codex alimentarius commission

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

WORLD HEALTH ORGANIZATION

JOINT OFFICE: Viale delle Terme di Caracalla 00153 ROME Tel: 39 06 57051 www.codexalimentarius.net Email: codex@fao.org Facsimile: 39 06 5705 4593

ALINORM 09/32/41

JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX ALIMENTARIUS COMMISSION

Thirty-second Session

Rome, Italy, 29 June - 4 July 2009

REPORT OF THE 3RD SESSION OF THE CODEX COMMITTEE ON CONTAMINANTS IN FOODS

Rotterdam, The Netherlands
23 – 27 March 2009

Note: This report includes Codex Circular Letter CL 2009/13-CF

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CX 4/35.2 **CL 2009/13-CF**
April 2009

To: Codex Contact Points
Interested International Organizations

From: Secretary,
Codex Alimentarius Commission,
Joint FAO/WHO Food Standards Programme,
Viale delle Terme di Caracalla,
00153 Rome, Italy

Subject: **Distribution of the Report of the Third Session of the Codex Committee on Contaminants in Foods (ALINORM 09/32/41)**

The Report of the Third Session of the Codex Committee on Contaminants in Foods is attached. It will be considered by the Thirty-second Session of the Codex Alimentarius Commission (Rome, Italy, 29 June – 4 July 2009).

MATTERS FOR ADOPTION BY THE 32ND SESSION OF THE CODEX ALIMENTARIUS COMMISSION

Draft and Proposed Draft Standards and Related Texts at Steps 8 or 5/8 of the Procedure

1. **Proposed Draft Revision to the Preamble of the GSCTF at Step 5/8 (para. 45 and Appendix III)**
2. **Draft Code of Practice for the Reduction of Acrylamide in Foods at Step 8 (para. 64 and Appendix IV)**
3. **Draft Code of Practice for the Reduction of Contamination of Food with Polycyclic Aromatic Hydrocarbons (PAH) from Smoking and Direct Drying Processes at Step 8 (para. 67 and Appendix V)**
4. **Draft Code of Practice for the Prevention and Reduction of Ochratoxin A in Coffee at Step 8 (para. 95 and Appendix VI)**

Other matters for adoption

5. **Amendments to Paragraph 10, Sample Preparation in the Sampling Plans for Aflatoxin Contamination in Ready-to-Eat Treenuts and Treenuts Destined for Further Processing: Almonds, Hazelnuts and Pistachios (para. 20 and Appendix II).**

Governments and interested international organizations wishing to submit comments on the above texts should do so in writing, preferably by E-mail, to the Secretary, Codex Alimentarius Commission, Joint FAO/WHO Food Standards Programme, Viale delle Terme di Caracalla, 00153 Rome, Italy (Email: codex@fao.org; Fax +39 06 570 54593) **before 30 May 2009**

SUMMARY AND CONCLUSIONS

The Third Session of the Codex Committee on Contaminants in Foods reached the following conclusions:

Matters for consideration by the Codex Alimentarius Commission

Draft and Proposed draft Standards and Related Texts at Steps 8 or 5/8 of the Procedure

The Committee agreed to forward:

- Proposed Draft Revision to the Preamble of the GSCTF at Step 5/8 (para. 45 and Appendix III);
- Draft Code of Practice for the Reduction of Acrylamide in Foods at Step 8 (para. 64 and Appendix IV);
- Draft Code of Practice for the Reduction of Contamination of Food with Polycyclic Aromatic Hydrocarbons (PAH) from Smoking and Direct Drying Processes at Step 8 (para. 67 and Appendix V);
- Proposed Draft Code of Practice for the Prevention and Reduction of Ochratoxin A Contamination in Coffee at Step 5/8 (para. 95 and Appendix VI).

Other matters for adoption

The Committee agreed to forward the:

- Amendments to Paragraph 10, Sample Preparation in the Sampling Plans for Aflatoxin Contamination in Ready-to-Eat Treenuts and Treenuts Destined for Further Processing: Almonds, Hazelnuts and Pistachios (para.20 and Appendix II);

Proposals for new work

The Committee agreed to submit to the Codex Alimentarius Commission, through the Executive Committee, the proposal for the following new work on:

- "Maximum Levels for Fumonisins in Maize and Maize-Products and Associated Sampling Plans" (para. 101 and Appendix VII);
- a "Code of Practice for the Reduction of Ethyl Carbamate in Stone Fruit Distillates" (para. 115 and Appendix VIII);
- a "revision of the Code of Practice for the Prevention and Reduction of Aflatoxin in Tree Nuts (additional measures for Brazil nuts)" (para. 123 and Appendix IX); and
- "Maximum Levels for Melamine in Food and Feed" (para. 126 and Appendix X).

Matters of Interest to the Codex Alimentarius Commission

The Committee agreed:

- not to consider methods of analysis and sampling for certain chemical substances in the Standard for Natural Mineral Waters in view of discussions in the CCMAS (para.8);
- to return the Proposed Draft Maximum Levels for Total Aflatoxins in Brazil Nuts for redrafting, comments and consideration by the next session of the Committee (para. 78).

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LIST OF APPENDICES

INTRODUCTION

1. The Third Session of the Codex Committee on Contaminants in Foods was held in Rotterdam, The Netherlands, from 23 – 27 March 2009, at the kind invitation of the Government of The Netherlands. Dr. Martijn Weijtens, Member of the Management Team of the Directorate of Food Quality and Animal Health, Ministry of Agriculture, Nature and Food Quality of The Netherlands, chaired the Session. The Session was attended by 186 delegates representing 64 Member Countries, one Member Organization, and 13 International Organizations. The List of Participants is attached to this report as Appendix I.

OPENING OF THE SESSION

2. Mrs Anita Wouters, Director-General of the Ministry of Agriculture, Nature and Food Quality of The Netherlands, opened the session and welcomed the participants on behalf of the Government of the Netherlands.

Division of Competence

3. The Committee noted the division of competence between the European Community and its Member States, according to paragraph 5, Rule II of the Procedure of the Codex Alimentarius Commission, as presented in CRD 1.

ADOPTION OF THE AGENDA (Agenda Item 1)[1]

4. The Committee agreed to discuss a proposal on the Revision of the Code of Practice for the Prevention and Reduction of Aflatoxin Contamination in Tree Nuts (proposed by Brazil) and melamine in food and feed (proposed by the European Community) under Item 11 (other business and future work).

5. The Committee further agreed to establish three in-session working groups, open to all participants on:

- the Proposed Draft Revision of the Preamble of the GSCTF, led by the European Community and working in English, French and Spanish (Agenda Item 4);
- the Draft Code of Practice for the Reduction of Contamination of Food with Polycyclic Aromatic Hydrocarbons (PAH) from Smoking and Direct Drying Processes, led by Denmark with assistance of the European Community and working in English, French and Spanish (Agenda Item 6); and
- the Priority List of Contaminants and Naturally Occurring Toxicants for Evaluation by JECFA, led by The Netherlands and working in English only (Agenda Item 10).

6. The Committee adopted the Provisional Agenda as the Agenda for the Session with the amendments noted above.

MATTERS REFERRED TO THE COMMITTEE BY THE CODEX ALIMENTARIUS COMMISSION AND/OR OTHER CODEX COMMITTEES/TASK FORCES (Agenda Item 2)[2]

Standard for Natural Mineral Waters

7. The Committee recalled that the 31st Session of the Commission had requested the Committees on Pesticide Residues, on Methods of Analysis and Sampling and on Contaminants in Foods to review in their respective areas of competence the question of methods of analysis for certain chemical substances included in the Standard for Natural Mineral Waters.

8. The Committee was informed that the Committee on Methods of Analysis and Sampling had agreed that a Circular Letter would ask members to provide information on methods of analysis and sampling currently used by members and views on the need for development of appropriate methods, for discussion at its next session. The Committee agreed that the question of methods of analysis and sampling should be considered by the CCMAS and did not require further discussion in CCCF. Members were encouraged to provide information to CCMAS.

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1 CX/CF 09/3/1-rev.1, CRD 24 (proposal of Brazil)

2 CX/CF 09/3/2, CX/CF 09/3/2-Add.1 , CRD 25 (Report of the in-session Working Group on the Aflatoxin Sampling Plan)

Methods of Analysis for Dioxins and Dioxin-like PCBs

9. The Committee considered the discussion paper prepared by the Committee on Methods of Analysis and Sampling on methods of analysis for dioxins and dioxin-like PCBs, following the earlier request of the Committee in relation to the development of the Code of Practice for the Prevention and Reduction of Dioxins and Dioxin-like PCBs and further clarification provided on the ranges for the determination of dioxins and dioxin-like PCBs. The document considered the methods currently used and the criteria for the methods, as well as information provided by governments and organisations which participated in the preparation of the discussion paper

10. The Committee noted that the document provided useful information that could be used by governments at the national level as a reference for the purpose of monitoring contamination by dioxins and dioxin-like PCBs.

11. The Committee recalled its earlier decision not to establish maximum levels for dioxins in foods and discussed how to proceed further, in view of the lack of new data since 2004 on dioxin and dioxin-like PCB contamination in the GEMS/Foods database at this moment. Several delegations informed the Committee that they had collected data on the occurrence of dioxins in foods and feeds or had initiated surveys for that purpose and indicated that they could send their data to GEMS/Foods.

12. The Joint WHO JECFA Secretary pointed out that very limited data submitted since 2004 in GEMS/Foods and that there was a need for more data originating from different regions in order to consider exposure to dioxins.

13. The Committee invited all countries to submit relevant data to GEMS Foods and agreed that the question of dioxins and PCBs would not be discussed further in the Committee, with the understanding that it could be reconsidered when relevant data became available.

Aflatoxin Sampling Plan for Almonds, Hazelnuts and Pistachios

14. The Committee recalled that following the recommendation of the Executive Committee, the Sampling Plan was adopted by the 31st Session of the Commission and forwarded to the Committee on Methods of Analysis and Sampling for advice.

15. The Committee discussed the proposed amendment put forward by the CCMAS concerning sample preparation ("dry grind with vertical cutter mixer type mill and a 50 g test portion") in order to make it less restrictive. Some alternative wording was proposed and it was also pointed out that the operating characteristic curve was based on dry grinding with the type of mixer specified. Some delegations pointed out that the sampling preparation procedures had been discussed extensively when the sampling plan was developed and that there was no need to reopen the discussion at this stage.

16. In order to facilitate the discussion, the Committee agreed to convene an in-session working group, working in English and chaired by the Delegation of the United States, in order to consider the amendments proposed by the CCMAS.

17. As proposed by the working group in CRD 25, the Committee agreed on a wording that included the mention of a vertical cutter type mill but was not limited to this equipment, as follows:

"sample shall be finely ground and mixed thoroughly using a process, e.g., dry grind with a vertical cutter mixer type mill, that has been demonstrated to provide the lowest sample preparation variance"

18. The Committee did not agree with the proposal from the CCMAS to add a reference to the correction for recovery and to "taking into account the measurement uncertainty" as sampling and measurement uncertainty was under discussion in CCMAS[3]. It was noted that national authorities take into account measurement uncertainties at the national level.

19. The Committee also confirmed that the recommendations included in the Procedural Manual on *The Use of Analytical Results: Sampling Plans, Relationship between the Analytical Results, the Measurement Uncertainty, Recovery Factors and Provisions in Codex Standards* had been taken into account in the development of the Sampling Plan.

[3] Proposed Draft Revised Guidelines on Measurement Uncertainty (CAC/GL 54-2004) at Step 3 (CX/MAS 09/30/9).

20. The Committee agreed to forward the above proposed amendment to the Commission for insertion into the *Sampling Plans for Aflatoxin Contamination in Ready-to-Eat Treenuts and Treenuts Destined for Further Processing: Almonds, Hazelnuts and Pistachios*, taking into account that the request to reconsider the document had been made directly by the Commission (Appendix II).

MATTERS OF INTEREST ARISING FROM FAO and WHO (INCLUDING JECFA) MATTERS OF INTEREST ARISING FROM OTHER INTERNATIONAL INTERGOVERNMENTAL ORGANIZATIONS (Agenda item 3)[4]

21. The representatives of FAO and WHO, referring to document CX/CF 09/3/3 Rev. 1 informed the Committee on activities carried out by FAO and WHO in the area of scientific advice to Codex and Member countries relevant to the Committee as well as other activities of interest.

FAO and WHO activities

22. The Representative of FAO, speaking on behalf of FAO and WHO, informed the Committee of recent accomplishments in the area of scientific advice. The Representative reported on the completion of one *ad hoc* expert meeting on the benefit and risks of the use of chlorine-containing disinfectants and alternatives in food production and food processing held in 2008 and summarized the main conclusions. The Committee was informed about the approaches developed and used for the assessment of the benefits of the reduction of food-borne disease risk caused by microorganisms on food and prevention of cross-contamination in the most common disinfection treatment scenarios and comparing them in a qualitative way to the potential risk from ingestion of chlorine-containing disinfectants and their reaction by-products. It was noted that an executive summary had been made available as an annex to the document CX/CF 09/3/3 Rev. 1 and that the full report would be published in the near future.

23. The Representative of FAO informed the Committee that the final expert meeting in the Joint FAO/WHO project to update the principles and methods for risk assessment of chemicals in food had been held in November 2008 and that this meeting had in particular considered all the comments received from the public review. It was announced that an expert consultation on the use of nanotechnology in the food industry would be held in June 2009, focusing on the review of current applications and risk assessment methodology for nanotechnology applications in the area of food and agriculture.

24. The Committee was informed that FAO and WHO were in the process of organizing an expert consultation on the risks and benefits of fish consumption, taking into consideration the health risks associated with methylmercury, dioxin and dioxin-like PCBs and the nutritive and health benefits of eating fish, in response to the request of the 29th session of the Commission. The consultation was planned to take place early 2010 and calls for data and experts would be issued shortly.

25. The representative of WHO, speaking on behalf of FAO and WHO, informed the Committee that the call for data for the 72nd JECFA meeting has recently been published[5]. The meeting, scheduled for February 2010, will evaluate the following contaminants: acrylamide to review newly available data as recommended by JECFA at the last evaluation; arsenic as the previous assessment may be outdated due to a large amount of new data; deoxynivalenol, furan, perchlorate on request of CCCF; and total mercury to take into account the lower PTWI for methyl mercury.

26. The Representative clarified that this agenda could be amended if at this session evaluations with higher priorities were identified.

27. As a follow-up on the FAO/WHO consultative process on the provision of scientific advice the Committee was informed that the framework document was available in English, French, Spanish, Chinese and Arabic. The Representative informed the Committee that in order to address the issue of sustainability of the provision of scientific advice, FAO and WHO have established a Global Initiative for Food-Related Scientific Advice (GIFSA) to increase awareness to the scientific advice program and mobilize resources and encouraged countries to contribute towards GIFSA.

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4 CX/CF 09/3/3 and CX/CF 09/3/3-Add.1

5 http://www.who.int/ipcs/food/jecfa/data/en/index.html ; http://www.fao.org/ag/agn/agns/jecfa_new_en.asp

28. The Committee was further informed on the activities and role of the International Food Safety Authorities Network (INFOSAN) in relation to food incidents. INFOSAN played an important role in the melamine incident by providing 14 emergency alerts to the full network and 4 alerts to specific member states to assist in the management of this important food safety incident.

29. The WHO representative reported on the outcome of the expert consultation on melamine where basic chemistry, analytical methods, occurrence and exposure of melamine and analogues was reviewed as well as the toxicology and a TDI established. An executive summary and conclusions and recommendations have been published in English, Spanish, French and Chinese, and the final report will be published next month. There was general agreement in the Committee for the need to establish a maximum limit for melamine and that this level should not be associated with deliberate addition of melamine to products. It was noted that the Committee would further consider this risk management under Agenda Item 11.

IAEA activities

30. The representative of the International Atomic Energy Agency (IAEA) provided an update on recent activities of the IAEA *Coordinated Research Project (CRP) on Applications of Radiotracer and Radio-assay Technologies to Seafood Safety Risk Analysis.* It was recalled that the intent of the project was to provide research for the potential establishment of maximum levels in seafood for those contaminants already evaluated (cadmium), as well as contaminants not evaluated to date (harmful algal blooms, persistent organic pollutants and other toxins), through the Joint FAO/WHO Expert Committee on Food Additives (JECFA) and the Joint FAO/WHO Codex Alimentarius Commission.

31. The CCCF noted that subsequent to the Consultants Meeting and the First Research Coordination Meeting (RCM) held under the CRP,[6] the Second Research Coordination Meeting met at the International Centre for Theoretical Physics in Trieste, Italy, from 8-12 December 2008.[7] Among other activities, the 2nd RCM noted research reports presented by the CRP participants, including representatives from Chile, China, France, French Polynesia, Ghana, Japan, the Philippines, Thailand and Vietnam. The presentations included information on production and trade statistics related to seafood trade, including information and data on toxic metals, ciguatera fish poisoning and paralytic shellfish poisoning.

32. The IAEA representative offered to keep the CCCF apprised of additional information at its next session on continuing activities of the Coordinated Research Project.

DRAFT REVISION OF THE PREAMBLE OF THE GSCTF (Agenda Item 4)[8]

33. The Committee noted that due to the late availability of the document comments had not be requested on document CX/CF 09/3/4-Rev.1 and that document CX/CF 09/4/3-Add.1 had not been prepared.

34. The Delegation of the European Community presented the report and recommendations of both the electronic[9] and in-session working groups (see Agenda Item 1) as presented in CX/CF 09/3/4-Rev.1 and CRD 27, respectively.

35. The Delegation reported that the in-session working group focused its discussion on the parts to be deleted from the Preamble as they related to procedural issues and the need for the inclusion of these parts into the Procedural Manual; the food categorization system to be used for the purpose of the GSCTF; and the revision of the text of the revised Preamble.

36. The Committee first considered the proposals made in CRD 27 and made the following decisions and observations:

Preamble (Appendix I)

37. The Committee agreed to:

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6 See CX/CF 08/2/3-Add. 1 of February 2008 for details.

7 The full report of the *Second Research Coordination Meeting (RCM) for the Coordinated Research Project on Applications of Radiotracer and Radio-assay Technologies to Seafood Safety Risk Analysis* is available on request.

8 CX/CF 09/3/4; CRD 17 (comments of Indonesia); CRD 27 (Report of the in-session Working Group on the Proposed draft Revision of the Preamble of the GSCTF)

9 ALINORM 08/31/41, para.62

- delete sections 1.4 and 1.6 and Annex II, since the information provided in these sections was more applicable to the internal procedures of Codex,

- to retain Annex I which had been revised to make it more appropriate for use by national governments;

- discontinue work on the food categorization system to be used for the purpose of the GSCTF, but to instead provide a clear description of the food/feed for which a maximum level applies; to screen the existing MLs provided for in Schedule I of the GSCTF to provide where necessary a clearer description of the food/feed to which the ML applies; and to delete schedule II for the time-being. The Committee agreed to make all consequential changes in relation to the abovementioned proposal as outlined in CRD 27.

Appendix II

38. The Committee agreed to not include the proposed Appendix II from CX/CF 09/3/4-Rev.1 as Annex to the Risk Analysis Principles Applied by the Codex Committee on Food Additives and the Codex Committee on Contaminants in Foods as it was considered that most of the text in this annex was already covered in some way by existing texts in the Procedural Manual. It was agreed that should more in-depth examination of this Appendix indicate that texts were not fully covered either explicitly or implicitly by other texts in the Procedural Manual this would be brought to the attention of the Committee for consideration for inclusion in the Procedural Manual.

39. The Delegation of The Netherlands noted that the preparation of the working document referred to in paragraph 24 was not provided for in the Procedural Manual and in view of its usefulness in providing an overview of decisions taken on contaminants and toxicological information available on these compounds, the Committee should consider inclusion of its preparation in the Procedural Manual. The Committee however agreed that reference to this working document in the Procedural Manual would not be appropriate and in acknowledging its usefulness to the work of the Committee, invited the Delegation of The Netherlands and Japan to continue preparing this information document for use during discussions in the Committee.

40. In addition to the decisions above, the Committee made the following amendments or observations on the Preamble.

Title

41. In view of the amendment to the title of the Standard to include reference to feeds, it was agreed to use the acronym, GSCTFF.

Section 1.3.3

42. The Committee agreed to delete “fair trade considerations” from this section and elsewhere, as appropriate, as it was more applicable in the context of Codex rather than for national governments.

43. All references to risk analysis principles applicable to the work of Codex or the Committee on Contaminants in Foods were deleted and replaced by the Working Principles for Risk Analysis for Food Safety for Application by Governments (CAC/GL 6-2007).

Section 1.5 Format of the General Standard for Contamination in Food and Feeds

44. The first sentence of the 2nd paragraph was deleted since there was no presentation format for the General Standard in the Procedural Manual.

Status of the proposed draft revision of the preamble of the GSCTF

45. The Committee noted that even though comments had not been solicited at Step 3 there was agreement on the revisions made to the Preamble and advanced the draft revision to the 32nd Session of the Commission for final adoption at Step 5/8 with the recommendation to omit Steps 6 and 7 (Appendix III).

DRAFT CODE OF PRACTICE FOR THE REDUCTION OF ACRYLAMIDE IN FOODS (Agenda Item 5)[10]

46. The Committee considered the draft Code and made the following comments and agreed on the following revisions:

General comments

47. The Committee recalled that scientific references[11] were useful in preparing discussion papers and codes of practice and were already widely available, but should not be part of the final document or be avoided to the extent possible as they might become outdated, while Codex texts, once adopted, should remain relevant for some time, and replacing or updating scientific references regularly could be difficult. In addition, the Committee noted that all working documents for Codex meetings were available on the Codex website and could thus be traced back for further consultation as per the scientific basis used for the development of Codex documents. In view of this, the Committee agreed to delete all references in the Code including the toxicology information contained in the Annex.

Specific comments

Introduction

48. The Committee agreed to insert a reference at the end of paragraph 1 to refer to the CIAA Acrylamide Toolbox as this was a key source of information for the manufacturing sector for the mitigation of acrylamide formation in foods. The Committee noted that, in addition to the toolbox, other simple tools, e.g. pamphlets, had also been prepared in 20 languages and were available on the EC[12] and CIAA[13] sites.

Scope

49. In relation to a proposal to retain the reference to the need to update the Code when new technology and data for the mitigation of acrylamide formation in other products (e.g. coffee) became available, the Committee acknowledged that the Codex Alimentarius Commission and its subsidiary bodies are committed to revision as necessary of Codex standards and related texts to ensure that they are consistent with and reflect current scientific knowledge and other relevant information and when required, a standard or related text shall be revised in accordance with the *Procedure for the Elaboration of Codex Standards and Related Texts*. In addition, each member of the Codex Alimentarius Commission is responsible for identifying, and presenting to the Committee any new scientific and other relevant information which may warrant revision of any existing Codex standard or related text[14]. In view of this, the Committee agreed that there was no need to introduce any specific provision in this regard.

General considerations and constraints in developing preventative measures

50. The Committee agreed to revise paragraph 6 to make it more general by deleting the references to national/regional regulations concerning the use of asparaginase as a processing aid. In addition, the Committee agreed to keep flexible the requirements for approval of potential new additives and processing aids by retaining "may need" as opposed to "should" since depending on the country such a requirement might not be compulsory.

51. The Committee agreed to delete the last sentence in paragraph 8 as it was more appropriately covered by other sections of the Code.

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10 ALINORM 08/31/41, Appendix CX/CF V and CX/CF 09/03/5 (comments from Japan, Sweden, Switzerland, Uruguay and CIAA); CRD 4 (comments from the United States of America); CRD 5 (comments from ICGMA); CRD 6 (comments from CIAA); CRD 7 (comments from CIAA); CRD 11 (comments from Mali); CRD 12 (comments from India); CRD 13 (comments from Philippines); CRD 14 (comments from the European Community); CRD 15 (comments from Cuba); and CRD 17 (comments from Indonesia).

11 ALINORM 08/31/41, para. 70.

12 http://ec.europa/food/food/chemicalsafety/contaminants/acrylamide_en.htm

13 http://www.ciaa.be/asp/documents/11.asp?doc_id=822

14 Revision of Codex Standards, General Principles of the Codex Alimentarius, Procedural Manual, Codex Alimentarius Commission.

Recommended practices to industry for the manufacture of potato products

Box I – Raw Materials

52. In the first box, the Committee agreed to revise the first sentence to indicate that reducing sugar levels should be kept as low as reasonably achievable taking into account regional and seasonal variability of potato cultivars. It was noted that it was inappropriate to mention specific target values of reducing sugars for potato varieties used for e.g. frying and baking in view of the high degree of regional and seasonal variation of these levels in potato cultivars. In this connection, paragraph 9(ii) was revised accordingly.

53. In the second box, the Committee agreed to revise the provisions related to potato deliveries remaining outside in freezing conditions for consistency with the language in the main text and to reorganize the provisions on reconditioning of potatoes for better clarity.

Box II – Control/Addition of Other Ingredients

54. In the second box, the Committee noted that the addition of asparaginase did not always reduce asparagine in some potato varieties and consequently acrylamide formation in potato dough based products produced from these varieties. In view of this, the Committee agreed to revise the text by referring to "in some cases". In this connection, paragraph 13 was revised to clarify this limitation.

Raw Materials

55. The Committee revised paragraph 9(iv) to also refer to the length of time needed for reconditioning as another decision that should also be made on the basis of the results of fry testing.

Control/Addition of Other Ingredients

56. The Committee revised paragraph 14 to clarify that sodium pyrophosphate and calcium salts were cited as examples of reagents that can be used as treatments prior to the frying stage to reduce acrylamide formation. In addition, the Committee agreed that additives should be used according to the appropriate legislation and in this regard made a consequential amendment to paragraph 26 (Control/Addition of Other Ingredients).

Food Processing and Heating

57. In paragraph 18, the Committee agreed to refer to far-infrared heating as another treatment that could aid to reduce acrylamide and fat uptake in potato snacks in commercial scale.

58. The Committee also agreed to revise paragraph 19 to improve the provisions relating to frying temperature values in relation to the formation of acrylamide and the uptake of fat. One Observer noted that in practice the heating power of the fryer would vary and it might be difficult to comply with such prescriptive provisions on frying temperatures and proposed to leave the text unchanged as it provided for enough consumer protection and flexibility in industry practices.

59. The Committee further agreed to revise paragraph 20 to refer to "prefabricated" as opposed to "oven" par fried French fries as a more appropriate term to designate these types of products and to reword the last sentence to better clarify the cooking instructions.

Recommended practices to industry for the manufacture of cereal-based products

60. The Committee agreed to amend to the title of this Section to indicate that the products in brackets were given as examples.

Box I – Raw Materials

61. The Committee agreed that excessive nitrogen fertilization should be avoided as this could favour the formation of acrylamide during the processing of the food. Paragraph 23 was also amended in this respect.

62. The Committee agreed to replace the term "biscuit, fresh bakeware" with the term "general".

Coffee

63. The Committee agreed to align the first sentence of paragraph 35 concerning stability of acrylamide in coffee powder in closed containers over extended storage periods with the JECFA[15] statement on acrylamide in ground coffee.

STATUS OF THE DRAFT CODE OF PRACTICE FOR THE REDUCTION OF ACRYLAMIDE IN FOODS

64. The Committee agreed to forward the draft Code to the 32nd Session of the Commission for adoption at Step 8 (Appendix IV).

DRAFT CODE OF PRACTICE FOR THE REDUCTION OF CONTAMINATION OF FOOD WITH POLYCYCLIC AROMATIC HYDROCARBONS (PAH) FROM SMOKING AND DIRECT DRYING PROCESSES (Agenda Item 6)[16]

65. The Committee considered the draft Code as revised by the in-session Working Group led by Denmark with the assistance of the European Community (see Item 1). The Delegation of Denmark informed the Committee that the revised version incorporated written comments submitted to this session and those made during the meeting of the in-session Working Group. The delegation noted that the changes were of editorial and organizational nature, the latter to facilitate the use of the Code. In addition, all references and background information were deleted (see Agenda Item 5).

66. In addition to editorial changes, the Committee agreed on the following amendments:

- Paragraph 7 – the paragraph was deleted in line with a previous decision not to refer to national/regional regulations, scientific information, etc. in the final document;
- Paragraph 34 – the second sentence was deleted as already covered by the first sentence;
- Paragraph 75 – the reference to "bread" was changed to "cereal grains" as more appropriate;
- Paragraph 85(c) – the reference to "fuel" was changed to "wood" as not all fuels were subject to this requirement.

STATUS OF THE DRAFT CODE OF PRACTICE FOR THE REDUCTION OF CONTAMINATION OF FOOD WITH POLYCYCLIC AROMATIC HYDROCARBONS (PAH) FROM SMOKING AND DIRECT DRYING PROCESS

67. The Committee agreed to forward the draft Code to the 32nd Session of the Commission for adoption at Step 8 (Appendix V).

PROPOSED DRAFT MAXIMUM LEVELS FOR TOTAL AFLATOXINS IN BRAZIL NUTS (AT STEP 4) (Agenda Item 7)[17]

68. The Committee recalled that its last session had agreed to initiate new work on the establishment of maximum levels for total aflatoxins in Brazil nuts, to be developed by an electronic working group led by Brazil, and that this new work had been approved by the 31st Session of the Commission.

69. The Delegation of Brazil introduced the document which considered the occurrence of aflatoxins in Brazil nuts, taking into account the evaluation performed by the 68th JECFA on the impact of different hypothetical limits of total aflatoxins (AFT) in tree nuts, including Brazil nuts, on dietary intake, and proposed maximum levels, as well as a sampling plan. As a result of these considerations, it was proposed to establish four categories of products and corresponding MLs: shelled Brazil nut ready-to-eat; shelled Brazil nut destined for further processing; in-shell Brazil nut ready-to-eat; in-shell Brazil nut for further processing. The Delegation highlighted the uniqueness of Brazil nuts, which are not cultivated as other tree nuts but collected in the rain forest, and the implications for sorting and processing in order to reduce contamination with aflatoxins.

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15 64th Meeting of JECFA, page 18.

16 ALINORM 08/31/41, Appendix VI and CX/CF 09/03/6 (comments from Brazil, Japan, Kenya, Philippines, Thailand and the United States of America); CRD 3 (comments from Japan); CRD 6 (comments from the European Community); CRD 8 (comments from the European Community); CRD 11 (comments from Mali); CRD 12 (comments from India); CRD 15 (comments from Cuba); CRD 17 (comments from Indonesia); CRD 19 (comments from Denmark); CRD 20 (comments from Turkey); CRD 30 (Report of the in-session Working Group on the Code of Practice for the Reduction of Contamination of Food with PAHs from Smoking and Direct Drying Process).

17 CX/CF 09/3/ 7, CRD 12 (comments of the Philippines)

70. Several delegations noted that the document had been made available very late and therefore it was not possible for them to take a position at this stage as they needed to examine the proposals carefully at the national level.

71. Several delegations expressed the view that the maximum levels for other nuts (almonds, hazelnuts and pistachios) were established on the basis of the intended use of the nuts (ready to eat or intended for further processing) but no distinction was made between shelled and in-shell nuts and a similar approach should be followed for Brazil nuts, taking into account that the ML would apply only to the edible part of the nuts.

72. The Committee noted the view of a Delegation that it was premature to establish maximum levels and that the application of the Code of Practice for the Prevention and Reduction of Aflatoxins in Tree Nuts was a better approach to reduce contamination, and that the Code could be revised if necessary, as would be discussed under Agenda Item 11.

73. One Observer supported the proposal for a maximum level for in-shell Brazil nuts and further pointed out that, in view of existing trade concerns a maximum level was urgently needed.

74. It was also pointed out that the conditions of production of Brazil nuts could not be controlled as in the case of other nuts, and therefore the distinction between shelled and in-shell nuts could be justified for Brazil nuts and required further consideration.

75. The Committee noted that due to the late availability of the document, it had not been circulated for comments and that different views were expressed on the proposed MLs and therefore it could not be advanced to a further step at the present session.

76. The Delegation of Brazil, supported by some delegations, proposed to consider first the MLs for shelled Brazil nuts (10 µg/kg in ready-to-eat nuts and 15 µg/kg in nuts for further processing) at the present session in order to make some progress and to reconsider separately the question of in-shell Brazil nuts at the next session in a revised discussion paper. The Committee however recognised that there was no agreement to proceed with different MLs for shelled and in-shell nuts at this stage and that the establishment of MLs should be discussed as a whole.

77. It was proposed to circulate the Proposed Draft Maximum Levels in the current document for comments in order to allow enough time to all delegations to comment and consider it further at the next session. The Delegation of Brazil indicated that it would be preferable to redraft the document in view of the questions raised at the present session, for further consideration at the next session.

STATUS OF THE PROPOSED DRAFT MAXIMUM LEVELS FOR TOTAL AFLATOXINS IN BRAZIL NUTS

78. The Committee agreed to return the Proposed Draft Maximum Levels to Step 2/3 for redrafting by the Delegation of Brazil, comments and consideration by the next session.

PROPOSED DRAFT CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF OCHRATOXIN A CONTAMINATION IN COFFEE (Agenda Item 8)[18]

79. The Committee recalled that its second session had agreed to initiate new work on the elaboration of a Code of Practice for the prevention and reduction of ochratoxin A (OTA) in coffee, to be developed by an electronic working group led by Brazil, and that this new work had been approved by the 31st Session of the Commission.

80. The Delegation of Brazil indicated that the Proposed Draft Code took into account the recommendations in the Guide developed by FAO to prevent mould formation in coffee insofar as they applied to ochratoxin A, and also comments provided in the electronic working group. Taking into account the written comments and the additional proposals put forward by the delegation of Brazil i (CRD 23), the Committee considered the document section by section and made the following amendments, in addition to editorial corrections.

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[18] CX/CF 09/3/8, CX/CF 09/3/8-Add. 1 (comments from Colombia, CIAA), CRD 8 (comments from the EC), CRD 13 (comments from the Philippines), CRD 15 (comments from Cuba), CRD 16 (comments from Kenya), CRD 23 (comments from Brazil), CRD 28 (comments from Viet Nam)

Introduction

81. In the first paragraph, the Committee agreed to retain only the reference to IARC concerning the classification of carcinogens, to insert the reference to the JECFA evaluation and to add a reference to the FAO *Guidelines for the Prevention of Mould Formation in Coffee* (2006).

Processing of Coffee Cherries

82. In paragraph 8 the second sentence was deleted as the information on commercial samples was not necessary in a code of practice; in paragraph 10 some clarification was made to the explanation regarding the contamination route; and in paragraph 11 a) some explanation was added to describe seed related material.

Wet Processing

83. In paragraph 29d) a fermentation time of 12 to 36 hours was specified as already mentioned in paragraph 27. In paragraph 29f) the meaning of secondary cherry coffee was clarified in relation to the control programme for that type of coffee.

84. In reply to a question, it was clarified that clean water was defined in the General Principles of Food Hygiene and a reference was included accordingly (paragraph 29 c).

Drying of Sorted and Processed Coffee Beans

85. The conditions of the sun drying process in paragraph 32 were clarified: “compact earth” was deleted as contact with the soil could result in contamination, and a reference to raised tables was added as this was commonly used, as mentioned by some delegations.

86. It was noted that the precautionary measures mentioned in paragraph 35 referred to the recommendations in paragraph 38 and the text was amended accordingly.

87. In paragraph 38a) it was agreed that the drying yard should be located far away from contamination sources such as dusty areas.

88. The Committee agreed to add in paragraph 38e) that practical training for drying yard workers should include the adequate use of moisture measurement equipment and in 38f) that the moisture measurement equipment should be verified regularly and calibrated every year with the ISO 6673 method.

Sections 3.7 and 3.8

89. The titles of sections 3.7 and 3.8 were amended to read respectively “Storage, Transportation and Trading” and “Ship Transportation” in order to clarify the content of the sections.

90. The Committee discussed a proposal to include a specific distance between the coffee bags and the wall in paragraph 46c.2. As it appeared that different provisions existed in producing countries and that the distance would depend on the type of wall and climatic conditions, the current text was however retained. In paragraph 47 the “plastic liner” was described more specifically.

91. It was agreed that the section on Vocabulary, renamed “Definitions” should be included at the beginning of the document in accordance with current practice in Codes, and an editorial amendment was made to the definition of “mucilage”.

92. In Figure 3 the skin and stalk were replaced by epicarp and peduncle, respectively.

93. The Committee expressed its appreciation to the Delegation of Brazil and to the working group for the preparation of this excellent document and agreed that, as all issues had been addressed, the Code should be forwarded to the Commission for final adoption.

94. The Committee noted that the Delegation of Cote d’Ivoire would provide some corrections to the French version.

STATUS OF THE PROPOSED DRAFT CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF OCHRATOXIN A IN COFFEE

95. The Committee agreed to advance the Proposed Draft Code of Practice for adoption by the Commission at Step 5/8 with the omission of Steps 6 and 7 (Appendix VI).

DISCUSSION PAPER ON FUMONISINS (Agenda Item 9a)[19]

96. The Delegation of Brazil, as leading country of the electronic Working Group on Fumonisins, outlined the main aspects considered in the discussion paper in particular, available data, analytical methods, sampling plans, occurrence in foods, intake levels, exposure and risk assessment, risk management considerations and public health aspects as well as agricultural, technological and commercial aspects. Based on this information, the Delegation concluded that the Committee could consider the establishment of a maximum level and the development of a sampling plan for fumonisins in maize and maize products.

97. The Committee focused its discussion on the conclusions and recommendations of the Working Group. Several delegations expressed the view that it would not be appropriate to propose a maximum level for consideration based upon occurrence data from before 2001, not taking into account the more recent occurrence data and the application of good agricultural and manufacturing practices to prevent the formation of fumonisins and that discussion on setting a maximum level for maize and derived maize products should focus on products intended for human consumption as maize can be used for other purposes than food such as feeds. It was also noted that it would be useful to asses the effectiveness of the implementation of the *Code of Practice for the Prevention and Reduction of Mycotoxin Contamination in Cereals, including Annexes on Ochratoxin A, Zearalenone, Fumonisins and Tricothecenes* (*CAC/RCP 51-2003*).

98. Other delegations indicated that maize was a staple food in their countries and that the setting of a maximum level and accompanying sampling plan and analytical methods would assist in the reduction of consumers exposure to fumonisins as well as in the surveillance of locally produced foods and imported products. Some delegations were of the view that data review should also include feeds as in certain countries the intended use of maize was not always known, for example at the import stage. A Delegation also noted the importance of recommendations in paragraphs 82 and 83 of CX/CF 09/03/9 so that efforts should be made to broaden the survey of bound fumonisins in extruded maize products, such as breakfast cereals, to better elucidate the potential release of Fumonisins B_1 from these bound fumonisins in the human gastrointestinal tract and the need for further research on possible synergies or combined effects of fumonisins and aflatoxins on human health in those countries where maize and maize-based products were staple foods.

99. The JECFA Secretariat noted that new available information on toxicology and occurrence data could provide the basis for a re-evaluation of fumonisins. The JECFA Secretariat furthermore pointed out that the discussion paper already contained some updated data since the last JECFA evaluation that the Committee could take into account in the development of a maximum level.

100. The Representative of the International Atomic Energy Agency (IAEA) informed the Committee of the results of a study[20] undertaken in collaboration with the Nigerian National Agency for Food and Drug Administration and Control (NAFDAC) designed to assess the incidence and contamination levels of fumonisin B1 in maize samples marketed in five geographical locations in Nigeria. The study indicated that fumonisin B1 is a widespread contaminant of maize kernels in Nigeria and although various contamination levels were encountered across the five different areas, the overall results revealed relatively low levels of contamination. It was noted that the enforcement of good agricultural practices, including the disposal of visibly damaged kernels and screenings and fines, through cleaning procedures, and wet food processing, were strongly recommended to reduce the fumonisin B1 content, thus preventing exposure of consumers to harmful toxins in food. The representative of the IAEA offered to make the full results of the study available to the JECFA and the CCCF for the proposed future evaluation of fumonisins.

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19 CX/CF 09/03/9 and CRD 8 (comments from the European Community); CRD 13 (Philippines); CRD 15 (comments from Cuba); and CRD 17 (comments from Indonesia).

20 CX/CF 09/03/3-Add.1.

101. The Committee, while acknowledging that maize was a staple food in many countries and that fumonisins in maize was a public health concern, agreed to initiate work on establishing maximum levels and developing a sampling plan for fumonisins in maize and maize-based products subject to approval by the 32nd Session of the Commission as presented in the project document (Appendix VII). It was further agreed to request JECFA to review the available toxicology and occurrence data in order to carry out a re-evaluation of fumonisins in maize and maize products and that, based on the outcome of this JECFA re-evaluation, the maximum level might be revised. It was noted that work would be completed by 2012 noting that JECFA could only consider fumonisins at the earliest its meeting in 2011.

DISCUSSION PAPER ON BENZENE IN SOFT DRINKS (Agenda Item 9b)[21]

102. The Delegation of Nigeria, as leading country of the electronic working group outlined the main aspects and recommendations covered by the discussion paper. It was highlighted that surveys had shown that the levels of benzene in soft drinks were generally below the permitted WHO guideline level for drinking water; that guidance was available in particular from the International Council of Beverages Associations (ICBA) on how to mitigate potential benzene formation in beverages and that governments were working with their beverage manufacturers to ensure that levels of benzene in beverages were kept low. However, a problem existed especially in tropical countries where elevated levels of benzoates were used to preserve soft drinks which in turn could lead to elevated levels of benzene.

103. The Delegation emphasized that since benzene was a carcinogen every effort should be made to ensure that benzene levels in beverages were kept as low as reasonably achievable and therefore proposed, amongst others, that the Committee consider the development of a code of practice for the prevention of benzene formation in soft drinks.

104. The Committee noted that benzene in soft drinks was not a major contributor to overall benzene exposure and in view of the considerable guidance available to industry to limit formation of benzene in soft drinks, in particular, the guidance by the International Council of Beverages Associations (ICBA) which is available in various languages, a code of practice was not necessary at this time. The Committee, however, agreed to encourage member countries, especially those in the tropics to continue data collection on the occurrence of benzene in soft drinks.

DISCUSSION PAPER ON CYANOGENIC GLYCOSIDES (Agenda Item 9c)[22]

105. The Delegation of Australia, as leading country of the electronic Working Group on Cyanogenic Glycosides, outlined the main aspects considered in the discussion paper and concluded that the Committee could request JECFA to re-evaluate cyanogenic glycosides in foods to advise on the public health implications of cyanogenic glycosides and their derivatives in foods in order that the Committee identify risk management options to deal with this matter.

106. The Joint FAO JECFA Secretariat informed the Committee that there were a number of FAO publications addressing good agricultural and manufacturing practices for the growing and processing of cassava, including other ongoing work in this field to assist countries with cultivation, processing and handling of this product. In addition, the Joint WHO JECFA Secretariat informed the Committee about a WHO initiative on the evaluation of the global burden for foodborne disease, where cyanogenic glycosides where one of the examples and many data have been collected which should facilitate the task for JECFA.

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21 CX/CF 09/3/10; CRD 10 (comments from Canada), CRD 13 (comments from Philippines), CRD 15 (comments from Cuba) and CRD 20 (comments from Republic of Korea).

22 CX/CF 09/03/11 and CRD 8 (comments from the European Community); CRD 9 (comments from Democratic People's Republic of Korea); CRD 13 (comments from Philippines); CRD 15 (comments from Cuba); CRD 16 (comments from Kenya); and CRD 17 (comments from Indonesia).

107. The Committee had an exchange of views on how to proceed further with this issue. Some delegations favoured the development of a code of practice and additional analytical methods for determination of hydrogen cyanide (free and total). Other delegations felt that it was more appropriate to wait for a re-assessment of cyanogenic glycosides and their derivatives by JECFA before considering the setting of maximum levels or the development of a code of practice. In addition, some delegations expressed the view that it would be useful to clarify the levels for cyanogenic glycosides and their derivatives in foods in a consistent way as the levels in some Codex standards carrying such a provision were not consistent in which substances were able to release cyanides and their levels expressed as cyanides ($^{-}$CN) or hydrogen cyanide (HCN). There is also a need to establish a consistent method to determine these levels. Therefore, there was a need to further explain the process leading to the establishment of levels of cyanogenic glycosides in order to consider an appropriate descriptor for total or free hydrocyanic acid in foods. In this regard, it was noted that the toxicity of cyanogenic glycosides was associated with its conversion into hydrogen cyanide. It was further noted that adequate processing of cyanogenic-glycosides-containing foods by consumers before consumption was out of the scope of the Committee as related more to labelling.

108. Based on the above discussion, the Committee agreed to request JECFA to review data available on occurrence of cyanogenic glycosides in foods and feeds, the mechanisms of releasing hydrogen cyanide in the human body, the effects of processing on reducing levels of hydrogen cyanide in the final product, and report back to the Committee in future.

DISCUSSION PAPER ON MYCOTOXINS IN SORGHUM (Agenda Item 9d)[23]

109. The Delegation of Tunisia, as leading country of the electronic working group outlined the main aspects, including 3 case studies and the recommendations covered by the discussion paper. It was pointed out that a number of mycotoxins, in particular fumonisins and aflatoxins, were associated with sorghum, but that this was dependent on several factors, amongst others, climatic conditions.

110. The Delegation concluded that while the implementation of the *Code of Practice for the Prevention and Reduction of Mycotoxin Contamination in Cereals* (CAC/RCP 51-2003) was a good start for limiting mycotoxin contamination in sorghum, a risk assessment was needed by JECFA in order for a maximum level to be set in future.

111. The JECFA Secretariat expressed the view that the Priorities Working Group (see Item 10) should in addition to considering fumonisins in the context of maize also consider sorghum. The Committee was further informed that aflatoxin had already been assessed by JECFA, but that an exposure assessment might be needed which would require more extensive data.

112. The Committee considered whether there was a need to develop a specific annex on prevention and reduction of contamination by aflatoxin in sorghum to the *Code of Practice for the Prevention and Reduction of Mycotoxin Contamination in Cereals*, but concluded that the Delegation of Tunisia would continue to collect all available data and to provide a more complete overview for discussion at the next session.

DISCUSSION PAPER ON ETHYL CARBAMATE IN ALCOHOLIC BEVERAGES (Agenda Item 9e)[24]

113. The Delegation of Germany introduced document CX/CF 09/3/13 and CRD 21 and stressed that the intake of ethyl carbamate from alcoholic beverages was a health concern, particularly with respect to stone fruit brandies.

114. Consequently, the Delegation recommended that the Committee consider the development of a Code of Practice for the reduction of ethyl carbamate in stone fruit distillates and that the Code should be based on the Annex described in CX/CF 09/3/13, including the signal value of 1mg/l ethyl carbamate. The Delegation further mentioned that the necessity of setting a maximum level of ethyl carbamate in stone fruit spirits should be assessed only after the Code of Practice has been implemented.

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23 CX/CF 09/3/12; CRD 18 (comments from the European Community).

24 CX/CF 09/3/13; CRD 9 (Comments from Democratic People's Republic of Korea); CRD 10 (Comments from Canada); CRD 13 (Comments from the Philippines); CRD 14 (Comments from the European Community); CRD 15 (Comments from Cuba); CRD 21 (draft Project Document on Code of Practice for the Reduction of Ethyl Carbamate in Stone Fruit Distillates).

115. The Committee agreed to start new work on a proposed draft Code of Practice for the Reduction of Ethyl Carbamate in Stone Fruit Distillates which will not include a signal value subject to approval by the 32nd Session of the Codex Alimentarius Commission, as presented in the Project Document appended to this Report (see Appendix VIII). The Committee agreed that depending on the outcome of the discussion the document may be finalized by 2010.

116. The Committee further agreed that the Delegation of Germany would prepare a proposed Draft Code of Practice for comments at Step 3 and consideration by the next session of the Committee.

PRIORITY LIST OF CONTAMINANTS AND NATURALLY OCCURRING TOXICANTS PROPOSED FOR EVALUATION BY JECFA (Agenda Item 10)[25]

117. The Delegation of the Netherlands, as Chair of the in-session Working Group on the Priority List of Contaminants and Naturally Occurring Toxicants for evaluation by JECFA, presented the report on the outcome of the discussion of the Working Group.

118. In addition to the information provided in CRD 2, it was noted that the current priority list contained three substances for evaluation by the 72nd meeting of JECFA (February 2010) namely: deoxynivalenol (DON), furan and perchlorate. 3-MCPD esters were not scheduled for evaluation by the 72nd JECFA since only limited data were available. Research on 3-MCPD esters was in progress and the preliminary results were expected by end of 2009 while the final results were expected by the end of 2010, therefore this compound was kept on the priority list.

119. The following substances were included in the priority list for future evaluation by JECFA: fumonisins and cyanogenic glycosides (foods and feeds) and cadmium and lead, the latter two receiving high priority for possible scheduling of the evaluation by the 73rd JECFA Meeting (June 2010).

CONCLUSION

120. The Committee endorsed the priority list of contaminants and naturally occurring toxicants for JECFA evaluation as proposed by the Working Group (Appendix XI) and agreed re-convene the in-session Working Group at its next session. The Committee further agreed to continue to request comments and/or information on the Priority List for consideration by the next session of the Committee.

OTHER BUSINESS AND FUTURE WORK (Agenda Item 11) [26]

Revision of the Code of Practice for the Prevention and Reduction of Aflatoxins in Tree Nuts

121. The Committee considered the rationale and the project document for the revision of the Code presented in CRD 24, prepared by the delegation of Brazil. Following the completion of the Standards and Trade Development Facility (STDF) project SafeNut which addressed the factors causing aflatoxin contamination in the Brazil nut production chain and the methods of control available, it appeared that an updating of the provisions on Brazil nuts in the Code of Practice was necessary in order to take into account the findings of the project.

122. The Committee generally agreed that this was an important issue in order to ensure consumer health protection and agreed that the revision should be undertaken. In the project document, the Committee agreed to delete the reference to trade decrease and the measures implemented by the EC for in-shell nuts from section 2 Relevance and Timeliness. The Committee noted that an outline of the amendments proposed was already presented and agreed that its objective would be to finalise the revision at its next session and forward the Proposed Draft Revised Code to the Commission for adoption at Step 5/8 in 2010.

123. The Committee agreed to initiate new work on the revision of the Code of Practice for the Prevention and Reduction of Aflatoxins in Tree Nuts, as presented in the project document in Appendix IX. Subject to the approval of the Commission, it was agreed that the Proposed Draft Revision prepared by the Delegation of Brazil would be circulated for comments at Step 3 and consideration at the next session.

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25 ALINORM 08/31/41, Appendix XIII and CX/CF 09/03/14 (comments from Uruguay); and CRD 2 (Report of the in-session Working Group on Priorities).

26 CRD 24 (Revision of the Code of Practice for the Prevention and Reduction of Aflatoxins in Tree Nuts), CRD 26 (Proposed Draft Maximum Levels for Melamine in Foods and Feeds)

Maximum Levels for Melamine in Food and Feed

124. Following its earlier discussion under Agenda item 3, the Committee considered a project document prepared by the Delegation of Canada (CRD 26) on the establishment of maximum levels for melamine. Some amendments were made to clarify that the levels would apply to foods and feed and were intended to promote consistency in risk management practices related to non-intentional and unavoidable presence of melamine.

125. The Committee confirmed that its objective was to finalise the maximum levels at its next session and to forward them to the Commission for final adoption at Step 5/8 in 2010.

126. The Committee agreed to initiate new work on maximum levels for melamine in foods and feed, as presented in the project document in Appendix X. Subject to approval by the Commission, the Committee further agreed that the Proposed Draft Maximum Levels would be developed by an electronic working group led by Canada and working in English, for comments at Step 3 and consideration at the next session.

DATE AND PLACE OF THE NEXT SESSION (Agenda Item 12)

127. The Committee was invited to consider whether the next session should continue be held on an annual basis. Some Delegations were of the view that annual sessions should depend on the size of the agenda and that longer intervals could be considered should the agenda not warrant the holding of annual sessions. The view was also expressed that the interval of sessions should be guided by the JECFA schedule. Many other Delegations were of the opinion that the next session should be convened before the 33rd Session of the Commission considering pressing issues such as melamine which needed to be completed.

128. The Committee was informed that the exact date and venue of the 4th Session of the Committee would be determined by the Host Government in consultation with the Codex Secretariat taking into account the views expressed.

SUMMARY STATUS OF WORK

SUBJECT MATTERS	STEP	ACTION BY:	DOCUMENT REFERENCE (ALINORM 09/32/41)
Draft Code of Practice for the Reduction of Acrylamide in Foods	8	Members and Observers, 32nd CAC	para. 64 and Appendix IV
Draft Code of Practice for the Reduction of Contamination of Food with Polycyclic Aromatic Hydrocarbons (PAH) from Smoking and Direct Drying Processes	8	Members and Observers, 32nd CAC	para. 67 and Appendix V
Proposed Draft Revision to the Preamble of the GSCTF	5/8	Members and Observers, 32nd CAC	para. 45 and Appendix III
Proposed Draft Code of Practice for the Prevention and Reduction of Ochratoxin A Contamination in Coffee	5/8	Members and Observers, 32nd CAC	para. 95 and Appendix VI
Amendments to Paragraph 10, Sample Preparation, in the Sampling Plans for Aflatoxin Contamination in Ready-to-Eat Treenuts and Treenuts Destined for Further Processing: Almonds, Hazelnuts and Pistachios	-	Members and Observers, 32nd CAC	para. 20 and Appendix II
Proposed Draft Maximum Levels for Total Aflatoxins in Brazil Nuts	2/3	Delegation of Brazil, Members and Observers, 4th CCCF	para. 78
Proposed Draft Maximum Levels for Fumonisins in Maize and Maize-Products and Associated Sampling Plans (new work)	1/2/3	Delegation of Brazil, Members and Observers, 4th CCCF	para. 101, Appendix VII
Proposed Draft Code of Practice for the Reduction of Ethyl Carbamate in Stone Fruit Distillates (new work)	1/2/3	Delegation of Germany, Members and Observers, 4th CCCF	paras 115 – 116, Appendix VIII
Proposed Draft Revision of the Code of Practice for the Prevention and Reduction of Aflatoxin in Tree Nuts (additional measures for Brazil Nuts)	1/2/3	Delegation of Brazil, Members and Observers, 4th CCCF	para. 123, Appendix IX
Proposed Draft Maximum Levels for Melamine in Food and Feed (new work)	1/2/3	Electronic Working Group led by Canada, Members and Observers, 4th CCCF	para. 126, Appendix X
Priority List of Contaminants and Naturally Occurring Toxicants Proposed for Evaluation by JECFA	-	Members and Observers, 4th CCCF	para. 120 and Appendix XI
Discussion Paper on Mycotoxins in Sorghum	-	Delegation of Tunisia	para. 112

APPENDIX I

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LISTE DES PARTICIPANTS
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APPENDIX II

AMENDMENTS TO PARAGRAPH 10, SAMPLE PREPARATION IN THE SAMPLING PLANS FOR AFLATOXIN CONTAMINATION IN READY-TO-EAT TREENUTS AND TREENUTS DESTINED FOR FURTHER PROCESSING: ALMONDS, HAZELNUTS AND PISTACHIOS

Treenuts destined for further processing / Ready-to-eat treenuts

Sample preparation – sample shall be finely ground and mixed thoroughly using a process, e.g., dry grind with a vertical cutter mixer type mill, that has been demonstrated to provide the lowest sample preparation variance.

APPENDIX III

PROPOSED DRAFT REVISION TO THE PREAMBLE OF THE CODEX GENERAL STANDARD FOR CONTAMINANTS AND TOXINS IN FOOD AND FEED

CODEX STAN 193-1995)

(At Step 5/8 of the Procedure)

1. PREAMBLE

1.1 SCOPE

This Standard contains the main principles which are recommended by the Codex Alimentarius in dealing with contaminants and toxins in food and feed, and lists the maximum levels and associated sampling plans of contaminants and natural toxicants in food and feed which are recommended by the CAC to be applied to commodities moving in international trade.

This standard includes only maximum levels of contaminants and natural toxicants in feed in cases where the contaminant in feed can be transferred to food of animal origin and can be relevant for public health.

1.2 DEFINITION OF TERMS

1.2.1 General

The definitions for the purpose of the Codex Alimentarius, as mentioned in the Procedural Manual, are applicable to the General Standard for Contaminants and Toxins in Food and Feed (GSCTFF) and only the most important ones are repeated here. Some new definitions are introduced, where this seems warranted to obtain optimal clarity. When reference is made to foods, this also applies to animal feed, in those cases where this is appropriate.

1.2.2 Contaminant

Codex Alimentarius defines a contaminant as follows:

"Any substance not intentionally added to food, which is present in such food as a result of the production (including operations carried out in crop husbandry, animal husbandry and veterinary medicine), manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such food or as a result of environmental contamination. The term does not include insect fragments, rodent hairs and other extraneous matter".

This standard applies to any substance that meets the terms of the Codex definition for a contaminant, including contaminants in feed for food-producing animals, except:

1) Contaminants having only food and feed quality significance (e.g. copper), but no public health significance, in the food(s) given that the standards elaborated within the Codex Committee on Contaminants in Foods (CCCF) has the objective to protect public health;

2) Pesticide residues, as defined by the Codex definition that are within the terms of reference of the Codex Committee on Pesticide Residues (CCPR).

3) Residues of veterinary drugs, as defined by the Codex definition, that are within the terms of reference of the Codex Committee on Residues of Veterinary Drugs in Foods (CCRVDF).

4) Microbial toxins, such as botulinum toxin and staphylococcus enterotoxin, and microorganisms that are within the terms of reference of the Codex Committee on Food Hygiene (CCFH).

5) Residues of processing aids that are within the terms of reference of the Codex Committee on Food Additives (CCFA)[1] .

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[1] Processing aids are any substance or material, not including apparatus or utensils, and not consumed as a food ingredient by itself, intentionally used in the processing of raw materials, foods or its ingredients, to fulfil a certain technological purpose during treatment or processing and which may result in the non-intentional but unavoidable presence of residues or derivatives in the final product

1.2.3 Natural toxins included in this standard

The Codex definition of a contaminant implicitly includes naturally occurring toxicants including toxic metabolites of certain microfungi that are not intentionally added to food and feed (mycotoxins).

Toxins that are produced by algae and that may be accumulated in edible aquatic organisms such as shellfish (phycotoxins) are also included in this standard. Mycotoxins and phycotoxins are both subclasses of contaminants.

Endogenous natural toxicants, such as e.g. solanine in potatoes, that are implicit constituents of food and feed resulting from a genus, species or strain ordinarily producing hazardous levels of a toxic metabolite(s), i.e. phytotoxins are not generally considered within the scope of this standard. They are, however, within the terms of reference of the CCCF and will be dealt with on a case by case basis.

1.2.4 Maximum level and related terms[2]

The ***Codex maximum level (ML)*** for a contaminant in a food or feed commodity is the maximum concentration of that substance recommended by the Codex Alimentarius Commission (CAC) to be legally permitted in that commodity.

1.3 PRINCIPLES REGARDING CONTAMINANTS IN FOOD AND FEED

1.3.1 General

Contamination of food and feed may pose a risk to human (and/or animal health). Moreover in some cases they may also have a negative impact on the quality of the food or feed. Food and feed can become contaminated by various causes and processes.

Contaminant levels in food and feed shall be as low as reasonably achievable through best practice such as Good Agricultural Practice (GAP) and Good Manufacturing Practice (GMP) following an appropriate risk assessment. The following actions may serve to prevent or to reduce contamination of feed and food[3]:

- preventing food and feed contamination at the source, e.g. by reducing environmental pollution.
- applying appropriate technology control measure(s) in food and feed production, manufacture, processing, preparation, treatment, packing, packaging, transport or holding.
- applying measures aimed at decontamination of contaminated feed or food and measures to prevent contaminated feed or food to be marketed for consumption.

To ensure that adequate action is taken to reduce contamination of food and feed a Code of Practice shall be elaborated comprising source related measures and Good Manufacturing Practice as well as Good Agricultural Practice in relation to the specific contamination problem.

The degree of contamination of food and feed and the effect of actions to reduce contamination shall be assessed by monitoring, survey programs and more specialized research programs, where necessary.

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[2] For the contaminants methylmercury, radionuclides, acrylonitrile and vinylchloride monomer a **Codex guideline level (GL)** has been established.
A ***Codex guideline level*** (***GL)*** is the maximum level of a substance in a food or feed commodity which is recommended by the CAC to be acceptable for commodities moving in international trade. When the GL is exceeded, governments should decide whether and under what circumstances the food should be distributed within their territory or jurisdiction.
Because the CAC has decided that the preferred format of a Codex standard in food or feed is a maximum level, the present existing or proposed guideline levels shall be reviewed for their possible conversion to a maximum level after a risk assessment performed by JECFA, if appropriate.

[3] In addition, reference is made to the Code of Practice for source Directed measures to reduce contamination of food with chemicals (CAC/RCP 49-2001) and the Code of Practice on Good Animal Feeding (CAC/RCP 54-2004)

When there are indications that health hazards may be involved with consumption of food that is contaminated, it is necessary that a risk assessment should be undertaken. When health concerns can be substantiated, a risk management measure must be applied, based on a thorough evaluation of the situation and consideration of a range of risk management options. Depending on the assessment of the problems and the possible solutions, it may be necessary to establish MLs or other measures to control the contamination of food and feed. In special cases, specific advice on dietary recommendations may also have to be considered to complement other regulatory measures, when the measures are not sufficiently adequate to protect public health and safety.

National measures regarding food and feed contamination should avoid the creation of unnecessary barriers to international trade in food and feed commodities. The purpose of the GSCTFF is to provide guidance about possible approaches to eliminate or reduce the contamination problem and to promote international harmonization through recommendations which in turn may prevent trade barriers and disputes.

For all contaminants, which may be present in more than one feed or food item, a broad approach shall be applied, taking into account all relevant information that is available, for the assessing of risks and for developing recommendations and control measures, including the setting of maximum levels.

1.3.2 Principles for establishing maximum levels in food and feed

MLs shall only be set for food in which the contaminant may be found in amounts that are significant for the total exposure of the consumer, taking into consideration the Policy of the Codex Committee on Contaminants in Foods for Exposure Assessment of Contaminants and Toxins in Foods or Food Groups (Section III of the Procedural Manual)

The maximum levels shall be set in such a way that the consumer is adequately protected. At the same time the other legitimate factors need to be considered. . This will be performed in accordance with the "Working principles for Risk Analysis for Food safety for Application by Governments".

The principles of Good Manufacturing Practice and Good Agricultural Practice as defined by Codex shall be used. Maximum levels shall be based on sound scientific principles leading to levels which are acceptable worldwide, so that there is no unjustified barrier to international trade. MLs shall be clearly defined with respect to status and intended use.

1.3.3 Specific criteria

The following criteria should (not preventing the use of other relevant criteria) be considered when developing MLs and/or other measures in connection with the Codex General Standard for Contaminants and Toxins in Food and feed : (Further details about these criteria are given in Annex I).

Toxicological information

- identification of the toxic substance(s);
- metabolism by humans and animals, as appropriate;
- toxicokinetics and toxicodynamics including information on possible carry-over of the toxic substance from feed to edible animal tissue/products;
- information about acute and long term toxicity and other relevant toxicity data; and
- integrated toxicological expert advice regarding the acceptability and safety of intake levels of contaminants, including information on any population groups which are specially vulnerable.

Analytical data

- validated qualitative and quantitative data on representative samples; and
- appropriate sampling procedures.

Intake data

- presence in food of dietary significance for the contaminant;
- presence in food that are widely consumed;
- presence in feed and feed components
- food intake data for average and most exposed/high consumer groups;

- results from total diet studies;
- calculated contaminant intake data from food consumption models; and
- data on intake by susceptible groups.
- data on intake by food producing animals

Technological considerations

- information about contamination processes, technological possibilities, production and manufacturing practices and economic aspects related to contaminant level management and control.
- **Risk assessment and risk management considerations (**cf. "Working Principles for Risk Analysis for Food Safety for Application by Governments) risk assessment;
- risk management options and considerations;
- consideration of possible maximum levels in food and feed based on the criteria mentioned above; and
- consideration of alternative solutions.

1.4 FORMAT OF THE GENERAL STANDARD FOR CONTAMINANTS IN FOOD AND FEED

The General Standard for Contaminants and Toxins in Food and feed contains one type of presentation for the Standards: Schedule I in which the standards are listed per contaminant in the various food and feed categories.

In order to obtain maximum clarity, explanatory notes shall be added where appropriate. The format contains all elements necessary for full understanding of the meaning, background, application and scope of the standards and contains references to the relevant documents and reports on which the standard is based.

A full description of the format is provided in Annex II.

ANNEX I

CRITERIA FOR THE ESTABLISHMENT OF MAXIMUM LEVELS IN FOOD AND FEED

Introduction

In this Annex criteria are mentioned regarding information which is considered necessary for evaluating contaminant problems in food and feed and for the establishment of maximum levels. The criteria mentioned here are elaborated in more detail than in section 1.3.3. of the Preamble. Only those aspects that need further clarification are detailed; however, criteria or aspects that are not specifically detailed here should not be ruled out in the evaluation process.

Toxicological information

Integrated toxicological expert advice regarding a safe/tolerable intake level of a contaminant is essential when decisions about maximum levels in foods are considered. A recommendation from JECFA regarding the maximum allowable or tolerable intake, based on a full evaluation of an adequate toxicological data base, should be the main basis for decisions by Codex members. In urgent cases, it may be possible to rely on less developed evaluations from JECFA or on toxicological expert advice from other international or national bodies.

When toxicological information is presented in relation to proposals for maximum levels for contaminants in food and feed, information about the following aspects is desirable:

- identification of the toxic substance(s);
- metabolism in humans and animals, as appropriate;
- toxicokinetics and toxicodynamics including information on possible carry-over of the contaminant from feed to edible animal tissue/products;
- information about acute and long term toxicity in animals and humans, including epidemiological data on humans and other relevant toxicity data;
- conclusions and advice of toxicological expert(s) (groups), with references, including information on specially vulnerable population groups or animals.

Analytical data

Validated qualitative and quantitative analytical data on representative samples should be supplied. Information on the analytical and sampling methods used and on the validation of the results is desirable. A statement on the representativeness of the samples for the contamination of the product in general (e.g. on a national basis) should be added. The portion of the commodity that was analyzed and to which the contaminant content is related should be clearly stated and preferably should be equivalent to the definition of the commodity for this purpose or to existing related contaminant regulation.

Information on appropriate sampling procedures should be supplied. Special attention to this aspect is necessary in the case of contaminants that may not be homogeneously distributed in the product (e.g. mycotoxins in some commodities).

Intake data

It is desirable to have information about the contaminant concentrations in those foods or food groups that (together) are responsible for at least half and preferably 80% or more of the total dietary intake of the contaminant, both for consumers with average and high consumption patterns.

Information about the ***presence of the contaminant in foods that are widely consumed*** (staple foods) is desirable in order to be able to make a satisfactory assessment of the contaminant intake and of risks associated with food trade.

For the contaminants which can be present in food of animal origin as a consequence of the carry over from feed, information about the presence of the contaminant in the feed and feed components should be given. Furthermore the intake of contaminants by the different food producing animals and the resulting levels of the contaminant in the food of animal origin should be estimated.

Food consumption data for average, most exposed (high consumers) and susceptible consumer groups are desirable for evaluations of (potential) intake of contaminants. This problem, however, has to be addressed differently on a national and on an international scale. It is therefore important to have information about both average and high consumption patterns regarding a wide variety of foodstuffs, so that for every contaminant the most exposed consumer groups may be identified for every contaminant. Detailed information about high consumption patterns is desirable, both regarding group identification criteria (e.g. age or sex differences, vegetarian or regional dietary customs, etc.) and statistical aspects.

Dietary intake of contaminants**:** Reference is made to the Guidelines for the study of dietary intake of chemical contaminants (WHO, 1985 - http://whqlibdoc.who.int/offset/WHO_OFFSET_87.pdf). It is important to supply all relevant details, such as the type of study (duplicate diet, total diet or market basket study, selective study), and statistical details. Calculated contaminant intake data from food consumption models may also be useful. When results about food groups and about effects of preparation and cooking etc. are available, these should also be supplied.

Technological considerations

Information about the source of the contaminant and the way in which the food and feed is contaminated, possibly including information, if available, about contamination being present in parts only of the product, is essential for assessing the possibilities to control the contamination process and to be able to guarantee a desired product safety and quality. Where possible ***Source-related measures*** should be proposed. ***Good Manufacturing Practice (GMP)*** and/or ***Good Agricultural Practice (GAP)*** should also be adapted to control a contamination problem. When this is possible, maximum levels may be based on GMP or GAP considerations to establish at a level as low as reasonably achievable and necessary to protect the consumer. Considerations regarding the technological possibilities to control a contamination problem, e.g. by cleaning, should also be taken into account when a primary risk assessment model (theoretical maximum daily intake) shows possible intakes exceeding the toxicological reference value. . In such a case the possibilities of lower contamination levels need further careful examination. Then a detailed study about all the aspects involved is necessary, so that decisions about maximum levels can be based on a thorough evaluation of both the public health arguments and the potential problem with complying with the proposed standard.

Risk assessment and risk management considerations

Risk assessment and risk management are conducted in accordance with the Working Principles for Risk Analysis for Food Safety Application by Governments.

Establishment of maximum levels

In case it is decided that, on the basis of the outcome of the risk assessment, there is no need to establish a maximum level to protect public health as the level of hazard/risk does not pose a public health problem, this should be communicated in a transparent and accessible manner (e.g. by using the full format as provided for Schedule I and to mention in the box of Maximum level "not necessary").

The ***establishment of maximum levels (MLs) of contaminants in food and feed*** involves several principles, some of which have already been mentioned in this Preamble. Briefly stated, the following criteria will help in maintaining a consistent policy in this matter:

- MLs should be set only for those contaminants that present both a significant risk to public health and a known or expected problem in international trade.
- MLs should be set only for food that is significant for the total exposure of the consumer to the contaminant. When identifying the significance of certain foods in the total exposure to the contaminant, the criteria contained in para 11 of the Policy of the Codex Committee on contaminants in Foods for Exposure Assessment of Contaminants and Toxins in Foods or Food Groups (section III of the Codex Alimentarius Commission Procedural Manual).should be consulted

- MLs should be set as low as reasonably achievable and at levels necessary to protect the consumer. Providing it is acceptable from the toxicological point of view, MLs should be set at a level which is (slightly) higher than the normal range of variation in levels in food and feed that are produced with current adequate technological methods, in order to avoid undue disruptions of food and feed production and trade. Where possible, MLs should be based on GMP and/or GAP considerations in which the health concerns have been incorporated as a guiding principle to achieve contaminant levels as low as reasonably achievable and necessary to protect the consumer. Foods that are evidently contaminated by local situations or processing conditions that can be avoided by reasonably achievable means shall be excluded in this evaluation, unless a higher ML can be shown to be acceptable from a public health point of view and significant economic aspects are at stake.

- Proposals for MLs in products should be based on data from various countries and sources, encompassing the main production areas/processes of those products, as far as they are engaged in international trade. When there is evidence that contamination patterns are sufficiently understood and will be comparable on a global scale, more limited data may be enough.

- MLs may be set for product groups when sufficient information is available about the contamination pattern for the whole group, or when there are other arguments that extrapolation is appropriate.

- Numerical values for MLs should preferably be regular figures in a geometric scale (0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5 etc.), unless this may pose problems in the acceptability of the MLs.

- MLs should apply to representative samples per lot. If necessary, appropriate methods of sampling should be specified.

- MLs should not be lower than a level which can be analyzed with methods of analysis that can readily be set up and applied in food and feed control laboratories, unless public health considerations necessitate a lower ML which can only be controlled by means of a more elaborate and sensitive method of analysis with an adequate lower detection limit. In all cases, a validated method of analysis should be available with which a ML can be controlled.

- The contaminant as it should be analyzed and to which the ML applies should be clearly defined. The definition may include important metabolites when this is appropriate from an analytical or toxicological point of view. It may also be aimed at indicator substances which are chosen from a group of related contaminants.

- The product as it should be analyzed and to which the ML applies, should be clearly defined. In general, MLs are set on primary products. MLs should in general preferably be expressed as a level of the contaminant related to the product as it is, on a fresh weight basis. In some cases, however, there may be valid arguments to prefer expression on a dry weight basis (this might be in particular the case for contaminants in feed) or on a fat weight basis (this might be in particular the case for fat soluble contaminants). Preferably the product should be defined as it moves in trade, with provisions where necessary for the removal of inedible parts that might interfere with the preparation and the analysis of the sample. The product definitions used by the CCPR and contained in the Classification of food and feed may serve as guidance on this subject; other product definitions should only be used for specified reasons. For contaminant purposes, however, analysis and consequently MLs should preferably be on the basis of the edible part of the product.

  For fat soluble contaminants which may accumulate in animal products, provisions should be applied regarding the application of the ML to products with various fat content (comparable to the provisions for fat soluble pesticides).

- Guidance is desirable regarding the possible application of MLs established for primary products to processed products and multi-ingredient products. When products are concentrated, dried or diluted, use of the concentration or dilution factor is generally appropriate in order to be able to obtain a primary judgement of the contaminant levels in these processed products. The maximum contaminant concentration in a multi-ingredient food and feed can likewise be calculated from the composition of the food and feed. Information regarding the behaviour of the contaminant during processing (e.g. washing, peeling, extraction, cooking, drying etc.) is however desirable to give more adequate guidance. When contaminant levels are consistently different in processed products related to the primary products from which they are derived, and sufficient information is available about the contamination pattern, it may be appropriate to establish separate maximum levels for these processed products. This also applies when contamination may occur during processing. In general however, MLs should preferably be set for primary agricultural products and may be applied to processed, derived and multi-ingredient food and feed by using appropriate conversion factors. When these factors are sufficiently known, they should be mentioned in the suffix to the maximum level following the format of list of MLs as defined in Annex II.
- MLs should preferably not be set higher than is acceptable in a primary (theoretical maximum intake and risk estimation) approach of their acceptability from a public health point of view. When this poses problems in relation to other criteria for establishing MLs, further evaluations are necessary regarding the possibilities to reduce the contaminant levels, e.g. by improving GAP and/or GMP conditions. When this does not bring a satisfactory solution, further refined risk assessment and contaminant risk management evaluations will have to be made in order to try to reach agreement about an acceptable ML.

Procedure for risk assessment in relation to (proposed) MLs

It is more difficult to control food and feed contamination problems than in the case of food additives and pesticide residues. Proposed MLs will inevitably be influenced by this situation. In order to promote acceptance of Codex contaminant MLs, it is therefore important that assessments of the impact of those MLs on dietary exposure are done in a consistent and realistic way. The procedure involves assessment of the dietary intake in relation to the proposed or existing MLs and the toxicological reference value.

In case a contaminant is carried over from feed to food of animal origin, the intake of a contaminant by the different food producing animal species and the resulting levels in the food of animal origin should be estimated.

The best estimate of dietary intake involves the national dietary pattern and corrections for concentration changes during transport, storage, food preparation, for known levels in foods as consumed, etc. Caution is recommended when using other than average food consumption values, although it is considered appropriate to use relevant average food consumption data for identifiable subgroups of the population. Food consumption patterns with a higher intake of critical foods may be used in the intake calculations when this is part of an accepted national or international health protection and risk management policy. A harmonized approach using an appropriate intake estimation model that is as realistic as possible is recommended. (cf. the "Policy of the Codex Committee on contaminants in Foods for Exposure Assessment of Contaminants and Toxins in Foods or Food Groups" -section III of the Codex Alimentarius Commission Procedural Manual). Calculated data should where possible always be compared with measured intake data. Proposals for MLs should be accompanied by intake calculations and risk assessment conclusions regarding their impact on dietary intake and use. The intake calculations should follow the methodology described in the CCCF Policy for Exposure Assessment and, if appropriate, be accompanied by the generation of distribution curves for the concentration in specific foods/food groups (see paras 5-8 and 12-14 of the Policy of the Codex Committee on Contaminants in Foods for Exposure Assessment of Contaminants and Toxins in Foods in the Codex Alimentarius Commission Procedural Manual). Statements from Governments about the non-acceptance of (proposed) Codex MLs should refer to specified intake calculations and risk management conclusions which support this position.

ANNEX II

FORMAT OF THE GSCTFF

Introduction

The format for Schedule shall contain the following elements:

- ***Name of the contaminant:*** symbols, synonyms, abbreviations, scientific descriptions shall be mentioned.
- ***Reference to JECFA meetings*** (in which the contaminant was discussed).
- ***PMTDI, PTWI or similar toxicological reference value:*** when the situation is complex a short statement and further references may be necessary here.
- ***Contaminant definition:*** definition of the contaminant as it shall be analyzed and to which the maximum level applies.
- ***Reference to a source-***directed measure or a code of practice for the contaminant, if appropriate.
- ***List of Codex maximum levels for that contaminant;*** this list shall be composed of the following elements, in columns:
  - Classification number of feed/food commodity or feed/food category;
  - Name of feed/food commodity/category;
  - Numerical value of maximum level;
  - Suffix accompanying a ML to specify the application of the ML;
  - References to documents, or adoption year
  - References to standard criteria for methods of analysis and sampling;
  - Notes/remarks.

APPENDIX IV

DRAFT CODE OF PRACTICE FOR THE REDUCTION OF ACRYLAMIDE IN FOODS (N06-2006)

(At Step 8 of the Procedure)

INTRODUCTION

1. Recent concern over the presence of acrylamide in food dates from 2002. Swedish scientists reported that up to "mg/kg" quantities of acrylamide could be formed in carbohydrate-rich foods during high-temperature cooking, e.g. during frying, baking, roasting, toasting and grilling. These findings were rapidly confirmed by other researchers; subsequently, major international efforts have been mounted to investigate the principal sources of dietary exposure, assess the associated health risks and develop risk management strategies. Details of these global research initiatives are provided on the WHO/FAO Acrylamide Information Network (http://www.acrylamide-food.org/) and the "Acrylamide Information Base[a]" http://ec.europa.eu/food/food/chemicalsafety/contaminants/acryl_database_en.htm. There has also been work on acrylamide mitigation studies which are reported in English in the CIAA Acrylamide Tool Box and at http://ec.europa.eu/food/food/chemicalsafety/contaminants/acrylamide_en.htm and **http://www.ciaa.be/asp/documents/11.asp?doc_id=822**.

2. Acrylamide is mainly formed in food by the reaction of asparagine (an amino acid) with reducing sugars (particularly glucose and fructose) as part of the Maillard Reaction; acrylamide may also be formed *via* reactions involving 3-aminopropionamide. Acrylamide formation primarily takes place under conditions of high temperature (usually in excess of 120°C) and low moisture.

3. The Joint FAO/WHO Expert Committee on Food Additives (JECFA) has undertaken a comprehensive analysis of acrylamide occurrence data from 24 countries, the majority originating from Europe and North America. It was concluded that the major contributing food groups were French fries[b], potato crisps[c], coffee, biscuits[d]/pastries, bread and rolls/toasted bread. The full extent of acrylamide present throughout the diet remains unclear.

SCOPE

4. This Code of Practice intends to provide national and local authorities, manufacturers and other relevant bodies with guidance to prevent and reduce formation of acrylamide in potato products and cereal products. The guidance covers three strategies (where information is available) for reducing acrylamide formation in particular products:

   i. Raw materials;

   ii. Control / addition of other ingredients; and

   iii. Food processing and heating.

GENERAL CONSIDERATIONS AND CONSTRAINTS IN DEVELOPING PREVENTATIVE MEASURES

5. Measures aimed at reducing levels of acrylamide cannot be taken in isolation from other considerations. Precautions need to be taken to avoid compromising the existing chemical and microbiological safety of the food. The nutritional qualities of products also need to remain unimpaired, together with their organoleptic properties and associated consumer acceptability. This means all minimisation strategies need to be assessed with regards to their benefits and any possible adverse effects. For example:

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[a] A database containing information on projects and activities relating to acrylamide in the EU Member States.

[b] Potato products that are thickly sliced and fried (referred to as French fries in some regions including North America, or as chips in the UK).

[c] Potato snack product that is thinly sliced and fried (includes foods called potato chips in some regions including North America).

[d] Baked cereal products (referred to as cookies in some regions, including North America).

i. When preventative measures for acrylamide are considered, checks should be made to ensure that they will not result in an increase in other process contaminants. These include N-nitrosamines, polycyclic aromatic hydrocarbons, chloropropanols, ethyl carbamate, furan, heterocyclic aromatic amines and amino acid pyrolysates.

ii. Preventative measures devised for acrylamide must not compromise the microbiological stability of the final product. In particular, regard needs to be paid to the moisture content of the final product.

iii. Precautions should be taken to avoid detrimental changes to the organoleptic properties of the final product. The formation of acrylamide is intimately associated with the generation of the characteristic colour, flavour and aroma of cooked foods. Proposed changes to cooking conditions, or indeed raw materials and other ingredients, must be assessed from the perspective of the acceptability of the final product to the consumer.

6. Formal safety assessments, efficacy-in-use demonstration and regulatory approval may be needed for potential new additives and processing aids such as asparaginase. Some companies are producing asparaginase for use in food products and some countries have approved it as a processing aid.

7. It should be noted that the extent of acrylamide formation can be quite variable e.g. within a production batch made at the same manufacturing plant, or between plants using the same process, ingredients and formulations.

8. Manufacturers need to be aware that variability in incoming raw materials and poorly controlled heating devices can complicate trials of mitigation strategies, by obscuring changes in acrylamide levels.

RECOMMENDED PRACTICES TO INDUSTRY FOR THE MANUFACTURE OF POTATO PRODUCTS (E.G. FRENCH FRIES, POTATO CRISPS, POTATO SNACKS).

THE MITIGATION MEASURES DISCUSSED IN THE FOLLOWING SECTIONS ARE NOT LISTED IN ORDER OF PRIORITY. IT IS RECOMMENDED THAT ALL REDUCTION MEASURES ARE TESTED TO IDENTIFY THE MOST SUCCESSFUL FOR YOUR OWN PRODUCT.

Production Stage	Reduction Measures
Raw Materials	Select potato cultivars with levels of reducing sugars as low as reasonably achievable taking into account regional and seasonal variability. Test incoming deliveries of potatoes for levels of reducing sugars, or fry test them (aim for a light golden colour).
	Avoid using potatoes stored below 6 °C. Control storage conditions from farm to factory and in cold weather, protect potatoes from cold air. Avoid leaving deliveries of potatoes outside (unprotected) in freezing conditions for long periods of time, e.g. overnight. Recondition potatoes from low-temperature storage at higher temperatures (e.g. 12 – 15 °C) for a period of weeks. .
Control / addition of other ingredients	In the case of potato-based snacks produced from doughs, where possible, replace some of the potato with other ingredients with lower reducing sugar/asparagine content e.g. rice flour Avoid addition of reducing sugars (e.g. as browning agent, spice carrier or coating).
	The addition of asparaginase in some cases has been shown to reduce asparagine and thus acrylamide in potato dough based products.
	Treatment of French fries with sodium pyrophosphate and treatment of potato products with di-and trivalent cations e.g. calcium salts before processing can contribute to the reduction of acrylamide.
Food Processing and heating	**French Fries:** Blanch potato strips in water to lower levels of reducing sugars before cooking. Lowering the pH with addition of sodium acid pyrophosphate during the latter stages of blanching can reduce levels further. Cut thicker strips; 14x14mm strips have been shown to have lower acrylamide levels than fine cut strips (8x8mm). If appropriate, par fry french fries.
	Potato crisps: Optimise time, temperature and cooker settings to produce a crisp product with a golden yellow colour. If available, consider vacuum frying to process high reducing sugar potatoes. Rapid cooling is recommended if flash frying is being used. Carry out in line colour sorting to remove dark crisps

Raw materials

9. A number of factors influence reducing sugar levels including:

i. Climatic conditions and fertilizer application rate – These factors are known to influence levels of reducing sugars, however, no specific information on reduction measures applicable to manufacturers are currently available.

ii. Cultivar - Select cultivars with levels of reducing sugars as low as reasonably achievable taking into account regional and seasonal variability for high temperature cooking processes such as frying and baking.

iii. Storage temperature and time – Control storage conditions from farm to factory; >6° C has been identified as good practice for long storage for processing. Avoid using potatoes that have been subject to excessive low-temperature sweetening during storage (at, or below 4-6 °C) for frying, roasting and oven-baking. In cold weather protect potatoes from cold air. Avoid leaving deliveries of potatoes standing outside (unprotected) over night in freezing conditions. Some cultivars are less prone than others to low temperature sweetening. Information on some cultivars is contained in a database available from the European Cultivated Potato Database and the German Federal Office of Plant Varieties.

iv. Reconditioning temperature and time - Potatoes that have been stored at low temperatures should be reconditioned over a period of a few weeks at higher temperatures (e.g. 12 – 15 °C).. The decision to recondition stored potatoes, as well as decisions on the length of time needed for reconditioning, should be made on the basis of the results of fry testing.

v. Tuber size/immature tubers - Immature tubers have higher reducing sugar levels and produce darker fried products with potentially higher levels of acrylamide. The presence of immature tubers should be avoided by selecting, sorting or grading of potatoes at some stage before processing.

10. Sprout suppressant is often essential in stores held at temperatures over 6 °C, although regional regulations in some cases do not permit the use of sprout suppressants.

11. Manufacturers of French fries and potato crisps should where feasible screen incoming lots by measuring reducing sugar content or assessing the colour of a fried sample. In particular, fry test potatoes that have been stored at low temperatures for long periods of time. When using cultivars with not sufficiently low reducing sugar contents, reconditioning and blanching before high temperature cooking processes, and vacuum frying for heating may lower the level of acrylamide.

Control/addition of other ingredients

12. For reconstituted or formed potato-based snacks produced from potato doughs, other ingredients with lower reducing sugar/asparagine content can sometimes be used in some products to partially replace the potato e.g. rice flour.

13. Addition of the enzyme asparaginase has been shown to reduce asparagine and thus acrylamide levels in potato products made from potato doughs.Asparaginase may be best suited for food products manufactured from liquidised or slurried materials. In practice asparaginase can functionally reduce acrylamide in prefabricated potato crisps, however, the amount of asparagines in the raw potato product is generally so high that in order to achieve a meaningful reduction in acrylamide a large amount of asparaginase must be added. This may preclude the use of the enzyme for some potato products.

14. Treatment with various other reagents e.g., sodium pyrophosphate and calcium salts prior to the frying stage has also been demonstrated to reduce acrylamide formation. Additives should be used according to the appropriate national or international legislation.

15. The use of reducing sugars as a browning agent, spice carrier or coating should also be avoided where possible because they can cause the formation of significant levels of acrylamide.

Food processing and heating

16. Decrease of the surface area can be employed; for example in French fries, by cutting potatoes into thicker slices; 14x14mm strips have been shown to have lower acrylamide levels than fine cut strips (8x8mm) or removal of fines (fine pieces of potato) before or after frying to reduce levels of acrylamide in fried or roasted potatoes.

17. Washing, blanching or par-boiling treatments can be employed to leach the asparagine/reducing sugar reactants from the surface of the potato before the cooking step. Various reagents for lowering pH can also be added during the latter stages of blanching to further reduce levels of acrylamide, these include, treatment of French fries with sodium acid pyrophosphate, treatment with calcium salts, and the salts of a number of other di- and trivalent cations (this method has been shown to reduce acrylamide formation in French fries made from potato dough) and blanching in sodium chloride solution (though this method may increase dietary exposure to sodium).

    i. Blanching or soaking potatoes has shown to reduce acrylamide levels but can also have an adverse effect on the flavour and texture of the final product. Blanching can also lead to leaching of vitamin C and minerals from potatoes. A blanching step before frying/roasting may lower the fat content of the final product, but there is contradictory information on this topic.

    ii. Blanching may also be unsuitable for some products e.g. potato crisps, as it may cause unacceptable moisture uptake, leading to loss of consistency/ crispness or possible microbiological spoilage.

18. Acrylamide levels in potato crisps can be reduced by controlling the thermal input. Vacuum frying might offer the opportunity to reduce acrylamide levels in crisps made from potatoes with high reducing sugar content. Rapid cooling potato crisps that are cooked by flash frying can also reduce levels of acrylamide in the final product. The use of in-line optical sorting to remove dark coloured crisps has been proved to be an effective measure to reduce acrylamide. Par cooking far-infrared heating and dry steam treatments used to make low fat crisps may also reduce acrylamide.

19. In order to achieve significant reductions in the acrylamide content of French fries, when cooking the product immediately prior to consumption, set the initial oil temperature to no more than 170-175^{o}C and cook to a golden-yellow rather than a golden-brown colour. Depending on the heating power of the fryer, the amount of potato immersed in the oil should aim to give an actual frying temperature starting from about 140^{o}C and ending at about 160^{o}C. A bigger long-lasting temperature drop after addition of the potato will increase the fat uptake, and a higher end temperature will result in excessive acrylamide formation.

20. Manufacturers of prefabricated par fried French fries should ensure that their on-pack cooking instructions are consistent with the need to minimise acrylamide formation. Where frying is one of the on-pack suggestions for “Prefabricated” French fries, the recommended frying temperature should not be greater than 175 °C. The cooking instructions should also mention that consumers should reduce the cooking time when cooking small amounts and that they should cook fries to a golden-yellow colour.

21. Some “Oven” French fries or prefabricated potato products are manufactured with a view to storage under refrigerated rather than frozen conditions. Storage at these conditions may be conducive to low-temperature sweetening due to residual amylase activity which leads to reducing sugar formation from starch. Should this be the case, blanching must be adapted (longer time and/or higher temperature) in order to fully inactivate the amylase activity.

RECOMMENDED PRACTICES TO INDUSTRY FOR THE MANUFACTURE OF CEREAL BASED PRODUCTS (E.G. BREAD, CRISPBREAD, BISCUITS/BAKERY WARES, BREAKFAST CEREALS).

THE MITIGATION MEASURES DISCUSSED IN THE FOLLOWING SECTIONS ARE NOT LISTED IN ORDER OF PRIORITY. IT IS RECOMMENDED THAT ALL REDUCTION MEASURES ARE TESTED TO IDENTIFY THE MOST SUCCESSFUL FOR YOUR OWN PRODUCT.

Production Stage	Reduction Measures
Raw Materials	Sulphur deficient soil should be avoided, or well fertilised. Excessive nitrogen fertilization should be avoided.
Control / addition of other ingredients	**General:** Consider the type of flour to be used. High extraction flours contain significantly less asparagine than wholemeal flours. However, lowering the wholemeal content will reduce the nutritional benefits of the final product. Consider part replacement of wheat flour by rice flour.
	Biscuits/bakery wares: When ammonium containing raising agents are used, consider replacements with other raising agents e.g. potassium and sodium containing raising agents. In the production of gingerbread replace fructose with glucose. The addition of asparaginase has been shown to reduce asparagine and thus acrylamide in hard, wheat-dough based products such as cookies and crackers.
	Bread: Avoid using reducing sugars in the recipe. The addition of calcium salts, e.g. calcium carbonate may reduce the formation of acrylamide.
	Breakfast cereals: Minimize reducing sugars in the cook phase. Consider the contribution of other inclusions e.g. roasted nuts, dried fruits and whether they are necessary if they are in a form that potentially can add a significant level of acrylamide.
Food Processing and heating	**General:** Do not over bake.
	Bread: Adjust the time-temperature profile of the baking process, i.e., decrease temperatures of the final stages when product reaches low moisture phase. Extend fermentation times of bread doughs.
	Crispbread: Control the final moisture content. In non-fermented crispbread control the process temperature and oven speed.
	Breakfast cereals: Do not over-bake or over-toast. Manage the toasting to achieve a uniform colour for the product.

Raw materials

22. Typically, asparagine can range from 75 to 2200 mg/kg in wheat, from 50 to 1400 mg/kg in oats, from 70 to 3000 mg/kg in maize, from 319 to 880 mg/kg in rye and from 15 to 25 mg/kg in rice. This level of variation suggests that there may be scope for reducing acrylamide by exploiting the variability of asparagine content in the cultivar pool. However, as in the similar case for potatoes, such approaches are likely to have a significant lead time, and other factors, such as yield and resistance to fungal infections (field mycotoxin formation), would need to be considered.

23. Deficiencies in the sulphur content of soil can cause an increase in asparagine levels in wheat and barley. Therefore, sulphur deficient soil should be avoided, or well fertilised. High nitrogen content in soils may result in higher asparagine content in cereals and excessive nitrogen fertilization should be avoided.

24. In mixed cereal products, there may be scope for reducing the proportion of the predominant source of acrylamide by incorporating cereals with lower asparagine content. For example, this strategy could include replacing rye and wheat with rice, however, nutritional and organoleptic implications must be considered.

Control/addition of other ingredients

25. Thought should be given to the type of flours used in products. High extraction flours contain significantly less asparagine than wholemeal flours. Part replacement of wheat flour by rice flour has been shown to reduce acrylamide in short sweet biscuits and gingerbread. However, lowering the wholemeal content will reduce the nutritional benefits of the final product. Types of flours vary in asparagine content and choice should be balanced between nutritional value and minimization of acrylamide formation.

26. Ammonium bicarbonate has been shown to increase the potential yield of acrylamide from a baked product. Thus, manufacturers need to consider whether the use of ammonium-containing raising agents can be reduced. Additives should be used according to the appropriate national or international legislation. Replacement leavening agents used commercially include:

    i. Sodium bicarbonate + acidulants;

    ii. Disodium diphosphate, sodium bicarbonate and organic acids;

    iii. Potassium bicarbonate + potassium bitartrate;

    iv. Sodium bicarbonate + sodium acid pyrophosphate (SAPP).

    v. Replacement of ammonium-containing raising agents with those containing sodium may increase dietary exposure to sodium and may also adversely affect the physical properties of gingerbread and the organoleptic qualities of biscuits. Combination of sodium bicarbonate and organic acids e.g. tartaric acid and citric acid, may result in a product with somewhat lesser leavening. The amount of organic acids added needs to be limited because an acidic taste may be developed and gas release in the dough may be too fast.

    vi. Greater amounts of acrylamide are formed if the reducing sugar is fructose rather than glucose. Commercial investigations have shown removal of sources of fructose or replacement by glucose in the product ingredients (sugar syrups, fruit puree, honey) to be successful in reducing acrylamide formation. If glucose syrup (also known as corn syrup in North America) is necessary, the level of fructose in this syrup should be as low as possible. The replacement of reducing sugars by sucrose is another effective way to significantly reduce acrylamide in sweet baked goods if browning is less important.

27. The addition of asparaginase has been shown to reduce asparagine and thus acrylamide in hard, wheat-dough based products such as cookies and crackers.

28. Care should also be exercised in the usage of reducing sugars during the manufacture of breakfast cereals. When such sugars are used they are usually added after the baking process, in which case no additional acrylamide formation will occur. However, addition of reducing sugars prior to baking represents an avoidable source of acrylamide formation.

29. Other minor ingredients can also have an influence. Increases in acrylamide formation have been shown to occur in some recipes when ingredients such as ginger, honey and cardamom are added during biscuit production. Conversely, nutmeg has been shown, in some cases, to result in a decrease in acrylamide. In order to reduce acrylamide levels in final products, manufacturers could investigate the effect of different spices in their own recipes.

30. Use of rework (the practice of re-using scraps) has been shown to increase acrylamide levels in some cases, but not in others. Manufacturers need to examine production processes for individual products to determine whether reducing rework can be used to mitigate acrylamide levels in their products.

Food processing and heating

31. Yeast fermentation of wheat bread doughs reduces the free asparagine content. Fermentation for two hours utilises most of the asparagine in wheat flour dough models; shorter times are less effective, as is sourdough fermentation.

32. Acrylamide formation can be reduced by modifying the time–temperature profile of the baking process, in particular by decreasing the temperature of the final stages when the product reaches the crucially vulnerable, low moisture phase. Compensation by increasing the temperature of the earlier stages of baking should not lead to a significant increase in acrylamide, since the moisture content at this stage should be sufficiently great so as to prevent acrylamide formation. Careful control of oven temperatures and time profiles can be effective in reducing acrylamide levels. These principles have been applied successfully in both a biscuit model and in non-fermented crispbreads.

COFFEE

33. No commercial measures for reducing acrylamide in coffee are currently available.

34. Studies have shown that concentrations of acrylamide decline in storage in coffee powder in closed containers over extended storage periods and work is underway to identify the underlying mechanisms that may provide future opportunities for mitigation. However, any changes to the roasting profile, or deliberate use of extended storage, to decrease acrylamide levels are likely to have a significant impact on the organoleptic properties and consumer acceptability of the product

CONSUMER PRACTICES

35. National and local authorities should consider advising consumers to avoid over-heating potato and cereal-based foodstuffs when using high temperature cooking processes. Such advice could include recommendations that French fries and roast potatoes be cooked to a golden-yellow rather than golden-brown colour, whilst still ensuring that the food is fully cooked. Similarly, the consumer could be advised to aim for a light brown colour when toasting bread and related products.

36. National and local authorities should also consider encouraging consumers to avoid storing potatoes intended for high-temperature cooking under cold and/or refrigerated conditions.

37. Where relevant, industry should endeavour to provide advice to consumers on appropriate cooking and handling instructions that can help to mitigate acrylamide formation in the product.

APPENDIX V

DRAFT CODE OF PRACTICE FOR THE REDUCTION OF CONTAMINATION OF FOOD WITH POLYCYCLIC AROMATIC HYDROCARBONS (PAH) FROM SMOKING AND DIRECT DRYING PROCESSES

(At Step 8 of the Procedure)

INTRODUCTION

1. Many chemical contaminants are formed during the combustion of fuel both in the smoking and in the direct drying process. Examples include polycyclic aromatic hydrocarbons (PAH), dioxins, formaldehyde, nitrogen and sulphur oxides (relevant for formation of e.g. nitrosamines). Furthermore, heavy metals are also found in combustion gases. The types and amount of contaminants depend on the fuel used, the temperature and possible other parameters.

2. Hundreds of individual PAH may be formed and released as a result of incomplete combustion or pyrolysis of organic matter, during forest fires and volcanic eruptions as well as industrial processes or other human activities, including the processing and preparation of food. Owing to their mode of formation, PAH are ubiquitous in the environment and therefore enter the food chain, especially via air and soil. PAH can be present in the raw materials due to environmental contamination from the air by deposition on crops, from contaminated soils and transfer from water to fresh and marine invertebrates. Commercial and domestic food preparation such as smoking, drying, roasting, baking, barbecuing or frying are recognized as important sources of food contamination. Presence of PAH in vegetable oils can also originate from smoking and drying processes used to dry oil seeds prior to oil extraction.

3 Contamination of food with PAH via environmental contamination should be controlled either by source-directed measures like filtering the smoke from relevant industries (e.g. cement work, incinerator and metallurgy) and limiting the exhaust fumes of PAH from cars. Good practices, including the selection of appropriate farmland/fishing waters, could also decrease the environmental contamination of raw materials with PAH. However, this contribution to the reduction of PAH intake from the final food is not included in this Code of Practice.

4. Processes such as smoking and direct drying provide a wide variety of food textures and flavours and consequently a broader choice for consumers. Many types of smoked and dried foods are traditional food items, where these types of processes have been used to prolong the storage period, keep quality and provide flavour and consistency required by consumers. The extension of shelf life may also have an effect on the nutritional value of foodstuffs, such as preservation of the vitamin content.

5. The major contributors to intakes of PAH are cereals and cereal products (owing to high consumption in the diets) and vegetable fats and oils (owing to higher concentrations of PAH in this food group). Generally, despite their usually higher concentration of PAH, smoked fish and meats and barbecued foods do not contribute significantly, particularly as they are small components of the diet. However, they do make larger contributions leading to higher PAH intakes where these foods make up a large part of the diet.

6. In its opinion on PAH, JECFA recommended that efforts should be made to reduce contamination with PAH during drying and smoking processes, e.g. by replacing direct smoking (with smoke developed in the smoking chamber, traditionally in smokehouses) with indirect smoking.

OBJECTIVES

8 This Code of Practice intends to provide guidance for national authorities and manufactures to prevent and reduce contamination of food with PAH in commercial smoking and direct drying processes. For this purpose, this Code of Practice identifies important points to consider and provides relevant recommendations. The smoking and direct drying processes are used both in industry and in private households. Food is often smoked by consumers using a direct smoking process, while drying can be done either directly or indirectly, e.g. in the sun or in a microwave oven. The Code of Practice and the guidance could also be used as the basis for information to consumers.

9. The Code of Practice recognizes the benefits of smoking and drying including the availability of traditional smoked food products, prevention of spoilage and microbiological contamination and growth, and the potential for lowering the risks to human health from PAH formed in foods during processing.

SCOPE

10 The scope of this Code of Practice is PAH contamination during commercial smoking, both direct and indirect, and direct drying processes.

11 The Code of Practice does not cover PAH contamination in food originating from

a. Use of herbs and spices in the smoking process[1];

b. Indirect drying;

c. Other food processes, including barbecuing and other types of cooking in private homes or the catering sector; and

d. Environmental contamination of raw materials.

12. This Code of Practice covers contamination with PAH only. It should, however, be emphasized that conditions that lead to a reduction of one contaminant might lead to increases in the levels of other contaminants or could lower the microbiological safety of the food products. The possible interplay among levels of contaminants like PAH, heterocyclic amines, and nitrosamines is not always well understood, but these contaminants can be food safety problems, either as such or due to the reaction with food components. This is the case of nitrogen oxide reaction with components in the food leading to the formation of nitrosamines. It should be underlined that any guidance given to reduce PAH levels in a final product should not lead to an increased risk to human health due to increases in other contaminants or to reduced microbiological safety.

DEFINITIONS

13 Contaminant is defined as any substance not intentionally added to food, which is present in such food as a result of the production (including operations carried out in crop husbandry, animal husbandry and veterinary medicine), manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such food or as a result of environmental contamination. The term does not include insect fragments, rodent hairs and other extraneous matter.

14 Drying direct refers to two types of drying processes: One is a drying process where the combustion gas is used directly as the drying gas in contact with the foods and the other is sun drying.

15. Sun drying is a direct drying process where sunshine and wind are used for drying under circumstances open to the environment.

16 Drying, indirect is a drying process where the combustion gasses do not come into direct contact with the foods, where the hot air is heated via a heat exchanger, electricity or by other means.

17 HACCP: A system which identifies, evaluates, and controls hazards which are significant for food safety.

18 *Plant materials, other* is covering other types of fuels than woods used in the smoking or drying process, e.g. bagasse, corn cobs and coconut husk and shell.

19 *Polycyclic aromatic hydrocarbons (PAH)* are a group of contaminants that constitute a large class of organic compounds containing two or more fused aromatic rings made up of carbon and hydrogen atoms.

20 *Pyrolysis* is the chemical decomposition of organic materials by heating in the absence of oxygen or any other reagents, except possibly steam.

21 *Smoke* consists of liquid and solid particulates suspended in a gaseous phase. Particles in the smoke, generally of a size of 0.2-0.4 µm (or as low as 0.05 to 1 µm), are estimated to constitute 90% of its overall weight. The chemical composition of smoke is complex and more than 300 components have been identified.

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[1] In the *smoking process*, the fuel used is often various wood species, in some cases with herbs and spices, e.g. juniper berries, to give a characteristic flavour. Such herbs and spices may be a potential source for PAH contamination. However, many different types of herbs and spices can be used, but normally only in smaller quantities and knowledge about the influence of using herbs and spices is limited. Their use is therefore not considered in this Code of Practice

22 *Smoke condensates* are products obtained by controlled thermal degradation of wood in a limited supply of oxygen (pyrolysis), subsequent condensation of the resulting smoke vapours, and fractionation of the resulting liquid products.

23 *Smoking* of food is a process used as a preservation method to prolong the shelf life of food due to components of the smoke inhibiting growth of some microorganisms. The smoking process is furthermore used to achieve the characteristic taste and appearance of smoked food.

24 *Smoking, direct* is a smoking process, where the smoke is developed in the chamber in which the food is processed.

25 *Smoking indirect* is a process where smoke generators are used, and the smoke is being developed in a chamber, separate from where the food is smoked. The smoke may be cleaned in various ways, e.g. by use of a water filter or a tar condenser before being fed into the smoke chamber.

GENERAL PRINCIPLES FOR REDUCING PAH CONTAMINATION IN FOOD

26. The food producer should be aware of the conditions under which higher levels of PAH are generated and wherever possible, should control those conditions to minimize their formation. To accomplish this, an analysis of important points to consider in processes used or intended to be used in food production with smoking or direct drying should be carried out.

27 The first step of the analysis is to identify important points to consider. Possible major important points to consider are described later in the code.

28. The producer should evaluate the identified important points to consider such as:

a. Possible sources of PAH from the environment and the process;

b. Possible effects on consumer health;

c. Controllability; and

d. Possible measures to reduce PAH contamination.

29. The producer should take appropriate measures to control the identified important points for reducing PAH, based on the results of the analysis and other legitimate factors relevant for human health protection and economic activities such as

a. The microbiological status and possible risks from other contaminants;

b. The organoleptic properties and quality of the final product (the ideal method would have no adverse effects on the appearance, flavour, taste or nutritional properties of the product); and

c. Feasibility and effectiveness of controls (cost, commercial availability, occupational hazards).

30 The producer should monitor the effects of the implemented measures and should review them if necessary.

EVALUATION OF COMPLIANCE WITH RELEVANT LEGISLATION

31. Processed food shall be in compliance with relevant national or international legislation and standards, including general requirements for consumer protection. Furthermore, food shall be produced in accordance with relevant Codex or national codes of practice. Some of these may contain further information about drying or smoking, which should also be considered.

GENERAL REMARKS ON SMOKING AND DIRECT DRYING PROCESSES

32. The formation of PAH during smoking and direct drying is dependent on a number of variables, including:

a. Fuel (woods and other plant materials, diesel, gases, liquid/solid waste and other fuels);

b. Smoking or drying method (direct or indirect);

c. Smoke generation process in relation to the temperature of pyrolysis and to airflow in the case of a smoke generator (friction, smouldering, thermostated plates) or in relation with other methods such as direct smoking or regenerated smoke by atomizing smoke condensate (liquid smoke);

d. The distance between the food and the heat source;

e. Position of the food in relation to the heat source;

f. Fat content of the food and what happens to it during processing;

g. Duration of smoking and direct drying;

h. Temperature during smoking and direct drying;

i. Cleanliness and maintenance of equipment;

j. Design of the smoking chamber and the equipment used for smoke/air mixture (which influences the smoke density in the smoking chamber).

33 In general, changes in processing techniques can in some cases reduce the amount of PAH formed during processing. Indirect drying or smoking processes result in lower PAH contents than direct drying or smoking. Also the use of smoke condensates, selection of fuel such as wood species and adjusting times and processing temperatures influences the PAH formation. Addition of activated carbon to coconut oil at the right dosage during the refining process can completely remove PAH contamination.

34. Application of an HACCP system in accordance with the principles and steps as recommended by Codex is one of options for reducing PAH.

SMOKING

35. Smoking techniques have been used for centuries as a method for preserving meat and fish. Smoking impregnates the high-protein food with aromatic components, which lend flavour and colour to the food, and also play a bacteriostatic and antioxidant role.

Fuel used in smoking

36 For smoking of food, woods are normally used, but other types of fuels like bagasse (plant material from sugarcane), corn cob and coconut husk and shell are used. The fuel used is an important point to consider for the potential contaminants of the food, e.g. the PAH contamination of food differs if wood or straw is used. PAH contamination of oil seed is higher when using coconut husk compared to coconut shell as fuel due to the higher lignin content of the husk.

37. The wood species used have an influence on PAH formation. However, it has not been possible to find generally accepted recommendations on the use of wood species or other plant materials. Therefore, it is recommended, that the individual species of woods and other plant materials used in smoking processes should be evaluated in relation to PAH formation before use. Also, the wood to be used in the process of smoking should preferably not be resinous.

38. The use of other fuels than wood and other plant materials for the purpose of smoking foodstuffs should be discouraged. Fuels like diesel oil, rubber (e.g. tyres) or waste oil must not be used even as a partial component, as they may lead to significantly increased PAH levels. Woods treated with chemicals such as for preserving, waterproofing, fireproofing etc. should not be used for smoking or the production of smoke condensates. Such treatments may result in tainting of the food as well as the introduction of other contaminants, e.g. dioxin from woods treated with pentachlorophenol (PCP).

Foodstuffs smoked

39. The position of the food in the smoke chamber and the distance between the food and the heat source is an important point to consider in the smoking process. As PAH are particle bound, a greater distance from the smoke source to the smoked food might reduce content of PAH in the food.

40. During direct smoking, fat dripping from the food into the source of the smoke, e.g. glowing wood or other plant materials might increase the content of PAH in the smoke and thereby in the smoked food. In order to avoid an increase in the PAH content through fat drippings into the open fire, perforated metal sheets can be installed between the food to be smoked and the heat source.

41 The microbiological quality of the final food product must be evaluated to ensure that there is no potential growth of pathogens during processing and in the final food.

42. The organoleptic properties of the final products are an essential part of their characteristics. Changes of methods might not necessarily result in organoleptically acceptable products.

Processing

43. Four types of smoking processes are generally recognized: smouldering, thermostated plates, friction processes, and smoking with smoke condensates. Friction processes allow smoke to be produced by pyrolysis of wood sawdust, wood chips, and wood logs, respectively. Smoke condensates may be used by exposing food to smoke which is reproduced or regenerated by atomizing smoke condensate (liquid smoke) in a smoking chamber.

44. Smoke is produced by pyrolysis of the fuel at temperatures of around 300-450 °C in the glow zone. To produce smoke for smoking food, flames should be avoided, including by adjusting airflow.

45. Differences in the smoking processes can lead to highly variable PAH levels in the final food product. The choice of technology for processing is very important for the final concentration of PAH. Identifying the parameters critical for PAH formation in a specific process may potentially be useful to control PAH levels. Direct smoking requires less equipment than indirect smoking but can result in higher levels of PAH in the final food product.

46 Replacing direct smoking with indirect smoking can significantly reduce contamination of smoked foods. In modern industrial kilns, an external smoke generator can be operated automatically under controlled conditions, to wash the smoke from particles before coming in contact with the food and to regulate its flow as it is brought into contact with the food. For more traditional or smaller scale operations, this may not, however, be an option.

47 Smoking processes are often divided into three groups depending on the temperatures used in the smoke chamber during processes:

a. *Cold* smoking with temperature of approximately 18-25 °C. Used for e.g. some fish species and salami-type sausages;

b. *Semi-warm* smoking with temperatures of approximately 30- 40 °C. Used for e.g. some fish species, bacon and pork loin;

c. *Warm* (or hot) smoking is smoking combined with heating resulting in a temperature of approximately 70-90 °C. Used for e.g. some fish species, hams, and frankfurter type sausages.

48 The type of generator used should be based on an assessment of possible reduction of the PAH content in the final food and where possible include washing of the smoke after the generator and before the smoke chamber. Good results are achieved by installing baffles after the smoke generator equipped with a device for decantation of tar. A more efficient way is to manage the pyrolysis temperature and decanting of heavy phase tanks to a cooling device with baffles. The scientific background and data to illustrate the exact influence of the use of different types of fuel, time, temperature etc. is limited and specific testing is needed for the identification of important points to consider in the individual processes. Also other methods like use of long pipes in the equipment can reduce the PAH.

49 As PAH are particulate bound, a filter may be used to remove particulate material from the smoke. This should reduce potential contamination with PAH.

50 Oxygen needs to be balanced as both too much and too little oxygen produces PAH. Adequate oxygen is needed to ensure partial/incomplete combustion of the fuel. However, too much oxygen may raise the temperature in the glow zone and lead to increased formation of PAH. A lack of oxygen may lead to the formation of more PAH in the smoke, as well as producing carbon monoxide, which may be hazardous to operators.

51 Temperature is of importance for the partial/incomplete combustion of the fuel. Generally, PAH formation increases with increasing temperature. The composition of the smoke depends on the temperature, which should be adjusted to minimize PAH formation. However, more data is needed to document which temperatures would be recommendable.

52 In principle, the smoking time should be as short as possible to minimize the exposure of the food surfaces to PAH-bearing smoke. However, in the case of hot smoking, when the product is being cooked at the same time, it will be essential to allow sufficient time for the product to be cooked thoroughly. In case hot smoke is the only heat source (traditional smoke houses), the smoking chamber should be heated before the food products are placed into the smoking chamber. Smoking time is not an important parameter as long as the source for smoke is well managed. Moreover, short smoking times may have an impact on food safety and shelf life. Clearly preventive measures cannot be taken in isolation from other considerations and it is vital that they do not adversely impact on the sensory properties and consumer acceptance of the product. Additionally, microbiological stability and nutritional properties need to remain unimpaired and care needs to be taken to ensure that other contaminants are not inadvertently introduced.

53 Because smoke condensates are produced from smoke that is subjected to fractionation and purification, products made with condensed smoke generally have lower PAH levels than products made with freshly generated smoke.

Post smoking treatment

54. There are three types of cleaning steps to be used either during processing or as post process treatment:

a. During the process smoke may be washed before it enters the smoking chamber. This can be achieved by washing (scrubbing), using a tar condenser, cooling or filtering all of which can remove particle-bound PAH from the smoke;

b. Post smoking treatment involves the cleaning of the smoked product itself. In this case rinsing the product or immersing it into water may remove soot and particles containing PAH on the surface of the food. This type of cleaning would not be possible to use for all types of products, e.g. not for smoked fish and fishery products;

c. The shaving off the surface of the smoked product itself. In case of solid smoked food e.g. smoked-dried bonito (i.e. *katsuobushi*, traditional Japanese food)), this can reduce PAH in the final product.

55 When possible, washing or water-cooling of smoke should be used to reduce the content of PAH in the final food. Water-cooling is already used in the meat industry. Washing the product after the process may remove PAH-containing particles from the surface of the product.

56 Washing of the product should not be used for fishery products as it could result in lower organoleptic quality and increased microbiological risk. Fish products are often smoked as the whole fish with the skin, and if the skin is not eaten, some contamination is removed together with the skin. The recommendation could be to prioritize smoking of fish with skin and, preferably, removing the skin before consumption.

IMPORTANT POINTS TO CONSIDER AND RECOMMENDATIONS ON SMOKING

57 PAH content of smoked foods can be minimized by identifying and evaluating the important points to consider mentioned below, and by taking appropriate measures. An HACCP system might be applied.

58 Fuel:

a. The type and composition of wood used to smoke foods, including age and lignin content in the wood used. In general, conifer woods containing higher lignin contents should be avoided;

b. Monitor the water content of the fuel. Lower water content may lead to rapid burning of fuel and higher PAH levels;

c. When individual species of woods and other types of plant materials like bagasse (from sugarcane), corn cob and coconut husk and shell are used, their use should be evaluated in light of PAH contamination;

d. Do not use woods treated with chemicals;

e. The use of other fuels than woods and plant materials: Do not use diesel fuel, waste products, especially rubber tyres and waste oil which may already contain significant levels of PAH;

f. Influence on the taste of the final food.

59. Smoke developed and used in the process:

a. The composition of the smoke depending of e.g. the type of wood or other plant materials, the amount of oxygen present and the temperature of pyrolysis and possibly the length of time for which the plant materials are burned;

b. The design of the smoking chamber and of the equipment used for smoke/air mixture (e.g. length of the pipe in the equipment);

c. Filtering or cooling the smoke where possible;

d. Washing off the smoke between a smoke generator and the smoke chamber where possible;

e. Install baffles after the smoke generator equipped with a device for decantation of tar if possible;

60. Foodstuffs smoked:

a. The position of the food in the smoke chamber and the distance between the food and the smoke source;

b. Chemical properties and composition of food, e.g. the fat content of the food to be smoked;

c. Deposits of smoke particles on the surface and the suitability of the surface for human consumption. For fish, the recommendation could be to prioritize smoking of fish with skin;

d. The microbiological quality after processing;

e. The organoleptic properties of the final food.

61. Smoking process:

a. Whether the smoking process is a direct or indirect process. Replace direct smoking with indirect smoking where possible;

b. Prior assessment of smoke generators by taking account of the resulting PAH content in the smoke;

c. Adjusting of the airflow to avoid excessive temperatures during smoke generation;

d. Selecting appropriate smoking chamber and device for treatment of air/smoke mixture;

e. The accessibility of oxygen during the smoking process;

f. Smoking time: Reducing the time that food is in contact with smoke, this should take the consequences for microbiological safety and quality into consideration;

g. Temperatures: Temperature in the glow zone (in the smoke generation step) and temperature of the smoke in the smoking chamber;

h. In order to avoid an increase in the PAH content through fat dripping into the heat source, perforated metal sheets can be installed between the food to be smoked and the heat source;

i. The cleaning method and schedule applied in the processing unit;

j. As an alternative to using freshly generated smoke, manufacturers can consider smoking with regenerated smoke from smoke condensates. They can also produce smoke-flavoured products by applying smoke condensates to foods, such as by spraying, dipping, injecting, or soaking.

62. Post smoking processes:

The cleaning of the smoked product itself. In this case soot and particles containing PAH on the surface of the food may be removed by rinsing the product or immersing it into water. This type of cleaning would not be possible to use for all types of products, e. g. not for smoked fish and fishery products. Also, washing might lower organoleptic quality and increase microbiological risk.

DIRECT DRYING

63 One of the oldest methods of food preservation is direct drying, as it uses less equipment than indirect drying. Direct drying reduces water activity sufficiently to delay or prevent bacterial growth. Direct drying of food can be done either by sunshine or wind or using hot combustion gases. Water is usually removed by evaporation and creating a hard outer-layer, helping to stop micro-organisms from entering the food.

CONSIDERATIONS IN DEVELOPING PREVENTIVE MEASURES TO REDUCE THE PAH CONTENT OF DRIED FOODS

This section is divided in direct drying using a) sun or wind, b) other fuels.

Sun drying

64 When drying by sun or wind, the potential source of PAH is the environment. Contamination can originate from soil/dust or/and from combustion from industry and from traffic as well as forest fires and volcanic eruptions.

65 Sun-drying of foodstuffs has the advantage of using free energy from the sun or wind. However, the benefits of greater control over the drying environment and drying time, quicker drying and less contamination from dirt, grass and insect particles, coupled with a consumer demand for a cleaner and less contaminated product may make artificial drying (dehydration) more attractive.

66 A major disadvantage of sun-drying is the exposure of foodstuffs to the environment, e.g. exposure to undesirable weather conditions and to contamination agents. Weather conditions, over which the grower has no control, greatly affect the drying rate. Contamination of dried foods with foreign matter is a serious concern. Sun-dried foods are exposed to contamination by windblown dust, seeds, insects, rodent and bird droppings.

67. Sun drying of foodstuffs should not take place near industrial point sources of combustion of gas, such as roads with heavy traffic, incinerators, coal-fired power stations, cement works etc., or in the immediate proximity of roads with intense traffic. Contamination from drying in such places is expected to be a special problem for foodstuffs with a large surface area such as spices. However, covered dryers may protect foodstuffs from industrial sources to some extent.

Direct drying processes, other than sun drying.

68 The drying process should begin as soon as possible after the receipt of the crops to avoid unnecessary deterioration.

Fuel used in direct drying other than sun drying

69 Different types of fuel are used in direct drying, e.g. natural gas, peat and mineral oils. For some foods, the effect of fuel choice on taste may be the important points to consider in choosing a fuel. In any event, fuels like e.g. diesel oil, rubber, tyres, or waste oil must not be used even as a partial component, as they may lead to significantly increased PAH levels.

Combustion gasses

70 Drying with combustion gases increased the contamination by 3- to 10-fold; use of coke as fuel resulted in much less contamination than use of oil. Direct contact of oil seeds or cereals with combustion products during drying processes has been found to result in contamination with PAH and should therefore be avoided. JECFA recommended that contact of food with combustion gasses be minimized.

Foodstuffs dried

71 Many types of food like meat and many fruits are usually dried. Drying is also the normal means of preservation for cereal grains.

72 Contamination of cereals and vegetable oils (including olive residue oils) with PAH usually occurs during technological processes like direct fire drying, where combustion products may come into contact with the food. Direct contact of oil seeds or cereals with combustion products during drying processes has been found to result in accumulation of PAH and should therefore be avoided.

Direct drying process

73 Dehydrators are useful for larger drying yards and growers. Dehydration allows a steady production cycle to be maintained, reduces labour costs and is an insurance against unfavourable weather conditions for sun drying. A system using a combination of initial sun drying followed by finish dehydration can have considerable advantages without loss of food quality.

74 Common direct drying/heating operations and applications include drying to remove water (and/or other solvents/chemicals) added, left or produced during processing. During direct drying, hot air is blown directly into the foodstuffs and combustion products can therefore directly enter the food. One example of PAH contamination from direct drying is contamination of vegetable oils (including olive residue oils) in which oil has been contaminated with PAH during technological processes. Another example can be drying oil seeds prior to oil extraction.

75 Continuous flow drying, where cereals pass the drying area continuously, is a widespread grain drying method. This technique can be used for drying cereals for food. Direct drying is mainly used with temperatures up to 120 ºC for feeds. For foods (cereal grains, malt, etc.), indirect drying (external heat generation) with temperatures between 65 and 80 ºC are mainly used. The time span for both types of drying is between ½ and 1 hour, depending on the initial moisture content of the grain.

76 Dehydration provides a form of insurance against poor weather conditions that can handicap traditional sun- and shade-drying. Accurate control of the drying conditions (temperature, relative humidity and air movement) essential for efficient dehydration is achieved. Many kinds of fresh fruits, vegetables, herbs, meat, and fish can be dried.

77 Too high a temperature (one that causes visible burning of the product) can cause PAH formation. Where a system with a burner is being used, the temperature of the burner should be sufficient to allow complete combustion of the fuel, as incomplete combustion can lead to PAH in the drying gasses. A good homogeneity of the temperature of the air is important to avoid overheating.

78 The drying time should be as short as possible to decrease the exposure of the food to the potentially contaminating gasses as much as possible.

79 The use of active carbon is required during refining of the oil as a way to reduce the PAH content after direct drying. A monitoring system for the PAH content should be established and additional refining steps (with active carbon) must be used when the PAH level in the food is unacceptable.

80 Ensure that complete burning of the fuel has occurred, by monitoring the gases for CO, monitoring the burner (if applicable) for soot accumulation, and checking burner settings and burner or fire temperatures.

81 As drying processes could be a potential source of PAH in cereals and oil seeds, there is also a need to control the levels of PAH in agriculture crops post-harvest, with particular reference to the source of contamination, as these crops can have a major impact on PAH intake from food. JECFA recommended avoiding fire drying of seeds, and seeking alternative drying techniques.

82 Numerous factors, including equipment cost and availability of energy sources often result in similar foods being dried in very different ways.

83 Replacing direct drying with indirect drying can significantly reduce contamination of dried foods. JECFA has recommended that direct drying be replaced with indirect drying.

IMPORTANT POINTS TO CONSIDER AND RECOMMENDATIONS ON DIRECT DRYING, EXCEPT SUN DRYING

84 PAH content of foods directly dried can be minimized by replacing direct drying with indirect drying, if possible or by identifying and evaluating the important points to consider mentioned below, and taking appropriate measures. An HACCP system might be applied.

85 Fuel:

a. The type and composition of fuel used to dry foods affects the PAH content;

b. Do not use woods treated with chemicals, e.g. preserved wood, painted wood;

c. Monitor the water content of the wood. Lower water content of wood t may lead to rapid burning of the wood and higher PAH levels;

d. Avoid the use of fuels such as diesel fuel, waste products, especially rubber tyres, olive residues and waste oil which may already contain significant levels of PAH;

e. The fuel influences the taste of the final food.

86 Drying process:

a. Temperature of the air should be optimal;
b. Minimize the time that food is in contact with combustion gasses;
c. Use of active carbon during refining of the oil;
d. Avoid fire drying of oilseeds;
e. Avoid direct contact of oilseeds or cereals with combustion products;
f. Keep equipment clean and well maintained (especially driers).

APPENDIX VI

PROPOSED DRAFT CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF OCHRATOXIN A CONTAMINATION IN COFFEE

(At Step 5/8 of the Procedure)

1. INTRODUCTION

1. Ochratoxin A (OTA) is a toxic fungal metabolite classified by the International Agency for Research on Cancer as a possible human carcinogen (group 2B). JECFA established a PTWI of 100ng/kg bodyweight for OTA. In recognition of this global concern, FAO developed the Guidelines for the Prevention of Mould Formation in Coffee (2006) as a strategy to enable coffee producing countries to develop and implement their own national programmes for the prevention and reduction of OTA contamination. OTA is produced by a few species in the genera *Aspergillus* and *Penicillium*. In coffee, only *Aspergillus* species, specifically *A. ochraceus* and related species *(A. westerdijkiae and A. steynii), A. niger* and related species, and *A. carbonarius* are involved. OTA is produced when conditions of water activity, nutrition and temperature required for growth and biosynthesis are present.

2. The main commercial coffee varieties produced and traded are *Coffea arabica* (arabica coffee) and *Coffea canephora* (robusta coffee).

3. After harvest, the crop is sorted, dried (as cherries or as beans), stored and traded. The moisture content of the beans is reduced to a maximum of 12.5% to prevent OTA production.

2. DEFINITIONS (based on ISO 3509)

Parts of the coffee fruit, undried (Figure 1)

Coffee Cherry: Fresh, complete fruit of the coffee tree.

Bean, fresh bean: endosperm (seed) of the coffee fruit. There are generally two beans per fruit.

Endocarp: Scientific term for 'parchment'. The tough integument tightly pressed to the seed when fresh but from which the seed shrinks during drying.

Endosperm: Scientific term designating the tissues that feed the embryo during germination, the bean consists of the endosperm and embryo, i.e., the material inside the developing fruit which ultimately forms the coffee beans. The endosperm fills the integument as the coffee cherry ripens.

Epicarp or Exocarp: Scientific word designating the skin of the fruit, a mono cellular layer covered with a waxy substance ensuring protection of the fruit.

Floating (or floats) coffee: Cherry coffee of low density, buoyant in water.

Mesocarp: Intermediate layer of tissues between the epicarp and the endocarp (parchment). It consists mainly of pectinaceous mucilage and pulp.

Mucilage: Common word to describe the slimy layer found between the pulp and adhering to the parchment inside a coffee cherry, but not removed by pulping. Not present in unripe and overripe coffee.

Naked beans or endosperm: Parchment coffee that has been partly or entirely peeled of its parch during pulping and/or washing.

Pulp: part of the coffee cherry composed of the external exocarp and most of the internal mesocarp (mucilaginous tissue).

Parts of the coffee fruit (dried)

Bean in parchment: coffee bean entirely or partially enclosed in its parchment (endocarp, pergamino).

Coffee bean: commercial term designating the dried seed of the coffee plant.

Defects: The general term for common undesirable particles, which can include various types of beans, parts of beans, fruit tissue and foreign matter, found in green and roasted coffee beans. Diverse and specific terms, according to the producing country, are used to describe the defects. The fruit defects are generally caused by faulty processing, pest damage, or adverse climatic conditions. Defects receive specific weight values to assist in the classification and grading of coffee lots under various national and international systems.

Natural coffee, dried coffee cherry, coco: dried fruit of the coffee tree, comprising its external envelops and one or more beans.

Green coffee bean: The dried seed of the coffee plant, separated from non-food tissues of the fruit.

Hull, dried parchment: dried endocarp of the coffee fruit

Husk, dried cherry pulp: assembled external envelopes (pericarp) of the dried coffee fruit.

Parchment (or Parch) or endocarp: The coffee fruit endocarp located between the fleshy part (pulp) and the silver skin. It is a thin, crumbly paper-like covering left on wet-processed beans after pulping and fermentation, removed during hulling.

Silverskin, dried testa, dried seed perisperm: coat of the coffee bean. It has generally a silvery or coppery appearance.

Washed and cleaned coffee: dry processed green coffee from which the silverskin has been removed by mechanical means in the presence of water.

Processes

Splitting of cherry: A variation of dry processing wherein the cherry is mechanically split open and the fruit and seeds maintained together in a mass.

Gleaning (or Sweeping): Coffee fruit found lying on the ground beneath coffee bushes, detached during harvest or abscised during development.

Selection: technological operation intended to eliminate foreign matter (e.g. stones, twigs, leaves) and to sort coffee cherries according to size, density and degree of maturity.

Dry process: treatment of coffee cherries consisting in drying them, either under sunlight or in drying machines, to give husk coffee. This is usually followed by mechanical removal of the dried pericarp (husk) to produce “natural” green coffee.

Dehusking: mechanical removal of the husks (pericarp) from dry coffee cherries.

Wet process: treatment of coffee cherries consisting of the mechanical removal of the exocarp (pulp) in the presence of water, alternatively followed by

- either removal of the mucilage (mesocarp) by fermentation or other methods, followed by washing to give parchment coffee, or
- direct drying of the pulped beans within their mucilaginous parchment, followed by hulling to produce “semi-washed” green coffee. Removal of the mucilage is usually followed by drying and hulling to produce “washed” green coffee.

Pulping: technological operation used in the wet process to remove the pulp (exocarp) and as much as possible of the mucilage (mesocarp) by mechanical means. A portion of the mucilaginous mesocarp usually remains adhering to the parchment (endocarp).

Fermentation process: treatment intended to digest the mucilaginous mesocarp adhering to the parchment of the pulped coffee, allowing its elimination by washing. The fermentation process can be replaced by a mechanical demucilaging system to remove the mucilage by friction.

Washing: technological operation intended to remove by water all traces of the mucilaginous mesocarp from the surface of the parchment.

Drying of parchment coffee: technological operation to reduce the moisture content of parchment coffee to a level that allows hulling under satisfactory technical conditions and that will not be detrimental to further storage of the coffee.

Hulling: removal of the dried endocarp of parchment coffee to produce green coffee.

Polishing: technological operation to remove the residual silverskin (perisperm) from green coffee by purely mechanical means.

Sorting: technological operation intended to remove foreign matter, fragments of coffee and defective beans from green coffee.

Roasting: heat treatment that produces fundamental chemical and physical changes in the structure and composition of green coffee, bringing about darkening of the beans and the development of the characteristic flavour of roasted coffee.

3. PROCESSING OF COFFEE CHERRIES

4. Coffee cherries are processed under two basic systems (Figures 2 and 3): a) the dry processing system which produces what is called natural coffee or dried coffee cherry (the seed is enclosed in the whole fruit) and b) the wet processing system, that generates what is called parchment coffee, where the seed is enclosed in the inner integument or endocarp.

5. In the dry processing of natural coffee, the whole fruit is either directly sun dried, on bare soil, bricks, tiles, concrete or even asphalt, or dried using a combination of sun and mechanical drying (particularly on more technologically advanced farms).

6. In wet processing, the fruit parts are mechanically separated, giving the pulp as by-product and the parchment as the main product. The latter is coated with mucilage, which can be degraded by fermentation and then washed or mechanically removed directly, without fermentation. After removing or not removing the mucilage, the parchment is usually sun dried, in a drying yard, or on suspended tables with many variations and technological innovations. Sun and mechanical drying can be combined and used together.

7. After processing, the dried coffee can be stored, separated from the fruit tissues by hulling and passed through sizing (grading), sorting, polishing, cleaning and bagging, before being sold.

8. Coffee roasting can remove a very significant percentage of OTA. Depending on the roasting process, 65 to 100% reduction of OTA can be achieved.

9. While this code of practices is focused on the reduction of OTA contamination, which is the primary food safety issue in the production of green coffee bean, industry food safety programmes must also effectively manage other potential hazards associated with the production, processing and handling of coffee.

4. RECOMMENDED PRACTICES

4.1 PRE-HARVEST

10. It is not certain whether OTA-producing fungi can infect coffee fruits and grow to produce OTA still on the plant. It is possible that infection on the plant may involve two different contamination routes: either through the flowers without visible sign, or by insect invasion such as the coffee berry borer (CBB) (*Hypothenemus hampei*), that can carry spores to the fruit by making holes in the cherries and one or more tunnels in the beans leaving visible signs.

11. Recommended practices to reduce the development and spore load from OTA-producing fungi on coffee plants and beans are:

a) Keep coffee plants vigorous, through the regular use of good agricultural practices (GAP) at the proper time, such as weeding, improving soil texture, pruning, fertilization, pest and disease control, and irrigation.

b) Do not use overhead irrigation during the flowering period. This could augment normal spore dispersal rates and increase the chance of infection of beans by OTA producers.

c) Use traps (such as alcohol traps) for *Hypothenemus hampei* control before harvesting, and encourage the use of the integrated pest management (IPM) programme.

d) Avoid disposal of uncomposted organic wastes, from coffee or any other source, in or around the plantation. Coffee seeds and seed-associated material, such as dust, earth, parchment and other seed processing residues, can allow proliferation of OTA producing fungi.

4.2 HARVESTING

12. The harvesting method chosen on any farm is a conjunction of the requirements of the processing method, economic considerations and labour availability.

13. Four basic harvesting systems are known: (i) single-pass stripping, where all branches bearing fruit are harvested at once; (ii) multi-pass stripping, where only branches bearing mainly ripe cherries are harvested; (iii) multi-pass selective picking (finger picking), where only ripe cherries are harvested and (iv) mechanical harvesting, where different types of machines are used to harvest fruit all at once.

14. Besides these basic main harvest systems, additional procedures can be used, such as a 'fly harvest' to collect prematurely ripe fruit or the collection (gleaning or sweeping) of cherries that fall on the ground or are left on the plants during harvest. In general, berries that fall onto the ground should not be collected, particularly in humid conditions, as fungal growth may occur, which can give rise to OTA contamination. However, brief contact with the ground is not problematic but can become so if the contact period lengthens. In wet or humid climates, only collection from the ground on the same day should be considered acceptable. If it is necessary to harvest beans that have fallen onto the ground, these should be stored separately until they are processed, to avoid the risk of contaminating the rest of the crop. Care should be taken to ensure that any fallen berries that are collected are rapidly subjected to the processing and drying stages, as these commodities may have a higher likelihood of fungal growth.

15. The harvest should be started as soon as there are sufficient ripe cherries for it to be economically viable. When the right time to commence harvest is decided, the following should first be carried out:

a.) Remove weeds, fallen cherries and brush from the proximity of the trees before harvest.

b.) Where possible, place mats, canvas or tarpaulins beneath the trees to prevent contamination by old fallen cherries.

c) Ensure that there are adequate arrangements for the subsequent storage and processing of the crop, so that conditions favour mould growth or other damage are avoided.

16. Coffee cherries should be processed as soon as possible after harvesting. The harvesting rate, processing performance and labour availability must follow the pace of the drying rate.

17. Coffee ready to be processed should be uniform and not of mixed categories i.e. wet with dry coffee in dry processing or pulpable with not pulpable in wet processing. Prior to processing low quality cherries (e.g. unripe or overripe fruit, or fruit that has coffee berry disease) should be removed. This can be done either by visual sorting, or via water separation. It should be ensured that any material that is out sorted is disposed of in an appropriate manner.

4.3 POST-HARVEST

18. Senescence and changes follow once coffee fruit is detached from the plant. The post harvest period is characterized by initial, transitional and final phases.

19. The initial or high moisture phase starts with harvest. The product is then in an unstable state, and spoilage can be controlled through competitor microrganisms, restricting oxygen and reducing the time which is critical in this state. In wet processing the high moisture phase may be extended and controlled through fermentation, but it is desirable to reduce this time.

20. The transitional phase is the least stable and most difficult to predict, when spoilage can only be controlled by time limitation. Mesophilic and xerophilic spoilage microrganisms have enough water to grow but not their hydrophilic competitors. Turning or stirring of the coffee is essential to promote uniform drying. When harvest coincides with a rainy or high humidity season, measures to optimize drying must be adopted.

21. The final or low moisture phase starts at the end of drying and continues until roasting. The product is in a stable condition and control is necessary to prevent water re-introduction or redistribution in the bulk coffee. At some point during drying, there is no further growth as the product reaches the low moisture phase.

4.4 DRY PROCESSING

22. In the dry processing system (Figure 2) the whole harvested fruit is dried. Although it is a simpler process compared to wet processing, a good quality finished product can only be obtained through the application of good practices and proper management.

23. One option used in regions where the harvest time normally occurs under arid weather conditions is to allow the fruit to dry on the plant. This method results in a lower level of immature fruit, which is safe, of good quality and is cheaper than the traditional harvest, as it allows one-pass stripping.

24. Wherever possible, freshly picked cherries should be dried on the same day that they are harvested. In some instances, the harvested fruit is retained in bags or heaps for up to a week. This practice leads to high temperatures and quick fermentation, different in nature from the fermentation process employed in wet processing, causing quality losses and increasing the risk of OTA in the product.

25. Prior to drying, the harvested fruit should be sorted to remove immature and over mature cherries, and cherries damaged to CBD (coffee berry disease). Sorting may be done either visually, or in combination with water floatation.

4.5 WET PROCESSING

26. Wet or washed processing (Figure 3) requires a raw material composed of only ripe cherries that have been selectively picked or are mechanically separated in the process itself. Green immature cherries and dried fruits are removed in a water separator. The mucilage is removed, either by fermentation, mechanically or using chemicals.

27. In the fermentation process, the mucilage is broken down by fermenting the beans in water at ambient temperature (using microrganisms) for between 12 and 36 hours. The fermentation process must be carefully monitored to ensure that the coffee does not acquire undesirable (sour) flavours. After fermentation is complete, the coffee beans are washed in clean water tanks or in special washing machines.

28. After passing through the washer separators and before removal of the pulp, the separation of the green immature cherries from the ripe ones can be performed, using differences in pressure, in a green cherry separator. The soft, ripe cherries pass through the holes of the screen. The hard, unripe cherries, which cannot pass through the holes, go to the edge of the cylinder where a counter weight controls their outflow.

29. Factors that need to be controlled are as follow:

a) Any equipment should receive regular maintenance, to reduce the possibility of failures which could delay processing and compromise coffee quality and safety.

a.1) Before the beginning of the crop season: clean, reassemble and lubricate the processing equipment; inspect the installation and check it is operational, so that there is enough time for repairs if any problem occurs.

a.2) At the end of the crop season: clean, repair, lubricate, dust all equipment and protect from water. Check pulping surfaces for wear.

b) Provide proper orientation/training to the workers and define their responsibilities. In addition define quality and acceptability criteria, the monitoring procedures and frequencies, and the corrective measures for each key element of the process, regarding:

b.1) Cherries – maximum acceptable proportion of immature and over-mature/tree-dried cherries.

b.2) Pulping - acceptable proportion of un-pulped cherries and nipped beans; cost-benefit to increase size uniformity of the cherries and effectiveness of skin removal. The efficiency of the operation can be improved based on the various estimates of the monitoring the quality and safety of the product.

c) Water quality – clean water[1] should be used for processing, as dirty water could lead to conditions favourable to OTA production.

d) Fermentation should be as short as possible (12 to 36 hours), to get the mucilage degraded and the beans washable. Monitoring procedures and frequencies should be established as well as the type and level of inoculum (in the in-coming cherry) and ambient temperature.

e) Fruit-flies should be monitored, as high populations can affect fermentation.

[1] As defined in the General Principles of Food Hygiene (CAC/RCP 1-1985)

f) Secondary cherry coffee, which can be defined as products separated by sorting or other procedures and are returned to the processing, should have a specific control program; i.e. good drying practices should be applied, such as maintenance of separate facilities for drying.

g) Washing protocols should be defined and implemented (e.g. by measuring the quantity of broken, nipped and naked beans, and non coffee objects, and the quantity of water used).

4.6 DRYING OF SORTED AND PROCESSED COFFEE BEANS

30. The main purpose of the drying operation is to efficiently decrease the high water content of the just harvested cherries to a safe level in order to get a stable, safe and good quality product.

31. In this section both dry and wet processes will be discussed. Most of the coffee produced is dried using direct sun.

32. In the sun drying process, the product is spread on surfaces such as cement or brick terraces, tarpaulin, plastic canvas, bamboo and sisal mats, raised tables covered in wire mesh or fish farm netting.

33. The drying process can be divided into three stages. In each stage OTA producing fungi will have varying opportunities for growth.

34. At the first stage, there is a slight decrease in moisture content that takes a time interval between 1 to 3 days for cherry coffee and 1 day or less for parchment coffee. The high moisture content ($a_w > 0.95$) provides unsuitable conditions for OTA producing fungi to grow.

35. The second stage is the one of maximum loss in moisture content for both cherry and parchment coffee, under similar conditions at the same period of time. This is mainly dependant on drying conditions and drying yard technology. During this stage, there are favourable conditions for OTA producing fungi to grow and therefore it is necessary to implement precautionary measures as recommended in paragraph 38.

36. At the third stage both cherry and parchment coffee, is much drier compared to the previous two stages. There is a slower slight decrease in the remaining moisture content. Conditions at this stage do not favour the growth of OTA producing fungi.

37. The OTA-producing fungi require favourable conditions during a certain period of time to grow and produce the toxin. The level of available water is the most important factor to be considered. At high water activity ($a_w > 0.95$) OTA-producing fungi will not likely grow, as fast-growing hydrophilic fungi and yeasts grow first. At lower water activity ($a_w < 0.80$) the OTA-producing fungi can be present but not produce the toxin, and at a_w below 0.78-0.76 they cannot grow. Therefore the most important point is to control the period of time in which coffee remains in the drying yard, in the range of water activity where OTA-producing fungi can grow (a_w 0.8 – 0.95). According to experimental results, 5 days or less in the drying yard is enough and effective to prevent OTA accumulation. In general, a maximum a_w of 0.67 to 0.70 and moisture content < 12.5% (wet basis) is sufficient for protecting parchment coffee from damage by fungi.

38. Recommended measures to dry the coffee beans efficiently are:

a) The drying yard should be located away from contaminant sources such as dusty areas and should receive maximum sun exposure and air circulation, during most of the day, to speed up the drying of the beans. Shady and low areas should be avoided.

b) The surface for the drying yard should be chosen according to the climate of the region, cost and quality of the dried product, as any type of surface has advantages and disadvantages. Bare soil is not appropriate for rainy areas. Plastic canvas gets humid under the coffee layer, promoting fungal growth. In rainy or wet regions coffee must be covered and re-spread, once the surface has dried. If parchment coffee is to be dried, ensure that the drying surface is cleanable, in order to avoid picking up taints.

c) The pace and total time of the harvest should be based on the available area of the drying yard and the average time necessary for drying, considering both good and bad weather.

d) The following practical measures should be incorporated into the drying process:

d.1) Dry coffee only in thin layers, 3 to 5 cm in depth which is equivalent to 25 to 35 kg/m^2 of fresh parchment or cherry coffee. In some cases (e.g. low air humidity, good air circulation and sun intensity, or in usually dry regions), thicker layers can be used.

d.2) Turn over the coffee layer constantly during the day time to allow faster drying, to reduce the risk of fungi growing and help to produce a better quality product.

d.3) Allow for the appropriate ventilation of the wet coffee during the night in order to avoid condensation. After one day of drying for parchment and three days for cherry coffee, the coffee can be heaped and covered at night or during rainy weather, to avoid re-wetting.

d.4) Do not mix different types of coffee nor coffee from different days of harvest. Use a specific identification for each one of them to identify each type of coffee and day of harvest.

d.5) Protect the drying yard area from animals, which can be a source of biological contamination for the drying coffee.

d.6) Regularly control CBB and other pest populations, using integrated pest management in drying yard.

d.7) Monitor the drying process regularly (<12.5% for both parchment and cherry coffee). Start taking samples from different points of each lot, two or three days before it is expected to be fully dry and continue re-evaluating it daily until it reaches the desired moisture content. Instrumental measurements should be adopted at field level. Moisture content measures should be calibrated to ISO 6673 method.

d.8) Avoid rewetting the beans because it favours rapid fungal growth and the possibility of OTA production.

e) Provide a clear and practical training for drying yard workers, including adequate use of moisture measuring equipment.

f) Repair, clean, protect and keep equipments in a clean storage area until the next season. Moisture measuring equipment should be regularly cross checked and calibrated once a year before harvest against the ISO 6673 method.

39. Mechanical driers are generally used as complementary after sun-drying, but in some regions it plays a major role in the drying process. Mechanical driers usually need to have control of two items: inlet temperature and duration of drying time. The most common problem with mechanical drying is over drying, causing weight loss and consequently income loss. The other problem is black beans from immature beans submitted to excessive inlet temperature, decreasing the quality of the product.

4.7 STORAGE, TRANSPORTATION AND TRADING

40. Properly identified lots of dried cherries or the dried parchment coffee should be stored, at the farm level or in out-of-farm warehouses, in bulk or in clean bags under appropriate storage conditions.

41. In different producing countries handling coffee in local trading varies in relation to the proper structure of the chain and the way the operations are performed. These functions include: post-cleaning, sorting, grading into size classes, re-bagging, sometimes re-drying, storage and transport. These operations add value to the traded product, before it is sold and sent for roasting.

42. During the entire process, the coffee must also be protected from re-wetting, degradation and cross-contamination. In long term storage conditions, humidity should be kept under strict control. Under a relative humidity below 60% coffee will continue to dry but if the relative humidity is above 80% the coffee will start to absorb water. Moisture in the storage place can originate from damp floors and walls, rain (wind-driven or through leaks), dead air, and the mixing of dry with wet coffee. Appropriate storage facilities, the use of good storage practice and regular monitoring can prevent or reduce problems.

43. In lower grade coffee, it has been observed that fruits with black and sour defects contained the highest levels of OTA. Tolerance for such defects in sorted green beans should be low and the out-sorted defective beans should not be re-blended into clean coffee or sold directly to roasters unless representative sampling plan and direct OTA analysis has shown them to be acceptable.

44. From the production areas coffee may be transported by different means of transportation to the trading points. The main aspect of concern here is to avoid rewetting of coffee, due to possible climatic changes between different regions, and taking the necessary control measures.

45. In the production chain, the local market is the most sensitive part from where improvements in practice can be administered. Here the authorities, through regulatory and non-regulatory mechanisms can enforce and influence practices in order to guarantee that producers reliably operate in a way as to assure the product safety.

46. Stakeholders should adopt procedures to protect coffee in each part of the chain, refuse suspect coffee and avoid practices that could generate or increase a problem. Dried coffee must be protected from re-wetting through contact with water, mixture with wet lots, absorption from wet air or surfaces or redistribution of water within the lot. Defects associated with high levels of OTA should be reduced to acceptable levels. Protection from contamination by other materials is also necessary.

a.) Minimum hygiene requirements and a rapid assessment method (including a sampling method with representative sub-sample of the in-coming lot for moisture content determination, defect levels, general physical quality assessment and visual or smell signs of mouldiness) should be established.

b) The warehouse design and structure should be adequate to maintain dryness and uniformity of the stored coffee.

b.1) The desirable characteristics are: cement floor with a damp proof course; not subject to flooding; water pipelines properly located to avoid wetting coffee in case of plumbing problems; water proof windows and roof and a high ceiling to allow good air circulation.

b.2) Do not expose stored coffee to direct sunlight nor store it near heating sources, to avoid the possibility of temperature differentials and water migration.

c) The operation of a storage facility must be optimised to prevent cross contamination, the reintroduction of moisture and to allow the best execution of receiving, sale and value-added operations that will preserve the coffee quality until it is sold to the next stakeholder in the production chain. The main recommendations are:

c.1) Record initial condition and age of the received stocks.

c.2) Arrange the coffee bags on pallets and away from walls, to allow good air circulation.

c.3) Implement cleaning and maintenance programmes in order to ensure that storage facilities are periodically inspected, cleaned and renewed.

c.4) Check coffee weevil in the warehouse, using integrated pest management.

c.5) Farms and other operations should separate coffee types. This requires planning of the storage area and adoption of a labelling system. Non-food materials should not be stored with coffee to prevent contamination or taints in the product.

d.) Coffee cleaning and sorting should not physically damage the product as this will make it more susceptible to contamination/deterioration nor introduce new contamination and should assure reduction of undesirable materials to acceptable pre-determined levels.

d.1) Ensure the facilities and equipment are regularly inspected, maintained and cleaned, through implementation of cleaning and maintenance programmes.

d.2) When storage is combined with cleaning and sorting, attention is required to avoid contamination of post-cured coffee with the curing by-products of dust and foreign matter, (e.g. through the use of partition walls or extractor fans).

d.3) Remove defects from main-crop production, discarding or screening them before their inclusion into the food chain. There is no uniform distribution of defects within the classes of beans separated from bulk coffee and evidence shows that defective beans and husk (also a defect) sometimes contain higher OTA levels than sound beans. Based on further investigations of OTA contamination of defects authorities should provide clear guidance to the stakeholders.

e) Transport of coffee also requires the adoption of practices to avoid re-wetting, to maintain temperature as uniform as possible and to prevent contamination by other materials. The main requirements here are:

e.1) cover coffee loading and unloading areas to protect against rain;

e.2) before receiving a new cargo, the vehicles must be cleaned from residues of the previous cargo;

e.3) the vehicles must have floor, side walls and the ceiling (in closed vehicles) checked for the presence of points where exhaust fumes or water from rain can be channelled into the coffee cargo. Tarpaulins and plastic canvas used to cover the cargo should also be regularly checked to ensure they are clean and without holes. The vehicles should also receive regular maintenance to be kept in good condition;

e.4) reliable transport service-providers that adopt the recommended good transportation practices should be selected by operators.

4.8 SHIP TRANSPORTATION

47. Coffee is transported from producing to consuming countries in bags or in bulk, usually in 18 to 22 tonnes capacity containers. Temperature fluctuations, during the transportation time, can cause condensation of the remaining water (present even in well-dried beans) and local re-wetting. The redistribution of water can lead to fungal growth, with the possibility of OTA production. The recommended practices during transportation in the port are:

a) Cover coffee loading and unloading areas to protect against rain.

b) Check coffee lots to ensure that they are uniformly dried and below 12.5% moisture content, free of foreign matter and respecting the established defect levels.

c) Check containers, before loading, to ensure they are clean, dry and without structural damage that could allow water entrance into the container.

d) Bags should be well stacked and crossed over for mutual support in order to avoid the formation of empty vertical columns (chimneys). The top layer and sides of bags should be covered with materials that can absorb condensed water, such as silica gel or cardboard for protection against the growth of fungi that could result in OTA production. For coffee in bulk a sealable plastic liner (e.g. big bag which allows aeration) is desirable and this should be kept away from the roof of the container.

e) Choose an appropriate place, not directly exposed to the weather, aboard the ship to reduce the possibility of undesirable situations mentioned that can lead to OTA contamination.

f) Keep the ventilation holes in the containers free.

g) Avoid unprotected stowage on the deck (top layer) and stow away from boilers and heated tanks or bulkheads.

h) The moisture content level should not exceed 12.5% anywhere, from the point where the coffee leaves the loading area to the point at which the coffee is unloaded, stored and/or subjected to other processing procedures such as roasting.

Figure 1. Coffee Cherry

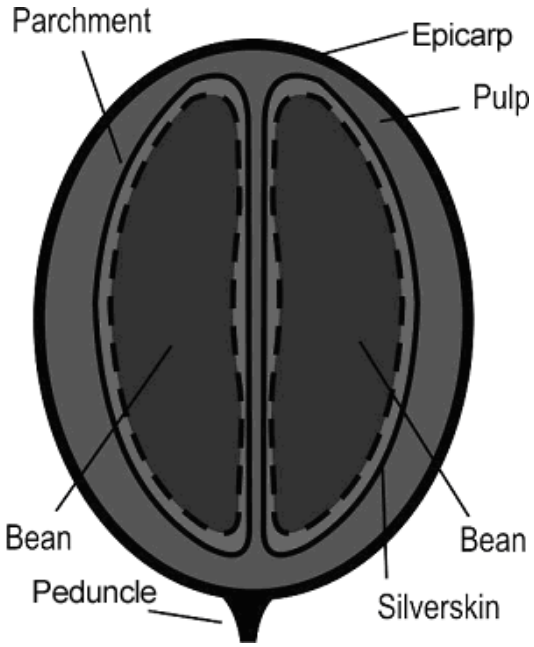


Figure 2. Dry processing flow

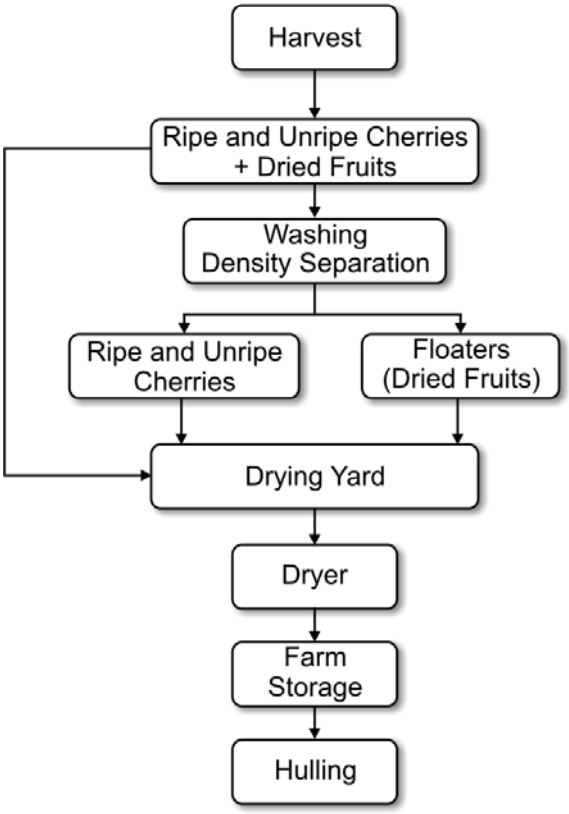
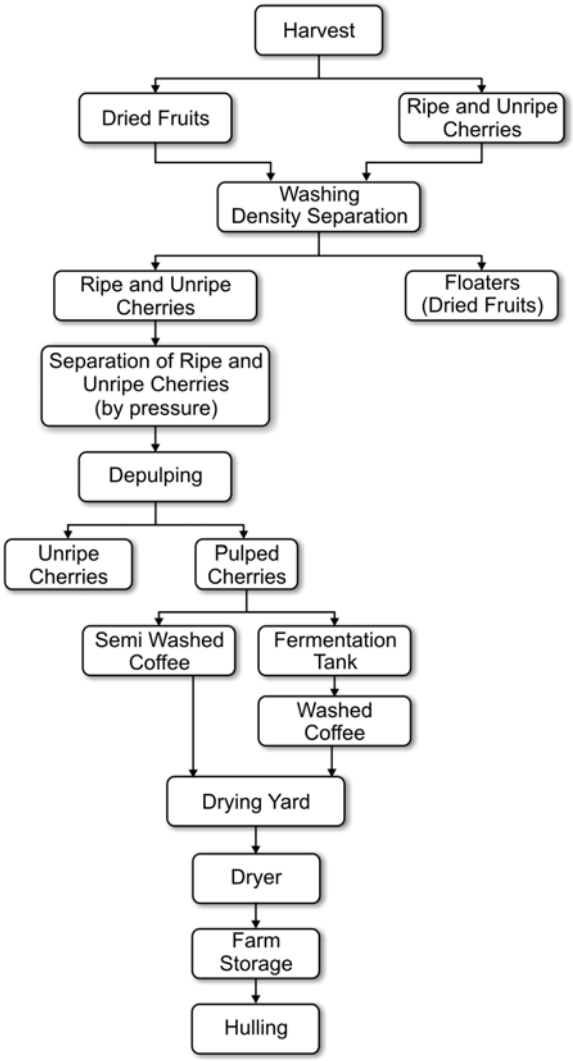


Figure 3. Wet processing flow.



APPENDIX VII

PROJECT DOCUMENT

PROPOSAL FOR NEW WORK ON MAXIMUM LEVELS FOR FUMONISINS IN MAIZE AND MAIZE PRODUCTS AND ASSOCIATED SAMPLING PLANS

1. The purpose and scope of the project

This project aims to establish maximum levels for fumonisins (FB1 + FB2) in maize and some maize products, such as maize flour, and to define the sampling plans associated to those commodities

2. Relevance and timeliness

High consumers of maize and maize products might be exposed to unsafe levels of fumonisins, including populations in certain areas of Africa and Central and South America. Furthermore, there is a need for an international regulatory level, based on scientific evidence, aiming at the protection of human health with a minimum economical impact on international trade.

3. The main aspects to be covered

It is proposed to discuss maximum levels for fumonisins in maize and maize products in food and feed, considering:

a) The results of the JECFA evaluation of fumonisins conducted at its 56th Meeting in 2001, including toxicological evaluation, exposure assessment and proposed sampling plans;

b) Updated occurrence data on fumonisins in maize and maize products and available information on sampling plans;

c) The application of good practices to prevent fumonisins contamination as much as reasonably achievable.

4. Assessment against the criteria for the establishment of work priorities

1. Consumer protection from the point of view of health, food safety, ensuring fair practices in the food trade and taking into account the identified needs of developing countries.

The new work will provide maximum levels for fumonisins in maize and some maize products, as well as associated sampling plans to guarantee fair international trade.

2. Diversification of national legislations and apparent resultant or potential impediments to international trade.

Currently, there are existing guideline/maximum levels for fumonisins (FB1+FB2 or FB1+FB2+FB3) in some countries for maize and some maize products. Considering that maize is a major staple food and a major exporting commodity for some countries, there is a need for an international maximum level and respective sampling plans to protect human health and guarantee fair trade.

5. Relevance to Codex Strategic Goals

The proposed work falls under the following Codex Strategic Goals:

Goal 1. Promoting sound regulatory frameworks

With a view to promoting maximum application of Codex standards, this work will provide harmonized regulations for developed and developing countries, leading to fair trade.

Goal 2. Promoting widest and consistent application of scientific principles and risk analysis

This work will help establish risk management options based on scientific evaluation.

Goal 3. Strengthening Codex work-management capabilities

The establishment of maximum levels for fumonisins in maize and some maize products is a way to manage risks associated with the consumption of high contaminated food, especially by high consumers of maize and maize products

Goal 4. Promoting maximum application of Codex standards

Due to the international nature of this problem, this work will support and embrace all aspects of this objective by requiring participation of both developed and developing countries to conduct the work.

6. Information on the relationship between the proposal and other existing Codex documents

This new work is recommended in the Discussion Paper on Fumonisins (CX/CF 09/3/9) presented and discussed at the 3rd Session of Codex Committee on Contaminants in Foods.

7. Identification of any requirement for any availability of expert scientific advice

There is need to update toxicological evaluation taking into account all new data on occurrence in feed and carry-over to address public health relevance including recent occurrence in food and exposure assessment.

8. Identification of any need for technical input to the standard from external bodies

At this point, there is no need for additional technical input from external bodies.

9. The proposed time line for completion of the new work, including the starting date, proposed date for adoption at Step 5 and the proposed date for adoption by the Commission

Subject to approval by the Commission, the proposed draft Maximum Levels for Fumonisins in Maize and Maize Products and Associated Sampling Plans will be considered by the 4th Session of the CCCF with a view to its finalization in 2012.

APPENDIX VIII

PROJECT DOCUMENT

PROPOSAL FOR NEW WORK ON A CODE OF PRACTICE FOR THE REDUCTION OF ETHYL CARBAMATE IN STONE FRUIT DISTILLATES

1. Purposes and scope

This project aims to establish a Code of Practice for the reduction of ethyl carbamate in stone fruit distillates particularly stone fruit spirits and stone fruit marc spirits. The Code will cover different stages of production (raw materials, distillation, packaging and storage).

2. Relevance and timeliness

Ethyl carbamate is genotoxic and multisite carcinogen in animals and probably carcinogen to humans. It can be formed from different precursors in fermented food and beverages. JECFA concluded at its 64th session 2005 that the intake of ethyl carbamate from alcoholic beverages is of health concern and recommended that mitigation measures to reduce concentrations of ethyl carbamate in some alcoholic beverages should be continued. Distilled stone fruit spirits, particularly stone fruit and stone fruit marc spirits, may contain ethyl carbamate in manifold higher concentrations than other alcoholic beverages. It is recognised that technological measures can be taken to prevent and reduce significantly high ethyl carbamate levels in stone fruit distillates.

3. Main aspects covered

a) The Code of Practice will cover all possible measures that have been proven to prevent and reduce high levels of ethyl carbamate in stone fruit distillates. It will cover different stages of the production (raw materials, distillation, packaging and storage).

b) These measures can be implemented with reasonable effort and expenses at all stages of production.

4. Assessment against the criteria for the establishment of work priorities;

This proposal is consistent with the following criteria for the establishment of work priorities:

a) The new work will provide good practices for the prevention and reduction of high ethyl carbamate concentrations in stone fruit distillates and will thereby support consumer protection from point of view of health by minimizing consumer dietary exposure to ethyl carbamate from stone fruit distillates.

b) The implementation of the proposed Code of Practice will have an acceptable economic impact on the producers.

c) The new work will provide an internationally harmonized standard which is assessable and available to all producers.

5. Relevance to the Codex strategic objectives

This proposal is relevant to the strategic goal 1 of the strategic framework 2008-2013

6. Relation between the proposal and other existing Codex documents

None.

7. Identification of any requirement for and availability of expert scientific advice

A JECFA risk assessment (2005) on ethylcarbamate is already available. There is no need for further scientific advice.

8. Identification of any need for technical input to the standard from external bodies

None.

9. Proposed time-line for completion of the new work

If the Commission approves in 2009 the proposal for new work, the Code of Practice will be drafted and circulated for consideration at Step 3 at the 4th meeting of CCCF 2010. Adoption at Step 5 is planned for 2010 and adoption at Step 8 can be expected in 2011. Depending on the outcome of the discussion the document may be finalized by 2010.

APPENDIX IX

PROJECT DOCUMENT

PROPOSAL FOR REVISION OF THE CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF AFLATOXIN IN TREE NUTS (CAC/RCP 59 -2005) – ADDITIONAL MEASURES FOR BRAZIL NUTS -

1. The Purpose and Scope of the Project

This project aims to revise the current code of practice for the prevention of aflatoxins in tree nuts.

2. Relevance and Timeliness

Aflatoxin contamination can be a potential problem in tree nuts, including Brazil nuts, which is the only extractivistic crop among the main internationally traded tree nuts. This activity is important for the native people in the growing countries, stimulating a sustainable use of renewable natural resources while conciliating social development with forest preservation.

A Code of Practice for the Prevention and Reduction of Aflatoxin Contamination in Tree Nuts was adopted by the CAC at its 28th Session. A specific Appendix, addressing Good Extractivistic Practice for Brazil Nuts, was included in the Code of Practice and adopted by the CAC at its 29th Session.

A validation of good practices, with respect to the factors causing aflatoxin contamination in the Brazil nut production chain and the methods of control available, has recently been completed in the STDF[1] project SafeNut[2]. The findings from this project indicate a need to up-date the current code of practice for the prevention and reduction of aflatoxin contamination in tree nuts**.** Therefore, we suggest as new work, that the code should be up-dated taking into account these new results. The STDF-SafeNut final report will be available in the spring of 2009, but a draft proposal for revisions is attached to this document (Appendix 1) for information.

3. The Main Aspects to be covered

It is proposed to revise the current code of practice considering:

a) The application of good practices to prevent aflatoxin contamination as much as reasonably achievable in particular as regards collection, transport, storage and processing of Brazil nuts.

b) The proposals attached to this document (Appendix 1)

c) The Final report of the STDF-SafeNut project[1, 2]

d) Any other relevant new data

4. Assessment against the *Criteria for the Establishment of Work Priorities*

1) Consumer protection from the point of view of health, food safety, ensuring fair practices in the food trade and taking into account the identified needs of the developing countries.

   The new work will provide additional guidance for countries in order to improve Brazil nut quality, preventing and reducing aflatoxin contamination and consequently minimizing consumer dietary exposure to aflatoxin from Brazil nuts.

2) Diversification of national legislations and apparent resultant or potential impediments to international trade.

The new work would provide internationally recognized scientific guidance in order to improve to the enhancement of international trade.

3) Work already undertaken by other organizations in this field.

This new work will be based on the results of the STDF-SafeNut project[1,2]

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1 The Standards and Trade Development Facility (STDF) is a global programme in capacity building and technical co-operation established by the Food and Agriculture Organization of the United Nations (FAO), the World Organization for Animal Health (OIE), the World Bank, the World Health Organization (WHO) and the World Trade Organization (WTO).

2 http://stdf-safenutproject.com/. (STDF project 114)

5. Relevance to Codex Strategic Goals

The work proposed fall under all five Codex Strategic Goals:

Goal 1. Promoting Sound Regulatory Frameworks.

The result of this work will assist in promoting sound regulatory frameworks in international trade by using scientific knowledge and practical experience for prevention and reduction of aflatoxins in Brazil nuts

With a view to promoting maximum application of Codex Standards, due to the importance of Brazil nuts international trade, this work will harmonize procedures for developed and developing countries, leading to a fair trade.

Goal 2. Promoting Widest and Consistent Application of Scientific Principles and Risk Analysis.

This work will help in establishing risk management options and strategies to control aflatoxins in Brazil nuts

Goal 3. Promoting Cooperation between Seamless Linkages between Codex and Other Multilateral Bodies.

The involvement of Codex in STDF activities forms a close link and the work developed by the STDF-SafeNut on this issue will be the base of this new Codex work.

Goal 4: Promoting Maximum Application of Codex Standards.

This work will support and embrace all aspects of this objective by requiring participation of both developed and developing countries to conduct the work.

6. Information on the Relationship between the Proposal and other Existing Codex Documents

Code of Practice for the Prevention and Reduction of Aflatoxin in tree nuts – Additional Measures for Brazil Nuts (CAC/RCP 59 -2005, REV.1-2006)

7. Identification of any Requirement for and Availability of Expert Scientific Advice

Additional scientific advice is not necessary at this moment, as the Final report of STDF-SafeNut project will be available in the next few months.

8. Identification of any Need for Technical Input to the Standard from External Bodies

There is no need for additional technical input from external bodies.

9. The Proposed Timeline for Completion of the New Work, Including the Starting Date, Proposed Date for Adoption at Step 5 and the Proposed Date for the Adoption by the Commission; the timeframe for revising a standard should not normally exceed two years.

If the Commission approves, the proposed draft Code of Practice will be circulated for comments at Step 3 and consideration t the 4th Session of CCCF in 2010. Adoption at Step 5/8 can be expected by 2010.

Annex

Proposal for revision of the "CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF AFLATOXIN CONTAMINATION IN TREE NUTS (CAC/RCP 59 -2005, REV.1-2006) – APPENDIX: ADDITIONAL MEASURES FOR THE PREVENTION AND REDUCTION OF AFLATOXINS CONTAMINATION IN BRAZIL NUTS"

COLLECTION

Paragraph 4: "Collection should begin as soon as most of the pods have fallen from the trees"

Change to: "Collection should proceed continuously as soon as the pods have fallen from the trees"

- Note: The time before all pods have fallen from the trees can take several weeks and hence the first pods may rest in the forest for too long time. It is recommended that collectors are protected (helmets) from accidents due to falling pods.

POST-COLLECTION

Paragraph 5: "Pods should be sorted to remove broken and damage ones and gathered in piles or thin layers for only a short period"

Change to: "Pods should be sorted to remove broken and damage ones and gathered in piles or thin layers for only a short period (less than 5 days)"

Paragraph 8: "At the location of the primary storage, nuts should be dried to a safe moisture content to prevent mould growth and possible aflatoxin contamination during storage." "Nuts should be spread out in thin layers, in open air, on clean surfaces, above ground level, and exposed to sun drying and or to a natural air circulation, with a regular turn"

- Note: This sun-drying practice doesn't work in the environment of the primary storage, i.e. in the rain forest area. The SafeNut results show that the aflatoxin producing fungi infect the nuts early, in the forest. Furthermore, the results show that the main aflatoxin production occurs during the primary storage and that the sun-drying is not sufficient to reach safe moisture levels (corresponding to water activity is less than 0.70).

Change to: to avoid aflatoxin formation the nuts should be dried to a safe moisture level within 10 days from the collection. Sun-drying is normally not sufficient to reach safe moisture levels. This recommendation is particularly important when producing Brazil nuts to be traded as "in-shell" where contaminated nuts are difficult to distinguish from sound nuts without cracking the nut.

Paragraph 11: "If the nuts are stored at an intermediate location, before reaching the processing facility, the storage facility should have the following:

a) protection from rain and pests;

b) a washable and impermeable floor;

c) drainage of ground water;

d) good air circulation;

e) sufficient area and proper divisions to allow separation of lots"

Add: "This intermediate storage is only possible if the moisture content corresponds to a water activity below 0.70. Otherwise no intermediate storage is possible"

GENERAL RECOMMENDATION

Add: "It is recommended that the current quality control system by checking the percentage "bad" nuts in the incoming lots, which is used in most processing plants, is further developed and validated. By doing so, this method may be used as a tool for decision if a lot can be used for production of "in-shell" nuts or if it should be shelled and sorted to eliminate bad nuts. Bad nuts are likely to contain very high levels of aflatoxins according to the results of the STDF-SafeNut project and the ConforCast project[3]."

[3] ConforCast (include link or reference)

APPENDIX X

PROJECT DOCUMENT

PROPOSAL FOR NEW WORK ON MAXIMUM LEVELS FOR MELAMINE IN FOOD AND FEED

1. The Purpose and Scope of the Project

This project aims to establish maximum levels for melamine in food and feed products resulting from non-intentional and unavoidable presence from different sources.

These maximum levels are aimed to promote consistency in risk management practices related to such melamine presence in food and feed.

This project will not apply to deliberate addition of melamine in food and feed, as part of fraudulent activities, which are not to be tolerated at any level.

2. Relevance and Timeliness

Over the last couple of years, several countries have experienced a number of food incidents related to the fraudulent presence of high levels of melamine in a wide variety of food products, including most recently in products containing milk and milk-derived ingredients. Some of the latest occurrences involved infant formula products and were associated with human illnesses and death.

Melamine is a synthetically produced chemical used for a wide variety of applications including electrical equipment, adhesives, laminates, permanent-press fabrics, flame-retardants, textile finishes, tarnish inhibitors, coatings and papers, and fertilizer-urea mixtures. Melamine can also be present in the environment as a result of the degradation of precursor compounds such as the dealkylation of some pesticides. It may be found at trace levels in the food chain as a result of its presence in the environment. Melamine may also enter the food chain indirectly through animal feeds

Due to the widespread use of melamine in applications involving contact with food, trace amounts of melamine may be found in food. Maximum limits are required to support governments in their efforts to discriminate between occurrence of melamine as a result of unavoidable presence in food and feed from deliberate adulteration practices.

A WHO expert consultation conducted in collaboration with FAO and with the support of Health Canada in December 2008, evaluated the most recent toxicological and occurrence data related to melamine and provided guidance on assessing risks associated with its presence in food and feed

Prior to and subsequent to this consultation, several governments developed maximum limits for melamine in food products and some also in feed, as interim risk management measures.

There is a need to establish maximum limits with international consensus to promote consistency in risk management practices related to melamine presence in food and feed.

3. The Main Aspects to be covered

1) It is proposed to discuss maximum levels for melamine in food and feed products within the scope as described above.

2) The WHO expert consultation conducted in December 2008 will be used to guide the development of maximum levels for melamine in food and feed.

3) Building on the guidance provided by the WHO expert consultation, consideration will be made to the availability and suitability of analytical methods to support the implementation of such standards with consultation of CCMAS.

4) This project will not consider maximum levels for melamine-related chemicals e.g. cyanuric acid, ammelide and ammeline, but recognises that these chemicals present in combination with melamine represent a more unique toxicological concern compared to melamine alone. Consideration will be given to the development of new maximum limits and/or revision of the proposed maximum limits, should new data become available.

4. Assessment against the *Criteria for the Establishment of Work Priorities*

1) Consumer protection from the point of view of health, food safety, ensuring fair practices in the food trade and taking into account the identified needs of developing countries.

2) This work will support the development of internationally harmonized standards.

5. Relevance to Codex Strategic Goals

The proposed work falls under the following Codex Strategic Goals:

Goal 1. Promoting sound regulatory frameworks

The result of this work will assist in promoting sound regulatory frameworks in international trade by using most up-to-date scientific knowledge.

With a view to promoting maximum application of Codex standards, this work will provide harmonized practices for developed and developing countries, leading to fair trade.

Goal 2. Promoting widest and consistent application of scientific principles and risk analysis

This work will help in establishing risk management options, based on the most recent scientific evaluation conducted under the auspices of WHO.

Goal 3. Strengthening Codex work-management capabilities

The establishment of maximum levels for melamine in food and feed will support the development of consistent risk management practices to protect public health, while not representing an impediment to international trade.

Goal 4. Promoting maximum application of Codex standards

Due to the international nature of this problem, this work will support and embrace all aspects of this objective by requiring participation of both developed and developing countries to conduct the work.

6. Information on the Relationship between the Proposal and other Existing Codex Documents

N/A

7. Identification of any Requirement for any Availability of Expert Scientific Advice

The WHO expert consultation conducted in December 2008 provided the most up-to-date scientific guidance to support the development of this new work..

8. Identification of any Need for Technical Input to the Standard from External Bodies

Same as above

9. The Proposed Time Line for Completion of the New work, Including the Starting Date, Proposed Date for Adoption at Step 5 and the Proposed Date for Adoption by the Commission

Pending approval by the CAC at its 32nd session in 2009, of this new work to be undertaken by CCCF, the following draft maximum levels, as already adopted by several governments and in line with the WHO expert consultation are proposed to be circulated at step 3, for comments, for consideration at the 4th Session of the CCCF in 2010:

- 2.5 ppm melamine in food and feed products and,

- 1 ppm of melamine in infant formula products.

The CCCF could agree to put forward these maximum levels for adoption at Step 5 by the CAC in 2010. Depending on the outcome of the discussion the maximum levels may be finalized by 2010.

APPENDIX XI

PRIORITY LIST OF CONTAMINANTS AND NATURALLY OCCURRING TOXICANTS PROPOSED FOR EVALUATION BY JECFA

Contaminants and naturally occurring toxicants	*Background and Question(s) to be answered*	*Data availability (when, what)*	*Proposed by*
3-MCPD esters	Full evaluation (toxicological assessment and exposure assessment)	Germany: end 2010 Japan: occurrence end 2009	Germany, supported by EC, Canada, Japan
Fumonisins	Update toxicological evaluation taking into account all new data Occurrence in feed and carry-over to address public health relevance Recent occurrence in food and exposure assessment	<u>Occurrence data:</u> EC: mainly maize Brazil: sorghum feed IAEA: maize US: maize Australia: surveillance data Ghana: maize <u>Toxicological data:</u> Published literature	CCCF
Cyanogenic Glycosides	Review of new data on toxicity, occurrence, effect on processing (food and feed) to decide if risk assessment is feasible and appropriate	To be determined in response to call for data	CCCF
Lead[1]	New studies indicate effects at current blood levels of 10microg/dl Dose-response analysis also below 10microg/dl (current concern level on blood levels)	Published data	US, Canada, Australia
Cadmium[1]	Recent EFSA Opinion with lower PTWI. Review of new toxicological data to review hazard and exposure assessment	EC: data available IAEA: Cd in seafood by end 2010	EC, Vietnam, Norway, US, Canada, IAEA

[1] High priority for evaluation by JECFA.