codex alimentarius commission

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

WORLD HEALTH ORGANIZATION

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JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON FOOD ADDITIVES AND CONTAMINANTS

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PROPOSED DRAFT CODE OF PRACTICE ON THE SAFE USE OF ACTIVE CHLORINE - COMMENTS AT STEP 3

The following comments have been received from: Canada, Cuba, European Community (E.S.F), USA, ICGMA, and ISDC.

CANADA:

Canada's Historic Position on this Issue

Canada has supported in principle the suggestion that specific questions relating to the use of active chlorine in food be evaluated by JECFA and proposals for such use be endorsed by CCFAC. This is consistent with established procedures for food additives and processing aids. However, in recognition of the established antimicrobial effects of active chlorine and the known benefits of its use in food processing applications, any potential risks associated with the use of chlorine would have to be carefully considered in relation to the benefits of use of chlorine. Canada recognized that this would likely result in some unique challenges for CCFAC and other Codex committees and, rather than have CCFAC move forward in a unilateral fashion, thought it appropriate to address this matter jointly with other affected Codex committees (e.g. CCFH and CCFFP).

Specific Comments of Canada on the Code of Practice Prepared by the Drafting Group

Canada supports the Discussion Paper being transformed into a Code of Practice as a Code of Practice is a more practical venue to deal with the subject of active chlorine. Nonetheless, Canada has some reservations and comments to make on the Code of Practice as it currently stands and believes that work on the Code should continue after the 36th Session of CCFAC to further clarify and improve its contents:

(1) It is stated in Section 2, "**SCOPE"**, that

"*Drinking water* as delivered from the drinking water supply system is not part of this Code of Practice. This includes chlorination in (of) the drinking water supply system and the use of chlorinated drinking water supplied and used in food production."

In Section 4.1, of **GENERAL CONDITIONS IN FOOD PROCESSING**, it further states that…..

"Water used in direct contact with food in food processing and treated with active chlorine in the food plants should in principle be of drinking-water quality in accordance with the WHO guideline."

Given the above statements, the requirement for a risk analysis as specified in Section 4.2 does create confusion. What is the purpose of this risk analysis in relation to the risk analysis identified in Section 6 (**RISK ANALYSIS BEFORE TREATMENT WITH ACTIVE CHLORINE**)? Is the purpose of the risk analysis in 4.2 intended to demonstrate that the use of active chlorine is a suitable means of microbiological control for the foodstuffs or groups of foodstuffs being processed or is it intended that the risk analysis in Section 4.2 would only be necessary if the chlorine levels are above those recommended in the WHO guideline?

Section 4.2 does not specify who should carry out the risk analysis but it is implied that it is the food producer, given the reference to Section 6. Furthermore, with regard to the risk analysis in 4.2, it is unclear for whom the risk analysis is being undertaken – for the satisfaction of the food producer? – for national regulatory authorities? – for CCFAC? The discussion on Page 2 (**PROPOSAL FOR PROCEDURE IN CODEX COMMODITY COMMITTEES AND IN THE CODEX COMMITTEE ON FOOD HYGIENE**) of the covering document (CX/FAC 04/36/11) would suggest that the Codex Commodity Committees (CCCs) and the Codex Committee on Food Hygiene (CCFH) would discuss, identify processes, justify and presumably request CCFAC to endorse residual levels of active chlorine and reaction products. The implication of the 1st sentence of Section 6 is that the food producer would need to develop data for submission to the CCCs and CCFH (see **PROPOSAL FOR PROCEDURE…..**p.2) for review. Considering all of the variables in the flow chart shown in Annex II (Page 9), the volume of work entailed in such a scheme would be unrealistic.

(2) In the **SCOPE** (Section 2), it is stated that,

"The use of chlorine as a general *disinfectant in the cleaning of food processing equipment* is also not covered in the Code of Practice."

Therefore, inclusion of a definition for "*disinfection"* in Section 3 "**DEFINITIONS**" falls outside of the scope of this Code and should be deleted.

(3) Section 5.1 of **5. EVALUATION OF COMPLIANCE WITH RELEVANT LEGISLATION** states that "The intended use of active chlorine could be to obtain different functions, for instance as disinfectants, processing aids, food contaminants or additives." This section requires clarification. First, one does not deliberately use chlorine for the function of contaminating food. Second and again, *disinfection* has been stated not to be included in this Code of Practice.

(4) In Section 6 (**RISK ANALYSIS BEFORE TREATMENT WITH ACTIVE CHLORINE**), while Environmental Assessment is a consideration for food additives in many countries' regulations (including Canada's), we question inclusion of the issue of "impact on the environment" in a Codex Code of Practice. This reference should be deleted as it falls outside of the mandate of Codex.

Also, how would other factors like "consumer perception" and effect on sensory properties, quality, appearance, smell and taste be factored into CCFAC's health and safety mandate of managing the risk of consumer exposure to chlorine and its reaction by-products? Again, Canada would suggest these points should be deleted as they fall outside of guidance on the ***safe*** use of active chlorine.

(5) Section 6.1 needs to be re-titled. In this heading, and in other parts of the Code of Practice, the term "potable water" should be used, since the Code does not, as stated in Section 2, deal with drinking water. Use of the term "potable water" would help clarify the Scope of the Code.

(6) Section 6.1.2, it is stated that,

"The microbiological quality of the drinking water should be evaluated in relation to its potential to contaminate the processed foodstuffs and the growth conditions for pathogens during processing and in the final food."

It will be recalled that Section 2 (**SCOPE**) indicated that "*Drinking water* as delivered from the drinking water supply system is not part of this Code of Practice." Inclusion of the reference to "drinking water" creates confusion and should be deleted for consistency with the Scope.

(7) With regard to Section 6.2 (**Overall efficacy**), the discussion in this Section, particularly under 6.2.2 should be moved to Section 6.4 (**Chemical aspects**) and 6.2.1 should be moved to **6.3 Microbial aspects.** The microbiological aspects *are* overall efficacy aspects and Section 6.3 might be aptly re-named **Microbial efficacy aspects**.

(8) Section 6.4 is vague as to whether it deals with water in contact with food *before* food contact, *after* food contact, or whether it deals with the food itself. This needs to be clarified. For example, Section 6.4.4 makes reference to the limits in Annex I which are the WHO *drinking water* guideline limits. The purpose Section 6.4.6 in the context of a Code of Practice is unclear. What guidance is provided by this Section to a user of active chlorine?

(9) There are inconsistencies between the information contained in Annex III and the WHO residual free chlorine guideline of 0.5 mg/L. For example, the value for chlorine opposite *Listeria* in the Table in this Annex suggests a concentration of 100 mg/L for 0.5 minutes. This could lead to confusion in determining the appropriate levels of active chlorine that should be used.

(10) On Page 15, how does the Codex Committee on Fish and Fishery Products recommended level of 10 mg/L chlorine contained in the Code of Practice for Frozen Shrimps and Prawns relate to the WHO residual free chlorine guideline value of 0.5 mg/L?

(11) Canada suggests that the use of Annexes in this Code of Practice is contributing to confusion rather than improving the understanding of the advice contained in the Code. As such, it is our view that consideration should be given to deleting the Annexes as they currently exist.

Conclusions and Position of Canada on the Code of Practice on the Safe Use of Active Chlorine

Canada supports continued development of this Code of Practice and believes that more practical advice on **how** to use chlorine and its compounds is required. CCFAC has traditionally employed Codes of Practice as guidance documents to those who are in a position to make decisions related to either minimizing the use of chemicals (in this case, so-called active chlorine compounds) or to treat foodstuffs in such a way so as to minimize or reduce contamination. In this case, it would be contamination resulting from "chlorination disinfection by-products" or "CDBPs" in plant process water and reaction by-products resulting from potential reaction of active chlorine with susceptible food components.

The current draft of the Code of Practice provides insufficient guidance in this regard. The sections on risk analysis are confusing and there is too much focus on issues beyond the purview of CCFAC, e.g. occupational hazards, cost, availability, impact on the environment, consumer perception, effects on sensory properties, etc. (Section 6). Clarification is required as to the issue of reaction products; i.e. is the focus of the concern related to chlorination disinfection by-products in the process water resulting from normal chlorination (i.e. up to WHO drinking water guidelines) or reaction by-products in food resulting from hyperchlorination of potable water with a view to affecting the characteristics of the food. A discussion on definitions, e.g. whether active chlorine compounds are food additives, contaminants or processing aids is not useful guidance for someone looking to the Code for advice and recommendations as to how to use chlorine and its compounds properly. The focus of this document needs to change and the advice needs to be practical, knowledgeable and simple.

Issues such as potential risk assessment, the establishment of MLs for residual chlorine and its compounds, the endorsement by CCFAC of MLs, debate as to when chlorine is a food additive and when it is a processing aid, etc. should be discussed within the CCFAC rather than in the Code of Practice. Canada is of the opinion that this document as currently drafted could result in confusion among member countries which have concerns and an interest in the future direction of these issues.

CUBA:

De acuerdo.

EUROPEAN COMMUNITY (English version):

General comment

The European Community wishes to complement the drafting group under the direction of Denmark for the initial efforts in preparing the present version of the draft code.

Specific comments

→ With regard to **point 3d: Definitions d) disinfectants**

Add: If the disinfectant is used to decontaminate food (instead of surfaces of food contact materials) it should be clearly indicated.

→ With regard to **point 4: General conditions in food processing**

4.1 Delete "should in principle" and replace by "has to" (be of drinking-water quality).

As one of the general conditions for application in food processing should be included:

4.4 Strict guidelines should be provided for the application of active chlorine in food production with regard to type of chlorine compound, concentration to be used, recommended pH and temperature range, point in the production process where application is permitted, maximum time period or frequency of application and types of food for which permission is granted.

→ With regard to **point 5: Evaluation of compliance with relevant legislation**

Add at the end of paragraph 5.1:

If used as a disinfectant, it should be made clear if it is used to decontaminate surfaces or food.

→ With regard to **point 6: Risk analysis before treatment with active chlorine**

Add the sentence in italics:

The food producer should carry out a risk analysis on the intended use of chlorine before treatment is decided as an option (see also Annex II). *The competent authority will grant permission for application based on the risk analysis and will perform risk management independently from the food producer (see 7: Risk management and practical treatment).*

Add as an additional bullet point following "the risk analysis should address the following points:"

⇨ Microbiological status of food before treatment

General statement

At present legislation prohibits the use of decontaminants in foods of animal origin in the European Community. Any changes in the current legislation permitting for example the use of active chlorine in food production, will require a proper risk assessment, which should address the benefits and risks for each combination of chemical compound and food product, and will also require risk management decisions stipulating strict conditions for its application.

EUROPEAN COMMUNITY (SPANISH VERSION):

La Comunidad Europea desearía agradecer a la Secretaría del Codex la posibilidad que le ofrece de comentar el Anteproyecto de Código de Prácticas para el Uso Seguro de Cloro Activo, y expone a continuación sus observaciones.

Observación general

La Comunidad Europea desea felicitar al grupo de redacción dirigido por Dinamarca por los esfuerzos realizados inicialmente para preparar la presente versión del Proyecto de Código.

Observaciones específicas

→ Con respecto al **punto 3d: Definiciones d) desinfectantes**

Añadir: Si el desinfectante se utilizara para descontaminar alimentos (en lugar de las superficies de los materiales en contacto con los alimentos), ello debería estar claramente indicado.

→ Con respecto al **punto 4: Condiciones generales en el procesado de alimentos**

4.1 En la versión inglesa, suprimir «*should in principle*» y sustituirlo por «*has to*» («ser de calidad de agua potable»).

Debería incluirse como una de las condiciones generales para la aplicación en el procesado de alimentos lo siguiente:

4.4 Deberían establecerse unas directrices estrictas para la aplicación de cloro activo en la producción de alimentos, referidas al tipo de compuesto de cloro, a la concentración que ha de emplearse, al rango de pH y temperatura recomendado, al punto del proceso de producción en el que está permitida la aplicación, al periodo de tiempo máximo o la frecuencia máxima de aplicación y a los tipos de alimento en los que está permitida.

→ Con respecto al **punto 5: Evaluación de conformidad con la legislación relevante**

Añadir al final del apartado 5.1:

Si se utilizara como desinfectante, debería precisarse si se emplea para desinfectar superficies o alimentos.

→ Con respecto al **punto 6: Análisis de riesgos antes del tratamiento con cloro activo**

Añadir la frase en cursiva:

Los productores de alimentos tendrían que llevar a cabo un análisis de riesgos sobre el uso pretendido del cloro activo antes de decidir utilizar el tratamiento como opción (véase el Anexo II). *La autoridad competente concederá el permiso para la aplicación basándose en el análisis de riesgos y llevará a cabo la gestión de riesgos independientemente del productor de alimentos (véase 7: Gestión de riesgos y tratamiento práctico).*

Añadir una flecha tras «El análisis de riesgos tendría que tratar los puntos siguientes:»

⇨ Estado microbiológico del alimento antes del tratamiento

Declaración general

Actualmente, la legislación prohíbe en la Comunidad Europea el uso de descontaminantes en alimentos de origen animal. Cualquier modificación de la legislación que permita, por ejemplo, utilizar cloro activo en la producción de alimentos exigirá una correcta evaluación del riesgo que determine las ventajas y los riesgos asociados a cada combinación de compuesto químico y producto alimenticio, así como decisiones de gestión del riesgo que establezcan condiciones estrictas para su aplicación.

EUROPEAN COMMUNITY (French version):

La Communauté européenne remercie le secrétariat du Codex de lui donner l'opportunité de présenter ses observations sur l'avant-projet de Code d'usage pour l'utilisation sans risque de chlore actif. La Communauté européenne souhaite lui faire part des observations suivantes.

Observation générale

La Communauté européenne félicite en premier lieu le groupe de rédaction placé sous l'égide du Danemark qui a rédigé la première ébauche de l'avant-projet de code.

Observations particulières

→ point 3 d: Définitions d) désinfectants

Ajouter: Si le désinfectant est utilisé pour décontaminer des aliments (au lieu de surfaces en contact avec des aliments), cela doit être indiqué clairement.

→ point 4: Conditions générales de transformation des aliments

4.1 Biffer «devrait être en principe » et remplacer par « doit être» (de l'eau potable).

Il conviendrait d'ajouter la nouvelle condition générale de transformation des aliments suivante:

«4.4 L'utilisation du chlore actif dans la production d'aliments devrait être soumise à des lignes directrices strictes en ce qui concerne le type de composant chloré, la concentration du produit, le pH et la plage de température recommandés, le stade du processus de production où l'utilisation du chlore est permise, la durée maximale d'application et sa fréquence ainsi que les types d'aliments pour lesquels l'autorisation est accordée.»

→ point 5: Évaluation ou conformité avec une législation pertinente

Ajouter à la fin du paragraphe 5.1:

«S'il doit servir de désinfectant, il convient de préciser son utilisation comme décontaminant de surface ou d'aliments.»

→ point 6: Analyse des risques avant traitement au chlore actif

Ajouter la phrase suivante en italiques:

«Le producteur d'aliments devrait effectuer une analyse des risques que présente l'emploi prévu de chlore avant qu'il soit décidé de faire du traitement une option (voir également l'Appendice II). *L'autorité compétente donnera son autorisation pour l'emploi ayant fait l'objet d'une analyse de risques et procédera à une gestion des risques préventive, indépendamment du producteur d'aliments*» (voir point 7: Gestion des risques et traitement pratique).

Ajouter un tiret supplémentaire après «L'analyse des risques devrait aborder les points suivants:

⇨ Le statut microbiologique des aliments avant traitement »

Déclaration générale

A l'heure actuelle, la législation interdit l'emploi de décontaminants dans les aliments d'origine animale dans la Communauté européenne. Toute modification apportée à la législation actuelle autorisant, par exemple, l'emploi de chlore actif dans la production alimentaire, exigera une évaluation des risques appropriée, déterminant les avantages et les risques respectifs associés à chaque combinaison de composé chimique et de produit alimentaire, de même que des décisions en matière de gestion des risques établissant les conditions strictes d'application.

UNITED STATES OF AMERICA:

During the 35th session of the CCFAC, the Committee agreed that a code of practice on the safe use of active chlorine in food production should be developed. The committee also agreed that a drafting group, headed by Denmark, would prepare the draft code of practice for circulation, comment and further consideration at the 36th session (ALINORM 03/12A, paras.67 and 68).

General comments

The United States of America appreciates the efforts of the Danish Delegation in leading this drafting group in preparing the proposed draft Code of Practice on the Safe Use of Active Chlorine in food production. We sense a general recognition by the drafting group that this task is very difficult at this time because of the absence of available, specific information on the use of "active chlorine" in the processing of particular commodities and the absence of an appropriate risk assessment. We note that this lack of information is compounded by the absence of comments submitted in response to CL 2003/13-FAC which requested comments on the need for the safe use of "active chlorine," and the food categories involved.

Although the 26th Session of the Codex Alimentarius Commission has endorsed the development of a code of practice for active chlorine, in our view this does not mean that the CCFAC should immediately begin drafting the specifics of the code of practice. We believe that a more efficient and constructive approach is for CCFAC to focus its initial efforts on obtaining the necessary information and risk assessments that would provide the scientific basis for the elaboration of a code of practice.

The United States recognizes that a code of practice for the use of "active chlorine" in food production should elaborate general principles and specific essential practices that should be implemented when processing food products with "active chlorine." Adherence to these principles and practices should result in processes that maintain the quality of the food and yield food products that are safe for consumption. These general principles and essential practices must be based on the findings of a balanced risk/benefit analysis of the known uses of each "active chlorine" species in food processing. CX/FAC 04/36/11 (page 2) suggests that CCFAC might consider requesting such a risk/benefit analysis by the Joint FAO/WHO Expert Committee on Food Additives and Contaminants (JECFA) and the Joint FAO/WHO Expert Meetings on Microbiological Risk Assessment (JEMRA).

The current draft of the code of practice also suggests that a risk/benefit analysis be carried out individually by food processors before "active chlorine" is used in the production of food (see Sections 4 and 6 of CX/FAC 04/36/11). While we agree that the principles and practices in a code of practice should be based upon a balanced risk/benefit analysis, individualized analyses will not serve this function. The risks and benefits of the use of "active chlorine" compounds in food processing need to be understood before a code of practice for their use can be developed.

We also believe that many users of active chlorine, especially those in lesser developed countries, would not have the resources or expertise to conduct the risk/benefit analysis demanded by this proposed draft code of practice. Consequently, the current draft is unlikely to achieve standardization of the safe use of "active chlorine" and therefore not advance the goals of protecting consumer's health and ensuring fair practice in the food trade.

Comments on the future direction of this Code of Practice

The United States believes that the development of a code of practice on the safe use of active chlorine in food production is an ambitious, but very important work. Illness associated with the ingestion of foods contaminated with bacteria, viruses, and parasites is a major public health issue, worldwide. Chlorine treatments are known to inactivate a wide variety of disease-causing microorganisms. We support the elaboration of a code of practice for the safe use of active chlorine in the production of food that provides processors with a solid framework for optimizing the antimicrobial efficacy of their process while minimizing any public health concerns about chemical hazards.

The United States recommends that the elaboration of a detailed scope for the Code of Practice be the next step for making progress. Categorizing the uses of active chlorine by the basic chemistry of the chlorine species used, and further, by commodities that benefit from such use would help to define the scope of a future risk assessment. An understanding of the process conditions or practices that would minimize the need for active chlorine treatments, as well as those that lead to optimum efficacy when there is a need, would help to focus an eventual risk assessment on appropriate questions. In addition, it is important to begin to identify the sources of information that would be used in such an assessment.

For example, because the basic chemistry of the various active chlorine species differs significantly, each species possesses different reactivity and microbiological performance. The potential for chlorination effects also differs among the active chlorine species, being related to the oxidation state of the chlorine in each. Both performance and side reactions are also strongly affected by such critical process variables as contact time, pH, concentration and temperature. Further, grouping the various active chlorine species according to their basic chemistry will reduce the complexity of an eventual risk assessment.

It is important to distinguish between the uses of "active chlorine" that are intended to reduce the microbial load in process water used in direct contact with food, from those uses intended to directly reduce the microbial load of the finished food. In the former case, the intent is to control the microbial load of the water for initial use, or to prevent cross contamination between food items (e.g., the presence of chlorine in poultry chiller water effectively prevents cross contamination between birds while having less effect removing lower numbers of microorganisms on any individual bird). In the latter case, the intent is to reduce the microbial load on the commodity itself by, for example, spraying it with a solution containing an "active chlorine" compound.

Active chlorine treatments are also used to control post-harvest disease in perishable commodities like fruit and vegetable crops by controlling spoilage organisms. Such uses become increasingly important as international trade in such commodities increases.

By categorizing the active chlorine species by chemistry, defining conditions of use, including the sensitivity of the process variables, and identifying the commodities that benefit from such treatment, the scope of a risk assessment can be defined. A thorough understanding of these uses is required to focus a risk assessment committee on specific questions that will address the risks and benefits of such treatments on food processing operations.

The United States is beginning to identify sources of information that would be required to define the scope of a risk assessment on active chlorine uses. For example, the European Commission[1] and the United States Department of Agriculture[2, 3] have recently conducted major safety and efficacy assessments on the uses of chlorine compounds (with oxidation states for chlorine of III and IV) in poultry processing. The United States also believes that the following data are needed to adequately define the scope of a risk assessment for a Chlorine Code of Practice.

1. Identification of food-borne pathogenic microorganisms

Bacteria

Viruses

Parasites (many parasites, particularly protozoa, are highly resistant to chlorine)

2. Extent of risks posed by such organisms (worldwide)

Quantify extent of disease outbreaks

Quantify extent of secondary disease complications resulting from such outbreaks

3. Known uses of Active Chlorine in or on food, or in process water

Commodities treated with active chlorine for pathogen reduction

Commodities treated for spoilage organism reduction

Active chlorine species employed for each commodity

Conditions of use and sensitivity of process variables for each chlorine species on each commodity (concentration, contact time, temperature, pH, growth stage of targeted organisms)

Additional Steps that reduce presence of active chlorine species and their byproducts

4. Chemistry of Active Chlorine

Chemistry of pathogen deactivation

Chemistry of active chlorine species with food matrices

Conditions when oxidation is expected

Oxidation reactions with food /exposure to oxidation by-products in food

Conditions when chlorination is expected

Chlorination reactions with food /exposure to chlorination by-products in food

5. Exposure assessments

For the active chlorine species themselves

For the oxidation and chlorination by-products

6. Efficacy data relating to chlorine used against these food-borne pathogens

May be categorized by commodity and type of "Active chlorine"

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[1] Draft Opinion of the Scientific Committee on Veterinary Measures Relating to Public Health on the Evaluation of Antimicrobial Treatments for Poultry Carcasses. 2003, European Commission Health & Consumer Protection Directorate-General. Directorate C - Scientific Opinions. C2 - Management of scientific committees; scientific co-operation and networks. P. 1-48

[2] SAIC, The Use of Chlorine Dioxide as an Antimicrobial Agent in Poultry Processing in the United States. 2002, Science Applications International Corporation (SAIC). p.1-65.

[3] SAIC, The Use of Acidified Sodium Chlorite as an Antimicrobial Agent in Poultry Processing in the United States. 2002, Science Applications International Corporation (SAIC). p. 1-63.

7. Safety data

Data relating to safety of exposures to active chlorine species

Data relating to safety of oxidation by-product exposures

Data relating to safety of chlorination by-product exposures

In conclusion, the United States strongly supports the development of a code of practice on the safe use of active chlorine. However, we continue to believe that until a balanced chemical and microbiological risk assessment is conducted, elaboration of the specifics of a science-based code of practice for use of "active chlorine" in food production is premature. The United States suggests the following next steps to developing a Code of Practice on the Safe Use of Active Chlorine:

1. Define a detailed scope for the Code of Practice
2. Identify appropriate questions to focus the risk assessment
3. Consult with the Codex Committee on Food Hygiene
4. Consult with the FAO/WHO regarding initiation of needed risk assessments.

INTERNATIONAL COUNCIL OF GROCERY MANUFACTURERS ASSOCIATIONS (ICGMA):

ICGMA, a recognized NGO before the Codex Alimentarius Commission, represents the interests of national and regional associations who collaborate with all sectors of the consumer packaged goods industry. ICGMA promotes the harmonization of scientific standards and policies concerned with health, safety, packaging, and labeling, of foods, beverages and other consumer packaged goods. ICGMA also works to facilitate international trade in the sector by eliminating or preventing artificial barriers to trade.

General Comments

Chlorine is a vitally important aspect of maintaining the safety of the world's food supply

Ingestion of foods contaminated with bacteria, viruses, and parasites is a major public health issue throughout the world, especially in developing countries where foodborne diarrhea is a serious problem. According to the World Health Organization (WHO), approximately 1.5 billion episodes of diarrhea affect children five and younger annually, resulting in over 3 million premature deaths.

Foodborne illnesses are caused by bacteria such as *campylobacter*, *salmonella*, *E. coli*, and *vibrio parahaemolyticus*; viruses such as Norwalk and hepatitis A; and protozoa such as *cryptosporidium* and *toxoplasma gondii*. Aside from gastrointestinal effects, foodborne infections can result in other chronic diseases. Chlorine is an effective weapon to battle foodborne illnesses. In either elemental form (chlorine gas) or in a bleach solution (made with either sodium hypochlorite or calcium hypochlorite), chlorine disinfects bacteria and inactivates viruses and protozoa, preventing the spread of disease.

Chlorine has been used to protect food from microbial contamination for more than 150 years. A literature review on chlorine use in food production reported:

> *It is apparent that, since 1850, chlorine has been extremely useful in preventing man's diseases even as new pathogens continue to emerge. To date, no other sanitizing agent has appeared which competes with chlorine in all the areas needed for safe food production.*[4]

[4] Denny, C. (2000). Survey of current published literature. In D.A. McLaren (Ed.), Use of chlorine-based sanitizers and disinfectants in the food manufacturing industry: Current and emerging technology approaches on waste minimization—Technology for efficient use of chlorine-based materials. University of Nebraska Food Processing Center.

Specific Comments

Chlorine use extends to food production, processing, transport, and preparation

Starting with food production, chlorinated water is used for irrigation, watering livestock, disinfecting seeds, and combating post-harvest disease. The use of chlorinated water for irrigation and livestock watering lowers the risk of waterborne contamination to crops and animals. Chlorine also prevents the formation of bacterial slime and biofilms on irrigation equipment. Soaking seeds in chlorinated water, sometimes with heating, can also reduce incidence of disease. Fruit and vegetable crops are treated with chlorinated water to prevent loss of highly perishable produce.

The use of chlorine is also evident during food processing where it is used to disinfect food and food-contact surfaces and to remove stains on equipment and walkways. Chlorine kills microorganisms on food surfaces within seconds. However, the physical and chemical properties of solid surfaces can impact the effectiveness of chlorine disinfection. The actual variety of microorganisms infecting the surface can also impact the effectiveness because some are more resistant than others.

Specific chlorine uses within various food industries include:

1. Meat and Poultry - In the meat and poultry industry, chlorine is used to sanitize worker hands, feet, and footwear. It is also used to clean equipment, disinfect meat, sanitize, and whiten. Chlorine is added to chillers in poultry slaughtering facilities to reduce microbial content and prevent cross-contamination.

2. Egg - When combined with anionic detergents, chlorine is used in the egg industry to remove protein and carbohydrate residues from eggshells, while also reducing bacteria levels.

3. Fish and Seafood - Chlorine, in the form of sodium and calcium hypochlorite, is used for sanitation purposes in seafood processing through application to stainless steel to inactivate biofilms.

4. Dairy – Chlorine compounds used for dairy sanitation include calcium and sodium hypochlorite and certain organic chlorine compounds. Cheese plants are the largest chlorine users in the dairy industry.

5. Fresh Produce - In the fresh produce industry, chlorine disinfects raw fruit and vegetables in wash, spray, and flume waters. For these purposes, chlorine is used in the forms of chlorine gas (used in large washing and grading operations where soil, plant debris, and decaying produce are present), calcium hypochlorite (used to disinfect produce and produce process water), and sodium hypochlorite (used in small operations). Chlorine dioxide is also an effective antimicrobial agent on fresh produce, resulting in longer shelf life and control of fungal disease.

Chlorine is also important in the transport of foods to prevent contamination from packaging materials and to increase shelf life while traveling long distances. Chlorine is used to sanitize storage containers, although such a practice should take place after pre-washing to remove debris which can deplete available chlorine. Calcium hypochlorite increases shelf life and disease resistance by adding calcium to the cell walls of produce. Also, packing ice made from potable, chlorinated water effectively guards against the transmission of diseases.

Finally, chlorine is an essential element of food preparation in commercial and consumer kitchens. Infections germs spread quickly when food is not prepared or stored correctly, leading directly to foodborne illnesses. A chlorine bleach solution applied to countertops, cutting boards, and cooking surfaces lowers the risk of disease transmission. Chlorine solutions have been found to kill viruses and more than 99.9% of bacteria.

Proper protocols should be followed when using chlorine in all food applications. Monitoring of several factors including chlorine concentration, pH, temperature, amount of organic matter present, exposure time, and the growth state of pathogens are critical to employing the most effective and efficient disinfection solution.

THE INTERNATIONAL SOFT DRINKS COUNCIL (ISDC):

The International Soft Drinks Council (ISDC) represents the interests of the worldwide soft drinks industry that produces a variety of non-alcoholic water-based beverages. ISDC is pleased to provide comments on the Proposed Code of Practice on the Safe Use of Active Chlorine at Step 3.

1. ***Scope***

"The benefits taken into account in this paper will only include the potential of lowering the risks to human health from microbial contamination."

ISDC questions why product quality factors are not considered as "benefits." Chlorine is active against several nonpathogenic food spoilage organisms that impact product quality, thus producing benefit to both manufacturers and consumers.

ISDC suggests also **excluding** the use of chlorine as water disinfectant in food and beverage manufacturing from the Scope. In the soft drinks industry and elsewhere, chlorine is used as a water disinfectant to ensure the safety and quality of ingredient water. It is important to note that not all source water used in the food and beverage manufacturing is supplied by the local drinking water system. Food manufacturing facilities may use ground water or well water as source waters. Further, the drinking water supply in many countries does not meet the high quality requirements for source water necessitating plant water treatment to bring the quality to meet drinking or potable water standards. Therefore we suggest adding

c. Disinfection of water used in food production

"The use of chlorine as a water disinfectant in food production is not part of the Code of Practice. This includes the use of chlorinated water that has been processed to meet the drinking water quality as an ingredient of foods and beverages."

6. ***Risk analysis before treatment with active chlorine***

The first paragraph refers to Annex II. We are puzzled by this since the diagram presented in Annex II is about the use of chlorine as a water disinfectant that is outside of the scope of the Codex Practice. We believe that a reference to HACCP would be adequate and the Annex II could be deleted since it is misleading. If Annex II is maintained, advise should be sought from the Codex Committee on Food Hygiene.

6.1 ***Addition of chlorine to the drinking water for decontamination of food***

6.1.1

This paragraph **should be deleted** since the water used in food and beverage manufacturing generally is adequately regulated. Most governments require that water used in food manufacturing must be potable, i.e., meet the standards established for potable water, either in accordance with the WHO guidelines or local drinking (potable) water regulations. There should be no need for further risk analysis.

6.2 ***Overall efficacy and Annex IV***

A reference is made to Annex IV that obviously is a view by one country and that contains some outdated information on the occurrence of disinfection by-products in drinking water and some foods. We question the need for Annex IV in the Code of Practice and suggest adding just a table of potential disinfection by-products by various forms of "active chlorine."

6.4 ***Chemical aspects***

6.4.4

"Any residue levels of chlorine and reaction by-products thereof should be below those limits listed in Annex I. CCFAC should specify maximum levels for individual foodstuffs or groups of foodstuffs following the advice of JECFA." We note that the Annex I lists the WHO guideline levels of disinfectants and disinfection by-products and, while informative, we question the need for Annex I since water disinfection is outside of the scope. We further question the need for CCFAC to specify maximum levels for individual foodstuffs or groups of foodstuffs and the inclusion of 6.4.4 in the draft Code. We note the conclusion by IPCS on the risk of disinfection by-products (see page 17 of the Appendix):

"No by-product studied to date is a potent carcinogen at concentrations found in drinking water.

1. Epidemiological studies do not provide convincing evidence that chlorinated water increases the risk of cardiovascular disease, cancers or adverse pregnancy outcomes"

Considering the expert assessment above and the fact that most of exposure to disinfectants and disinfection by-products comes from drinking water, we wonder why the draft Code of Practice puts so much emphasis on the potential exposure from foods that, even according to the table in Annex IV generally contain considerably less these chemicals than drinking water and whose residues originate from the use of chlorinated drinking water in food manufacturing processes. If the concern is the safety of potential reaction products of "active chlorine" with food components (such as proteins,) then information first should be sought on the chemical species, occurrence, and toxicological data on such substance in order to conduct a proper risk assessment.