



Technews

National Dairy Development Board

For Efficient Dairy Plant Operation

March-April 2000

No.25

INTERNATIONAL STANDARDS FOR FOOD CONTAMINANTS

This bulletin includes technical and latest development on products, systems, techniques etc. reported in journals, companies' leaflets and books and based on studies and experience. The technical information in different issues is on different areas of plant operation. It is hoped that the information contained herein, if employed in the dairy plant, will help in making its operations more efficient.

The theme of information in this issue is **International Standards for Food Contaminants**. It may be understood that the information given here is by no means complete.

In this issue ...

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1. INTRODUCTION

Concern about the food being safe for human consumption has always been there. Government of India enacted the 'Prevention of Food Adulteration Act' in 1954 to protect consumers' health from food-borne health hazards. The "purity" of a food, however, was primarily based on the absence or control of hazardous chemical "adulterants" in food.

In the last two decades, however, food science and technology has made rapid progress. With the advent of more sensitive analytical methods, knowledge about the nature of food, its quality and associated health hazards also grew quickly. As more economic progress was made, as more and more information about food and related matters became available, consumers all over the world started getting apprehensive about the "invisible" health hazards from foods, such as micro-organisms, environmental contaminants, pesticide residues, residues of veterinary drugs and food additives, too. Then, well-organized and informed national and international consumers' groups started taking up the cause of protecting communities from hazardous and poor-quality foods.

It must be accepted that people have the right to expect their food to be safe, of good quality and suitable for consumption. **Food-borne illnesses are at best unpleasant, at worst they can be fatal.** But there can be other consequences:

- * Outbreaks of food-borne illness can damage trade and tourism and can lead to loss of earning, unemployment and litigation,
- * Poor quality food can destroy the commercial credibility of suppliers, both nationally and internationally,
- * Food spoilage is wasteful and costly, and
- * Unsafe food can adversely affect trade and consumer confidence.

The international trade of commodities, including food (milk and milk products), is governed by the guidelines of the World Trade Organization, WTO (see Technews issue 22, Sept-Oct. 1999). The WTO has recognized the Food Standards set by the Codex Alimentarius Commission.

Over the years, Codex standards have become more exact with a view to minimize the risk of food-borne health hazards to the consumer. These standards include maximum permissible limits of contaminants, pesticide residues, mycotoxins and residues of veterinary drugs in milk and milk products. These limits are determined through scientific procedure considering global data, and are advised by joint FAO/WHO expert committees, such as Joint Expert Committee on Food Additives and Joint Meeting on Pesticide Residues.

This issue of Technews presents some aspects of these contaminants in milk and milk products.

2. VARIOUS STANDARDS

Pesticide Residues

The contamination of milk and milk products with pesticide residues is never the result of a direct treatment of milk or milk products to prevent pest infection. The pesticides are used on food and forage plants, and can be secreted into milk through animal feeds. The problem of pesticide in milk has, however, drastically diminished since the ban of organochlorines. Table 1 gives the recommended MRLs of pesticides residues in milk by Codex.

Table 1. Maximum Pesticides Residue Limits in Milk (unless otherwise mentioned) set by Codex and EU.

Contaminant	Recommended MRL, mg/kg (ppm)		Remarks
	Codex	EU	
Abamectine	0.005	0.005	
Acephate	0.1	0.1	
Aldicarb	0.01	0.01	
Aldrin	0.006	0.006	E, F
Amitraz	0.01		V
Anilazin	0.01		
Azocyclotin	0.05		V, MP
Bendiocarb	0.05		V
Bentazone	0.05	0.05	
Bifenthrin	0.05	0.05	F
Carbaryl	0.1		MP
Carbendazim	0.1		

Contaminant	Recommended MRL, mg/kg (ppm)		Remarks
	Codex	EU	
Carbofuran	0.05	0.05	
Chinomethionate	0.01		
Chlordane	0.002	0.002	E, F
Chlorfenvinphos	0.008	0.008	F, V
Chlormequat	0.1	0.1	
Chlorpyrifos - ethyl	0.01		F, V
Chlorpyrifos - methyl	0.01		F
Clofentezin	0.01		
Cyfluthrin	0.01		F, V
Cyhexatin	0.05		V, MP
Cypermethrin	0.05		F, V
Cyromazin	0.01		V
2,4-Dichlorophenoxy butyric acid	0.05		MP
DDT	0.05		E, F
Deltamethrin	0.02		F, V
Diazinon	0.02		F, V
Dichlorvos	0.02		
Dicofol	0.05		F
Dieldrin	0.006	0.006	E, F
Diiflubenzuron	0.05		
Dimethipin	0.02		
Diquat-bromide	0.01		
Disulfoton	0.02		
Dithiocarbamates	0.05		
Edifenfos	0.01		
Endosulfan	0.004	0.004	F
Endrin	0.0008	0.0008	F, E

Contaminant	Recommended MRL,mg/kg (ppm)		Remarks
	Codex	EU	
Ethephon		0.05	
Ethiofencarb	0.02		
Ethion	0.02	0.02	FV
Etrimfos	0.01	0.01	F
Fenbutatin-oxide	0.02		
Fenitrothion	0.002	0.002	E, F
Fenpropathrin	0.1		F
Fenthion	0.05	0.05	F, V
Fenvalerate (cis,trans)	0.1		F
Flusilazol	0.01		
Glyphosate	0.1		
Heptachlor	0.006	0.006	E, F
Isofenphos	0.01	0.01	F
Lindane	0.01		F, V
Mecarbam	0.01		
Methacrifos	0.01		F
Methamidophos	0.01	0.01	
Methidathion	0.0008		F
Methiocarb	0.05	0.05	
Methomyl	0.02		
Methoprene	0.05		F, V
Monocrotophos	0.002		
Monocrotophos	0.02		MP only
Myclobutanil	0.01		
Paraoxon-methyl	0.01		
Paraquat-dichloride	0.01		
Penconazole	0.01		

Contaminant	Recommended MRL, mg/kg (ppm)		Remarks
	Codex	EU	
Permethrin	0.1		F
Phenthoate	0.01	0.01	F
Phorate	0.05	0.05	
Pirimicarb	0.05	0.05	
PP-DDT	0.05	0.05	E, F
Triadimefon	0.1	0.1	F
Trichlorfon	0.05	0.05	V
Phosmet	0.02		F, V
Phoxim	0.05		F, V
Pirimiphos-methyl	0.05		F
Prochloraz	0.1		
Profenofos	0.01		
Propargite	0.1		F
Propiconazole	0.01		
Propoxur	0.05		
Terbuphos	0.01		
Thiabendazole	0.1		
Triadimenol	0.01		
Triazophos	0.01		

E = extraneous residue, F = the residue is fat soluble, V = additional veterinary use, MP = milk products.

Residues of Veterinary Drugs

Antimicrobials, antibiotics and other chemotherapeutics such as sulfonamides, are administered in therapeutic amounts for the treatment of individual animals for specific diseases and to prevent diseases. Veterinary drugs administered to animals enter the milk to some degree. Their residues in milk beyond certain levels

pose health risk. The maximum residue limits (MRLs) of veterinary drugs in milk and milk products set under Codex standards are given in Table 2, in addition to Table 1.

Table 2. The maximum residue limits (MRLs) of veterinary drugs in milk fixed by Codex and EU.

Contaminant	Recommended MRL, mg/ μ g/kg (ppb)	
	Codex	EU
(Neo)spiramycin		200
2,4,5-Trichlorophenoxy acetic acid	0.05	
Amoxicillin		4
Ampicillin		4
Baquiloprim		30
Benzylpenicillin	4	4
Cefquinome		20
Ceftiofur	100	100
Chloramphenicol		0
Chlortetracycline		100
Cloxacillin		30
Colistin		50
Dapsone		0
Dicloxacillin		30
Dihydrostreptomycin	200	200
Dimetridazole		0
Erythromycin		40
Gentamicin	100	100
Nitrofurans Group (furazolidone, ...)		0

Contaminant	Recommended MRL, mg/μg/kg (ppb)	
	Codex	EU
Marbofloxacin		75
Neomycin (+framycetin)	500	500
Oxacillin		30
Oxytetracycline	100	100
Penethamate		4
Rifaximin		60
Ronidazole		0
Spectinomycin	200	200
Streptomycin		200
Sulfadimidine	25	
Tetracycline		100
Thiabendazole	0.1	0.1
Trimethoprim		50
Tylosin		50

Heavy Metals

The concentration of heavy metals and other trace elements in milk is relatively constant and only exceptionally increases when animals consume contaminated feed. Compounds of some metals, especially of lead and mercury, are fat-soluble and readily excreted with the milk fat. The ionic metal salts, however, are efficiently removed by the various metabolic processes in the animal. Under heavy metals Codex has so far considered lead only. The recommended MRL of lead in butter is 0.05 mg/kg.

MRLs for lead of 0.02 mg/kg in milk and in proportion of their concentration factors in milk products are under consideration.

Mycotoxins

Mycotoxins are metabolites of moulds. The most important mycotoxins for the dairy industry are aflatoxin B₁ in feed and aflatoxin M₁ in milk. Aflatoxin B₁ is formed in feed by moulds. When animal eats a feed contaminated with aflatoxin B₁, 1-3% of the aflatoxin is carried over to the milk as aflatoxin M₁. Under certain conditions, the carry over could be as high as 6%. Aflatoxin B₁ and M₁ are carcinogenic and possibly carcinogenic to humans, respectively. Several countries have established MRLs for aflatoxins B₁ and M₁. EU and USA have set the following MRLs in microg / kg (ppb):

Myco-toxin	Product	MRL, µg/kg (ppb)	
		EU	USA
Aflatoxin B ₁	Animal Feed	5	20
Aflatoxin M ₁	Milk	0.05	0.5

3. MEASURES TO CONTROL CONTAMINANTS

Pesticide Residues

- i) Pesticides should only be used according to the specifications on the label/approval sheet. Non-authorized ("extra-label") uses may impose severe risks to the food supply and the environment;
- ii) The principles of good agricultural practice in plant protection regimes must be strictly adhered to;

- iii) When forage cultures for food producing animals are treated, special attention must be drawn to the label specifications and prescribed waiting times after use;
- iv) Forage cultures should never be located downwind of other pesticide-treated fields (at the time of treatment);
- v) Under no conditions an unapproved use of pesticides in dairy rooms, dairy-related equipment and even dairy products (e.g. cheese ripening) is permitted;
- vi) Parasite control on the animal or in the animal shed must be only performed with approved formulations, preferably (or exclusively) under a veterinarian's supervision or at least prescription;
- vii) Any violations of an MRL should be reason for a pursuance of the GAP conditions.
- viii) Processing systems for milk products should be designed and constructed to minimize the opportunity for incidental contact of pesticides with the product or with product contact air.

Residues of Veterinary Drugs

- i) A HACCP-like system should be applied for the prevention of use of veterinary drugs.
- ii) Veterinary drugs should be used only under veterinary prescription, and only approved drugs

should be used.

- iii) Withholding time after the use of each drug should be strictly observed.
- iv) Any overdosing or spillage of wash, spray or dip solutions must be avoided to keep the penetration into the environment low.
- v) Treatment sites and treated animals must be well separated from all dairy vessels / equipment and dairying sites.
- vi) A preventive step is snail control and sanitation of grazing fields (if any) and other environmental factors for the stock to reduce the invasion of the animal in an early stage of the parasite's development.

Heavy Metals

- i) Animal feed with metals above maximum concentration established by regulations should not be given to animals producing milk.
- ii) Industrial production and food producing agriculture should be separated.
- iii) Milk and milk products should only come in contact with inert surfaces.

Mycotoxins

- i) All controllable factors in mycotoxin development should be addressed, such as Good Manufacturing Practices and Good Storage Practices.
- ii) Take measures leading to a lower risk of contamination and growth of moulds, such as elimination of nutrients, water, oxygen and / or addition of inhibitor e.g. propionic acid in appropriate concentration.