codex alimentarius commission

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

WORLD HEALTH ORGANIZATION

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Agenda Item 3

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JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON FOOD ADDITIVES

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MATTERS OF INTEREST ARISING FROM FAO AND WHO AND FROM THE 69TH MEETING OF THE JOINT FAO/WHO EXPERT COMMITTEE ON FOOD ADDITIVES (JECFA)

Attached to this document is the Executive summary of the Joint FAO/WHO Expert meeting on the benefits and risks of the use of chlorine-containing disinfectants in food production and food processing, which was held in Ann Arbor (Michigan, USA) on 27-30 May 2008.

Food and Agriculture Organization of the United Nations

World Health Organization

Joint FAO/WHO Expert meeting on the benefits and risks of the use of chlorine-containing disinfectants in food production and food processing

Ann Arbor USA, 27 - 30 May 2008

Executive summary

Background

The Joint FAO/WHO Expert meeting on the use of chlorine-containing disinfectants[1] in food production and food processing was held 27 – 30 May 2008, in Ann Arbor, Michigan, United States of America supported by NSF International, WHO Collaborating Centre for Food and Water Safety, and Indoor Environment.

The meeting was organised to provide scientific advice in response to a request made by the Codex Alimentarius Commission[2] based on proposed terms of reference prepared the 37th session Codex Committee on Food Additives and Contaminants (CCFAC)[3] and the 37th session of Codex Committee on Food Hygiene (CCFH)[4], on the safety and benefits of the use of 'active chlorine' in food processing.

The primary intended benefit of disinfection processes is the reduction of microbial food borne disease risk and of spoilage by control of contamination with pathogenic and non-pathogenic micro-organisms. Control can be through direct treatment of foods, and through management of (cross-)contamination from processing water and food contact surfaces. Disinfection treatment may lead to residues of chemicals and chemical by-products which need to be considered in a risk/benefit assessment. Whilst disinfectant chemicals will also control spoilage bacteria and hence, increase the shelf life and stability of foods, this aspect was not considered as it has no direct impact on health risks.

Results

The expert meeting considered all available data related to the benefits and risks for human health of the use of disinfection processes in the food production and food processing industry, with emphasis on chlorine-containing compounds but also considering alternative substances and methods used for disinfection of food and food contact surfaces. The main goals of the meeting were to consider the risk of chemical residues in food products (excluding environmental impact) following disinfection in food production and processing (incl. handling), versus the benefit of lowering the risk of microbial hazards. The efficacy of chlorine treatment needed to be considered, taking into account different treatment scenarios, different chlorine-containing substances and different combinations of pathogens and food commodities. These considerations focused on most common current practices in various food sectors, as well as taking into account certain proposed new practices. Considerations were given to the efficacy and feasibility of potential alternative treatments in replacement to chlorine use. Unintended consequences, such as the potential for development of tolerance to microorganisms and effects on nutritional and organoleptic qualities were also reviewed.

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[1] Chlorine-containing compounds include hypochlorous acid, hypochlorite ion, chlorous acid and its conjugate base chlorite ion, chlorine gas and chlorine dioxide. Chloramines, chloramine T and dichloroisocyanurate only included where of relevance in the food processing industry.

[2] ALINORM 06/29/41, paragraph 225

[3] ALINORM 05/28/12, appendix XV

[4] ALINORM 05/28/13, appendix VI

The main food categories considered in food production and processing (incl. handling) were:

- meat and poultry
- fish and fishery products
- fresh produce (incl. hydroponics and sprouts)
- food contact surfaces

Previous work and assessments carried out on national/regional and international level formed the primary basis for the assessment, but additional information submitted in response to an open call for information was considered, as well and publicly available scientific studies and other information.

The approach taken was identification of most common disinfection practices for the food categories described above; identification of possible chemical residues in foods resulting from these treatments and estimating dietary exposure to these residues; evaluation of efficacy of treatment in reduction in the prevalence and numbers of pathogenic micro-organisms on food and possible resulting decreased health risk. The strength of the evidence was evaluated in all cases. Potential health risk from chemicals exposure was then compared to potential benefits of decreased health risk from pathogen exposure in a systematic and step-wise approach.

A number of key use scenarios for each food category were described.. Sodium hypochlorite is the most widely used disinfectant, in particular in the production and processing of poultry meat, leafy greens, sprouts, hydroponics, and seafood, while the use in red meat processing is less common. Acidified sodium chlorite solutions are commonly used as an alternative to sodium hypochlorite in specific poultry processing steps. The use of chlorine-containing compounds in the fish and fishery products industry is mainly focused on disinfection prior to distribution and the use on edible portions of fish and shellfish is limited. Non-chlorine based chemical alternatives included peroxyacids in poultry production and organic acids in meat production. Physical treatments were not considered.

A number of chlorine-containing disinfectants, including by-products, and alternatives can lead to residues in foods and hence to possible health risk. The toxicology of these substances was reviewed and compared to estimated dietary intakes. The identified residues of chlorine-containing disinfectants and by-products did not raise health concerns based on estimated dietary exposures. However, the evidence for hypochlorite use in poultry, fish and shell fish was weaker, due to lack of qualitative and quantitative information on formation and presence of trihalomethanes (THMs) on the food. It was noted that, although generally conservative estimates were used, there was a high degree of uncertainty in the dietary exposure assessments as data on by-products was only available for drinking water and these data would have limited applicability to food. However, chlorine containing chemicals are unstable and it was concluded that there is a low potential for presence of by-products in foods as consumed.

Microbiological risk assessments were performed for the key use scenarios, based on available studies and risk assessments. It was concluded that the antimicrobial effects of disinfectants in food production may be overestimated by a lack of studies on an industrial scale, and by lack of including controls for the physical effects of water alone. On the other hand, the effects may be underestimated by studying processes in isolation in industries where disinfectants have already been applied in previous steps. There was evidence for reduction of pathogens on poultry carcasses and red meats by application of acidified sodium chlorite and chlorine dioxide, and by application of sodium hypochlorite in smoked fish. There was also evidence that no pathogen reduction is achieved by application of sodium hypochlorite on poultry carcasses and red meats. Limited data provided evidence for reduction of cross-contamination by the application of disinfectants (in particular sodium hypochlorite) in wash and flume waters. Effective disinfection of food contact surfaces is an important means of reducing human exposure to pathogens in food.

Regarding unintended consequences of disinfection practices, the changes in nutrient content are low relative to the normal dietary intake for these nutrients. And there is no evidence to indicate that the use of chlorine containing disinfectant and its alternatives are associated with acquired antimicrobial resistance to therapeutic agents.

Risk-benefit assessment integrates the results of two separate activities: risk assessment and benefit assessment, which can be done in a qualitative or quantitative way. Due to lack of data that would allow a quantitative assessment, the meeting developed a stepwise approach to risk-benefit assessment of chlorine containing disinfectants and other alternatives, to allow for a systematic comparison in a qualitative manner. Where scientific data were available, an assessment of risk and/or benefit was undertaken, and the meeting categorized the use scenarios per food commodity in one of the following four categories:

1. No health concern identified, nor benefits identified
2. No health concern identified, but benefits identified
3. Health concern identified, no benefits identified
4. Health concern identified, and benefits identified

The meeting identified several disinfectant use scenarios where there were no health concerns identified but for which there was a benefit. Only use scenarios, for which it was concluded that there are both health concerns and benefits were considered to need further evaluation. However, the meeting did not identify use scenarios which were of this type. The level of evidence supporting these conclusions, as well as the uncertainties, are discussed in the report.

The meeting identified important gaps in the available data. These data gaps constrained the scope of the risk-benefit assessments. Consequently, the meeting agreed a number of recommendations for further scientific studies and the development of standardized practices.

The meeting emphasized that disinfectant treatment of water used in food processing must not be used to mask poor hygienic practices. The meeting recommended that disinfectants be used within the framework of good hygienic practice, with a HACCP based system where applicable, and adequate process controls in place.