

ANNEX 1: LIST OF PARTICIPANTS

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, Michigan, USA, 27–30 May 2008

LIST OF PARTICIPANTS

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ANNEX 3: LIST OF ACRONYMS AND ABBREVIATIONS

ADI	acceptable daily intake
ASC	acidified sodium chlorite
BCAN	bromochloroacetonitrile
BCC	basal cell carcinoma
BDCM	bromodichloromethane
BEMX-1	(<i>E</i>)-2-chloro-3-(bromochloromethyl)-4-oxobutenoic acid
BEMX-2	(<i>E</i>)-2-chloro-3-(dibromomethyl)-4-oxobutenoic acid
BEMX-3	(<i>E</i>)-2-bromo-3-(dibromomethyl)-4-oxobutenoic acid
BMD	benchmark dose
BMD ₁₀	benchmark dose for a 10% increase in effect
BMDL ₁₀	95% lower confidence limit on the benchmark dose for a 10% increase in effect
BMX-1	3-chloro-4-(bromochloromethyl)-5-hydroxy-2(5H)-furanone
BMX-2	3-chloro-4-(dibromomethyl)-5-hydroxy-2(5H)-furanone
BMX-3	3-bromo-4-(dibromomethyl)-5-hydroxy-2(5H)-furanone
bw	body weight
CAS	Chemical Abstracts Service
cfu	colony-forming unit
CHO	Chinese hamster ovary
CI	confidence interval
CNS	central nervous system
CPC	cetylpyridinium chloride
CSFII	Continuing Survey of Food Intakes by Individuals (USA)
CYP	cytochrome P450
DALY	disability-adjusted life year
DBA	dibromoacetic acid
DBAN	dibromoacetonitrile
DBCM	dibromochloromethane
DBDMH	1,3-dibromo-5,5-dimethylhydantoin
DBP	disinfection by-product
DCA	dichloroacetic acid
DCAN	dichloroacetonitrile
DMH	dimethylhydantoin
DNA	deoxyribonucleic acid
EFSA	European Food Safety Authority
EMA	European Medicines Agency
EMX	(<i>E</i>)-2-chloro-3-(dichloromethyl)-4-oxobutenoic acid
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GC/MS	gas chromatography/mass spectrometry
GDWQ	Guidelines for Drinking-water Quality (WHO)
GEMS/Food	Global Environment Monitoring System – Food Contamination Monitoring and Assessment Programme
GLP	Good Laboratory Practice
GRAS	generally recognized as safe
GST	glutathione <i>S</i> -transferase

GV	guideline value
HAA	haloacetic acid
HACCP	hazard analysis and critical control point
HAN	haloacetonitrile
HEDP	1-hydroxyethylidene-1,1-diphosphonic acid
HP	hydrogen peroxide
IARC	International Agency for Research on Cancer
IOBW	inside–outside bird washer
IPCS	International Programme on Chemical Safety (WHO)
IRIS	Integrated Risk Information System
IUGR	intrauterine growth retardation (restriction)
JECFA	Joint FAO/WHO Expert Committee on Food Additives
JMPR	Joint FAO/WHO Meeting on Pesticide Residues
LAE	ethyl lauroyl arginate
LBW	low birth weight
LO(A)EL	lowest-observed-(adverse-)effect level
LOD	limit of detection
MAP	modified atmosphere packaging
MCL	maximum contaminant level (USA)
MTDI	maximum tolerable daily intake
MX	3-chloro-4-(dichloromethyl)-5-hydroxy-2(5H)-furanone
NA	not available
NaDCC	sodium dichloroisocyanurate
nd	not detected
NDEA	<i>N</i> -nitrosodiethylamine
NDELA	<i>N</i> -nitrosodiethanolamine
NDMA	<i>N</i> -nitrodimethylamine
NDPA	<i>N</i> -nitrosodiphenylamine
NMOR	<i>N</i> -nitrosomorpholine
NO(A)EL	no-observed-(adverse-)effect level
NOM	natural organic matter
NPIP	<i>N</i> -nitrosopiperidine
NPRO	<i>N</i> -nitrosoproline
NPYR	<i>N</i> -nitrosopyrrolidine
NTD	neural tube defect
NTP	National Toxicology Program (USA)
OECD	Organisation for Economic Co-operation and Development
OR	odds ratio
ox-EMX	(<i>E</i>)-2-chloro-3-(dichloromethyl)-butenedioic acid
ox-MX	2-chloro-3-(dichloromethyl)-butenedioic acid
PMTDI	provisional maximum tolerable daily intake
POA	peroxyacetic acid/hydrogen peroxide
PTSA	<i>p</i> -toluenesulfonamide
QAC	quaternary ammonium compound
red-MX	3-chloro-4-(dichloromethyl)-2(5H)-furanone
SCC	squamous cell carcinoma
SCF	the former Scientific Committee for Food in the European Union
SD	standard deviation
SGA	small for gestational age
SI	Système international d'unités
spp.	species

T ₃	triiodothyronine
T ₄	thyroxine
TBARS	2-thiobarbituric acid reactive substances
TCA	trichloroacetic acid
TCAN	trichloroacetonitrile
TDI	tolerable daily intake
THM	trihalomethane
TSH	thyroid stimulating hormone
TSP	trisodium phosphate
TTHM	total trihalomethanes
USA	United States of America
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFDA	United States Food and Drug Administration
UV	ultraviolet
VLBW	very low birth weight
VTEC	verotoxigenic <i>Escherichia coli</i>
v/v	volume by volume
WHO	World Health Organization
ZMX	(Z)-2-chloro-3-(dichloromethyl)-4-oxobutenoic acid

ANNEX 4: GLOSSARY

Acceptable daily intake (ADI): An estimate of the amount of a substance in food or drinking-water, expressed on a body weight basis (usually milligrams per kilogram body weight), that can be ingested daily over a lifetime by humans without appreciable health risks.

Acceptable daily intake “not limited”: A term no longer used by the Joint FAO/WHO Expert Committee on Food Additives, which has the same meaning as acceptable daily intake “not specified”.

Acceptable daily intake “not specified”: A term applicable to a food substance of very low toxicity that, on the basis of the available chemical, biochemical and toxicological data as well as the total dietary intake of the substance, does not, in the opinion of the Joint FAO/WHO Expert Committee on Food Additives, represent a hazard to health. For that reason, the establishment of an acceptable daily intake expressed in numerical form is not deemed necessary.

Acquired resistance: Resistance to an antimicrobial treatment that is passed on to progeny.

Active chlorine: Chlorine in a form that is readily available for chemical reaction with microorganisms.

Antimicrobial: A disinfectant; an agent that kills or inactivates microorganisms.

Aquaculture: The farming during part or the whole of their life cycle of all aquatic animals, except mammalian species, aquatic reptiles and amphibians, intended for human consumption.

Bacteriocin: A peptide or small protein produced by bacteria that inhibits the growth of closely related strains or species.

Benefit assessment: An activity that estimates the probability and magnitude of benefit in a particular exposure scenario as a basis for risk management decisions and communication to the public.

Biocide: An active substance that inactivates microorganisms on animate or inanimate surfaces or in foods.

Biofilm: Microbial growth as a thin layer on a surface, including associated extracellular products.

By-product: A secondary or incidental product deriving from a manufacturing process, a chemical reaction or a biochemical pathway, not the primary product or service being produced. *See also* Disinfection by-products.

Chiller: A tank or vat containing cooled water or slush ice, used for cooling (e.g. poultry carcasses) in the food industry; sometimes used in series, with the first tank used for prechilling with tap water.

Chlorine alternative: A treatment or substance that replaces the use of chlorine-based compounds in a specified process by accomplishing the same functions without generating active chlorine compounds.

Colony-forming unit: A measure of viable cells in which a colony represents an aggregate of cells derived from a single progenitor cell.

Colour parameters (L, a and b): Descriptors of a globally recognized colour system, in which L represents lightness and a and b are colour space coordinates. They provide a standard, approximately uniform colour scale (known as the CIELAB colour scale) so that colours can be easily compared.

Cross-contamination: The transfer of microorganisms from an individual food item (animal carcass, single fish, whole fruit or vegetable, or single cut piece of these items) to another individual food item through air, water, handlers, contact with equipment surfaces or direct contact between individual items. This may occur between units within a batch or between batches.

D-value: A measure of the amount of time needed to provide a 1 log reduction in the number of microorganisms. A D-value of 73 min means that it would take 73 min to produce a 1 log reduction.

D₁₀ value: The radiation dose needed to inactivate 1 log of a target microorganism (measured in kilograys).

DALY: A time-based measure (disability-adjusted life year) that combines years of life lost due to premature mortality and years of life lost due to time lived in states of less than full health.

Depuration: A short-term process commonly used to reduce low levels of bacterial contamination in filter-feeding shellfish. Long-term relaying is required if there is the risk of high levels of contamination.

Disability-adjusted life year: *See* DALY.

Disinfectant: A substance used in aqueous solutions in food production and processing to eliminate or reduce the number of microorganisms on the food in washing, chilling and other processes. In some countries, a distinction is made between disinfection and sanitization, but for the purpose of this document, no such distinction is made.

Disinfection: The reduction by means of chemical agents and/or physical methods of the number of microorganisms in the environment to a level that does not compromise food safety or suitability.

Disinfection by-products (DBPs): Chemical compounds formed during disinfection processes, other than the original substances introduced in the aqueous solution used for disinfection.

End-point disinfection: The final treatment of a food product with disinfectant solution before retail distribution or the disinfection of a food contact surface immediately before use.

Flume: An elevated trough or pipe filled with wash water that keeps the product immersed for a certain minimum time as required by the treatment.

Further processed: A meat or poultry product that has undergone further processing, such as smoking, cooking or curing.

GEMS/Food consumption cluster diets: Per capita consumption of raw and semiprocessed agricultural commodities expressed in grams per person per day for distinct groups of the world's population that share similar dietary patterns. Based on food balance sheet data from the Food and Agriculture Organization of the United Nations, the diets were generated using a cluster analysis, which assigned countries to one of the 13 cluster diets.

Generally recognized as safe (GRAS): A designation used by the United States Food and Drug Administration, stating that a chemical or substance added to food is considered safe by experts and so is exempted from the usual Federal Food, Drug, and Cosmetic Act (i.e. the law in the USA that authorizes the United States Environmental Protection Agency to oversee the safety of foods, drugs and cosmetics) food additive tolerance requirements.

Hazard characterization: The qualitative and, wherever possible, quantitative description of the inherent properties of an agent or situation having the potential to cause adverse effects. This should, where possible, include a dose-response assessment and its attendant uncertainties.

Hazard identification: The identification of the type and nature of adverse effects that an agent has an inherent capacity to cause in an organism, system or (sub)population.

Infective dose: That amount of pathogenic organisms that will cause infection in susceptible subjects.

Iodophor: A mixture of iodine and surface-active agents that act as carriers and solubilizers for the iodine.

Log unit: "Log" stands for logarithm, which is the exponent of 10. For example, log 2 represents 10^2 or 10×10 or 100.

Log reduction: Log reduction stands for a 10-fold or one decimal or 90% reduction in numbers of recoverable bacteria in a test food vehicle. For example, a 1 log reduction would reduce the number of bacteria by 90%. This means, for example, that 100 bacteria would be reduced to 10 or 10 reduced to 1.

Lowest-observed-(adverse)-effect level (LO(A)EL): Lowest concentration or amount of a substance, found by experiment or observation, that causes an (adverse) alteration of morphology, functional capacity, growth, development or lifespan of the target organism distinguishable from normal (control) organisms of the same species and strain under the same defined conditions of exposure.

Margin of exposure: The ratio of the no-observed-adverse-effect level (NOAEL) or benchmark dose lower confidence limit for the critical effect to the theoretical, predicted or estimated exposure dose or concentration.

Margin of safety: The margin between the health-based guidance value (e.g. acceptable daily intake, tolerable daily intake) and the actual or estimated exposure dose or concentration. For some experts, the margin of safety has the same meaning as the margin of exposure.

Maximum tolerable daily intake (MTDI): *See* Provisional maximum tolerable daily intake (PMTDI).

Maximum tolerated dose (MTD): A high dose used in chronic toxicity testing that is expected, on the basis of an adequate subchronic study, to produce limited toxicity when administered for the duration of the test period.

Modified atmosphere packaging: A packaging technology for increasing shelf life in which the internal atmosphere is modified by reducing oxygen and replacing it with either carbon dioxide or nitrogen gas.

No-observed-(adverse)-effect level (NO(A)EL): Greatest concentration or amount of a substance, found by experiment or observation, that causes no detectable (adverse) alteration of morphology, functional capacity, growth, development or lifespan of the target organism under defined conditions of exposure.

Potable water: Drinking-water of sufficiently high quality that it can be consumed or used without risk of immediate or long-term harm.

Provisional maximum tolerable daily intake (PMTDI): The reference value, established by the Joint FAO/WHO Expert Committee on Food Additives, used to indicate the safe level of intake of a contaminant with no cumulative properties. Its value represents permissible human exposure as a result of the natural occurrence of the substance in food and drinking-water. In the case of trace elements that are both essential nutrients and unavoidable constituents of food, a range is expressed, the lower value representing the level of essentiality and the upper value the PMTDI. The tolerable intake is generally referred to as “provisional”, as there is often a paucity of data on the consequences of human exposure at low levels, and new data may result in a change to the tolerable level.

Residue: Chemicals that remain in or on food after, for example, disinfection, pesticide application, etc.

Resistance: An increased, genetic-based ability of a microorganism to survive a recommended usage level of an antimicrobial compound, resulting in a high

likelihood of treatment failure. This is similar to the definition of “clinical resistance” used by the European Food Safety Authority.

Risk assessment: A process intended to calculate or estimate the risk to a given target organism, system or (sub)population, including the identification of attendant uncertainties, following exposure to a particular agent, taking into account the inherent characteristics of the agent of concern as well as the characteristics of the specific target system. The risk assessment process includes four steps: hazard identification, hazard characterization, exposure assessment and risk characterization.

Risk–benefit assessment: An activity that weighs the probability and severity of harm in a particular exposure scenario against the probability and magnitude of benefit as a basis for risk management decisions and communication to the public.

Risk characterization: The qualitative and, wherever possible, quantitative determination, including attendant uncertainties, of the probability of occurrence of known and potential adverse effects of an agent in a given organism, system or (sub)population, under defined exposure conditions.

Spoilage microorganism: Microorganisms that cause undesirable changes to the colour, odour, taste and texture of food.

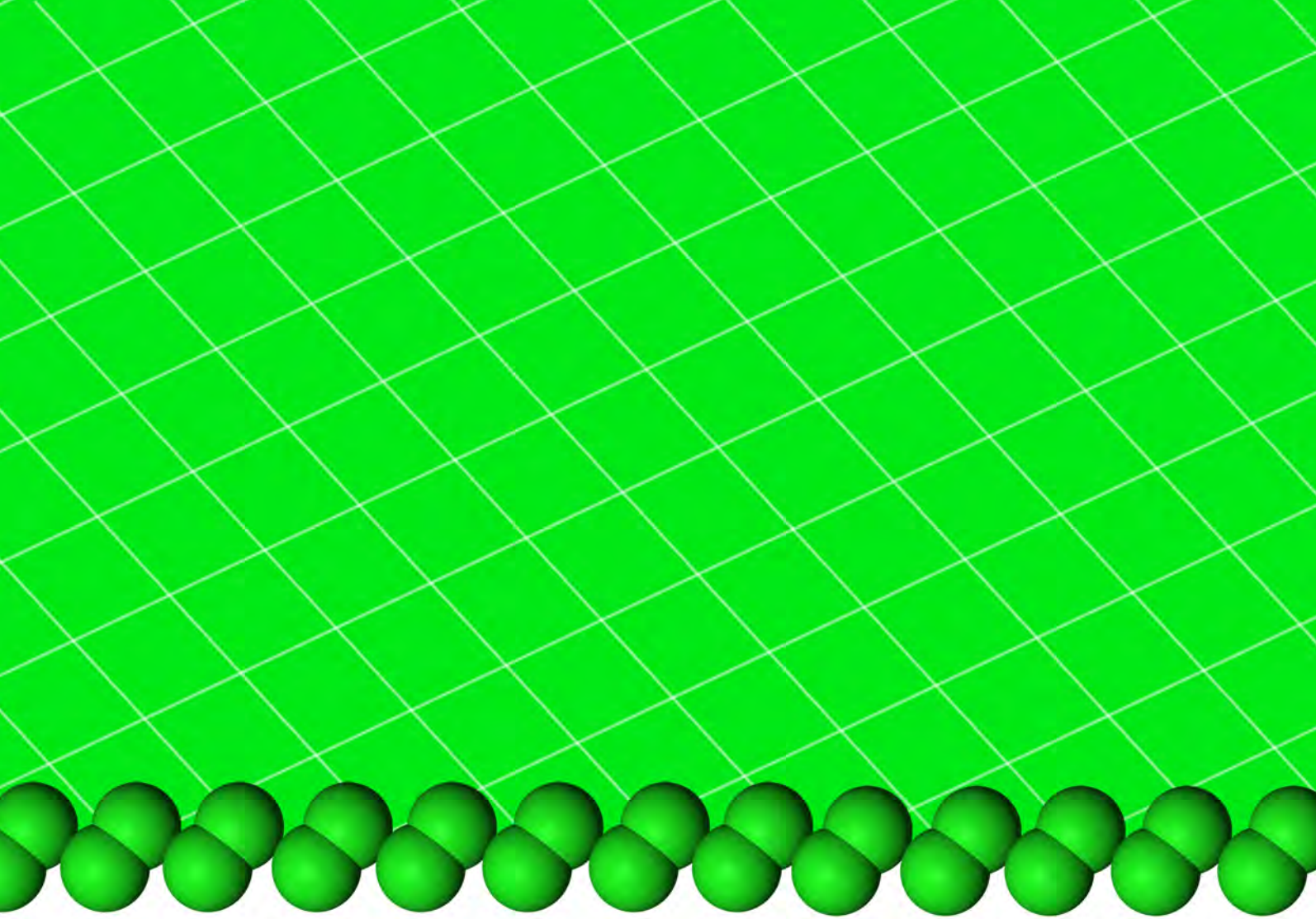
Superchlorination: Use of high chlorine dosage to ensure sufficient free chlorine residual to inactivate harmful microorganisms.

Target microorganism: A microbial species, genus or group for which lack of control during a specified process could result in adverse public health consequences.

2-Thiobarbituric acid reactive substances (TBARS): Biological specimens contain a mixture of TBARS, including lipid hydroperoxides and aldehydes, which increase as a result of oxidative stress. Plasma concentrations of TBARS are an index of lipid peroxidation and oxidative stress.

Tolerable daily intake (TDI): Analogous to acceptable daily intake (an estimate of the amount of a contaminant in food or drinking-water, expressed on a body weight basis, which can be ingested daily over a lifetime by humans without appreciable health risks). The term tolerable is used for agents that are not deliberately added, such as contaminants in food.

Tolerance: Reduced susceptibility of a microorganism to an antimicrobial treatment, usually determined as an increase in the minimum inhibitory concentration or minimum bactericidal concentration, that does not result in treatment failure, if the treatment is applied as recommended.



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