received support from a number of countries and had the Committee's agreement. In the opinion of the Committee, shelf-stable products could be defined as those which had an expected shelf- life of at least 18 months under normal conditions of storage.

238. During discussion the question was raised whether the principle of positive date marking of shelf- stable foods could be regarded as a general one. It was pointed out that there were fundamental differences in the properties of commercially sterile products in respect of for example can corrosion and texture degradation and that no general rule could be applied and that the problem was best solved on a commodity by commodity basis.

239. Accordingly, as Canned Corned Beef fell in the class of shelf-stable products, the Committee agreed that no provision on date marking should be included in the standard for Canned Corned Beef CODEX STAN 88-1981).

240. The Committee agreed that since all the remaining standards included non-shelf-stable products, provisions for declaration of the date of minimum durability should be included in the standards: Cooked Cured Ham (CODEX STAN 96-1981). Cooked Cured Pork Shoulder (CODEX STAN 97-1981), Cooked Cured Chopped Meat (CODEX STAN

98-1981), and Luncheon Meat (CODEX STAN 89-1981). An accompanying requirement that adequate storage instructions should be given on the label was also necessary. The Committee noted the proposed wording for date marking agreed was based on the Revised General Standard for Labelling of Prepackaged Foods and would cover products both for consumer use and for catering purposes.

241. It was agreed that the procedure for the amendment of the Codex standards be initiated and that the matter be brought to the attention of the forthcoming session of the Codex Committee on Food Labelling. The agreed text for amendment of the standard is given below.

242. Section 6.6 "Storage Instructions" in all standards mentioned in para 240 should be replaced by:

"6.6 Date Marking and Storage Instructions

6.6.1 For products which are not shelf-stable, i.e. which may be expected not to keep for at least 18 months in normal conditions of storage and sale, and which are packaged in a container ready for offer to the consumer or for catering purposes, the following date marking shall apply:

(i) The "date of minimum durability" shall be declared.

(ii) This shall consist at least of:

- the day and the month for products with a minimum durability of not more than three months
- the month and the year for products with a minimum durability of more than three months. If the month is December, it is sufficient to indicate the year.

(iii) The date shall be declared by the words:

- "Best before" where the day is indicated
- "Best before end" in other cases.

(iv) The words referred to in paragraph (iii) shall be accompanied by:

- either the date itself, or
- a reference to where the date is given.

(v) The day, month and year shall be declared in uncoded numerical sequence except that the month may be indicated by letters in those countries where such use will not confuse the consumer.

6.6.2 In addition to the date of minimum durability, any special conditions for the storage of the food shall be declared on the label if the validity of the date depends thereon.

6.6.3 For products which are not shelf-stable and which are packaged in containers not sold directly to the consumer or for catering purposes, adequate storage and distribution instructions shall be declared."

243. With regard to the provision 6.6.3 of the proposal the delegation of Australia proposed that the words "and transport" be deleted. The delegation of the UK opposed deletion since in its opinion there was a need to cover conditions of handling both during storage and during transportation. The Committee agreed to substitute the word "distribution" for "transport" in 6.6.3.

PROVISIONS FOR CONTAMINANTS IN PROCESSED MEAT AND POULTRY PRODUCTS (Agenda Item 14).

244. The Committee had for its consideration document CX/PMPP 84/7 prepared by the Danish Secretariat and a Conference Room Document CX/PMPP 84/7 - Addendum 1 containing the maximum limits for contaminants in meat products permitted by Sweden.

245. The Committee recalled the decision that it had taken at its last (12th) session, to consider the question of including provisions for contaminants in the Codex Standards for Processed Meat and Poultry Products (ALINORM 83/16, para 231).

246. The Committee noted that information was sought by means of a circular letter (CL 1982/35) from governments and international organizations on:

1. The actual levels of metallic contaminants especially tin and lead present in canned meat and poultry products with special reference to: (i) canned corned beef (ii) luncheon meat (iii) cooked cured ham (iv) cooked cured pork shoulder and (v) cooked cured chopped meat packaged in different types of cans (plain and lacquered tin-plate containers etc.).
2. Legislative control in the different countries on contaminant levels in processed meat and poultry products.

247. Information that had been received from Federal Republic of Germany, Kenya, Netherlands, Poland, Sweden, Thailand and UK was considered to be useful but insufficient for the Committee to arrive at meaningful conclusions.

248. As the contamination of canned products by lead and tin results from the container and is related to the construction of the can and use of solder, the delegation of Netherlands was of the opinion that for all non-acid canned foods the provision should be limited to consideration of lead and tin. Since in that delegation's opinion Processed Meat Products (PMPP) are similar to soups and broths the delegation proposed for PMPP the same limit for lead of 0.5 mg/kg and tin of 250 mg/kg as provided in the standard for soups and broths.

249. The chairman proposed that a small working group should be set up to carry out a survey of the existing data on the levels of contaminants in processed meat and poultry products, and arrive at meaningful levels for the contaminants that could be recommended for inclusion in the standards. This proposal received the support of the Committee, and it was agreed that the group could work by correspondence.

250. Australia, UK, Netherlands, Federal Republic of Germany and Thailand agreed to participate in the working group and Australia agreed to coordinate the work of the group. The participation of Australia and UK was, however, subject to the approval of the appropriate authorities in their countries.

251. As regards the list of contaminants for consideration by the working group, the Committee expressed the view that it should restrict itself to tin and lead, although some delegations thought that the review should take a broader view. It was agreed that the aim of the survey would be to establish reasonable limits for tin and lead in PMPP standards which could be endorsed by the Codex Committee on Food Additives. The Committee suggested that the working group follow the same procedure as followed by the Committee on Processed Fruits and Vegetables.

FUTURE WORK (Agenda item 15).

252. In anticipation that the Code of Hygienic Practice for Processed Meat and Poultry Products with Annexes A, B, and C which had been advanced by the present session to Step 8 would be adopted by the Commission at its 16th Session, the following items arising from the present session would remain:

1. Annex D to the Code of Hygienic Practice for PMPP - Step 4.
2. Guidelines for the Use of Vegetable Protein Products and Milk Protein Products in PMPP - Step 7.
3. Provisions for contaminants in standards for PMPP.

253. The Committee identified a need for work on revision of existing Codex Standards for Processed Meat and Poultry Products. The following matters were considered necessary for attention:

a) Levels of Nitrite and Nitrate: At the time of adopting the standards, the Committee expressed the view that the levels of nitrate and nitrite prescribed in the text need to be reviewed in the near future in the light of newer research on the subject. The paper on "Processing of shelf-stable canned cured meats" (Agenda item 8) at the present session pointed out that the levels of nitrite and nitrate in the standards had very limited value and that the content of nitrite should be expressed as ingoing concentrations.

b) Luncheon Meat: The standard made a broad definition for meat, and ways and means to use mechanically separated meat for the purpose of manufacture of luncheon meat should be explored.

c) Cooked Cured Ham, Cooked Cured Pork Shoulder and Cooked Cured Chopped Meat: Updating would be necessary to reflect changes in technology.

254. The Committee noted that the Regional Coordinating Committee for Europe was carrying out a review of acceptances of certain standards including one for Cooked Cured Ham. The results of the review might provide to this Committee more information on need for revision of certain provisions in the standards.

255. The representative of MARINALG proposed that the use of gelling agents and thickeners in Processed Meat and Poultry Products needs further study. The Committee pointed out that this could be considered as and when the standards would be reviewed.

256. In addition further views from member countries would be sought by the Codex Secretariat by a Circular Letter as to the need for reviewing the existing standard.

Guidelines for the Prevention of Transmission of Animal Diseases through Meat Products in International Trade

257. The delegation of Denmark proposed that the Committee might consider "Guidelines for the prevention of transmission of animal diseases through meat products in international trade", which in its opinion was posing problems to many member countries, as a future work.

258. The International Commission on Microbiological Specifications for Foods (1CMSF) is presently conducting an international survey of costs associated with microbiological hazards in food in international trade. From that it appears that not only hazards to the public health, but also animal health hazards have important economic consequences. These may result in the banning of the importation of foods of animal

origin from countries where certain animal diseases exist, or the requirement to set up a specific treatment of such foods, usually a heat treatment.

259. The detailed requirements may vary from country to country, and a considerable benefit - both for importing and exporting countries - would result from an international agreement on these processing requirements.

260. As regards the processing technology and the resistance of the animal disease agents', some expertise exists in the CCPMPP. With respect to a definition of the geographical size of a disease region, and the decisions to be taken on the time lapse after the eradication of an animal disease before a region can be considered disease free, expertise exists in other international organization, as e.g. the FAO and the OIE (Office Internationale des Epizooties).

261. If it is considered feasible to develop recommendations for an integrated programme for meat and poultry products, the PMPP-committee could cooperate with the above-mentioned international organizations.

262. The Committee discussed whether this was an appropriate task and agreed to refer the problem to the Commission. The Committee was of the view that a background document on this important topic would prove useful to guide the Commission to take decision on the subject. The Committee asked the Codex Secretariat to explore possibilities of having such a background document prepared by FAO and WHO.

263. The delegation of Sweden said that the future work would need to be of a substantial nature to justify further meetings of the Committee. The chairman expressed the view that given the current workload, it was a possibility that the Committee would complete its work at its next session after which it might be in a position to adjourn sine die.

OTHER BUSINESS (Agenda Item 16).

Statement by the Delegation of People's Republic of China

264. The delegation of People's Republic of China expressed appreciation of the work being carried out by the Committee and gave a short account of the Food Hygiene situation in China. The delegation's statement is reproduced in Appendix VII.

DATE AND PLACE OF NEXT MEETING (Agenda Item 17).

265. The next session of the Committee would be held in Copenhagen before the 17th Session of the Codex Alimentarius Commission at a date to be determined by the Danish Government in consultation with the Codex Secretariat.

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Proposal for revised version of the Recommended
International Code of Hygienic Practice for Processed
Meat Products (CAC/RCP 13-1976)

DRAFT CODE OF
HYGIENIC PRACTICE FOR PROCESSED MEAT AND POULTRY PRODUCTS

(at step 8 of the Procedure)

Explanatory Preface

A. The Code has, as far as possible, been made consistent with the lay-out and content of the General Principles of Food Hygiene.

B. The Hazard Analysis Critical Control Point (HACCP) System has been applied to the Code.

The HACCP System consists of: (1) an assessment of hazards associated with growing, harvesting, processing/manufacturing, marketing, preparation and/or use of a given raw material or food product; (2) determination of critical control points required to control any identified hazard(s); and (3) establishment of procedures to monitor critical control points.

The critical control points have been identified in the Code and explanatory notes describing the risk and giving the type and frequency of controls to be applied have been inserted in connection with the relevant paragraphs (marked as CCP-Notes).

C. In the preparation of this Code recognition has been given to the need to avoid precluding the adoption of new technological developments provided these are consistent with the hygienic production of wholesome meat and meat products.

When introducing new technology, care should be taken to ensure that it does not create hazards to health, e.g. new rapid methods for production of fermented sausages require special controls to prevent staphylococcal toxin formation.

D. Properly trained inspectors and personnel and an adequate sanitary infrastructure are necessary in order to implement the Code satisfactorily.

E. It should be noted that many small manufacturers, supplying a limited number of retail outlets only, do not package their meat products before sale. It is not possible for the Code to make special provisions for such premises and the application of the Code to such manufacturers is left to the discretion of the special agency having jurisdiction in each country.

F. If poultry meat and/or game meat is used in the manufacture of meat products, the provisions of this Code equally apply to such type of meats.

References

- Recommended International Code of Hygienic Practice for Fresh Meat (CAC/RCP 11-1976)
- Recommended International Code of Practice for Ante-Mortem and Post-Mortem Inspection of Slaughter Animals (CAC/RCP 12-1976)

- Recommended International Code of Hygienic Practice for Game (CAC/RCP 29-1983)
- Recommended International Code of Practice. General Principles of Food Hygiene (CAC/Vol.A - Ed. 1)
- Recommended International Code of Practice for Low-Acid and Acidified Low-Acid Canned Foods (CAC/RCP 23-1979)
- Recommended International Code of Hygienic Practice for Poultry Processing (CAC/RCP 14-1976)

SECTION I - SCOPE

This Code of Hygienic Practice, including the Annexes, applies to processed meat and poultry products. It contains the minimum requirements of hygiene in the production, handling, packaging, storing and transportation of processed meat products to assure a healthful and wholesome supply of such products.

SECTION II - DEFINITIONS

2. For the purpose of this Code:
 - 2.1 "Abattoir" means premises approved and registered by the controlling authority used for the slaughter of animals for human consumption.
 - 2.2 "Brand" means any mark or stamp approved by the controlling authority and also includes any tag or label bearing such mark or stamp.
 - 2.3 "Cleaning" means the removal of soil, food residues, dirt, grease or other objectionable matter.
 - 2.4 "Contamination" means the direct or indirect transmission of objectionable matter.
 - 2.5 "Controlling authority" in relation to an establishment means the official authority charged by the government with the control of hygiene including inspection of meat and meat products.
 - 2.6 "Detain" shall be interpreted in the sense described in General Principles for the Establishment and Application of Microbiological Criteria for Foods (Codex Alimentarius Food Hygiene Committee)*

* When a product is detained there are in principle several options as to the action to be taken, depending on the findings and the circumstances. Such options include sorting, reprocessing (e.g. by heating), and destruction, and may need to be specified. In deciding on the option the major consideration should be to keep to a minimum the risk that unacceptable food reaches the consumer. However, food must not be needlessly destroyed nor declared unfit for human consumption.
 - 2.7 "Disinfection" means the reduction, without adversely affecting the food, by means of hygienically satisfactory chemical agents and/or physical methods, of the number of micro-organisms to a level that will not lead to harmful contamination of meat and meat products.
 - 2.8 "Edible" means fit for human consumption.
 - 2.9 "Establishment" means any premises approved and registered by the controlling authority in which meat products are prepared, processed, handled, packaged or stored.

- 2.10 "Game meat" means any edible part including offals, derived from a game carcass processed in a game packaging house, and passed by an inspector as fit for human consumption.**
- 2.11 "Hermetically sealed containers" mean containers which are designed and intended to protect the content against the entry of microorganisms during and after heat processing.
- 2.12 "Ingredient" means any substance including food additives used in the manufacture or preparation of a meat product.
- 2.13 "Inspector" means a properly trained officer appointed by the controlling authority of an country for the purpose of inspection of meat and meat products and supervision of meat hygiene.
- 2.14 "Lot" means a definite quantity of a commodity produced under essentially the same conditions.
- 2.15 "Manager" in relation to an establishment includes any person for the time being responsible for the management of the establishment.
- 2.16 "Meat" means the edible part of any mammal slaughtered in an abattoir.**
- ** Wherever in the Code the word "meat" appears it shall be taken to include poultry and/or game meat.
- 2.17 "Meat product" means a product intended for human consumption containing meat from mammals and/or poultry and/or game meat.
- 2.18 "Packaging material" means containers such as cans, bottles, cartons, boxes, cases and sacks, or wrapping and covering material such as foil, film, metal, paper, wax-paper and cloth.
- 2.19 "Potable water" means water that is pure and wholesome in accordance with WHO requirements contained in the "International Guidelines for Drinking Water Quality".
- 2.20 "Poultry meat" means the edible part of slaughtered domesticated birds including chickens, turkeys, ducks, geese, guinea-fowls or pigeons.*
- * Wherever in the Code the word "meat" appears it shall be taken to include poultry and/or game meat.
- 2.21 "Processed" includes all methods of manufacture and preservation but does not include prepackaged fresh, chilled or frozen meat.
- 2.22 "Protective clothing" means special garments intended to prevent the contamination of meat and/or meat products and used as outer-wear by persons in an establishment and includes head coverings, footwear and gloves.
- 2.23 "Unfit for human consumption", in relation to meat and meat products, means an article that would normally be edible but is inedible because of disease, decomposition or any other reason.

SECTION III - ESTABLISHMENT: REGISTRATION, DESIGN AND FACILITIES

3.1 Registration

Establishments should be approved and registered by the controlling authority.

3.2 Location

Establishments should be located in areas not subject to regular and frequent flooding and free from objectionable odours, smoke, dust and other contaminants.

3.3 Roadways and Areas Used by Wheeled Traffic

- 3.3.1 Such roadways and areas serving the establishment which are within its boundaries or in its immediate vicinity should have a hard paved surface suitable for wheeled traffic. There should be adequate drainage and provision should be made to allow for cleaning.
- 3.3.2 Where appropriate, establishments should be so designed that access can be controlled.

3.4 Buildings and Facilities

- 3.4.1 Establishments should provide adequate working space for the satisfactory performance of all operations.
- 3.4.2 The construction should be sound and ensure adequate ventilation, good natural or artificial lighting and easy cleaning. All construction materials should be such that they do not transmit any undesirable substances to the meat or meat products.
- 3.4.3 The establishment should be laid out and equipped so as to facilitate proper supervision of meat hygiene including performance of inspection and control.
- 3.4.4 The establishment should be of such construction as to protect against the entrance and harbouring of insects, birds, rodents or other vermin, as well as the entry of environmental contaminants such as smoke, dust etc.
- 3.4.5 Buildings and facilities should be designed to provide separation, by partition, location or other effective means, between those operations which may cause cross-contamination.
- 3.4.6 Establishments should be laid out and equipped so as to ensure, that meat and meat products do not come into contact with floors, walls or other fixed structures, except those which are specifically designed for contact with meat.
- 3.4.7 The construction and layout of any chilling room, freezing room, freezer store or freezer should satisfy the requirements of this Code.
- 3.4.8 In rooms where work on meat and meat products is undertaken:
 - Floors should be of water-proof, non-absorbent, washable and non-slip materials, without crevices, and should be easy to clean and disinfect. Where appropriate, floors should slope sufficiently for liquids to drain to trapped outlets including grates.
 - Walls should be of water-proof, non-absorbent and washable materials and should be light coloured. Up to a height appropriate for the operation they should be smooth and without crevices, and should be easy to clean and disinfect. Where appropriate, angles between walls and floors should be sealed and coved, and angles between walls and walls, and ceilings and walls, should be sealed to facilitate cleaning.

- Ceilings should be so designed, constructed and finished as to prevent the accumulation of dirt and minimize condensation, mould development and flaking, and should be easy to clean.
 - Windows and other openings should be so constructed as to avoid accumulation of dirt and those which open should be fitted with insect-proof screens. Screens should be easily movable for cleaning and kept in good repair. Internal window sills, if present, should be sloped to prevent use as shelves.
 - Doors should have smooth, non-absorbent surfaces and, where appropriate, be self-closing and close fitting.
 - Stairs, lift cages and auxiliary structures such as platforms, ladders and chutes, should be so situated and constructed as not to cause contamination to meat. They should be capable of being effectively cleaned. Chutes should be constructed with inspection and cleaning hatches.
- 3.4.9 The use of construction materials which cannot be adequately cleaned and disinfected, such as wood, should be avoided unless its use would clearly not be a source of contamination.
- 3.4.10 Office accommodation should be provided for the use of the inspection service.

3.5 Sanitary Facilities

3.5.1 Water Supply

- 3.5.1.1 An ample supply of potable water under adequate pressure should be available with adequate facilities for its storage, where necessary, and distribution, and with adequate protection against contamination.

CCP-Note: Water should comply with the requirements contained in the WHO "International Guidelines for Drinking Water Quality", and in particular those concerned with microorganisms of enteric origin. Samples should be taken regularly, but the frequency should depend upon the origin and the usage of the water, e.g. usually more frequent from private supplies than from public supplies, and more frequent from water used for cooling of canned meats than from water used for cleaning purposes. If chlorination has been employed checks should be made daily by chemical tests for available chlorine. The point of sampling should preferably be at the point of usage, but occasionally it would be useful to sample at the point of entry of the water in the establishment.

- 3.5.1.2 An adequate supply of hot potable water should be available at all times during working hours.

CCP-Note: This provision is intended to cover water for both cleaning purposes and the destruction of microorganisms (especially those pathogenic to man), on knives, utensils etc. coming into direct contact with meat and meat products. For cleaning purposes a temperature of 65°C of the water is suitable (for details see Annex I of the General Principles of Food Hygiene, CAC/Vol. A - Ed. I). For disinfection purposes hot water at e.g. 80°C for no less than two minutes could be used and dispensed in such a way (e.g. in specially designed boxes near the

working area) that blades of knives etc. can be submerged in the water for an adequate contact time (no less than two minutes).

Often this water supply is separate from other hot water supplies used for cleaning, hand-washing etc. But if there is only one hot water supply the term "adequate" should mean that even at times where large amounts of hot water is used (e.g. during cleaning operations) the water supply from any tap in the establishment should not be decreased.

3.5.1.3 Ice should be made from potable water and should be manufactured, handled and stored so as to protect it from contamination.

3.5.1.4 Steam used in contact directly with meat and meat products should be produced from potable water and contain no substances which may be hazardous to health or may contaminate the food.

3.5.1.5 Non-Potable Water used for steam production, cooling of refrigeration equipment, fire control and other similar purposes not connected with meat and meat products should be carried in completely separate lines, identifiable preferably by colour and with no cross-connection with or back siphonage into the system carrying potable water.

3.5.2 Effluent and Waste Disposal

Establishments should have an efficient effluent and waste disposal system. All effluent lines (including sewer systems) should be large enough to carry peak loads and should be constructed in such a manner as to avoid contamination of potable water supplies.

3.5.3 Facilities for Storage of Waste and Inedible Material

Facilities should be provided for the storage of waste and inedible material prior to removal from the establishment. These facilities should be designed to prevent access to waste or inedible material by pests and to avoid contamination of food, potable water, equipment or buildings on the premises.

3.5.4 Changing Facilities and Toilets

Adequate, suitable, and conveniently located changing facilities and toilets should be provided in all establishments. Toilets should be so designed as to ensure hygienic removal of waste matter. These areas should be well lit, ventilated and where appropriate heated and should not open directly on to food handling areas. Hand washing facilities with warm or hot and cold water, a suitable hand-cleaning preparation, and with suitable hygienic means of drying hands, should be provided adjacent to toilets and in such a position that the employee must pass them when returning to the processing area. Where hot and cold water are available mixing taps should be provided. Where paper towels are used, a sufficient number of dispensers with paper towels and receptacles for used towels should be provided adjacent to each washing facility. Taps of a non-hand operable type are preferable. Notices should be posted directing personnel to wash their hands after using the toilet.

3.5.5 Hand Washing Facilities in Processing Areas

Adequate and conveniently located facilities for hand washing and drying should be provided wherever the process demands. Where appropriate, facilities for hand disinfection should also be provided. Hand washing facilities should be equipped as under 3.5.4. The facilities should be furnished with properly trapped waste pipes leading to drains.

3.5.6 Cleaning and Disinfection Facilities

3.5.6.1 All rooms used for de-boning, preparing, packaging or other handling of meat and meat products should be equipped with adequate facilities for cleaning and disinfecting implements, conveniently located for the use of personnel during operations. These facilities are for use exclusively in the cleaning and disinfection of knives, steels, cleavers, saws and other implements.

3.5.6.2 All facilities for cleaning and disinfecting implements should be of such nature and size as to permit proper cleaning and disinfection of implements. These facilities should be constructed of corrosion-resistant materials and should be capable of being easily cleaned.

3.5.6.3 All facilities for cleaning and disinfecting of implements should be fitted with suitable means of supplying hot water in sufficient quantity at all times while meat or meat products are being handled in that part of the establishment.

3.5.7 Lighting

Adequate natural or artificial lighting should be provided throughout the establishment. Where appropriate, the lighting should not alter colours and the intensity should not be less than:

540 lux (50 foot candles) at all inspection points.

220 lux (20 foot candles) in work rooms.

110 lux (10 foot candles) in other areas.

Light bulbs and fixtures suspended over meat in any stage of production should be of a safety type and protected to prevent contamination of meat and meat products in case of breakage.

3.5.8 Ventilation

Adequate ventilation should be provided to prevent excessive heat, steam condensation and dust and to remove contaminated air. The direction of the air flow should never be from a dirty area to a clean area. Ventilation openings should be provided with an insect screen or other protective enclosure of non-corrodible material. Screens should be easily removable for cleaning.

3.6 Equipment and Utensils

3.6.1 Materials

All equipment and utensils used in meat handling areas and which may contact exposed meat and meat products should be made of material which does not transmit toxic substances, odour or taste, is non-absorbent, is resistant to corrosion and is capable of withstanding repeated cleaning and disinfection. Surfaces should be smooth and free from pits and crevices. The use of wood and other materials which cannot be adequately cleaned and disinfected should be avoided except when their use would clearly not be a source of contamination.

The use of different materials in such a way that contact corrosion can occur should be avoided.

3.6.2 Sanitary Design, Construction and Installation

3.6.2.1 All equipment and utensils should be so designed and constructed as to prevent hygienic hazards and permit easy and thorough cleaning and disinfection and, where practicable, be visible for inspection. Stationary equipment should be installed in such a manner as to permit easy access and thorough cleaning.

3.6.2.2 Containers for inedible material and waste should be leak-proof, constructed of non-corrosive metal or other suitable impervious material which should be easy to clean or disposable and, where appropriate, able to be closed securely.

3.6.2.3 All refrigerated spaces should be equipped with temperature measurement or recording devices.

3.6.3 Equipment Identification

Equipment and utensils used for inedible materials or waste should be so identified and should not be used for edible products.

SECTION IV - ESTABLISHMENT: HYGIENE REQUIREMENTS

4.1 Maintenance

The buildings, rooms, equipment and all other physical facilities of the establishment, including drains, should be maintained in good repair and in orderly condition. Except for rooms where heat processing or cleaning operations are performed they should be free from steam, vapour and surplus water.

4.2 Cleaning and Disinfection

4.2.1 Cleaning and disinfection should meet the requirement of this Code. For further information on cleaning and disinfection procedures, see Annex I of the General Principles of Food Hygiene (CAC/Vol.A - Ed.I). Working rooms should be kept clean.

4.2.2 Amenities provided for the use of employees and the inspection service including changing facilities, toilets and the inspection office space should be kept clean at all times.

4.2.3 If rooms intended and most of the time used for the handling, preparation, processing, packaging or storage of meat and meat products are used for any other food preparation purposes, then cleaning and disinfection are necessary immediately before and after such use.

CCP-Note: Handling other foods in a room intended for handling of meat or meat products may adversely affect the microbiology of meat and meat products, and the handling of meat and meat products in a room that subsequently is used for a different food may adversely affect that food. Therefore it is advisable to separate these operations by cleaning and disinfection. The inspector in charge should satisfy himself that the cleaning and disinfection procedures are carried out every time there is such a change of use.

4.2.4 The temperature in rooms for boning-out and trimming should be controlled and held suitably low, unless cleaning practices of equipment and utensils are carried out at least every four hours.

CCP-Note: Experience has shown that when unwrapped meat is handled on cleaned and disinfected surfaces, as will be the case at start of operation, the meat will contaminate the surfaces. If the temperature of the room is relatively high (above 10°C), microorganisms on the surface of the equipment will start to multiply and after some period of time (1-4 hours) the number of microorganisms on the surface will be contaminating the meat. To interrupt that cycle the surfaces should be cleaned at intervals of 4-5 hours, unless room temperature is held below 10°C. Disinfection could be employed as well, provided residues of disinfectant are removed promptly. Inspection should ensure that the cleaning, the possible application of disinfectant, and the removal of such disinfectant is performed at the appropriate intervals. The temperature in temperature controlled rooms should be checked regularly.

- 4.2.5 To prevent contamination of meat and meat products, all equipment, implements, tables, utensils including knives, cleavers, knife pouches, saws, mechanical instruments and containers should be cleaned at frequent intervals during the day and immediately cleaned and disinfected whenever they come into contact with diseased material, infective material or otherwise become contaminated. They shall also be cleaned and disinfected at the conclusion of each working day.

CCP-Note: Equipment, utensils etc. in constant contact with meat will be contaminated with microorganisms and proliferation of microorganisms on these will soon take place. This may adversely affect meat or meat products handled subsequently. Therefore cleaning is necessary at frequent intervals during the day, at least after every break. A particular situation exists if e.g. a knife comes into contact with diseased material. Here a risk of infecting subsequent pieces of meat with pathogenic organisms is evident, and cleaning and disinfection should immediately be carried out. The purpose of cleaning and disinfection at the conclusion of each working day is i.a. to hinder the building-up of an undesirable, possibly pathogenic flora in the establishment. Monitoring should be done by regular inspection, preferably aided by microbiological testing.

- 4.2.6 If any skip or trolley or any container used in a department where edible material is handled enters an area where inedible material is handled it should be cleaned and disinfected immediately before re-entering the edible department.

CCP-Note: Such practice should be restricted, but if it happens the inspector should check that cleaning and disinfection is carried out.

- 4.2.7 Immediately after the cessation of work for the day or at such other times as may be required, the floors and walls should be cleaned to remove contamination. Floor drains should be kept in good condition and repair with strainers in place.
- 4.2.8 Roadways and yards in the immediate vicinity of and serving the establishment should be kept clean.
- 4.2.9 Adequate precautions should be taken to prevent meat and meat products from being contaminated during cleaning or disinfecting of rooms, equipment or utensils by water and detergents or by disinfectants and their solutions.

Detergents and disinfectants should be suitable for the purpose intended and should be acceptable to the official agency having jurisdiction. Any residues of these agents on a surface which may come in contact with food should be removed by rinsing with potable water before the area or equipment is again used for handling meat and meat products.

4.3 Hygiene Control Programme

It is desirable that each establishment in its own interest designates a single individual, whose duties are divorced from production, to be held responsible for the cleanliness of the establishment. His staff should be a permanent part of the organization or employed by the organization and should be well trained in the use of special cleaning tools, methods of dismantling equipment for cleaning and in the significance of contamination and the hazards involved. A permanent cleaning and disinfection schedule should be drawn up to ensure that all parts of the establishments are cleaned appropriately and that critical areas, equipment and material are designated for cleaning and/or disinfection daily or more frequently if required.

4.4 Storage and Disposal of Waste

Waste material should be handled in such a manner as to exclude contamination of food or potable water. Precautions should be taken to prevent access to waste by pests. Waste should be removed from the meat and meat products handling and other working areas at intervals and at least daily. Immediately after disposal of the waste, receptacles used for storage and any equipment which has come into contact with the waste should be cleaned and disinfected. At least daily the waste storage area should also be cleaned and disinfected.

4.5 Exclusion of Domestic Animals

Animals that are uncontrolled or that could be a hazard to health should be excluded from establishments.

4.6 Pest Control

- 4.6.1 There should be an effective and continuous programme for the control of insects, birds, rodents or other vermin. Establishments and surrounding areas should be regularly examined for evidence of infestation.
- 4.6.2 Should pests gain entrance to the establishment or surrounding areas, eradication measures should be instituted. Control measures involving treatment with chemical, physical or biological agents should only be undertaken by or under direct supervision of personnel who have a thorough understanding of the potential hazards to health resulting from the use of these agents, including those which may arise from residues retained in the product. Such measures should only be carried out in accordance with the recommendations of the official agency having jurisdiction and with the full knowledge of the inspector.
- 4.6.3 Pesticides should only be employed if other precautionary methods cannot be used effectively. Only pesticides approved for use in an establishment by the competent authority should be used and the greatest care should be exercised to prevent any contamination of the meat or meat products, equipment or utensils. Before pesticides are applied all meat and meat products should be removed from the room and all equipment and utensils should be thoroughly washed prior to being used again.

4.7 Handling and Storage of Hazardous Substances

Pesticides or other substances which may represent a hazard to health should be labelled with a warning about their toxicity and use. Except as required for purposes of hygiene such substances which may contaminate meat and meat products, packaging materials and ingredients should be handled and stored in a part of the establishment which is not used for the preparation, processing, handling, packaging or storage of meat and meat products. They should be handled and dispensed only by authorized and properly trained personnel or by persons under strict supervision of trained personnel. Extreme care should be taken to avoid contamination of meat and meat products. However, materials employed in the construction and maintenance of an establishment may be used at any time with the approval of an inspector.

CCP-Note: Many substances used for the purposes of pest control, disinfection, painting etc. may contain substances harmful to man, and if they contaminate meat and meat products they may present a public health hazard. The inspector should learn the potential danger of such substances to man, the storage of them and their use. He should discourage the use of such substances during operation, and satisfy himself that they -when used -do not leave any residues on meat and meat products or on surfaces or utensils that meat and meat products may contact.

4.8 Personal Effects and Clothing

Personal effects and clothing should not be deposited in food handling areas.

4.9 Maintenance tools

Cleaning and maintenance tools and products should not be stored in a food handling area.

SECTION V - PERSONNEL HYGIENE AND HEALTH REQUIREMENTS

5.1 Hygiene Training

Managers of establishments should arrange for adequate and continuing training of every handler of meat and meat products in hygienic handling of meat and meat products and in personal hygiene so that they understand the necessary precautions to prevent contamination. Instructions should include relevant parts of this Code. For this purpose material elaborated by the controlling authority or the establishment in cooperation with the inspector should be used.

5.2 Medical Examination

- 5.2.1 Persons who come into contact with meat and meat products in the course of their work should have a medical examination prior to their employment if the official agency having jurisdiction, acting on medical advice, considers that this is necessary, whether because of epidemiological considerations, the nature of the meat product prepared in a particular establishment or the medical history of the prospective meat or meat product handler. Medical examination of a meat or a meat product handler should be carried out at other times when clinically or epidemiologically indicated.

- 5.2.2 The manager of any establishment should, if required to do so by an inspector, produce for perusal by the inspector any medical certificate produced to the manager by an employee of the establishment.

5.3 Communicable Diseases

The management should take care to insure that no person, while known or suspected to be suffering from, or to be a carrier of a disease likely to be transmitted through meat and meat products or while afflicted with infected wounds, skin infections, sores or with diarrhoea, is permitted to work in any area in any capacity in which there is any likelihood of such a person directly or indirectly contaminating meat or meat products with pathogenic microorganisms. Any person so affected should immediately report to the management that he is ill.

CCP-Note: Persons with infected wounds or skin infections may contaminate meat and meat products - even such in cans immediately after retorting -with staphylococci. Persons with diarrhoea and even symptomless carriers of microorganisms causing gastroenteritis may contaminate meat and meat products with salmonellae or other gastrointestinal pathogens. Such persons should not be allowed to handle meat and meat products even in closed containers, until the responsible medical authority has declared that they do not create a hazard to health.

5.4 Injuries

Any person who has a cut or a wound should discontinue working with meat and meat products and until he is suitably bandaged should not engage in the preparation, handling, packaging or transportation of meat and meat products. No person working in any establishment should wear exposed bandage unless the bandage is completely protected by a waterproof covering which is conspicuous in colour and is of such a nature that it cannot become accidentally detached. Adequate first-aid facilities should be provided for this purpose.

CCP-Note: If unprotected, wounds become easily infected with pathogenic microorganisms like staphylococci. These may then subsequently contaminate meat and meat products. To prevent infection and contamination wounds should immediately be dressed with e.g. detectable bandage. Workers should be encouraged to report such accidents to the management.

5.5 Washing of Hands

Every person engaged in a meat and meat products handling area should wash his hands frequently and thoroughly with a suitable hand cleaning preparation under running warm potable water while on duty. Hands should always be washed before commencing work, immediately after using the toilet, after handling contaminated material, and whenever else necessary. After handling diseased or suspect materials hands should be washed and disinfected immediately. Notices requiring hand-washing should be displayed.

CCP-Note: It should be the responsibility of management to arrange for easy access to hand-washing facilities - outside toilets, near the working area etc. Also management should motivate and instruct the

employees in proper hand-washing. There should be adequate supervision to ensure compliance with this requirement.

5.6 Personal Cleanliness

- 5.6.1 Every person engaged in an area in an establishment where meat and meat products are handled should maintain a high degree of personal cleanliness while on duty, and should at all times while so engaged wear suitable protective clothing including head covering and footwear, all of which should be washable unless designed to be disposed of and which should be maintained in a clean condition consistent with the nature of the work in which the person is engaged.

CCP-Note: In the establishment clothing may easily become contaminated with meat scraps, fat and blood. Besides being unaesthetic such contamination may give rise to microbial proliferation, which may affect adversely meat and meat products. At the end of a shift all protective clothing should be thoroughly washed and dried.

- 5.6.2 Aprons and similar items should not be washed on the floor.

- 5.6.3 Such items should not be left on equipment in the working area.

CCP-Note: Such items should preferably be deposited in locked safes, protected against vermin. Under no circumstances should they be left on implements in the working area.

- 5.6.2 Aprons and similar items should not be washed on the floor.

5.7 Personal Behaviour

Any behaviour which can potentially contaminate the meat and meat products, such as eating, use of tobacco, chewing, spitting, should be prohibited in any part of an establishment used for the preparation, handling, packaging, storing or transportation of meat and meat products.

5.8 Gloves

Gloves if used in the handling of meat and meat products should be maintained in a sound and clean condition. The wearing of gloves does not exempt the operator from having thoroughly washed hands. Gloves should be made of an impermeable material except where their usage would be inappropriate or incompatible with the work involved.

CCP-Note: Disposable gloves are to be preferred - to be changed as often as the work involved requires or at least after every break. Special care should be given to metal gloves. Such gloves should be cleaned and disinfected at least once a day and also whenever they become contaminated. Metal gloves with worn or missing links should be promptly repaired or replaced.

5.9 Visitors

Every person who visits an area in an establishment where meat and meat products are handled should wear clean protective clothing. Visitors should observe the provisions recommended in paragraphs 4.8, 5.3, 5.4 and 5.7. should wear clean protective clothing. Visitors should observe the provisions recommended in paragraphs 4.8, 5.3, 5.4 and 5.7.

5.10 Supervision

Responsibility for ensuring compliance by all personnel with all requirements of paragraphs 5.1 -5.9 inclusive should be specifically allocated to competent supervisory personnel.

SECTION VI - ESTABLISHMENT: HYGIENIC PROCESSING REQUIREMENTS

6.1 Raw Material Requirements

- 6.1.1 All meat used in the manufacture of meat products should have been produced in compliance with the provisions of the Code of Hygienic Practice for Fresh Meat and should have been subjected to the inspection processes prescribed therein and in the Code of Practice for Ante- Mortem and Post-Mortem Inspection of Slaughter Animals. It should have been passed by an inspector as fit for human consumption.
- 6.1.2 Poultry meat should have been produced in compliance with the Code of Hygienic Practice for Poultry Processing and should have been passed by an inspector as fit for human consumption.
- 6.1.3 Game meat should have been produced in compliance with the Code of Hygienic Practice for Game, and should have been passed by an inspector as fit for human consumption.
- 6.1.4 All other raw materials and ingredients - whether of animal, vegetable or other origin - should be fit for human consumption, and - if applicable - should have been produced in compliance with the provisions of a relevant Code of Hygienic Practice.

CCP-Note: The provisions in 6.1.1 - 6.1.3 should ensure that a competent authority has inspected the origin and production of the meat, poultry meat or game meat to be used for the production of meat products. If he has found that the raw material is fit for human consumption, he will mark it accordingly and may issue a certificate that should follow the consignment of the meat, poultry meat or game meat. The inspector or the manager in the establishment producing meat products should convince himself of the acceptability of the raw material by inspecting the marking, the accompanying certificate, if any, and the raw material itself. For other raw material, as referred to under 6.1.4 no previous inspection or certification may have taken place. In this case the inspector or the manager may accept the ingredient, if it is acceptable for human consumption or if it is found hygienically acceptable after testing as recommended under 6.1.5.

- 6.1.5 No meat, poultry meat, game meat or other ingredient which has undergone deterioration or any other process of decomposition or which has been contaminated with foreign matter, making it unfit for human consumption should be used for the processing and manufacture of meat products. Where necessary, laboratory tests should be made of the ingredients prior to their being moved into the production area of the establishment.

CCP-Note: Although passed for human consumption by an inspector, the meat may have undergone such changes, e.g. during transportation, that in the establishment producing meat products it is found no longer fit for human consumption. Such meat may be used for other purposes than human consumption or be destroyed. In cases where only superficial

contamination has taken place, trimming of the contaminated part may suffice. The decision whether or not the meat is still fit for human consumption may be guided by microbiological, chemical or physical analysis relative to the changes observed or suspected.

- 6.1.6 Raw materials and ingredients stored on the premises of the establishment should be maintained under conditions that will prevent spoilage, protect against contamination and minimize damage. Stocks of raw materials and ingredients should be properly rotated.

6.2 Prevention of Cross-Contamination

- 6.2.1 Effective measures should be taken to prevent contamination of meat or meat products by direct or indirect contact with material at an earlier stage of the process. Every department in which meat products are prepared, processed or stored should be used at that time only for that purpose or for the preparation and storage of other edible products subject to the same conditions of hygiene. If the departments are used for processing of non-meat products, the arrangements should be such that it can be ensured that there is no resultant contamination of the meat product.
- 6.2.2 Any persons handling raw materials or semi-processed meat products capable of contaminating the end product should not come into contact with any finished products unless and until they have cleaned and disinfected all utensils used by them and have changed all protective clothing worn by them during the handling of raw materials and semi-processed products which have come into contact with or have been soiled by the raw materials or semi-processed products. Hands and arms should always be washed thoroughly and disinfected after handling raw materials and semi-processed products prior to handling finished products.

CCP-Note: In most cases finished products have been subjected to a process that will reduce its microbial count, but e.g. after heat processing there could be a possibility for micro-organisms contaminating the meat products. In this case microorganisms contaminating the meat product after heat processing will lack the competition from the meat's "natural" flora and may proliferate quickly. Such contamination may be derived from utensils and from hands, arms or clothing of personnel that have been working with raw materials or semi-processed meat products. For that reason it is important that they take any precautions for preventing the contamination of the finished, especially un-packaged product. In certain cases, e.g. after handling of a finished product as sausages with mould growth, workers should preferably not handle raw materials or semi-processed meats.

- 6.2.3 Equipment such as trays, vats, tables etc. should not be used interchangeably for raw products and processed products unless it is completely cleaned and disinfected before moving to the area designated for processed meat products. Exposed ready-to-eat or cooked products should not be stored in the same room with raw meat.

CCP-Note: The same situation as described in the note to 6.2.2 applies here.

- 6.2.4 The operation of de-boning and trimming should always be carried out as rapidly as possible and meat should not be allowed to accumulate in rooms used for de-boning and trimming.

CCP-Note: De-boning and trimming involve exposure of meat surfaces to contamination - from other meat and from equipment and utensils. Such contamination could be kept to a minimum by prompt removal of de-boned or trimmed meat - either to a cold store or to further processing.

- 6.2.5 Any cooking or smoking of meat products should be done in separate areas equipped for this purpose.

6.3 Use of Water

- 6.3.1 Without prejudice to 6.3.2 and 6.3.3 only potable water should be used in meat processing.
- 6.3.2 Non-potable water may be used with the acceptance of the official agency having jurisdiction for steam production, refrigeration, fire control and other similar purposes not connected with food. However, non-potable water may, with specific acceptance by the official agency having jurisdiction be used in certain food handling areas provided this does not constitute a hazard to health.
- 6.3.3 Water re-circulated for re-use within an establishment should be treated and maintained in a condition so that no health hazard can result from its use. The treatment process should be kept under constant surveillance. Alternatively re-circulated water which has received no further treatment may be used in conditions where its use would not constitute a health hazard and will not contaminate either the raw material or the end-product. Non-potable re-circulated water should have a separate distribution system which can be readily identified. The acceptance of the official agency having jurisdiction should be required for any treatment process and for the use of re-circulated water in any food process.

6.4 Processing

- 6.4.1 Processing should be supervised by technically competent personnel.
- 6.4.2 All steps in the production process, including packaging, should be performed without unnecessary delay and under conditions which will prevent the possibility of contamination, deterioration, or the development of pathogenic and spoilage microorganisms.

CCP-Note: Ideally a production process should be so designed that all steps are performed immediately after each other - in a continuous flow. If, however, for some reason delays are necessary, semi-manufactured products should during the delay be chilled to and held at temperatures below 10°C. Processing of meat often means a change of the state of the meat product so that it will be more susceptible to microbial attack. Exceptions are e.g controlled drying and curing, processes that will reduce the potential for microbial growth. Otherwise time and temperature, under certain circumstances water activity, oxidation-reduction potential or the microbiology of the meat product should be regularly monitored.

- 6.4.3 Methods of preservation and necessary controls should be such as to protect against contamination or development of a public health hazard and against deterioration within the limits of good commercial practice.

6.5 Packaging

- 6.5.1 No containers, equipment or utensils should be stored in any part of an establishment in which exposed meat or meat products are prepared, processed, handled, packaged or stored.
- 6.5.2 All packaging material should be stored in a clean and hygienic manner. The material should be appropriate for the meat product to be packaged and for the expected conditions of storage and should not transmit to the product objectionable substances beyond the limits acceptable to the official agency having jurisdiction. The packaging material should be sound and should provide appropriate protection from contamination.
- 6.5.3 Meat product containers should not have been used for any purpose which *may* lead to contamination of the product. If necessary according to their origin containers should be inspected immediately before use to ensure that they are in a satisfactory condition and are cleaned or cleaned and disinfected; when washed they should be well drained before filling. Only packaging material required for immediate use should be kept in the packaging or filling area,

CCP-Note: Packaging material such as paperboard for cartons should not be assembled in rooms where exposed meat or meat products are prepared, processed, handled, packaged or stored, unless it is part of a hygienically performed automated operation.

- 6.5.4 Rough treatment of the containers should be avoided to prevent the possibility of contamination of the finished meat product.
- 6.5.5 Meat products should be packaged in a manner which will protect them from contamination and deterioration under normal condition of handling, transportation and storage.

6.5.6 Lot Identification

Packaged meat products should bear a permanent marking in code or in clear to identify the producing factory and the lot.

6.5.7 Processing and Production Records

Permanent legible and dated records of pertinent processing and production details should be kept concerning each lot. These records should be retained for a period that exceeds the shelf life of the product, but unless a specific need exists they need not be kept for more than two years. Records should also be kept of the initial distribution by lot.

6.6 Storage

- 6.6.1 Meat and meat products should be stored under such conditions as will preclude the contamination with and/or proliferation of microorganisms and protect against deterioration of the product or damage to the container. During storage, periodic inspection of the meat and meat products should take place to ensure that only meat products which are fit for human consumption are dispatched and that end product specifications should be complied with when they exist. The product should be dispatched in the sequence of the lot numbers.
- 6.6.2 The following provisions should apply where meat or meat products are placed in chilling rooms:

6.6.2.1 Entry should be restricted to personnel necessary to carry out operations efficiently.

6.6.2.2 Doors should not be left open for extended periods and should be closed immediately after use.

6.6.2.3 Meat or meat products as well as containers holding meat or meat products should not be stacked directly on the floor.

CCP-Note: Warm products should be chilled before packaging into large containers to prevent deterioration of the central part of the product. Rapid cooling down of all parts or all packages of meat products and maintaining non-shelf-stable meat products at chill temperature are essential. They should be placed on pallets or on dunnage in such a way that there is adequate air circulation.

6.6.2.4 No chilling room should be loaded beyond its designed capacity.

6.6.2.5 Where refrigeration equipment is not manned, automatic temperature recorders should be installed. If no automatic device is installed, temperatures should be read at regular intervals and the readings recorded in a log book.

CCP-Note: Maintenance of the desired temperature in chilling rooms is extremely important. Accidentally the cooling equipment may fail with consequent temperature rise in the room and in the products. To detect such temperature failures, records - automatic or manual - should be taken and the results reported to the manager who will, if necessary, inform the inspector for him to decide what action to be taken.

6.7 Transport of the End Product

6.7.1 Means of transport of containers should comply with the following conditions:

6.7.1.1 All internal finishes should be made of corrosion-resistant material, be smooth, impervious and easy to clean and disinfect. Joints and doors should be sealed so as to prevent the entry of pests and other sources of contamination.

6.7.1.2 The design and equipment should be such that the required temperature can be maintained throughout the whole period of transport. Where transportation is under refrigeration it is desirable to install temperature recorders. If no automatic device is installed, temperature should be read at regular intervals and the reading recorded in a log book.

6.7.1.3 Vehicles intended for the transport of meat products should be equipped in such a manner that the meat products do not come into contact with the floor.

6.7.2 Meat products should not be carried in any means of transport which is used for conveying live animals.

6.7.3 Meat products should not be carried in the same means of transport as other goods in a way which may adversely affect the meat products.

6.7.4 Meat products should not be placed in any means of transport which are not clean. If necessary it should be cleaned and disinfected before loading.

6.7.5 Every effort should be made to prevent changes in temperature of frozen meat products at any time during storage and transport but where accidental thawing takes place, the meat products should be examined and evaluated by the inspector before any further step is taken.

6.8 Sampling and Laboratory Control Procedure

- 6.8.1 In addition to the routine control carried out by the inspection services, it is desirable that each establishment should have access to laboratory control of the meat products processed. The amount and type of such control will vary with the type of meat product as well as the needs of management. Such control should reject all meat products that are unfit for human consumption.
- 6.8.2 Laboratory facilities should be available for the purpose of monitoring hygiene. This could be the establishment's own laboratory or an official laboratory or any other appropriate laboratory.
- 6.8.3 The inspector should have access to all information relevant to his duties and responsibilities.
- 6.8.4 Samples of the production should be taken to assess the safety and hygiene of the meat product.
- 6.8.5 Laboratory procedures used should preferably follow recognized or standard methods in order that the results may be readily interpreted.
- 6.8.6 Laboratories checking for pathogenic microorganisms should be well separated from meat production area.

SECTION VII - END PRODUCT CRITERIA

- 7.1 Criteria such as microbiological, chemical or physical may be required depending on the nature of the meat product. However, application of the hazard analysis critical control point concept should be more effective than intensive end product testing in ensuring that the requirements of this Code are followed and its purpose achieved. If end product testing is carried out, criteria should include sampling procedures, analytical methodology, specifications and limits for acceptance.
- 7.2 To the extent possible in good manufacturing practice the products shall be free of objection- able matters.
- 7.3 When tested by appropriate methods of sampling and examination, the products:
 - (a) shall be free of pathogenic microorganisms in numbers representing a hazard to health;
 - (b) shall not contain any substances originating from microorganisms in amounts which may represent a hazard to health; and
 - (c) shall not contain any other poisonous or deleterious substances in amounts which may represent a hazard to health.
- 7.4 The products should comply with the requirements for pesticide residues and food additives laid down by the Codex Alimentarius Commission.

ANNEX A

PRESERVATION OF MEAT PRODUCTS IN HERMETICALLY SEALED RIGID CONTAINERS

For details concerning preservation of shelf-stable meat products in hermetically sealed metal containers, see: Recommended International Code of Hygienic Practice for Low-Acid and Acidified Low-Acid Canned Foods. (CAC/RCP 23-1979).

In preserving meat products in hermetically sealed rigid containers the critical control points are:

- (a) Heat processing. The products should be processed so that they present no public health hazard and withstand spoilage during subsequent storage, transport and sale. The temperature and duration of processing of specific formulations should be based on the recommendations of technical specialists competent in canning technology.
- (b) Supervision of processing. Processing should be supervised by technically competent personnel and be subject to check by the inspector.
- (c) Seam control. Control of can seams should be made regularly during production, and this, with processing records adequate to identify the processing and history of each batch of product, should be kept by the management and made available to the inspector.
- (d) Water control. Only potable water should be used for washing of empty containers or for the cooking and cooling of any hermetically sealed container. Where re-circulated water is used for cooling heat processed containers it should be filtered and if necessary treated by the addition of Chlorine. Such water, depending upon the potential degree of non-potability, should contain from two to five parts per million of residual chlorine at the discharge end of the cooler. Any other acceptable disinfectant may be used in effective concentration in place of chlorine.
- (e) Treatment of containers. Rough treatment of containers both before and after processing should be avoided to prevent the possibility of contamination of the processed products. If it is essential to handle wet cans, personnel should do so exercising hygienic precautions. Belts, runways, and other can conveying equipment should be maintained in a clean condition and good repair.
- (f) Storage of meat products. Canned meat products not subjected to a heat treatment that will make them shelf-stable at ambient temperature should always be stored, transported and sold under chilled conditions.

ANNEX B

PRESERVATION OF NON-SHELF-STABLE MEAT PRODUCTS HEAT TREATED PRIOR TO PACKAGING

- (a) In establishments in which meat products are heat treated prior to packaging a chill-room should be available for holding raw unprocessed meat on its reception and for storing boned, cut or otherwise raw unprocessed meat

which is not transferred directly to the sections in which it is cooked or otherwise processed.

Adequate means for rapidly chilling and storing any cooked meat product to an internal temperature of not more than 7°C at the point of slowest refrigeration should be available.

- (b) After preparation the product should be kept chilled until final cooking. The temperature and duration of the cooking process for these heat treated meat products should be such that the heat treatment alone or in combination with other preserving processes is sufficient to eliminate the health risk from vegetative forms of pathogenic organisms. Processes should be supervised by technically competent personnel and checked as necessary by the official agency having jurisdiction. Processing records adequate to identify the processing and history of each batch of products should be kept by the management and made available to the official agency having jurisdiction.

CCP-Note: Experience has shown that the main risk to public health from such meat products is due to food-poisoning organisms such as salmonellae, staphylococci and Clostridium perfringens. To reduce this risk a heat treatment should ensure the inactivation of vegetative organisms. This would require proper time-temperature conditions, which should be monitored.

- (c) At all stages following cooking, manual handling of exposed meat products should be kept to an absolute minimum and, if at all possible, should be replaced by mechanical methods.

CCP-Note: After heat processing the meat product is especially sensitive to microbial contamination from hands and from surfaces with which they come into contact. Particularly important will be contamination from hands with e.g. staphylococci. Use of disposable gloves by personnel handling such meat products should be encouraged.

- (d) Cooked meat products Should be rapidly chilled in a hygienic manner to an internal temperature of not more than 7°C. If water is used for cooling any cooked meat product it should be of potable quality and may be re-circulated if treated and returned to potable quality.

CCP-Note: Rapid cooling is essential to inhibit growth of any organisms that have survived cooking, e.g. Clostridium perfringens, or that have contaminated the meat product after cooking. The potability of the water should be checked in accordance with CCP-Note to para. 3.5.1.1. Cooling temperatures should be frequently, if not continuously, monitored.

- (e) Packaging of meat products preserved by heat treatment should be carried out without undue delay in a separate room.

CCP-Note: Particular care must be taken to prevent cross-contamination from raw, unprocessed meat. Where packaging follows slicing and cutting these operations should preferably take place in the same room under satisfactory conditions of hygiene. Packaged finished products should be inspected to ensure the detection and rejection of visibly defective packages.

- (f) Meat products heat treated prior to packaging should be stored in chilled accommodation and protected from contamination.

CCP-Note: Only chill storage and protection from contamination of meat products packaged after heat treatment will ensure the expected shelf-life and protect against public health hazards. Temperatures in cooling rooms should be frequently, if not continuously, monitored.

- (g) Adequate laboratory facilities should be available for the purpose of making regular microbiological examinations.

CCP-Note: Such microbiological monitoring would not only include the meat products itself, but also meat contact surfaces to ensure that cleaning and disinfecting procedures are satisfactory.

ANNEX C

PROCEDURES FOR INVESTIGATIONAL MICROBIOLOGICAL EXAMINATION OF MEAT PRODUCTS IN HERMETICALLY SEALED CONTAINERS

Explanatory memorandum

1. To control the safety and stability of large consignments of meat products in hermetically sealed containers by microbiological tests would require examination of more containers than laboratory facilities and personnel are likely to be able to handle, and would lead to considerable wastage of product. Detection of botulism through microbiological testing is unlikely.
2. Better knowledge of safety and stability can be gained from data on production control and heat treatment provided by the processing establishment, and of the water supply. Reliance may also be placed on knowledge of the product of an establishment gained from experience of previous shipments from that source. If such data are adequate and satisfactory, testing may be dispensed with. The controlling authority might nevertheless decide to carry out periodic examinations of shipments presented at the port of entry in cases where factory data are satisfactory.
3. The integrity of hermetically sealed containers is critical to the safety of the product. Where shipments are examined, a careful examination should therefore be made for container integrity.
4. Where shipments are examined care should be taken not to damage the containers, as this could place safety of the consignment at risk. Damage to the containers in a sample could lead to unjustified detention of a consignment.
5. As indicated in 1., the probability of finding a microbiological hazard leading to a public health risk (e.g. botulism) by sampling is remote. For shelf-stable heat-processed meat products this document merely indicates the probabilities of obtaining defective samples in lots with different proportions of these being defective. The sampling procedures are investigational, i.e. when there is a reason to suspect improper processing or risk of post-processing contamination. Examinations could be performed on cans taken directly from the lot on arrival in a port of entry or after an adequate incubation period. For non-shelf-stable heat-processed meat products a sampling plan involving microbiological examinations and guidelines is proposed. The main reason for suspicion for these products is temperature abuse after processing, during transportation and storage, and so a sampling plan involving a

smaller number of samples will suffice. However, this plan should also be used when there is a reason to suspect improper processing.

SECTION 1 - Scope

1. These procedures are guidelines to be used in international trade for microbiological investigational purposes for lots of meat products in hermetically sealed containers, which have been heat-treated after packaging.
2. For shelf-stable products the number of samples to be taken and the method of examination are assessed by the inspecting agency. The document contains probabilities of obtaining defective samples in a lot. Detection of botulism through microbiological testing is unlikely.
3. For non-shelf-stable heat-processed meat products a sampling plan involving microbiological examinations and guidelines is proposed.
4. All these procedures are intended to be used in cases, where the controlling authority has reason to suspect that the lot is unsatisfactory, and not for routine purposes.

SECTION II - References

1. Recommended International Code of Hygienic Practice for Low-Acid and Acidified Low-Acid Canned Foods (CAC/RCP 23-1979).
2. Annex A to this Code.

SECTION III – Procedure

A. Shelf-stable meat products, heat-treated after packaging

1. The inspecting agency will assess the number of samples to be taken according to the expected hazard and the feasibility of inspecting the number of samples required. The following table is meant to guide the inspecting agency in its choice of sampling plans, but is in no way restrictive, as numbers of samples outside the range given, or between the numbers may be useful for different purposes, where investigational sampling is employed.

The probability of obtaining one or more defectives in a sample of (n) subsamples (sample units) with proportion (p) of the lot defective

Number of sample units (e.g. cans) examined per sample	Proportion of the lot that is defective			
	0.01	0.001	0.0001	0.00001
	Probability of detecting one or more defectives			
200	0.87	0.18	0.02	0
1000	1.00	0.63	0.10	0.01
2000	1.00	0.86	0.18	0.02
3000	1.00	0.95	0.26	0.03
4000	1.00	0.98	0.33	0.04
5000	1.00	0.99	0.39	0.05

B. Non-shelf-stable meat products, heat-treated after packaging

1. For non-shelf-stable meat products five containers are inspected visually and the contents subjected to microbiological examination. Depending on the results obtained and any other relevant information on the lot it may be passed, detained * or set aside for further investigation.

* See definition of "detain" in the main Code.

2. Technique:

- (a) Sample 5 containers from the warmer places in the lot and examine for visual defects.
- (b) Identify the 5 sample containers mentioned under (a) in a proper manner and send them to a laboratory for microbiological examination. The transportation should take place under refrigeration, 10°C or less.
- (c) In the laboratory draw test portions from the 5 sample containers with aseptic precautions, so as to obtain one test portion from the centre of each container and one test portion from the periphery of each container.
- (d) Examine the 2 x 5 test portions for aerobic plate count. Use ISO Standard (IS 2293) - Aerobic Count at 30°C (Reference Method).
- (e) Detain if any of the 10 test portions has an aerobic plate count exceeding 10.000 per gramme. Also detain if test portions from the centre or the periphery of 3 or more of the containers show an aerobic plate count higher than 1000 per gramme.
- (f) In case of detention an investigation for specific organisms might be indicated.

PRESERVATION OF SHELF-STABLE CURED MEAT PRODUCTS IN
CONSUMER-SIZE HERMETICALLY SEALED CONTAINERS

(At Step 3 of the Procedure)

(Annex D to Code of Hygienic Practice for Processed Meat and Poultry Products,
ALINORM 85/16, Appendix II)

In preserving shelf-stable cured meat products in hermetically sealed containers the following factors are critical: salt and moisture content, ingoing nitrite content, microbial contamination of meat and non-meat ingredients, the thermoprocess and the integrity of the container. Shelf stability is assured by partial thermodestruction of the bacterial spore contaminants and subsequent inhibition of the surviving spores. The inhibitory action of the safety factors is synergistic.

By convention, the effective heat treatment of a product is expressed as F_0 . F_0 is the equivalent, in minutes at 121.1°C, of heat with respect to its capacity to destroy spores. A value of $F_0 = 1$ is equivalent to 1 minute at 121.1°C at the coldest (centre) point of the container. Also, a heat treatment for 10 minutes at 111.1°C or for 100 minutes at 101.1°C is equal to $F_0 = 1$.

In preservation of meat products in hermetically sealed containers in general there are also other critical control points - reference is made to the Recommended International Code of Hygienic Practice for Low-Acid and Acidified Low-Acid Canned Foods, and to Annex A of this Code.

- a) The raw meat ingredients should before being used for the production of shelf-stable cured meat products be inspected and only used if found hygienically acceptable.
- b) The microbial contamination of the raw meat ingredients should be verified periodically. Menu levels in excess of 3 clostridial spores/g or of 100 mesophilic bacillary spores/g should be sufficient cause for a thorough examination of the production chain for potential sources of contamination or for application of a more severe heat treatment.
- c) A microbiological guideline for the mesophilic spore count for spices should be 5×10^3 /g.
- d) The contribution of non-meat ingredients other than spices to the contamination of the final raw product should be collectively within 50 mesophilic spores/g (microbiological guideline).
- e) The upper limit of ingoing nitrite should not be set at a level below 150 mg/kg.
- f) Provided the requirements in paragraph a) - e) are complied with, the following combinations of brine concentrations ($\%NaCl \times 100/\%NaCl + \% H_2O$) and thermoprocesses, in conjunction with 150 mg/kg of added sodium nitrite, may serve as broad guidelines in the manufacture of safe shelf-stable luncheon meats and chopped meats, ham (and shoulder) and sausages in hermetically sealed containers:

Luncheon meats and chopped meats:

3.0-4.0 % brine/1.0-1.5 F₀
4.0-4.5% brine/1.0 F₀
4.5-5.0 % brine/0.5-1.0 F₀
5.0-5.5 % brine/0.5 F₀

Ham and shoulder:

3.3 % brine/0.3-0.5 F₀
3.7 % brine/0.2-0.3 F₀
4.0 % brine/0.1-0.2 F₀

Sausages:

2.5 % brine/1.5 F₀

These proposed combinations are subject to appropriately controlled levels of bacterial spores in the raw products.

g) If less stringent combinations of safety factors are to be applied, these should be based on extensive plant experience, and/or experimental work, and on standards of hygiene to ensure minimum levels of bacterial spores.

h) The brine concentration and the ingoing amount of nitrite should be verified periodically.

i) The heat processing equipment should be equipped with relevant alarm systems, the thermal process should be measured continuously, and the obtained F₀-value in the center of at least three containers in different sites of the heat processing equipment should be verified periodically.

PROPOSED DRAFT GUIDELINES FOR THE USE OF VEGETABLE PROTEIN
PRODUCTS (VPP) AND MILK PROTEIN PRODUCTS (MPP) IN PROCESSED MEAT
AND POULTRY PRODUCTS

(At Step 5 of the Procedure)

1. SCOPE

To provide guidance for the use of VPP and MPP in processed meat and poultry products by establishing:

- (i) principles for the appropriate use of VPP and MPP in processed meat and poultry products, and
- (ii) principles for the appropriate labelling of processed meat and poultry products containing VPP and MPP.

2. DEFINITIONS

Milk Protein Products (MPP): To be elaborated.

Vegetable Protein Products (VPP): Vegetable products which have been processed in a manner which results in a significant increase in the protein content of the final product, and that conform to applicable standards described by the Codex Committee on Vegetable Proteins.

3. BASIC PRINCIPLES

3.1 The presence of VPP and MPP in processed meat and poultry products should be clearly indicated on the label.

In this connection processed meat and poultry products containing VPP and MPP should be labelled in accordance with the Codex General Standard for the Labelling of Prepackaged Foods, with the proviso that:

- (a) A complete list of ingredients should be declared on the label in descending order of proportion.
- (b) The ingredient statement should contain the source (e.g., pea, groundnut), and where appropriate product type and processed form (e.g., textured, spun) of each vegetable protein ingredient and each milk protein ingredient in the meat or poultry product.

4. USES OF VPP AND MPP FOR FUNCTIONAL AND OPTIONAL PURPOSES

4.1 VPP and MPP may be used for functional purposes, or as optional ingredients, provided their use does not result in any replacement of meat and poultry content required by a compositional standard.

4.2 For the purpose of defining VPP and MPP as a functional or optional ingredient the level of VPP and MPP should be calculated on a dry weight basis in the final product. The actual level of use will vary according to the nature of the added protein product and of the product concerned.

4.3 The use of VPP and MPP as a functional or optional ingredient should be regulated in the same way as other functional or optional ingredients with no required change in the name of the product. However, a declaration of the presence of VPP and

MPP should be given in connection with the name of the product if its omission would mislead the consumer.

5. USES OF VPP AND MPP IN PARTIAL SUBSTITUTION OF THE MEAT OR POULTRY

5.1 VPP and MPP may be used to partially substitute the meat or poultry in any processed meat or poultry product, provided that the presence of VPP and MPP is clearly indicated on the label.

5.2 When VPP or MPP partially substitutes for the protein of a processed meat or poultry product, the name of the mixture should include the established or common name of the processed meat or poultry product being substituted and the term, "vegetable protein product" or "milk protein product" in descending order of predominance by weight (hydrated basis) in the mixture connected by the word, "and". The name of the source of the VPP or MPP may be used instead of the word "vegetable" or "milk".

or

PROPOSAL OF THE U.K.

5.2 A name which has been established for a meat or poultry product in a Codex standard may not be used as part of the name of the meat or poultry product where some or all of the protein content of that food has been replaced by vegetable protein or milk protein.

METHODS OF ANALYSIS INCLUDED IN CODEX STANDARDS
FOR PROCESSED MEAT AND POULTRY PRODUCTS

(All ISO references are the most current)

<u>Parameter to be measured</u>	<u>Method</u>	<u>Type of method</u>
Nitrite	ISO-2918 - Meat and Meat Products Determination of nitrite content ¹ (Reference method)	II
Total fat content	ISO-1443 - Meat and Meat Products 1 Determination of total fat content	I
Nitrogen/Protein	ISO-937 - Meat and Meat Products I &. 11 Determination of nitrogen content	I & II
Nitrate	ISO-3091 - Meat and Meat Products II Determination of nitrate content ¹⁾	II

1) The method is under revision by ISO.

PROCESSING OF SHELF-STABLE CANNED CURED MEATS

Consultation Paper prepared by Dr. A. Hauschild (Canada)

At the twelfth session of the Codex Committee on Processed Meat and Poultry Products, the Committee agreed that there was a need to review the current situation concerning processing of canned, cured, heat treated, shelf-stable meat products with respect to both the technological and the microbiological aspects. The Committee, therefore, recommended that a consultant should prepare a paper on the subject for consideration of the Committee at its next session.

The terms of reference for the study were as follows:

1. To review the literature and good commercial practices as regards:
 - (a) The microbiology, and in particular the frequency of sporeforming organisms, including those pathogenic to man, in meat and ingredients to be used for canned cured meat and poultry products.
 - (b) The effect of heat processing of meat and poultry products on the destruction and/or inactivation of microorganisms.
 - (c) The effect of salt and/or nitrite, and where relevant other chemical and physical factors on the inhibition of microorganisms including those pathogenic to man.
 - (d) The combined effect - whether antagonistic, additive or synergistic - of the factors mentioned under a), b) and c).
2. To review legislation and existing recommendations of technical specialists competent in canned meat technology - especially with regard to shelf-stable, cured meats - with respect to temperature and duration of processing of specific shelf-stable cured meat formulations, whether in rigid or flexible containers.
3. To propose recommendations, either in the form of a code of practice or as guidelines, and as specific as possible, taking into consideration the known interactions between the microbiology of the raw material and ingredients, the concentration of salt, nitrite and other chemical and physical parameters, and the heat processing. Recommended heat processes should be related to the type of product, the size and shape of the container, the type of heat processing equipment, and the expected storage conditions of the heat processed product. These recommendations should at least comprise those products already covered by Codex standards.

As other important parameters such as container closure, the microbiology of the cooling water, etc., already are covered by existing codes, no detail reference to these factors are necessary, unless it is felt that they may significantly interact with the microbiology of the raw material and ingredients, the concentration of preservatives, the recommended physical parameters and the heat processing.

1. INTRODUCTION

In accord with the terms of reference, this report will be focused on safety and stability aspects that are specifically relevant to shelf-stable canned cured meats

(SSCCM). These aspects are associated mainly with the control of bacterial spores. In contrast to non-cured canned meats whose safety depends on the complete destruction of spores during the thermoprocess, bacterial spores in SSCCM are controlled by a combination of thermo-destruction and subsequent inhibition. Most other aspects pertinent to the safety and stability of SSCCM have been dealt with in the draft codes of Hygienic Practice for Low-acid and Acidified Low-acid Canned Foods (Alinorm 79/13A, App. IV) and of Hygienic Practice for Processed Meat and Poultry Products (Alinorm 83/16, App. IV), e.g. control of hygiene, thermo-process, seam integrity, post-process contamination, container purity, cooling water, etc. These will not be discussed here.

This report deals exclusively with canned cured meats that are (a) heat-processed and (b) processed to full shelf stability. Shelf stability may also be attained by radiation (54), but this process has not as yet been approved for commercial production in any country. Likewise, SSCCM-related products such as "Three quarter conserves" which are to be stored at or below 15°C and for a limited period only (22) have not been included. Although they have been popular for some years in Central Europe, apparently without incidents of illness, there is a general reluctance in licensing these products because actual storage temperatures often exceed 15°C, both at retail and in the home (33).

Microbial development in canned meats, cured and non-cured, originates either from surviving spores inherent in the product, or from post-process contamination (PPC). Serious illnesses from inherent spores are essentially limited to botulism, while illnesses from PPC are most commonly staphylococcal intoxications, followed at some distance by salmonellosis, perfringens enteritis, botulism and miscellaneous infections (46). PPC-associated problems are common to all shelf-stable canned meats and have been dealt with before (Alinorm 79/13A, App. IV). Therefore, the problems to be discussed primarily in this report are associated with the control of microbial spores inherent in the product, namely of Clostridium botulinum for safety, and of spoilage causing bacilli and clostridia for stability.

The safety record of SSCCM with respect to botulism is nearly unblemished, except for a single confirmed outbreak from underprocessed canned cured liver paste which occurred in 1963, both in the province of Quebec and in New York State, and involved a total of four cases with one death (48, 49). On the other hand, little reliable information is available on the frequency of spoilage.

The present discussion focuses on cured meats in cans, rather than flexible pouches, simply because very little information could be obtained on cured meats in pouches. However, apart from PPC-associated problems, the conditions for adequate protection of shelf-stable cured meats in cans should be readily applicable to pouches.

Published information on the safety and stability of SSCCM is scanty and deals mainly with the control of clostridia in luncheon meats. Additional, unpublished research has been done in this field, but the results are considered proprietary by the funding industry and are not shared with the research community at large. In lieu of sufficient research data, the present assessment had to rely heavily on commercial practices and experience. In general, the response of meat processors and their associations to the request of sharing this experience has been of the "all or nothing" type, i.e., full cooperation or none at all.

2. BASIC CONSIDERATIONS IN THE QUANTITATION OF SAFETY AND STABILITY

Safety and stability of shelf-stable canned cured meats are functions of the salt (NaCl) and nitrite concentrations and of the heat process. Compared to canned products whose safety depends on the heat treatment alone (generally referred to as "low-acid canned foods"), the thermoprocess for SSCCM is relatively mild and allows the survival of a significant number of bacterial spores. These in turn must be adequately inhibited from outgrowth by the salt/nitrite combination; the effectiveness of this combination depends largely on the preceding heat process. For SSCCM to attain the same degree of safety as low-acid canned foods, the difference in spore destruction must be fully compensated for by inhibition.

For low-acid canned foods, safety from the survival and outgrowth of *C. botulinum* is considered guaranteed by the application of the "botulinum cook" which is the heat process resulting in the destruction of $12 \log_{10}$ units of *C. botulinum* spores, or the reduction of a hypothetical number of 10 spores to a single surviving spore. This process, also known as the 12D treatment, is completed after about 2.4 minutes at 121°C (250°F); at higher or lower temperatures, this period is shortened or prolonged. Since the spore destruction proceeds along a logarithmic straight line (like a first-order chemical reaction), the time required for a 1D (or 90%) destruction at 121°C is $2.4/12 = 0.2$ minutes ($D_{121} = 0.2$ min).

The efficacy of the heat process above or below 121 °C is governed by the z value (10°C for *C. botulinum* spores) which is the temperature interval that causes a ten-fold increase or decrease in the rate of spore destruction, e.g., $D_{131} = 0.02$ min; $D_{111} = 2.0$ min.

It should be pointed out that the above considerations are based on idealized destruction rates for *C. botulinum* spores. In reality, the destruction curves (at constant temperatures) may have extended shoulders and/or tails (19) where the spore destruction proceeds at a slower rate than in the log-linear part of the curve. Also, the D and z values of *C. botulinum* spores are by no means uniform.

By convention, the effective heat treatment of a product is expressed as F_0 . A value of $F_0 = 1$ is the equivalent to 1 minute at 121°C at the coldest (centre) point of the can. Thus, heat treatments of 2.4 minutes at 121°C, 24 minutes at 111°C and 240 minutes at 101°C would all be expressed as $F_0 = 2.4$.

How can the safety of a canned meat be expressed in quantitative terms when the destruction of spores is largely compensated for by inhibition?

Pivnick and Petrasovits (31) suggested the following equation: $Pr = D_s + I_n$, where Pr = protection, D_s = destruction by heat and I_n = inhibition by the combined, synergistic effects of the various safety factors.

In the safety assessment for SSCCM it is irrelevant whether the spores are destroyed or merely inhibited. This is also demonstrated by equation $Pr = D_s + I_n$. Accordingly, the approach of Hauschild (13) in calculating product safety makes no distinction between destruction and inhibition. Its primary aim was the evaluation of existing experimental data, but the method is also applicable to commercial data (see chapter 6.4). The basic formula $P = MPN/s$ estimates the probability (P) of individual spores to successively survive the heat process, overcome the inhibition, and grow out and produce toxin. MPN is the most

probable number of spores capable of toxin production per experimental can, and s is the number of inoculated (or estimated) spores per can. MPN in turn is calculated as $MPN = \ln(n/q)$, where n is the total number of experimental cans, and q the number of non-toxic cans. Thus, if 100 experimental cans were inoculated with 1000 spores per can and processed, and if 5 cans showed growth and toxin formation, then P would be $\ln(100/95)/1000 = 5.1 \times 10^{-5}$.

The reciprocal of P , $(1/P)$, expresses the number of total spores for each single spore capable of toxin production. $\log 1/P$ is therefore identical to $\text{Pr}(D_s + \ln)$ and analogous to the number of D units for low-acid canned foods.

No safety estimate for commercial products is complete unless the natural contamination with C. botulinum spores is considered. While $\log 1/P$ relates to the numbers of spores effectively controlled, the numbers of commercial cans effectively protected may be expressed as $\log 1/(P \times i)$, where i = incidence, of C. botulinum spores per can. If, in the above example of $P = 5.1 \times 10^{-5}$ ($\log 1/P = 4.3$), we assumed contamination of a given commercial product with 0.1 spores per can, then $\log 1/(P \times i)$ would be 5.3j or: out of 200,000 cans marketed, one can would be expected to allow toxin formation.

Industrial data may be evaluated by essentially the same calculations. The equivalent to $\log 1/(P \times i)$ would be the decimal number of cans marketed per number of cans causing illness. These values are designated here arbitrarily as SU (safety units). Thus, if 10 cans were marketed without causing illness, SU would be $\log(10 / <1) = >7$ (see Table 10).

It should be pointed out that $\log 1/(P \times i)$ and SU values are not strictly comparable for the following reasons: (a) while experimental incubation periods are indefinite, the turnover of commercial cans is relatively fast; (b) toxic experimental cans are nearly always detected, while only a fraction of toxic commercial cans would be expected to be consumed and lead to illness; the rest would be rejected because most toxic cans show some signs of deterioration. $\log 1/(P \times i)$ values therefore would tend to be somewhat lower than SU values.

3. FACTORS RELEVANT TO THE SAFETY AND STABILITY OF SSCCM

3.1 Additives, heat, pH, oxidation-reduction potential

The three main factors: salt, nitrite and heat and their synergistic interactions in the inhibition of spores (43) will be dealt with in detail in subsequent chapters.

Additional factors that may affect safety and/or stability are: pH, oxidation-reduction (redox) potential, ascorbate/isoascorbate, nitrate and polyphosphates. The effects of pH (in the 6.0-6.7 range likely to be encountered in SSCCM) and the redox potential on C. botulinum in these products remain to be elucidated. At present, they are rarely considered in the industrial process. The role of ascorbate/isoascorbate in SSCCM also needs to be clarified. Isoascorbate at 200 mg/kg enhances the anti-botulinal effect of nitrite in pasteurized cured meats, probably through iron sequestration, while at higher concentrations of isoascorbate the effect may be reversed, possibly by accelerated depletion of nitrite (50, 51). The ascorbate or isoascorbate level in commercial SSCCM is often in the 400-500 mg/kg range and may be detrimental to the control of C. botulinum. Nitrate (42, 43) and polyphosphates (34) do not seem to measurably improve the safety of SSCCM either. Nitrate was actually found to enhance

spoilage from the genus Bacillus (42) which may be attributable to the function of nitrate as a hydrogen acceptor.

3.2 Contamination of SSCCM ingredients with bacterial spores

Any minimum safety criteria for the production of SSCCM are likely to be inadequate if the meat ingredients are heavily contaminated with spores. Periodic analysis of the meat supply is necessary, therefore, for quality assurance. Meats have been analyzed for the spores of C. botulinum, total clostridia, putrefactive anaerobes (PA), and of bacilli.

In contrast to low-acid canned foods where spoilage is caused by the heat-resistant, largely thermophilic microflora (26), spoilage of SSCCM is not limited to any particular group of sporeformers.

The reported outbreak from canned cured liver paste (see Chapter 1) was attributed largely to a build-up of C. botulinum spores in the meat. However, routine analysis of meats for C. botulinum spores would be impractical because (a) the low incidence of such spores would require large numbers of samples and large volumes of material, and (b) the analyst would be exposed to undue hazards. Estimates of the incidence of C. botulinum spores in meats are in the range of 0.1-1/kg (11, 14, 15, 21, 38). Table 1 summarizes a number of studies for the enumeration of PA and clostridial spores. Although, in theory, counts for total clostridia which include the non-putrefactive as well as the putrefactive species should be higher than PA counts, both types of spore counts are considered here together because (a) the errors inherent in the methods are likely to exceed the fraction of non-putrefactive clostridia, and (b) clostridial counts by current methods are incomplete; these methods are based on sulfite reduction indicated by a black precipitate, yet several clostridial species fail to produce a sulfide precipitate (10, 37). Table 1 shows that the median counts were consistently below 3/g. The weighted mean, calculated on the basis of the number of samples analyzed in the studies, was 2.5 spores/g before processing. However, individual counts may be as high as 50/g.

The means of mesophilic aerobic spore counts are generally in the order of 20-100/g, but maximum levels may be in the 10^3 - 10^4 /g range (1, 4, 24, 25, 35).

The microbial quality of meats destined for SSCCM can be assured by enumerating the spores of either clostridia (or PA) or of bacilli. Clostridial spore counts have the advantage that they likely reflect more accurately the incidence of C. botulinum, while the enumeration of bacillary spores has the advantage of a simpler procedure: their numbers allow direct plate counting, while the low numbers of clostridia (or PA) require an MPN procedure.

The surveys quoted above suggest a ratio of 10 :1 in the incidence of PA spores to C. botulinum spores in raw meats. A similar ratio might be expected in the frequency of putrefactive spoilage to toxin production by C. botulinum in SSCCM, but we would have to assume that PA and C. botulinum spores are both heat-killed and inhibited at comparable rates. Although there is no adequate base for such an assumption, the frequency at which putrefactive spoilage occurs must be regarded, on a relative scale, as an indicator (or warning signal) for the potential of canned cured meat becoming toxic.

The microbial spore load of cured comminuted meat products is affected also by non-meat ingredients which may include spices, proteins, flour, starch and sugar.

Mol and Timmers (24) found twice the number of clostridial spores in luncheon meat with untreated spices as in meat with decontaminated spices. Existing and potential methods for the decontamination of spices have been reviewed in document CX/PMPP 82/11 and discussed at the 12th session of the Codex committee on processed meats and poultry products (Alinorm 83/16, 217-224). The predominant method currently in use involves the fumigation of spices with ethylene oxide (ETO). In contrast to heat, the ETO treatment results in the destruction of spores and vegetative cells at comparable rates (23, 52, 53). Industrial decontamination processes (at 600 + 100 ml ETO/m for about 6 h) generally result in reductions of the total bacterial numbers to 10^4 /g or less (6, 9, 12). A total-count limit of 10^4 /g for spices is recommended by ICMSF (18). Roughly 50% of these contaminants are bacillary spores. Treated spices therefore should generally contribute considerably fewer spores to the final product than the meat ingredients. Since clostridia seem to constitute less than 1% (28, 32) to the total count, clostridial spores of decontaminated spices are unlikely to add significantly to the clostridial spore load of SSCCM either. The contamination level of 10^4 /g may occasionally be exceeded (6, 12, 17).

A joint FAO/IAEA/WHO expert committee on food irradiation has endorsed the irradiation of spices as an alternative to the decontamination with ETO (CX/PMPP 82/11). Should the ETO treatment be replaced in the future by irradiation (8), the effect on the spore load of SSCCM would likely be insignificant. However, if current treatment methods with ETO or other fumigants were to be discontinued before acceptable alternative decontamination methods are in place, the safety of SSCCM could be seriously compromised.

Few surveys on the spore content of other non-meat ingredients of SSCCM have been published. From available data it would appear that the level of mesophilic spores in proteins of both plant and animal origin could be held to well below 10^3 /g (5, 7, 20). Spore contents of flour, starch and refined sugar from well-managed plants are within 100/g (29, 39, 44, 47).

How can the manufacturer of SSCCM assure that stability and safety are not compromised by contaminated non-meat ingredients? As a rule-of-thumb, manufacturers in at least one country aim for mesophilic spore counts within 100/g for ingredients used in fractions of 1% or more, and for spore counts within 1000/g for ingredients used in fractions of less than 1%, i.e., spices. In view of the foregoing discussions and of inherent spore levels of meats, a somewhat more lenient rule might be applied by limiting (a) the contamination of spices to a total aerobic plate count (the common assay in the spice industry) of 10^4 /g or to a mesophilic spore count of 5×10^3 /g, and (b) the mesophilic spore load of the remaining non-meat ingredients to such levels that they would collectively contribute not more than 50 spores/g in the final product.

3.3 Validity of Fo values in expressing the effective heat process for SSCCM

In calculating Fo for low-acid canned foods, a z value of 10°C is applied to account for the relationship between temperature and destruction rate of *C. botulinum* spores. The same z value is applied in calculating Fo values for SSCCM. However, these values cannot adequately express the effective thermoprocess to SSCCM, unless the same correlation exists between temperature and spore destruction on one hand and between temperature and spore inhibition, subsequent to the thermoprocess, on the other. We have no

basis for such an assumption. Preliminary work of Richards and Ranken (34) actually suggests that a thermoprocess for luncheon meat at 116°C to 0.7 Fo may be more effective than a process at 110°C to the same Fo. Therefore, we may be using the wrong z values in calculating Fo for SSCCM.

Since heat acts in synergy with other safety factors in the inhibition of *C. botulinum*, it is possible that z values applicable to SSCCM may depend on the concentrations of added preservatives.

3.4 Incubation of processed cans

Incubation of processed cans serves essentially the same limited function in both the control of low-acid foods and of cured meats, and will therefore not be discussed here in detail. In commercial practice, one or two cans per retort are commonly incubated at 35-37°C for 7-10 days; some companies have extended the incubation period to 3 weeks. It must be kept in mind that the incubation of cans in such small numbers and for relatively short periods can only serve to discover or confirm heavy post-process contamination or gross malfunctions of the retorting system and is not a substitute for rigorous production controls (Alinorm 79/13A, App. IV).

More meaningful results may be obtained when processed cans are incubated for investigational purposes, but this requires considerably larger numbers (Alinorm 83/16, App. III) and extended holding periods.

3.5 Potential hazards from nitrosamines

The potential for nitrosamine formation in cured meats is of considerable concern. Panalaks et al. (27) demonstrated up to 3 µg/kg of nitrosodimethylamine in a small number (3/16) of various shelf-stable canned cured meats, but this work was done before the discovery of preformed nitrosamines in spice mixtures with nitrite/nitrate (40) which universally led to regulations disallowing the use of such mixtures. Subsequent surveys (16, 40) of a variety of SSCCM for volatile N-nitrosamines were either negative or showed traces only (<1 µg/kg). It appears, therefore, that the presence of nitrite in this type of product does not subject the consumer to any undue risk from nitrosamines.

3.6 Shelf-stable canned pasteurized bacon

In contrast to the bulk of SSCCM products, pasteurized bacon is protected from microbial spores by inhibition alone. Products distributed in the United States have a minimum brine concentration of 7%. Combined with 120 ppm of nitrite, this salt concentration should ensure effective inhibition of clostridial and bacillary spores. While the low heat (see Chapter 5) is unlikely to have any effect in accentuating spore inhibition, the pasteurization process is certainly significant in the destruction and inhibition of the salt-tolerant non-sporing microflora. Since the establishment of a minimal brine concentration of 7%, canned pasteurized bacon has apparently had an excellent safety and stability record.

4. EXPERIMENTAL BASIS FOR THE SAFETY AND STABILITY OF SSCCM

Experimental work that would lend itself to a quantitative assessment of the stability of canned cured meats, with respect to the control of *C. botulinum* or putrefactive anaerobes (PA), has been summarized in Tables 2 and 3. The calculated values of log 1/P are a measure of decimal destruction plus inhibition

of clostridial spores and are thus equivalent to the number of D units in the thermal process of low-acid canned foods (see Chapter 2).

The work of Pivnick et al. (30) (Table 2) confirms the conclusions of others (41, 43) about the crucial role of the brine concentration (salt x 100/salt + H₂O) in the control of clostridial spores. At the lower brine concentrations of 3.6-4.6%, protection (log 1/P) at both levels of nitrite was between 7 and 8 log units. At 5.0-5.8% brine, log 1/P increased to between 8 and 9 without nitrite, 8 and >9.5 with 75 mg/kg nitrite, and to between 8 and >10 with 150 mg/kg of nitrite. It should be pointed out that the heat resistance of the spore preparations used in this work was relatively low: in M/15 phosphate buffer, pH 7.0 heated to Fo = 0.64, the minimum decrease in viable spores was 5 log units (30). Different spore preparations therefore might have resulted in significantly lower log 1/P values. The calculated log 1/P values have also been shown graphically (13).

The work of Silliker et al. (42) differs from that of Pivnick et al. (30) in that the canned luncheon meat contained no added spores and was examined for the development of putrefactive anaerobes (PA). Since the spore load is an essential factor in calculating log 1/P, a value approximating the average natural contamination with PA spores had to be assumed. From the surveys listed in Table 1, a mean concentration of 2.5 PA spores/g of meat was applied (see Chapter 3). The results (Table 3) indicate protection from putrefactive anaerobes by at least 4-5 log units in luncheon meats with 3.5% brine, 78 mg/kg nitrite input and a heat process to Fo of about 0.1. For finite results, the meat would have to contain additional spores prior to the heat process.

It is obvious that the D equivalent for shelf-stable canned cured meats is some log units below the minimum 12D treatment required for low-acid canned foods. However, despite their apparently lower degree of protection, SSCCM have had a nearly perfect safety record, and putrefactive spoilage occurs infrequently (21). It would be unrealistic, therefore, to aim for a 12D equivalent for this group of products. Riemann (36) estimated D equivalents of commercial canned cured meats in the range of 2-8 and attributed the safety record to a generally low contamination of meats with C. botulinum spores and a rapid turnover of canned cured meats. The lower end of the 2-8 range (36) is obviously unsafe, but the experimental data on SSCCM are not adequate to either establish a meaningful equivalent to the minimal number of D units (log 1/P), or to recommend minimal safety criteria for these products. Instead, we are largely dependent on the experience of the meat industry.

Table 4 summarizes some minimal criteria that have been proposed. Of the five recommendations, No. 3 and No. 4 are based on industrial practice. Formulation No. 4, however, is outdated: current commercial practices generally call for considerably less salt; nitrate, although permitted in several countries (see Table 5) is now rarely included in formulations. Recommendations 1, 2 and 5 (Table 4) are based on limited experimentation. The discussion of minimal safety criteria will be resumed in Chapter 6 on the basis of industrial experience.

5. REGULATORY ASPECTS

Of the various safety factors, only the amount of nitrite/nitrate added (or detectable in the finished product) is universally specified by national regulations (Table 5). Most countries regulate input of nitrite rather than residual nitrite. In view of the rapid decrease in residual nitrite during and after processing (21),

regulation of nitrite input would seem preferable, provided that adherence to maximum input levels can be assured. Nitrate input is still permitted in a number of countries but is rarely included in commercial formulations because it does not appear to contribute to the stability of the product.

The required heat process is generally specified in vague terms only. In the absence of uniform levels of salt, which is the most important safety factor next to heat, more specific heat requirements would make little sense. All regulations governing the heat process in essence require "commercial sterility", a state in which no surviving microorganism in the can is capable of reproducing under normal unrefrigerated conditions of storage and distribution. Excerpts from a few such regulations are listed here as examples:

"...by application of heat, sufficient, alone or in combination with other ingredients and/or treatments, to render the product free of microorganisms capable of growing in the product at non-refrigerated conditions..." (Proposed Rule - U.S. Fed. Register, vol. 49, April 12, 1984; pp. 14646-14647);

"...has been heat processed... at a temperature and for a time sufficient to prevent the formation of any bacterial toxins;" (Canadian Food and Drugs Act, 64A, June 26, 1980);

"...to a heat process which will ensure destruction of Clostridium botulinum unless they are so formulated that the growth of Clostridium botulinum is prevented." (Advisory Memorandum on Hygienic Production of Low Acid Canned Food, Dept. of Health and Social Security, London, 1983);

"The products packed in hermetically sealed rigid metal containers should be processed so that they present no public health hazard and withstand spoilage during subsequent storage, transport and sale. The temperature and duration of processing of specific formulations of canned meats should be based on the recommendations of technical specialists competent in canning technology" (International Code of Hygienic Practice for Processed Meat Products: CAC/RCP 13-1976).

Specific salt requirements have been formulated by USDA for the shelf stability of canned bacon (Labeling Policy Book, USDA, Food Safety and Inspection Service, April 1981):

(a) Canned pasteurized bacon must have a brine concentration of at least 7% for shelf stability. This product is pumped to 120 mg/kg nitrite, packed in 1-lb cans and heated to a centre temperature of about 70°C. Though popular as a camping item, it has a relatively small market.

(b) Canned pre-fried bacon must have a water activity not exceeding 0.87, a brine ratio (moisture/salt) not exceeding 9:1 or a brine concentration of at least 10%. This product is also pumped to 120 mg/kg nitrite, fried, rolled up, and packed in half-trays or 6-lb cans. It is sold in relatively large volumes to the army and the food service sector and merely requires microwave heating to be served.

Finally, a number of regulatory agencies require incubation of representative cans after the heat process. The EEC directive on health problems affecting intra-Community trade in meat products specifies a 7-day incubation period at 37°C or a 10-day period at 35°C for shelf-stable canned meats with a thermoprocess of less than 3.0 Fo (Official Journal of the European Communities

No. L26/85,31.1.1977). The U.S. Meat and Poultry Regulations (1974, p. 133) and the Canadian Meat Inspection Act (1979, p. 27) require 10-day periods at 35°C and 37°C, respectively, for all shelf-stable canned meats. The limited value of incubation tests was pointed out in Chapter 3.

6. INDUSTRIAL PRACTICE

6.1 Luncheon meats

Table 6 shows a number of characteristics of luncheon meats for which the overriding safety factors (brine concentration, nitrite input and thermo-process) could be obtained.

For 340-g cans, the minimum heat treatment was 60 min at 108°C. The corresponding brine concentrations were in the 4-5% range, and nitrite input levels were 120-150 mg/kg. Products from country I with similar brine and nitrite concentrations received a minimum of 0.7 Fo (70 min at 113°C).

Lower brine concentrations (3.5 + 0.5%) are listed for luncheon meats manufactured in country III, but these are compensated for by a more severe heat process (1.0-1.5 Fo).

For comparison, a few processes obtained from another major manufacturing country are listed in Table 7. The value of these data is limited because the moisture contents are missing. However, it appears that all of the luncheon meats listed here are relatively well protected; unless their moisture contents differ considerably from those of a neighboring country (I) with similar traditions in food manufacture, each of these products receiving less than the botulinum cook should have a brine concentration in the 4.5-5.0% range, with a minimal thermoprocess of 0.5 Fo.

6.2 Ham and shoulder

Characteristics of shelf-stable canned ham and shoulder are listed in Table 8. The lowest heat process was 30 min at 110 or 112°C for 1-lb cans. The corresponding brine concentration was 4% and the nitrite input 90-150 mg/kg.

The lowest brine concentrations were 3.3-3.4%, both for countries I and II. However, the Fo values of the corresponding heat processes differed by a wide margin. The highest heat process (1.0-1.5 Fo) was listed for ham from country IV.

In view of the mild heat processes that some cans of ham and shoulder receive (Table 8) the stability and safety of these products would appear marginal at best. This appearance, however, is contradicted by an unblemished safety record (see below). At present, this contradiction cannot be resolved because of two missing elements that are essential for a proper safety evaluation: the clostridial spore contamination of the products in question, and the potential of clostridial spores for outgrowth and toxigenesis in shelf-stable canned ham.

For additional stability, one manufacturer of shelf-stable ham (not listed in Table 8) incubates all processed cans for one month, with the rationale that spore germination is accelerated at the elevated temperature, and that germinated spores die off rapidly while nitrite is still present. In view of the relatively minor role of nitrite in canned cured meats, the beneficial effect of the incubation period would seem questionable.

6.3 Sausages

Shelf-stable canned sausages differ basically from luncheon meats and canned ham in their low salt content. The brine concentrations listed in Table 9 were in the 2-3% range. At these concentrations, salt is unlikely to contribute appreciably to the control of *C. botulinum*. Since the efficacy of nitrite is salt-dependent, its anti-clostridial effect is also likely to be relatively small (13). The safety of shelf-stable canned sausages therefore will rest mainly on the thermoprocess and the destruction of clostridial spores.

Most of the products listed in Table 9 received only a 5-7D treatment, but they too have an unblemished safety record. However, in contrast to luncheon meats and ham, they are commonly heated before being served. Although the heating will often be insufficient to completely destroy any preformed toxin, it is nevertheless a significant factor in the overall protection of canned sausages.

6.4 Safety estimates based on production volumes

Table 10 shows recorded production volumes for a number of individual commercial products over the number of years indicated. The estimated SU values expressing decimal numbers of cans over cans causing illness are listed in the last column. The values generally exceeded the log 7-8 range. The good safety record of commercial SSCCM is also demonstrated by the SU values calculated from export figures of country II (Table 10).

For luncheon meats, a safety level of at least 7-8 SU was attained by the following approximate combinations of brine concentration and thermal processing (with nitrite levels from 75 to 170 mg/kg):

3.0-4.0% brine/1.0-1.5 Fo

4.0-4.5% brine/0.9-1.3 Fo

5.0-5.5% brine/0.5 Fo

These combinations are somewhat higher than almost all the recommended values listed in Table 4. However, the last of the above combinations is nearly identical with recommendation No. 4 (Table 4) from which a combination of approximately 5.0% brine/0.5 Fo may be estimated.

A similar combination (5.0-5.5% brine/0.6 Fo) was examined by Pivnick et al. (30) for the control of *C. botulinum*. The number of D equivalents (log 1/P) estimated from their results were 8 to 9 with 75 mg/kg nitrite and 8 to greater than 10 with 150 mg/kg of nitrite.

According to Table 10, canned ham could be processed to the safety level of luncheon meats by the combination of

3.3% brine/0.2-0.6 Fo

The heat process recommended by Lechowich et al. (21) for shelf-stable canned ham is somewhat higher (1.3 Fo or 130 min at 110°C for 1.5-lb ham in 144 x 100 x 67 mm cans). On the other hand, the SU values for products 4 and 8 and for export figures from country II (Table 10) suggest that acceptable safety levels may be attainable with considerably milder thermoprocesses, yet without the need for compensating the heat reduction with much higher brine concentrations. The importance of contaminating spores in the stability of SSCCM suggests that the continued safety record of mildly heat-processed canned ham (such as

products 4 and 8, Table 10) will depend on rigid controls towards reducing microbial contamination to minimum levels. Since these levels are unknown and may not be universally attainable, a heat process for canned ham below 0.1 Fo cannot be recommended at this time. The safety of mildly heated ham will need further exploration.

Safety margins of over 7-8 SU may be attained for canned sausages by heat processing to 1.0-1.5 Fo (Table 10). As discussed above, the actual brine concentration in the vicinity of 2.5% may be irrelevant in the control of C. botulinum in these sausages.

7. CONCLUSIONS

7.1 The factors primarily responsible for the safety and stability of SSCCM are the brine concentration, the amount of ingoing nitrite and the thermo- process. Shelf stability is assured by partial thermodestruction of the bacterial spore contaminants and subsequent inhibition of the surviving spores. In shelf-stable canned pasteurized bacon the thermal destruction of spores is essentially nil; the spores are controlled therefore by inhibition alone. The inhibitory action of the safety factors is synergistic. Therefore, each change of formula involving salt, nitrite or the thermoprocess requires a careful adjustment of the other factors in order to retain the same degree of safety and stability.

7.2 Safety and stability of SSCCM are largely dependent on the microbial contamination of the raw product. The mean levels of clostridial spores and of mesophilic bacillary spores in raw meats destined for SSCCM are in the order of 2-3/g and 50-100/g, respectively. Non-meat ingredients, in particular spices and proteins, have the potential of significantly increasing the spore load of the final product, but surveillance and careful selection of non-meat ingredients will allow the manufacturer to hold the spores to levels that would not appreciably add to the contamination of the final product.

Non-comminuted cured meats (ham and shoulder) can likely be prepared with considerably lower spore numbers than comminuted meats, due to both the meat and non-meat ingredients; their cure mixes are comparatively free of microbial contaminants. Accordingly, commercially canned comminuted ham receives a much more severe heat treatment than the non-comminuted product.

7.3 In analogy to the number of D units expressing decimal destruction of C. botulinum spores in low-acid canned foods, the control of spores in SSCCM may be expressed as $\log 1/P$ which is the decimal destruction plus inhibition combined; P is the probability of the individual spore to develop and produce toxin during storage - against the odds of being heat-killed or inhibited.

The protection of commercial cans may be expressed as $\log 1/(P \times i)$ which is the decimal number of cans marketed for each can with the potential for toxin development; i is the incidence of contaminating C. botulinum spores per can.

7.4 Published experimental work is inadequate to reliably assess the safety of SSCCM. Instead, we have to lean heavily on industrial experience for such an assessment. In analogy to $\log 1/(P \times i)$, the safety of commercial cans may be expressed as SU (safety units), the decimal number of cans produced and marketed per can causing illness. For example, if 10 cans of a given product were marketed without a single can causing illness, safety could be expressed as $SU = \log(10^8 / <1) = > 8$.

- 7.5 On the basis of calculated SU values in the range of > 7 to > 8, combinations of the major safety factors could be recommended for the production of relatively safe shelf-stable canned cured meats (Chapter 8.2).
- 7.6 Because of the many factors involved in the control of microbial spores in SSCCM, any regulations governing all of these factors would be impracticably cumbersome. However, regulatory agencies could satisfactorily assure product safety if they had on record detailed information on product formulas regarding the essential safety factors, and access to the manufacturer's monitoring data on the critical control points including salt and moisture contents, microbial contamination of meat and non-meat ingredients, control of the thermoprocess and other pertinent parameters listed in Alinorm 83/16, App. IV. In most cases, these data would obviate the need for routine testing of the final product by regulatory agencies.
- 7.7 Of the main safety factors, only the amount of nitrite (ingoing or residual) is universally regulated. Where adherence by manufacturers to maximum input levels can be assured, regulating the nitrite input, rather than residual levels, would be preferable because residual nitrite declines rapidly during storage. However, analysis of residual nitrite may well serve as an indicator of compliance with regulated input levels, e.g., residues in the order of 75 mg/kg at any time after processing would suggest input levels in excess of 150 mg/kg. Current regulations for residual levels of 150 or 200 mg/kg (Table 5) do not take into account the rapid conversion of nitrite in SSCCM, and exceed by far the amount of nitrite required for shelf stability.
- 7.8 It would seem inappropriate at the present time to drastically reduce the legal upper limit of ingoing nitrite because (a) there is a dearth of research data on the stability and safety of SSCCM, and on the effect that large reductions in nitrite input might have; (b) nitrite has a demonstrated, albeit modest role in the control of bacterial spores in SSCCM; (c) occasional putrefactive spoilage of SSCCM would suggest that these are not overly protected; (d) the conversion of nitrite to nitrosamines in SSCCM is essentially nil.

Recent changes in the Danish regulations governing the use of nitrite in meats have taken the exceptional status of SSCCM into consideration: while the nitrite input into most cured meats was reduced to 60 mg/kg, the permitted input into SSCCM remained at 150 mg/kg.

- 7.9 Nitrate has little or no effect in the control of clostridia in SSCCM and may actually enhance spoilage by bacilli. Essentially all the major manufacturers no longer include nitrate in their formulas.
- 7.10 The 12 D concept is not applicable to the safety of SSCCM. Attempts to approach a level of protection from *C. botulinum* equivalent to a 12 D treatment would be unrealistic.
- 7.11 Fo values do not adequately express the effective heat treatment of SSCCM. Until it can be replaced with a comparable value that reflects the combined destruction and inhibition of *C. botulinum*, an adequate description of the thermoprocess for SSCCM must include the size of can, retorting time and temperature, and the centre temperature of the product.

7.12 The preceding chapters have revealed a serious lack of useful research data pertinent to the safety and stability of SSCCM. Studies along the following lines should be of considerable benefit to both the meat industry and to consumers:

- (a) Control of PA and *C. botulinum* spores as functions of the main safety factors. The aim of this work would be to establish (i) the minimum requirement of salt (brine concentration), nitrite and thermal processing (as pursued by Pivnick et al., 30), with special consideration of current trends towards lowering the salt input, and potential means of compensating for the loss in protection from lowering brine concentrations, and (ii) a realistic D equivalent as a minimum safety requirement for the manufacture of SSCCM. The work involves varying current formulations with respect to salt and nitrite contents, challenge of the raw products with clostridial spores, thermal processing with various time/temperature combinations, post-process incubation, examination of cans for putrefactive spoilage and/or toxicity, and estimation of the D equivalent.

In contrast to previously reported work, the proposed study should also include cured ham, particularly with respect to minimal thermal processing, and low-salt items such as canned cured frankfurters.

- (b) Replacement of the F_0 value with a comparable value that better reflects the combined destruction and subsequent inhibition of *C. botulinum* in SSCCM relative to the heat process.
- (c) Role of ascorbate or isoascorbate in the control of *C. botulinum* in SSCCM.
- (d) A survey of raw meat ingredients of SSCCM to determine the incidence of clostridial spores.

8. RECOMMENDATIONS

8.1 Proposed codes for processed meat and poultry products governing hygienic, manufacturing and control aspects (Alinorm 83/16, App. IV) should be applied to shelf-stable canned cured meats.

8.2 The following combinations of brine concentrations (% NaCl x 100/% NaCl + % H~Q) and thermoprocesses, in conjunction with 150 mg/kg of sodium nitrite, may serve as broad guidelines in the manufacture of safe shelf-stable canned luncheon meats, ham (and shoulder) and sausages:

Luncheon meats:

3.0-4.0% brine/1.0-1.5 F_0

4.0-4.5% brine/1.0 F_0

5.0-5.5% brine/0.5 F_0

Ham and shoulder:

3.3% brine/0.3-0.5 F_0

4.0% brine/0.1-0.2 F_0

Sausages:

2.5% brine/1.5 F_0

These proposed combinations are subject to rigidly controlled levels of ' bacterial spores in the raw products.

- 8.3 If less stringent combinations of safety factors are to be applied, these should be based on extensive plant experience, and/or experimental work, and on rigid standards of hygiene to ensure minimum levels of bacterial spores.
- 3.4 The microbial contamination of the raw meat ingredients should be monitored periodically. Mean levels in excess of 3 clostridial spores/g or of 100 mesophilic bacillary spores/g should be sufficient cause for a thorough examination of the production chain for potential sources of contamination.
- 8.5 The mesophilic spore count for spices should not exceed 5×10^6 /g.
- 8.6 The contribution of non-meat ingredients other than spices to the contamination of the final raw product should be collectively within 50 mesophilic spores/g.
- 8.7 Regulations governing the complexity of safety parameters for SSCCM would be impractical. However, regulatory agencies of the producer countries should have on record detailed information on product formulas regarding the essential safety factors, and access to the manufacturer's monitoring data on the critical control points listed in Chapter 7.6.
- 8.8 Nitrite inputs rather than residual nitrite, should be regulated. The upper limit of ingoing nitrite should not be set at a level substantially below 150 mg/kg at the present time.
- 8.9 The use of nitrate in SSCCM should be discontinued.
- 8.10 There is a need for considerable research on the parameters conferring safety and stability to canned cured meats (see Chapter 7.12).

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Table 1. Contamination of meats with PA or "total" clostridial spores.

Meat	Spore count		No. of spores/g			Ref.
	PA	Clostr	Median	Mean	Max.	
<u>Pork trim</u>		<u>+</u>		<u>1.5</u>	<u>42</u>	<u>35</u>
	<u>+</u>		<u><3</u>		<u>51</u>	<u>35</u>
	<u>+</u>			<u>2.3</u>		<u>11</u>
	<u>+</u>		<u>0.2-1</u>	<u>2.3</u>	<u>51</u>	<u>45</u>
		<u>+</u>		<u>0.5-2</u>		<u>24</u>
<u>Cured pork trim</u>	<u>+</u>		<u>0.2-1</u>	<u>3.4</u>	<u>43</u>	<u>45</u>
<u>Raw luncheon meat</u>		<u>+</u>	<u><1</u>		<u>15</u>	<u>35</u>
		<u>+</u>		<u><3</u>		<u>35</u>
<u>Pasteurized luncheon meat</u>	<u>+</u>		<u>0.2-1</u>	<u>0.7</u>	<u>4</u>	<u>45</u>
		<u>+</u>		<u>3-11</u>		<u>24</u>
<u>Beef and beef trim</u>	<u>+</u>			<u>2.8</u>		<u>11</u>
		<u>+</u>	<u>1-2</u>	<u>6.5</u>	<u>46</u>	<u>45</u>
		<u>+</u>		<u>0.6-1.2</u>		<u>24</u>

Table 2. Protection (log 1/P) of canned luncheon meats from *C. botulinum*.^a

Salt (% brine) ^b	F _o	Nitrite (mg/kg)		
		0	75	150
3.6	0.64		7.6	7.6
4.1	"		7.5	7.8
4.6	"		7.6	7.8
4.8	0.68			8.7
4.9	0.57	<8.2	8.2	>9.5
5.0	"	8.1		
5.2	0.62	8.2	>8.2	8.0
"	"	8.5	9.1	>8.2
"	0.64		7.8	10.2
5.3	0.57			9.7
5.4	0.64		8.0	>8.8
5.5	0.57	8.3	8.6	>9.5
"				10.2
"	0.61			>10.2
5.8	0.57	8.8	>9.5	>9.5

^a Log 1/P values (see Chapter 2) calculated from data of Pivnick et al. (30).

^b % NaCl x 100/% NaCl + % H₂O.

Table 3. Protection (log 1/P) of canned luncheon meats from putrefactive anaerobes (PA).

Salt (% brine)	Fo	No nitrite		78 mg/kg nitrite	
		Putrid cans/ total cans	log 1/P	Putrid cans/ total cans	log 1/P
3.5	~0.1	0/12	>4.0	0/12	>4.0
5.0	~0.1	0/12	>4.0	0/12	>4.0
3.5	0.08	6/32	3.6	0/16	>4.1
3.5	0.13	3/32	4.0	0/16	>4.1
3.5	~0.1`	13/131	3.9	0/96	>4.9

^a Log 1/P values calculated from data of Silliker et al.₂(42). Assumed level of natural contamination with PA spores: 2.5/g (8.5 x 10 /can).

Table 4. Previous recommendations for brine concentration, nitrite input and heat process in canned luncheon meats.

No.	Added Salt (%)	Brine (%)	Nitrite (mg/kg)	Heat process		Fo	Ref.
				Time (min)	Temp (°C)		
1		4.0	?			≥0.4	35
2 ^a		3.5-4.0 ^b	75-150			0.1-0.4	43
3		3.5-4.0	75-150	60-70 ^c	110	0.05-0.4	21
4	3.3		156 ^d	70 ^c	110		23
5		3.5-3.6 ^b	75-150		110	0.1-0.7	34

^a Assuming that the clostridial spore load does not exceed 1/g.

^b Salt on moisture only.

^c 340 g oblong cans.

^d And 625 mg/kg NaNO₃.

Table 5. Nitrite/nitrate regulations for shelf-stable canned cured meats (SSCCM).

Country	SSCCM	Maximum nitrite (mg/kg) (calculated as NaNO ₂)			
		Input	Residual		
Argentina	All		200	<u>and</u>	300 mg/kg NaNO ₃ or KNO ₃ (calculated as Na salt)
Australia	"	150			
Austria	"	200			
Belgium	"	200 ^a			
Canada	"	200			
Denmark	"	150 ^a			
Finland	"	150 ^a	75	<u>and</u>	300 mg/kg NaNO ₃
France	Comminuted	150 ^a		<u>or</u>	120 mg/kg NaNO ₂ and 100 mg/kg KNO ₃
	Non-commin. ^b	120 ^a		<u>or</u>	500 mg/kg KNO ₃
				<u>or</u>	120 mg/kg NaNO ₂ , and 200 mg/kg KNO ₃
				<u>or</u>	500 mg/kg KNO ₃
W, Germany (FRG)	All		10Q ^a		
E. Germany (GDR)	All		50 ^a		
Greece	"	200		<u>and</u>	500 mg/kg KNO ₃
Italy	"	150 ^{a,c}		<u>and</u>	250 mg/kg NaNO ₃ ^b
Japan	"		105 ^d		
Netherlands	"	200 ^a		<u>and</u>	500 mg/kg KNO ₃
Norway	"	60 ^a			
Spain	"	125		<u>and</u>	200 mg/kg NaNO ₃
Sweden	"	150 ^a			
Switzerland	"		200 ^{a,e}		
United Kingdom	"		150	<u>and</u>	nitrate to 250 mg/kg nitrite + nitrate (calculated as NaNO ₂) in the product
United States	Comminuted	156 ^c		<u>and</u>	nitrate to 200 mg/kg
	Non-commin. ^b	^b 200 ^{c,f}			NaNO ₂ . In the product

- a To be used only as nitrite salt, with regulated NaNO₂ contents varying from 0.4%-0.6%.
b Pumped or immersion-cured.
c Calculated on the meat content.
d May also be derived from nitrate.
e May also be derived from nitrate to be used as nitrate salt containing up to 6% NaNO₃.
f Except for canned cured bacon (120 mg/kg).

Table 6. Characteristics of commercial shelf-stable luncheon meats.^a

Country	Product		Can content	pH	Brine (%)	Nitrite input (mg/kg)	Ascorbate/ isoascorb. (%)	Polyphosphate (%)	Report		Centre temp. (°C)	Fo
	No	Company							Time (min)	Temp. (°C)		
I	1	A	340 g (12 oz) ^b	6.1	4.2	170	0	0	85	110	104	0.9-1.2
	2	"		6.1	4.5	170	0	0	80	110	108	1.2-1.3.
	3	B	"	6.2	4.2	700	400	0	80	110		(1.3) ^d
	4	C	"	6.1	3.7	143	0	0	80	115.5		(2.3)
	5	D	"		4.0	108	500	0	70	113		(0.7)
II	6	A	"		4.6	147	300	0.25	60	108	104	0.4
	7	"	"		4.0	147	300	0.25	60	108	104	0.4
	8	B	"		5.7	113	400	0.1	65	110	104	0.5
	9	"	"		4.9	91	150	0	65	110	104	0.5
	10	C	"		3.8	120	230	0	60	108	106	0.6
	11	D	"		5.3	140	480	0	60	108	105	0.6
	12	"	200 g (7 oz) ^c		5.3	140	480	0	50	108	107	0.9
III	13	A	0.2-1.8 kg	6.2-6.7	3.0-4.0	75-110	400-500	0.4-0.5		110-114		1.0-1.5

^a Basic data provided by producers, except for brine cone, and pH of products from country I which were determined by the author. Spaces left blank where data were not available.

^b Oblong cans, 93 x 47 x 91 mm (312 x 114 x 310).

^c Oblong cans, 93 x 47 x 57 mm (312 x 114 x 204).

^d Approximate values, estimated from lethality diagrams of nonspecific luncheon meats.

Table 7. Characteristics of some commercial shelf-stable luncheon meats from a major producing country not included in Table 6.^{a, b}

Product	Salt input (%)	Nitrite input (mg/kg) ^c	Retort		Approx. Fo
			time (min)	temp. (°C)	
1	3.3	102	70	110	0.6
2	3.4	92	70	110	0.6
3	3.0	156	80	110	1.3
4	3.3	70	61	113	0.5
5	2.6	140	85	115.5	2.8
6	2.S	156	85	115.5	2.8

- ^a Compare footnotes of Table 6.
^b No ascorbate/isoascorbate added.
^c Calculated on the meat content.

Table 8. Characteristics of commercial shelf-stable canned ham and shoulder.^a

Country	Product No.	Company	Can content ⁰	pH	Brine (%)	Nitrite input (mg/fcg)	Ascorbate/ isoascorb. (mg/kg)	Poly-phosphate (%)	Retort		Centre temp. CO	Fo
									time (min)	temp (°C)		
IV	1				3.5-5.1 ^d	150		-0.5 ^e				1.0-1.5
I	2	A	454 g (1 lb)	6.3	3.3	180	500	0.5	65	110	106.5	0.5
	3	"	681 g (1 1/2 lb)	6.3	3.3	180	500	0.5	90	110	106	0.2-0.6
II	4	C	454 g (1lb)		4.0	90		0.4	30	110	100	0
	5	D	"		4.0	150	440	0.4	30	112	102	0.1
	6	E	"		3.4	121	218	0.3	45	108	100	0
	7	"	"		3.7	101	200	0.4	50	108	103	0.2
	8	C	908 g (2 lb)		4.0	90		0.4	70	110	100	0
	9	E	"		3.4	121	218	0.3	70	108	98	0
	10	"	1300 g (3 lb)		3.4	121	218	0.3	85	108	100	0
	11 ^b	C	454 g		4.4	150		0	60	108	106	0.6
	12 ^b	"	908 g		4.4	150		0	130	108	103	0.4

^a Compare footnotes of Table 6.

^b Chopped ham.

^c Pear-shaped cans; 1 lb: 144 x 99 x 47 mm (512 x 315 x 114); 2 lb: 162 x 116 x 66 mm (608 x 410 x 210); 3 lb: 190 x 140 x 67 mm (708 x 509 x 210).

^d Range of general survey data. Mean = 4.2% (3).

^e Limited to 0.3% P₂O₅ equivalent.

Table 9. Characterization of commercial shelf-stable canned sausages.

Country	Product No.	Label	Company	Can content	PH	Brine (%)	Nitrite input (mg/kg)	Retort		Centre temp (°C)	Fo	
								time (min)	temp (°C)			
I	1	Vienna s.	A	128 g (4 1/2 oz) 63 x 63 (208 x 208)	6.1	2.4	170	30	115.5	114.5	min. 1.0	
II	2	Hotdogs	B	454 g	72 x 115	6.2-6.7	2.6	80	40	110	110	2.0
	3	Frankfurters	"	200 g	(alufoil)	"	3.2	90	10	120	120	3.0
	4	Cocktail s.	C	227 g	57 x 100	"	2.9	60	25	108	108	1.3
	5	Sausages	D	227 g	57 x 100	"	2.4	145	25	108	108	1.3
	6	"	"	415 g	72 x 115	"	2.2	60	35	108	108	1.5
V	7	"	"	2600 g	166 x 103 x 190	"	2.4	145	50	108	106	1.5
	8	Frankfurters	A	~1/2 lb	54 x 102 (202 x 400)				30	108		~1.0
	9	"	"	~1ib	68 x 124(211x414)				110	100		~0.5
III	10	"	"	~2 1/2 lb	159 x 124 (604 x 414)				45	108		~1.0
	11	Frankfurters	A	150 g-2 kg		6.0-6.5	2.0-2.5	100-175		108-112		1.0-1.5

^a Compare footnotes of Table 6.

Table 10. Estimate of minimum safety of SSCCM basec on production volumes without recorded incidence of illness.^a

Product	Reference table	Product No.	Main safety factors			Product volume		Can content	SU ^b
			Brine (%)	Nitrite (mg/kg)	Fo	Total years	Total weight (kg)		
Luncheon meat	6	1	4.2	170	0.9-1.2	30	2.0 x 10 ⁷	340 g	>7.8
		2	4.5	170	1.2-1.3	30	3.7 x 10 ⁷	"	>8.0
		8	5.7	113	0.5	17	~1.3 x 10 ⁷	"	>7.6
		9	4.9	91	0.5	9	-2.0 x 10 ⁶	"	>6.8
		13	3.0-4.0	75-100	1.0-1.5	5	3-4 x 10 ⁷	340 g ^c	>8.0
Ham and shoulder	8	2	3.3	180	0.5	30	9.6 x 10 ⁶	1 lb	>7.3
		3	3.3	180	0.2-0.6	30	7.1 x 10 ⁶	1 1/2 lb	>7.0
		4	4.0	90	0	5	-1.0 x 10 ⁷	1 lb	>7.3
		8	4.0	90	0	5	-3.8 x 10 ⁶	2 lb	>6.6
Sausages	9	1	2.4		min. 1.0	30	2.0 x 10 ⁷	128 g	>8.2
		11	2.0-2.5	100-175	1.0-1.5	5	1-2 x 10 ⁷	11b ^c	>7.5
Luncheon meat	Exports from II					17	1.1 x 10 ⁹	340 g	>9.5
Ham and shoulder	"					12	1.2 x 10 ⁸	1 lb ^c	>8.4
Sausages	"					12	1.1 x 10 ⁸	1 lb ^c	>8.4

^a Products listed in Tables 6, 8 and 9.

^b Safety units: log No. of cans marketed per can causing illness.

^c Assumed content as basis for estimate in last column.

^d Data include chopped, cured meats.

STATEMENT BY THE DELEGATION OF THE PEOPLE'S REPUBLIC OF CHINA

We are very pleased to attend the Thirteenth Session of the Codex Committee on Processed Meat and Poultry Products for the first time.

Allow me, first of all, on behalf of the Chinese delegation, to take this opportunity to show our gratitude to FAO and WHO for inviting us to this Session. At the same time, I would like to thank Mrs. Brincker, the Chairman of the Committee and the Codex Secretariat for their special welcome and friendly words to the Chinese delegation in their speeches. I would also like to express our warm greetings to all of you.

China has become a full member of the Codex Alimentarius Commission. We have a good understanding about the Commission.

We very much appreciate the active efforts of FAO, WHO, the Codex Alimentarius Commission and its subsidiary bodies including the Codex Committee on Processed Meat and Poultry Products directed towards protecting the health of the consumers and facilitating the world food trade.

As you know, China is one of the countries with an ancient civilization. The food industry in China has a long history. Our country has a unique tradition in respect of manufacturing, processing and cooking of foods including Meat and Poultry Products. Our Government has given great attention to the work of food sanitation. The Government has formulated and promulgated the Provisional Act of Food Hygiene, the measures for Sanitary Management for Foods intended for Export, other food hygiene regulations and various kinds of food hygiene standards. In the field of Processed Meat and Poultry Products, we have the tentative provisions for Sanitary Inspection of Meats, Sanitary Regulations Governing the Processing of Frozen Rabbit intended for export and some hygiene standards for Meat, Meat Products and Poultry Products. The quality control of food and the work of food standardization in our country are evidently being improved.

Moreover, in recent years, our Government has formulated a series of policies and taken some effective measures to raise the productivity. For the above reasons, the food industry in China has had remarkable development in recent years. The assortment and output of meat and poultry products are increasing with each passing year. But, our work still does not meet the needs of the country and the growing demands for the improvement of the people's life and the development of foreign trade. Therefore, the food industry in our country must be developed more rapidly and improved further in technology, equipment, quality control, standardization, production and management.

The main purposes of our participation in the Codex Committee on Processed Meat and Poultry Products are to learn from the good experiences of other countries in the development and improvement in the processing of Meat and Poultry Products, and to make joint efforts with other members of the Committee to promote the international standardization work on Processed Meat and Poultry Products. We would be deeply grateful for your cooperation.

In the course of this session, we have met many delegations, officials and experts. They have given us very friendly explanation about this Committee and some

related questions. Now I would like once again to express our thanks to them for their kindness and explanation.

Finally, please allow me to extend our warm congratulation for the success of the Session, to express our sincere thanks to the Government of the host country, Denmark and Danish colleagues and friends for giving us a warm reception. We have had a very pleasant stay in this beautiful city of Copenhagen, and we give our best wishes to all of you.

Thank you very much