DDT (021)

EXPLANATION

DDT was first evaluated in 1966 and has been reviewed several times since. At the 22nd (1990) and 23rd (1991) Sessions of the CCPR countries were requested to supply monitoring and other relevant data on DDT (ALINORM 91/24, para 77; ALINORM 91/24A, para 77). At the 23rd Session the existing Extraneous Maximum Residue Limits (ERLs) for DDT were converted to temporary limits awaiting evaluation by the 1993 JMPR. The 1993 JMPR proposed ERLs for carrots, eggs, meat and milks and the 1994 JMPR confirmed the existing TERL for cereal grains on the basis of the available data. The 1995 CCPR was informed that additional data on meat were available from Australia, New Zealand and the USA and decided to keep the proposal for meat at Step 3 pending the evaluation of these data by the 1996 JMPR. The 28th (1996) Session of the CCPR advanced all ERLs except that for meat to Step 8 (ALINORM 97/24, para 85).

The Meeting received national residue survey data on DDT in animal products from Australia (Anon., 1995a), Germany (Anon., 1995b), New Zealand (Anon., 1994; Jowett and Viggers, 1995), Norway (Anon., 1996), Thailand (Anon., 1995c) and the USA (Anon., 1995d) and on DDT in food of plant origin from Norway (Anon., 1996) and The Netherlands (Anon, 1995e). The Netherlands also submitted information on analytical methods and national MRLs (Anon., 1995e). Poland provided information on national MRLs (Anon., 1995f). The British annual report of the Working Party on Pesticides Residues for 1994 included information on DDT residues (Anon., 1995g). Residue data and information on the dietary intake of DDT were made available by the Global Environment Monitoring System - Food Contamination Monitoring and Assessment Programme (GEMS/Food) of WHO (WHO, 1996; Moy, 1996a,b).

USE PATTERN

No information was supplied by governments on registered or recommended uses of DDT in agriculture. An evaluation by the Pesticide Action Network (PAN, 1991) showed that DDT is banned (all uses prohibited by final regulatory action owing to health or environmental hazards) in 29 countries, severely restricted (most uses prohibited owing to health or environmental hazards, certain specific uses remain authorized) in 23 countries, and unregistered (no registered uses, but not explicitly banned) in 4 countries.

RESIDUES IN FOOD IN COMMERCE OR AT CONSUMPTION

The presentation of the data received differed from country to country, and the layouts in the Tables are consequently different. With the exception of the Australian data all the residues are expressed as the sum of *p,p*¢DDT, *o,p*¢DDT, *p,p*¢DDE and *p,p*¢TDE (*p,p*¢DDD), in conformity with the Codex definition. In the Australian survey the residues of DDT, DDE and TDE were reported separately.

Monitoring of meat in Australia (Table 1). Residues of *p,p′*- and *o,p′*-DDT, *p,p′*-DDE and *p,p′*-TDE were reported for the period January 1989-December 1994 by the National Residue Survey of Australia. The reporting limit was 0.1 mg/kg for each compound.

Table 1. Residues of DDT in meat in Australia, 1989-1994 (Anon., 1995a).

Commodity	Compound	No. of samples	No. of residue-free samples	No. of samples with trace only[1]	No. of samples with residues, mg/kg, in ranges 0.1-1	1.1-2.5	2.6-5	5.1-10	>10
Beef (fat)	DDT	39854	39730	60	61	1	1		1
	DDE	39854	37149	1283	1394	24	3	1	
	TDE	39854	39752	47	53	2			
Buffalo (fat)	DDT	432	432						
	DDE	432	428	1	3				
	TDE	432	438	1	1				
Deer (fat)	DDT	110	110						
	DDE	110	106	3		1			
	TDE	110	110						
Emu (fat)	DDT	9	9						
	DDE	9	7	2					
	TDE	9	9						
Game goat (fat)	DDT	87	87						
	DDE	87	87						
	TDE	87	87						
Goat (fat)	DDT	927	925		2				
	DDE	927	912	4	7				
	TDE	927	924	3					
Horse (fat)	DDT	1939	1926	4	9				
	DDE	1939	1837	31	70	1			
	TDE	1939	1936		2	1			
Kangaroo (fat)	DDT	482	480	2					
	DDE	482	473	3	6				
	TDE	482	482						
Sheep (fat)	DDT	29270	29169	59	41				
	DDE	29270	25604	1336	2314	13			
	TDE	29270	29208	33	28	1			
Porcine (fat)	DDT	15900	15761	62	74	2		1	
	DDE	15900	15257	427	210	5	1		
	TDE	15900	15814	44	40	2			
Poultry (fat)	DDT	2167	2161	4	2				
	DDE	2167	2007	151	9				
	TDE	2167	2165	1	1				
Rabbit (fat)	DDT	570	570						
	DDE	570	566	4					
	TDE	570	562	7	1				

[1] Trace only: unquantifiable amount between the limit of detection and the reporting limit (0.1 mg/kg)

Monitoring of meat in Germany (Table 2). Information was supplied on residues of DDT from monitoring carried out in 1993. Residue data were expressed on the fat and raw product basis with a limit of determination of 0.001 mg/kg. The commodities were classified according to Council Directive of 24 July 1986, 86/363/EEC, modifying Council Directive 93/57/EEC of 29 June 1993 (EEC, 1986, 1993).

Table 2. Residues of DDT in meat in Germany, 1993 (Anon., 1995b).

Commodity according to 86/363/EEC	No. of samples	No. of samples with DDT residues , mg/kg in range <0.001	0.001 - 0.01	0.002 - 0.015	0.011 - 0.02	0.016 - 0.05	0.021 - 0.1	0.051 -0.2	0.11 -0.5	0.21 -1	0.6 -2	1.1 -5	2.1	max., mg/kg
Meat, except sheep (fat) ex 02.01	777	128		87	54	102	230	119	39	17	1			0.5
Meat, except	1080	618	192	221	36	7	3	2		1				0.42

Commodity according to 86/363/EEC	No. of samples	No. of samples with DDT residues , mg/kg in range												max., mg/kg
		<0.001	0.001 - 0.01	0.002 - 0.015	0.011 - 0.02	0.016 - 0.05	0.021 - 0.1	0.051 -0.2	0.11 -0.5	0.21 -1	0.6 -2	1.1 -5	2.1	
sheep (fresh substance) ex 02.01														
Sheep, meat (fat) ex 02.01	87	6		2	4	14	18	11	24	6	1	1		1.01
Sheep, meat (fresh substance) ex 02.01	30	8	3	9	2	5	3							0.033
Poultry, meat and edible offal (fat) 02.02	74	17		3	13	19	15	4	3					0.19
Poultry, meat and edible offal (fresh substance) 02.02	63	42	10	11										0.005
Poultry, liver (fresh substance) 02.03	14	11		3										0.003
Rabbit etc., meat (fat) ex 02.04	15				2	2	3	3	1	1	3			0.79
Rabbit etc., meat (fresh substance) ex 02.04	140	39	35	44	9	8	4	1						0.078
Bacon (pork fat), poultry fat ex 02.05	671	220		37	74	147	131	50	8	2			2	3.9
Meat salted, meat dried (fat) 02.06	29	17			6	3	3							0.045
Meat salted, meat dried (fresh substance) 02.06	6	4	1	1										0.002

Commodities according to Council Directive 86/363/EEC:
ex 02.01: Meat and edible offal of horses, asses, mules,bovine animals, swine, sheep and goats, fresh, chilled or frozen
02.02: Dead poultry and edible offal thereof (except liver), fresh, salted or in brine
02.03: Poultry liver, fresh, chilled, frozen, salted or in brine
ex 02.04: Other meat and edible offal, fresh, chilled or frozen, of domestic pigeons, domestic rabbits and game
ex 02.05: Pig fat and poultry fat, fresh, chilled, frozen, salted, in brine, dried or smoked
02.06: Meat and edible offal (except poultry liver), salted, in brine, dried or smoked

Monitoring of meat in New Zealand. The results of residue monitoring from July 1990 to June 1994, including routine testing (Table 3) and specifically targeted sampling from regions with a known DDT history (Table 4) were submitted.

Table 3. Residues of DDT in meat in New Zealand, 1990-1994 (Anon., 1994).

Commodity, Year	No. of samples analysed	No. positive[1]	No. of samples with residues, mg/kg fat, in range					DDT, mg/kg		
			0.02 -0.5	0.51 -1.0	1.01 -2.0	2.1 -5.0	>5	Mean	Median	Max.
Lambs										
1990-1991	244	123	119	1	3			0.13	0.05	1.4
1991-1992	159	95	84	4	7			0.24	0.11	1.7
1992-1993	261	138	127	7	2	2		0.19	0.07	3.7
1993-1994	301	178	161	13	4			0.19	0.08	1.5
Sum	965	534	491	25	16	2				
% of no. analysed		55.5	51	2.6	1.7	0.2				
Adult sheep										
1990-1991	203	85	77	5	1	2		0.21	0.07	3.3
1991-1992	158	87	78	5	4			0.2	0.07	1.5
1992-1993	84	37	34	2	1			0.2	0.09	1.2
1993-1994	103	68	61	3	2	2		0.24	0.06	2.6
Sum	548	277	250	15	8	4				
% of no. analysed		50.5	46	2.7	1.5	0.7				
Adult bovine										
1990-1991	202	70	69	1				0.085	0.04	0.73
1991-1992	261	125	117	5	3			0.14	0.06	1.3
1992-1993	132	47	47	1				0.08	0.04	0.89
1993-1994	164	77	71	4	2			0.16	0.08	1.4
Sum	739	319	304	11	5					
% of no. analysed		43	41	1.5	0.68					
Suckling calves										
1990-1991	306	201	175	18	8			0.23	0.11	1.3
1991-1992	309	246	206	26	7	7		0.31	0.13	4.1
1992-1993	310	193	188	5				0.13	0.09	0.98
1993-1994	301	217	199	9	6	2	1	0.29	0.15	5.2
Sum	1211	857	768	58	21	9	1			
% of no. analysed		71	63	4.8	1.7	0.74	0.08			
Pigs										
1990-1991	232	88	85	3				0.07	0.03	0.62
1991-1992	305	180	175	1	2	2		0.12	0.045	3.1
1992-1993	288	170	161	4	3	1	1	0.17	0.04	6.2
1993-1994	100	69	66	2	1			0.12	0.05	1.45

Commodity, Year	No. of samples analysed	No. positive[1]	No. of samples with residues, mg/kg fat, in range					DDT, mg/kg		
			0.02 -0.5	0.51 -1.0	1.01 -2.0	2.1 -5.0	>5	Mean	Median	Max.
Sum	925	507	487	10	6	3	1			
% of no. analysed		55	53	1.1	0.65	0.32	0.11			
Deer										
1990-1991	10	6	4	1						
1991-1992	17	4	3	1						
1992-1993	15	6	6					0.17	0.16	0.32
1993-1994	185	102	91	9	2			0.17	0.07	1.2
Sum	227	118	104	11	2					
% of no. analysed		52	46	4.8	0.88					
Goats										
1990-1991	7	2	2							
1991-1992	17	4	4							
1992-1993	13	4	4							
1993-1994	30	1	1							
Sum	67	11	11							
% of no. analysed		16	16							

[1] ≥0.02 mg/kg

Table 4. Residues of DDT in meat from lambs in New Zealand from a region with known DDT history, 1992-3 (Anon., 1994).

	No. of samples analysed	No. positive[1]	No. of samples with residues, mg/kg fat, in range					DDT, mg/kg		
			0.02-0.5	0.51-1.0	1.01-2.0	2.1-5.0	>5	Mean	Median	Max.
% of no. analysed	403	396	183	82	60	58	13	1.2	0.64	13
		98	45.4	20.3	14.9	14.4	3.2			

[1] ≥0.02 mg/kg

Monitoring of meat in Norway (Table 5). In total, 1568 samples of meat were analyzed in the period from 1990 to 1994. Residues were detected (LOD 0.02 mg/kg) in only 2 samples, both from 1990: 1 sample of pig meat and 1 sample of cattle meat contained 0.023 and 0.315 mg/kg of *p,p*¢DDE in the fat respectively.

Table 5. Residues of DDT in meat in Norway, 1990-1994 (Anon., 1996).

Commodity	No. of samples	No.of samples with DDT residues (mg/kg fat)	
		<0.02	0.02-0.5
Bovines (fat)	537	536	1
Pigs (fat)	537	536	1
Sheep (fat)	149	149	
Hens (fat)	145	145	
Reindeer (fat)	31	31	
Moose (fat)	169	169	

Monitoring of meat in Thailand (Table 6). Data on residues of DDT in meat during the period 1993-1994 were submitted by Thailand without reference to the expression of residues. However since the Codex commodity numbers were given for chicken meat (PM0840), duck meat (PM0841), pig meat (MM0818) and cattle meat (MM0812), it could be assumed that the residues were expressed on a fat basis, corresponding to the Codex expression of the residues of fat-soluble pesticides.

Table 6. Residues of DDT in meat in Thailand, 1993 and 1994 (Anon., 1995c).

Commodity, year	No. of samples	No. of samples with DDT residues, mg/kg, in range				
		<0.01	0.01-0.05	0.06-0.1	0.11-0.5	0.51-1
Chicken meat, 1993	9514	47	3618	3481	2342	26
Chicken meat, 1994	14650	457	9475	3669	1027	22
Duck meat, 1993	2291	27	1778	395	90	1
Duck meat, 1994	1810	19	1575	199	17	
Cattle meat, 1993	30	2	23	2	3	
Cattle meat, 1994	123	2	94	16	11	
Pig meat, 1993	65	1	48	10	6	
Pig meat, 1994	157	1	129	19	8	

Monitoring of meat in the USA. The 1993 JMPR evaluated only the data on DDT residues in imported meat. The present Meeting received new information on the monitoring of domestic and imported samples for the years 1991, 1992 and 1993, shown in Tables 7-10. All residue values are expressed on a fat basis. The reporting limit was 0.01 mg/kg.

Table 7. Residues of DDT in meat in the USA, 1991 (Anon., 1995d).

Species	No. of samples	No. of violations	No. of samples with DDT residues, mg/kg fat, in range								Total No. positive
			0.01- 0.1	0.11-0.2	0.21-0.3	0.31-0.5	0.51-1.0	1.01-2.5	2.51-5.0	>5.0	
Horse	106	0	1								1
Bull	25	0									0
Steer	1967	0	27	10	2	3	2	1			45
Beef cow	272	0	3	1	3	1					8
Heifer	1327	0	18	5	1		1	1			26
Dairy cow	217	0	4		1	1					6
Formula-fed calf	319	0									0
Non-formula calf	243	0	3	1			1				5
Heavy calf	280	0	3	3	1	1					8
Mature sheep	27	0									0
Lamb	320	0	2	1	3						6
Goat	94	1		1						1	2
Market hog	329	0	1		1		1				3
Boar or stag	61	0	1								1
Sow	253	0	3	1				1	1		6
Young chicken	3197	0	1	1							2
Mature chicken	338	0	1								1
Young turkey	3267	0	23	1							24
Mature turkey	205	0	2		1						3
Duck	108	0									0
Goose	62	0	4								4
Rabbit	81	0	1	1	1						3

Table 8. Residues of DDT in meat in the USA, 1992 (Anon., 1995d).

Species	No. of samples	No. of violations	No. of samples with DDT residues, mg/kg fat, in range								Total No. positive
			0.01-0.1	0.11-0.2	0.21-0.3	0.31-0.5	0.51-1.0	1.01-2.5	2.51-5.0	>5.0	
Horse	98	0	2		1		2				5
Bull	1	0									0
Steer	196	0	4	5	1	1	1				12
Beef cow	56	0	2	2		1					5
Heifer	131	0	3		1						4
Dairy cow	240	0	23	9	5		3				40
Formula-fed calf	334	0	3								3
Non-formula calf	293	0	3	7	2			1			13
Heavy calf	295	0	29	15	2	1	1		1		49
Mature sheep	25	0	2	1							3
Lamb	317	0	13	10	4	7	4	1			39
Goat	104	0	2	1			1	1			5
Market hog	3285	2	42	20	12	11	4	2		2	93
Boar or stag	60	0	1	2	3						6
Sow	259	0	8	3	1	1	2		1		16
Young chicken	415	0									0
Mature chicken	321	0	3		1						4
Young turkey	319	0	13								13
Mature turkey	203	0	12	1							13
Duck	109	0									0
Goose	38	0	1								1
Rabbit	71	0	1								1

Table 9. Residues of DDT in meat in the USA, 1993 (Anon., 1995d).

Species	No. of samples	No. of violations	No. of samples with DDT residues, mg/kg fat, in range								Total No. positive
			0.01- 0.1	0.11-0.2	0.21-0.3	0.31-0.5	0.51-1.0	1.01-2.5	2.51-5.0	>5.0	
Horse	425	0	17	14	2	6	3				42
Bull	555	0	13	12	7			2			34
Steer	523	0	13	10		3	3				29
Beef cow	651	0	23	13	4	5	1				46
Heifer	546	0	11	8	1	1	1				22
Dairy cow	272	0	15	17	11	7	2				52
Formula-fed calf	529	0	3			1					4
Non-formula calf	458	0	8	4	2	5	1	1			21
Heavy calf	498	0	52	18	7	3	2	3			85
Mature sheep	470	0	22	8	8	3	2	2			45
Lamb	574	0	39	29	7	4	2				81
Goat	533	0	17	10	2	2	1				32
Market hog	499	0	3	4	3	1					11
Boar or stag	452	1	7	2	3	1	1	1		1	16
Sow	537	0	12	6	4	3	1				26
Young chicken	498	0	3								3
Mature chicken	457	0	9	1							10
Young turkey	519	0	10			1					11

Species	No. of samples	No. of violations	No. of samples with DDT residues, mg/kg fat, in range								Total No. positive
			0.01- 0.1	0.11-0.2	0.21-0.3	0.31-0.5	0.51-1.0	1.01-2.5	2.51-5.0	>5.0	
Mature turkey	228	0	4								4
Duck	322	0		1							1
Goose	3	0									0
Rabbit	84	0	2	1							3

Monitoring data for the period January-December 1994 are summarized in Table 10. The reporting limit was 0.04 mg/kg. All residues are expressed on a fat basis.

Table 10. Residues of DDT in meat in the USA, 1994 (Anon., 1995d).

Species	No. of samples	No. of samples with DDT residues, mg/kg fat, in range								
		<0.04	0.04-0.1	0.11-0.2	0.21-0.3	0.31-0.5	0.51-1	1.01-2.5	2.51-5	>5
Cattle	3955	3657	151	66	39	31	7	2	1	1
Pigs	1457	1346	57	27	14	8	3	1		1
Horses	217	213	1	2						
Poultry	1990	1973	13	3		1				
Sheep and goats	900	692	91	55	27	15	18	2		

Monitoring of dairy products in New Zealand (Table 11). DDT residues found in the monitoring of dairy products carried out from June 1992 to May 1994 are shown in Table 11. In samples with a fat content of 2% or more "total DDT and metabolites" occurred only as DDE. Two anomalously high residues in cheese of 0.48 and 0.55 mg/kg in the fat, were both considered to be due to stress of the animals caused by an early summer snow storm. In addition to butter, cheese and fortified milk (baby food) the products analysed were anhydrous milk fat (99.9% fat), buttermilk powder (12% fat), whole milk powder (26% fat), whey protein concentrate (1.2% fat), skim milk powder (max. 1.2% fat), casein, caseinate, total milk protein (max. 1.2% fat), lactose and lactalbumin. In all, 2915 samples were analysed (Table 11, last line) using an analytical method with a limit of determination of 0.01 mg/kg.

Table 11. Residues of DDT in dairy products in New Zealand, June 1992 - May 1994 (Jowett and Viggers, 1995).

Commodity	No. of samples	No. of samples with DDT residues, mg/kg fat, in range					Max. residue, mg/kg fat
		<0.01	0.01-0.099	0.1-0.19	0.2-0.49	0.5-1.0	
Butter	180	29	142	9			0.13
Cheese	398	42	277	61	17	1	0.55
Fortified milk, Baby food	295	144	148	3			0.16
All product groups combined[1]	2915	966	1748	171	29	1	0.55

[1] Butter, cheese, fortified milk, anhydrous milk fat, buttermilk powder, whole milk powder, whey protein concentrate, skim milk powder, casein, caseinate, total milk protein, lactose, lactalbumin

Monitoring of foods of plant origin in Norway. In Norway, domestic and imported food is routinely

analysed for residues of DDT. In the period 1985-1995 12,682 samples of fruit, vegetables and potatoes were analysed with a limit of determination of 0.05 mg/kg (Anon., 1996). Residues were found only in a single sample of imported table grapes in 1994 which contained 1.2 mg/kg DDT, probably owing to illegal use. Results from the monitoring of cereal grains (wheat 411, rye 70, oats 15 samples) during the period 1990-1995 were also received. The residues were below the Norwegian national MRL (before 1994 0.1 mg/kg, since 1994 0.05 mg/kg).

Monitoring of food of plant origin in The Netherlands. The 1993 JMPR reported monitoring data on DDT residues for the period 1987-1991. The present Meeting received additional information for 1991-1993 and 1994 (Tables 12 and 13). In addition 167 samples of tea were analysed during 1991-1993: four samples contained residues of DDT above the LOD of 0.05 mg/kg but below the Dutch MRL of 1 mg/kg.

Table 12. Residues of DDT in foods of plant origin in The Netherlands, 1991-1993 (Anon., 1995e).

Product	No. of samples	No. of samples with DDT residues, mg/kg, in range		
		<0.05	0.05-0.09	0.1 or higher
Berries and small fruit: grapes	999	994	5	
Miscellaneous fruit: kiwifruit	309	307	2	
Root and tuber vegetables: carrots	609	606	3	
Fruiting vegetables: sweet peppers	1129	1127	2	
cucumbers	644	222	2	
Leaf vegetables and fresh herbs: lambs lettuce	310	305	5	
iceberg lettuce	557	553	4	

Table 13. Residues of DDT in foods of plant origin in The Netherlands, 1994 (Anon., 1995e).

Product	No. of samples	No. of samples with DDT residues, mg/kg, in range		
		<0.025	0.025-0.049	≥0.05
Berries and small fruit	103	101	2	
Root and tuber vegetables: carrots	144	143	1	
Stem vegetables: celery	209	208	1	
Fruiting vegetables: tomatoes	332	331	1	
melons	164	164		
Leaf vegetables and fresh herbs: iceberg lettuce	185	184	1	
parsley	149	148	1	
Pulses	23	22	1	

UK monitoring data. Table 14 shows the results of the 1994 UK monitoring programme for DDT residues (Anon., 1995g).

Table 14. Residues of DDT in foods in the UK, 1994 (Anon., 1995g).

Commodity	No. of samples	Residue or range, mg/kg, and (no. of samples)	Basis	MRL, mg/kg	Remarks
Bread	53	<0.01 (53)			
Milk	202	<0.0008 (201), 0.002 (1)	whole product	0.04	residue present as *p,p*¢DDE
Apple, dessert Apple, cooking Apple, juice	25 UK 48 imported 29 UK 40 UK 9 imported	<0.05 (73) <0.05 (29) <0.05 (49)			
Asparagus	6 UK 20 imported	<0.01 (26)			
Lettuce imported UK produced	 31 56	 <0.01 (30), 0.02 (1, France) <0.01 (56)		0.05	residue present as *p,p*¢DDE
Infant cereals Wheat germ Wheat bran	12 8 11	<0.01 (12) <0.01 (8) <0.01 (11)			
Cream UK produced unknown origin	 30 6	 <0.04 (30) <0.04 (6)	 fat fat		
Chocolate UK produced imported	 62 2	 <0.02 (62) <0.02 (2)	 fat fat		
Honey UK produced imported blended	 20 60 20	 <0.008 (20) <0.008 (59), 0.009 (1, Mexico) <0.008 (20)	 whole product		residue present as *p,p′*-DDT and *o,p′*-DDT
Vegetable oils imported unknown origin	 57 16	 <0.02 (62) <0.02 (2)	fat		
Goat cheese UK produced imported unknown origin Goat milk	 11 11 6 8	 <0.01 (11) <0.01 (11) <0.01 (6) <0.004 (8)	 fat fat fat whole product		
Pig kidney UK produced imported unknown origin	 11 1 11	 <0.008 (11) <0.008 <0.008 (11)	 whole product		
Lamb kidney UK produced imported unknown origin	 11 6 8	 <0.008 (9), 0.009 (2) <0.008 (6) <0.008 (8)	 whole product	0.1	1st sample:0.009 *p,p′*-DDE, 2nd sample: 0.003 *p,p′*-TDE and 0.006 *p,p′*-DDE
Ox kidney UK produced unknown origin	 15 16	 <0.008 (15) <0.008 (16)	 whole product		
Lamb, imported	74	<0.01 (38), 0.01-0.09 (23) 0.1-0.3 (12), 0.8	fat	1	residue present as *p,p′*-DDE
Lamb liver UK produced imported	 12 5	 <0.008 (12) <0.008 (5)	 whole product		

Commodity	No. of samples	Residue or range, mg/kg, and (no. of samples)	Basis	MRL, mg/kg	Remarks
unknown origin	7	<0.008 (7)			
Chicken liver UK produced unknown origin	 24 7	 <0.008 (24) <0.008 (6), 0.01	whole product	0.1	residue present as *p,p′*-DDE
Ox liver UK produced unknown origin	 10 14	 <0.008 (10) <0.008 (14)	whole product		
Cattle, kidney fat UK produced	 116	 <0.01 (108), 0.01-0.05 (8)	fat		residue present as *p,p′*-DDE
Pig, kidney fat UK produced	 114	 <0.01 (108), 0.01-0.05 (6)	fat		residue present as *p,p′*-DDE
Sheep, kidney fat UK produced	 114	 <0.01 (96), 0.01-0.06 (18)	fat		residue present as *p,p′*-DDE
Pheasant UK produced unknown origin	 46 22	 <0.008 (42), 0.009-0.01 (4) <0.008 (21), 0.008	whole product	0.1	residue present as *p,p′*-DDE
Rabbit UK produced imported unknown origin	 29 32 (China) 1	 <0.004 (26), 0.007-0.008 (3) <0.008 (23), 0.009, 0.01-0.04 (8) 0.09	whole product	0.1	residue present as *p,p′*-DDE
Wood pigeon UK produced unknown origin	 17 13	 <0.004 (8), 0.004-0.007 (8), 0.5 <0.004 (7), 0.004-0.002 (6)	whole product	0.1	0.5 mg/kg: 0.01 *p,p′*-DDE, 0.04 *p,p′*-TDE, 0.02 *p,p′*-DDT
Fish paté UK produced imported unknown origin	 19 1 22	 <0.008 (12), 0.01-0.09(7) <0.008 <0.008 (10), 0.009-0.05 (12)	whole product		residue present as *p,p′*-DDE, *p,p′*-TDE and *p,p′*-DDT
Fish paste UK produced imported unknown origin	 16 1 (Italy) 26	 <0.004 (8), 0.004-0.009 (6), 0.01-0.02 (2) 0.02 <0.004 (15), 0.004-0.009 (9), 0.01 (2)	whole product		residue present as *p,p′*-DDE, *p,p′*-TDE and *p,p′*-DDT
Eel (common) UK produced unknown origin Eel (conger) unknown origin	 15 (14 jellied, 1 fresh) 27 (26 jellied, 1 fresh) 3	 <0.008 (2), 0.01-0.3 (13) <0.008 (2), 0.01-0.2 (25) <0.008 (2), 0.02	whole product		residue present as *p,p′*-DDE, *p,p′*-TDE and *p,p′*-DDT
Herring, smoked, unknown origin	 2	<0.006 (2)	whole product		
Mackerel, smoked	40	<0.006 (39), 0.02	whole product		residue present as *p,p′*-DDE

Residues of DDT in foodstuffs from GEMS/Food database (Table 15). Data on residues of DDT in various foods from the GEMS/Food database were available from WHO (Moy, 1996a). Most of the data (Table 15) are too summarized for the estimation of ERLs. Supplementary information on the number of samples, if available was supplied by Moy (1996b).

Table 15. DDT residues in foodstuffs from various countries (GEMS/Food; Moy, 1996a,b).

Commodity/Country	Year	Residues, mg/kg				Remarks and {no. of samples}
		Median	Mean	90th percentile	Range	
Cereals/Australia	1990-1992		0.0082		0.00002-0.0023	
Cereals/Canada	1989-1990	<0.01 <0.01		<0.01 <0.01	<0.01-0.02 <0.01-0.01	Breakfast cereal {50} Infant cereal {50}
Cereals/China (P.R.)	1992 1990	0.019	0.027 0.0012	0.095	<0.001-0.095 0.0009-0.0014	
Cereals/India	1990 (R) 1990 (R) 1990 (R) 1989		0.12 0.026 0.31 0.0035		max.0.52 max.0.085 max 1.3 0.0017-0.0054	Wheat Rice Maize
Cereals/Former Soviet Union	1991 (R) 1991 (R)		1.3 1.2			*o,p′*-DDT in wheat *p,p′*-DDT in wheat
Cereals/Spain	1990-1991 1990-1991		<0.001 <0.001		<0.001-0.003 <0.001-0.003	Bread, Basque country Cereals, Basque country
Cereals/Qatar	1989-1991		<0.01			Wheat, barley, maize, rice, flour {233}
Cereals/Vietnam	1990-1991		0.002		0.001-0.0033	Rice
Chicken/Brazil	1991 1990 1989	<0.001 <0.001 <0.001		0.07 0.04 0.07	<0.001-0.3 <0.001-0.22 <0.001-0.16	Sao Paulo {30} Sao Paulo {22} Sao Paulo {36}
Chicken/Canada	1984-1989 1986-1988 1986-1988		0.001 0.0014 0.0009		max. 0.003 max.0.0013	Chicken meat, domestic DDE, Avian, broiler DDE, Avian, turkey
Chicken/Denmark	1986-1991		0.003		0.002-0.003	Poultry meat, domestic
Chicken/Japan	1992-1993		0.001			
Chicken/Kenya	1988 (R)		0.68			
Chicken/Poland	1992		0.056 0.02			
Chicken/Spain	1995 (R)		0.00063		0.0004-0.00087	DDE, fresh poultry sausage
Eggs/Canada	1986-1988		0.008		max. 0.009	DDE, extractable fat, Ontario
Eggs/China (P.R.)	1992 1990	0.02	0.03 0.041	0.095	0.01-0.095 0.013-0.072	
Eggs/Cuba	1985-1988		0.61			Fat
Eggs/Denmark	1986-1991		0.02		0.02-0.03	
Eggs/Finland	1994 (R)		0.0016		0.0005-0.024	Imported (fat)
Eggs/Netherlands	1990-1992				0.11-0.20	Egg powder (fat)
Eggs/Spain	1990-1991		<0.001			Basque country
Fish/Arabian Gulf	1987 (R) 1987 (R)				0.002-0.011 0.005-0.045	NW Arabian Gulf Hor-al-Hammar
Fish/Australia	1990-1991		0.022		0.00014-0.23	
Fish/Canada	1984 1984		2 3			Cod, Admiralty Intel Cod, Barrow Strait
Fish/China (P.R.)	1992 1990	0.024	0.046 0.14	0.095	max. 0.31 0.0097-0.44	Fish uncooked Aquatic food
Molluscs/Croatia	1976-1990 1976-1990 1976-1990	0.0051 0.0051 0.006	0.0079 0.0084 0.0063			Bivalves Mussels Oysters
Fish/Cuba	1985-1988		0.075			
Fish/Egypt	1990 (R) 1990 (R) 1990 (R) 1990 (R) 1986-1988 1986-1988 1986-1988		0.0049 0.076 0.047 0.015 0.73 0.23 0.057			*o,p′*-DDE *p,p′*-DDT *o,p′*-DDT *p,p′*-DDT *o,p′*-DDT, Red Sea gov. *p,p′*-DDE, Ismailia gov. *p,p′*-DDT, Ismailia gov.

Commodity/Country	Year	Residues, mg/kg				Remarks and {no. of samples}
		Median	Mean	90th percentile	Range	
	1986-1988		0.01			*o*,*p*′-DDE, Suez gov.
Fish/Finland	1979				0.7-2.2	Herring muscle (fat)
	1986				0.3-1.0	Herring muscle (fat)
Molluscs/France	1989 (R)				<0.0004-0.59	dry wt., Mussels
	1989 (R)				0.001-0.73	dry wt., Oysters
Fish/India	1989-1993		0.015		0.00086-0.14	
	1989		0.015		0.00086-0.14	
Fish/Indonesia	1989-1993		0.028		0.00066-0.076	
Fish/Japan	1992-1993		<0.001			Tuna
	1992-1993		0.0087			Sea bream
	1992-1993		0.0091			Horse mackerel
	1992-1993		0.0089			Salmon
	1992-1993		0.041			Young yellowtail
	1992-1993		0.00016			Shrimp
	1992-1993		0.00016			Short-necked clam
	1992-1993		0.0024			Salted salmon
	1992-1993		0.0032			Semi-dried horse mackerel
	1992-1993		<0.001			Canned tuna
	1992-1993		0.0011			Seasoned tuna
	1992-1993		0.0036			Fish paste products
	1992-1993		<0.0001			Fish sausage
	1990	0.002		0.0048	<0.001-0.005	Fishes, flat, fresh {11}
	1990	0.002		0.009	<0.001-0.018	Horse mackerel, fresh {12}
Fish/Qatar	1989		<0.01		<0.01	Greasy grouper
	1989		<0.01		<0.01	Whitespotted-spinefoot
	1989		<0.01		<0.01	Gold toothless-trevally
	1989		<0.01		<0.01	Starry pigface bream
Fish/Spain	1990-1992		0.081		0.003-1	wet wt., Catalonia
	1990-1992		9.9		0.033-183	lipid wt., Catalonia
	1990-1991		0.002		<0.001-0.003	wet wt., Basque country
Fish/Thailand	1989-1993		0.0062		0.00048-0.019	wet wt.
Fish/ Molluscs/UK	1988		0.016			wet wt., Mackerel, liver
	1988		0.016			wet wt., Herring, liver
	1988		0.031			wet wt., Monkfish, liver
	1988		0.12			wet wt., Dogfish, liver
	1988		0.014			wet wt., Crab, hepato-pancreas
	1988		0.002			wet wt., Mussels, whole
Fish/ Molluscs/USA	1986-1989		0.42			*p*,*p*′-DDE, Carp
	1986-1989		0.08			*p*,*p*′-DDE, White sucker
	1986-1989		0.63			*p*,*p*′-DDE, Channel catfish
	1986-1989		0.06			*p*,*p*′-DDE, Largemouth bass
	1986-1989		0.03			*p*,*p*′-DDE, Smallmouth bass
	1986-1989		0.03			*p*,*p*′-DDE, Walleye
	1990 (R)		0.0054		<0.005-0.016	wet wt., Oysters
	1990 (R)		0.030		<0.005-0.18	wet wt., Crabs
Fish/Vietnam	1990-1991		0.026		0.0039-0.076	wet wt., Fish
	1990-1991		0.0017			wet wt., Prawn
	1990-1991		0.0072			wet wt., Shellfish
	1990-1991		0.078			wet wt., Crab
	1990-1991		0.090		0.050-0.12	wet wt., Caviar
Fruits/Australia	1990-1992		0.00013		0.00002-0.00024	wet wt.
Fruits/Canada	1992-1993	<0.01		<0.01	<0.01-0.01	Cherry
	1984-1989		0.02		0.01-0.03	Grapes, domestic
	1984-1989		0.03			Grapes, imported
	1984-1989		0.08		0.04-0.12	Pear, imported
Fruits/China (P.R.)	1992	0.002	0.035	0.095	<0.001-0.095	
	1990		0.003		0.0007-0.006	
Fruits/India	1990 (R)		0.003		max. 0.005	Guava
	1990 (R)		0.004		max. 0.007	Apple
	1990 (R)		0.004		max. 0.006	Grape

Commodity/Country	Year	Residues, mg/kg				Remarks and {no. of samples}
		Median	Mean	90th percentile	Range	
Fruits/Spain	1990-1991		<0.001			Basque country
	1990-1991		<0.0002			Sugars, Basque country
Fruits/USA	1991-1992				max. 0.01	Sugar beet
Meat/Australia	1990-1992		0.013		0.00016-0.083	wet wt., Meat and fat
Meat/Canada	1984-1989		0.14		0.10-0.17	Pig meat (fat), domestic
	1986-1988		0.030		max. 0.41	DDE, Beef (fat)
	1986-1988		0.008		0.008	DDE, Goat (fat)
	1986-1988		0.055		max. 0.15	DDE, Rabbit (fat)
	1986-1988		0.029		max. 0.20	DDE, Lamb, Mutton (fat)
	1986-1988		0.024		max. 0.08	DDE, Pork (fat)
	1985-1987				0.00025-0.0038	highest in Pork
Meat/China (P.R.)	1992	0.095	0.16	0.48	<0.001-0.6	DDT, Meat, uncooked
	1990		1.2		0.12-4.1	Meats, fat
Meat/Cuba	1985-1988		0.43			Pork fat, Havana
Meat/Denmark	1986-1991		0.04		0.02-0.09	Cattle meat (fat), domestic
	1986-1991		0.04		0.02-0.10	Pig meat (fat), domestic
Meat/Egypt	1993 (R)				1-5	Beef carcases, Cairo
	1993 (R)				1-7	Beef carcase muscle, Cairo
	1993 (R)				4	Beef carcase fat, Cairo
	1993 (R)					Buffalo carcases, Cairo
	1993 (R)				0	Buffalo carcase muscle, Cairo
						Buffalo carcase fat, Cairo
	1993 (R)				4	Buffalo carcase liver, Cairo
	1993 (R)				9.6	Mutton carcases, Cairo
	1993 (R)					Mutton carcases muscle, Cairo
	1993 (R)				4	Mutton carcase fat, Cairo
	1993 (R)				1-7	Mutton carcase liver, Cairo
	1993 (R)				5	
Meat/India	1989		0.5		0.00065-4.1	wet wt., (fat)
Meat/Japan	1992-1993		0.016			Beef fat
	1992-1993		0.0086			Pork fat
	1992-1993		0.075			Sausage fat
Meat/Mexico	1995 (R)		0.14			Bovine kidney fat, Vera Cruz
Meat/Netherlands	1990-1992				0.11-0.50	Calf (fat), domestic
	1990-1992				0.11-0.50	Pig (fat), domestic
	1990-1992				0.01-0.05	Sheep (fat), domestic
	1990-1992				0.01-0.05	Goat (fat), domestic
	1990-1992				0.01-0.10	Horse (fat), domestic
Meat/New Zealand	1990-1991	<0.03			<0.03	Beef (fresh) {48}
	1990-1991	<0.03			<0.03	Meat products {48}
						p,*p*′- DDT, *o*,*p*¢DDT
Meat/Poland	1990-1993		0.87			*p*,*p*′-DDE, Wild boar
	1990-1993		0.73			DDT, Wild boar
	1990-1993		0.26			*p*,*p*′-DDE, Roe-deer
	1990-1993		0.28			DDT, Roe-deer
	1990-1993		0.12			*p*,*p*′-DDE, Stag
	1990-1993		0.14			DDT, Stag
	1990-1993		0.12			*p*,*p*′-DDE, Elk
	1990-1993		0.14			DDT, Elk
	1991 (R)				0.00034-0.0018	Muscle, Horse
	1991 (R)				0.022-0.12	Fat, Horse
	1987-1988				0.045-0.084	Fat, Ruminants
	1987-1988				0.079-0.14	Fat, Rabbits, Swine, Turkeys, Geese
	1987-1988				0.40-0.44	Fat, Duck, Wild boar
	1986-1989		0.18			Fat, Wild boar
	1986-1989		0.063			Fat, Roe-deer
	1986-1989		0.048			Fat, Stag
	1986-1989		0.049			Fat, Elk
	1986		0.10			Fat, Pig
	1986		0.032			Liver, Pig

Commodity/Country	Year	Residues, mg/kg				Remarks and {no. of samples}
		Median	Mean	90th percentile	Range	
	1986		0.0065			Meat, Pig
	1984-1985				0.18-0.32	Fat, Wild boar, Roe-deer, Red deer
	1984-1985				0.006-0.009	Brain, Wild boar, Roe-deer, Red deer
	1980-1983		0.23			Fat,Wild boar
	1980-1983		0.057			Fat, Roe-deer
	1980-1983		0.045			Fat, Stag
	1980-1983		0.0071			Fat, Elk
Meat/Former Soviet Union	1991 (R)		2.0			*o*,*p*¢DDT, Pork
	1991 (R)		2.0			*p*,*p*′-DDT, Pork
Meat/Spain	1994 (R)		25		max. 91	Lamb
	1990-1991		<0.003			Meat, Basque country
	1990-1991		<0.005		<0.005-0.007(2)	Meat products, Basque country
	1995 (R)					DDE, Pork, Cured sausage
	1995 (R)		0.0063		0.004-0.016	(fat)
	1995 (R)					DDE, Pork, Cured ham (fat)
	1995 (R)		0.007		0.004-0.015	DDE, Pork, Bologna (fat)
			0.016		0.009-0.03	DDE, Fresh sausage with beef
	1995 (R)		0.0066		0.004-0.013	and pork (fat)
						DDE, Fresh beef sausage (fat)
			0.0077		0.004-0.013	
Meat/USA	1991-1992				max. 0.50	Cattle (fat), imported
	1992				max. 0.19	Pig (fat), imported
	1992				max. 0.44	Sheep (fat), imported
	1991				max. 1.1	Sheep, lamb, goat (fat), imported
	1991				max. 0.27	Pig (fat), imported
Meat/Vietnam	1990-1991		0.0013		0.061-0.18	Wet wt., Fat
	1990-1991		0.048		0.01-0.086	Wet wt., Meat
Edible Oils/Australia	1990-1992		0.0021		0.00036-0.0053	Wet wt.
Edible Oils/China (P.R.)	1992	0.022	0.035	0.095	<0.007-0.095	
Edible Oils/India	1990 (R)		0.59		max. 0.73	Vegetable
	1990 (R)		2.4		max. 7.5	Mustard
	1990 (R)		1.5		max. 2.2	Groundnut
	1990 (R)		0.21		max. 0.65	Sesame
	1989		0.021		0.0018-0.057	Wet wt.
Edible Oils/Spain	1990-1991		<0.01			Fats and oils, Basque country
Edible Oils/Vietnam	1990-1991		0.067			Wet wt.
Pulses/Australia	1990-1992		0.0024		0.00002-0.0086	Wet wt.
Pulses/India	1990 (R)		0.022		max. 0.051	Arhar
	1990 (R)		0.016		max. 0.057	Moong
	1990 (R)		0.023		max. 0.086	Gram
	1990 (R)		0.063		max. 0.16	Lentil
	1990 (R)		0.039		max. 0.12	Black Gram
	1989		0.02		0.0011-0.04	Wet wt.
Pulses, Nuts/Spain	1990-1991		<0.001			Basque country
Pulses/Vietnam	1990-1991		0.0019		0.00034-0.003	Wet wt.
Vegetables/Australia	1990-1992		0.0033		0.00007-0.0089	Wet wt.
Vegetables/Canada	1984-1989		0.04		0.01-0.11	Carrots, domestic
	1984-1989		0.43		0.39-0.48	Carrots, imported
	1984-1989		0.05			Potatoes, domestic
	1984-1989		0.04		0.01-0.07	Potatoes, imported
	1984-1989		0.02			Cucumbers, imported
Vegetables/China (P.R.)	1992	0.019	0.024	0.095	<0.001-0.095	Fresh vegetable
	1990		0.0021		0.0015-0.0028	Legumes and nuts
	1990		0.0016		0.0004-0.0033	Potatoes
	1990		0.0009		0.0032-0.008	Vegetables
	1994 (R)		0.38			Vegetables (fatty food)
	1992 (R)				0.0012-0.11	Vegetables

Commodity/Country	Year	Residues, mg/kg				Remarks and {no. of samples}
		Median	Mean	90th percentile	Range	
Vegetables/Egypt	1990 (R)		0.002		max. 0.005	Spinach
Vegetables/Spain	1990-1991		<0.001			Basque country
Vegetables/USA	1991-1992				max. 0.17	Carrots, domestic
	1991-1992				max. 0.13	Carrots, imported
	1991-1992				max. 0.03	Tomatoes, imported
Dairy/Argentina	1994		0.00096			Butter, Santa Fe, Rosario
Dairy/Australia	1990-1992		0.0059		0.0016-0.018	Wet wt., Dairy products
Dairy/Brazil	1989-1991	0.020	0.025	0.05	<0.01-0.14	Cow whole Milk, Sao Paulo {184}
Dairy/Bulgaria	1993		<1.0		max. 1.8	Ewe Milk-cheese (one sample)
Dairy/Canada	1986		0.00064			Cow milk (fat basis)
	1984-1989				0.02-0.1	Butter, domestic
	1984-1989		0.03		0.01-0.06	Cheese, domestic
	1984-1989		0.04		0.01-0.11	Cheese, imported
Dairy/China (P.R.)	1992	0.025	0.033	0.095	<0.008-0.095	Whole fluid Milk (uncooked)
	1990		0.0028		0.0005-0.0063	Milk
Dairy/Cuba	1985-1988		0.0049			Butter, Havana
	1985-1988		0.024			Whole product, Milk, Havana
	1985-1988		0.030			Whole product, Cheese, Havana
Dairy/Denmark	1986-1991		0.02		0.02-0.03	Butter, domestic
	1986-1991		0.03		0.02-0.05	Cheese, domestic
	1986-1991		0.04		0.02-0.04	Cheese, imported
	1986-1991		0.03		0.03-0.03	Butter, imported
Dairy/Finland	1994 (R)		ND			Wet wt., Milk
	1994 (R)		0.00068		0.0002-0.0007	*p,p′*-TDE, domestic Cheese
	1994 (R)		0.00054		0.0002-0.0012	*p,p′*-DDE, imported Cheese
	1994 (R)		0.00014		0.0002-0.00076	*p,p′*-TDE, imported Cheese
Dairy/Greece	1992-1993		0.10			Northern Greece
Dairy/India	1994 (R)		0.63			Milk (fat)
	1993 (R)				0.042-0.38	Milk, Delhi
	1993 (R)		0.22			Buffalo Milk
	1993 (R)		0.19			Milk, condensed
	1993 (R)		0.34			Cheese
	1993 (R)		0.38			Cream
	1993 (R)		0.19			Curd
	1993		0.006			Cow milk
	1992 (R)				0.040	Bovine milk, Haryana
	1992 (R)				0.74	Baby milk, Haryana
	1990 (R)		0.058		max. 0.22	Milk
	1990 (R)		4.8		max. 9.8	Butter
	1990 (R)		3.8		max. 6.0	Deshi ghee
	1989		0.0014		0.17-5.2	Wet wt.
	1989		1.4		0.78-3.0	Wet wt.
	1988 (R)		0.78			Cheese, Punjab
Dairy/Israel	1986		0.0032			Cow milk
Dairy/Japan	1994	<0.02	<0.02	0.057	<0.02-0.076	Milk, cow's, pasteurized whole
	1994	<0.025	<0.025	<0.025	<0.025	fluid
	1992-1993		0.0026			Milk, cow's, raw whole fluid
	1992-1993		0.0023			Ice cream
	1992-1993		0.00021			Processed Cheese
	1993	<0.02	<0.02	0.029	<0.02-0.059	Cow milk
	1993	<0.02	<0.02	0.028	<0.02-0.081	Milk, cow's, raw whole fluid
	1992	0.013	0.014	0.023	<0.01-0.074	Milk, cow's, pasteurized whole
	1992	0.012	0.015	0.026	<0.01-0.056	fluid
	1991	0.013	0.022	0.054	<0.01-0.17	Milk, cow's, pasteurized whole fluid
	1991	0.019	0.032	0.058	<0.01-0.11	Milk, cow's, raw whole fluid
	1990	0.013		0.017	<0.01-0.053	Milk, cow's, pasteurized whole fluid

Commodity/Country	Year	Residues, mg/kg				Remarks and {no. of samples}
		Median	Mean	90th percentile	Range	
						{90} Milk, cow's, raw whole fluid {11} Milk, cow's, raw whole fluid {72}
Dairy/Mexico	1993		0.0023		0.00016-0.025	Cow milk
Dairy/Netherlands	1990-1992				0.0044-0.02	Dairy cow products, domestic
Dairy/Poland	1994		0.0026		0.00044-0.015	Milk
Dairy/Qatar	1990		<0.01		<0.01	Whole dried cow milk
Dairy/Slovakia	1987-1988				0.041	Milk products
Dairy/Spain	1994 (R) 1990-1991 1990-1991 1990		0.056 <0.001 <0.002 0.00084			Milk, sterilized Milk, Basque country Dairy products, Basque country Cow milk
Dairy/USA	1990-1991 1991-1992				max. 0.019 max. 0.0076	*p,p′*-DDE,whole product basis Milk, domestic
Dairy/Vietnam	1990-1991		0.0072		0.007-0.0073	Wet wt., Butter

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Dietary intake of DDT (Table 16). Data on adult dietary intakes of DDT were prepared by the GEMS/Food programme (WHO, 1996). The data are from studies of regular diets.

Table 16. Dietary intake of DDT by adults (WHO, 1996). ADI: 20 ì g/kg bw.

Country	Year	Daily intake, ì g/kg bw	% of ADI
Australia	1980 1987	0.39 0.026	1.95 0.13
Egypt	1988	13.7	68.5
Finland	1984 1986	0.041 0.026	0.21 0.13
Guatemala	1982 1984 1985 1988	0.26 0.2 0.065 0.031	1.3 1.0 0.33 0.16
India	1981 1983	3.9 3.6	19.5 18
Japan	1980 1982 1984 1986 1988	0.056 0.07 0.03 0.02 0.02	0.28 0.37 0.15 0.1 0.1
Netherlands	1984 1985	0.004 0.004	0.02 0.02
New Zealand	1982	0.003	0.015
Switzerland	1983	0.03	0.15
Thailand	1980 1987	1.6 0.0008	8 0.004
UK	1980 1981 1985	0.05 0.035 0.05	0.25 0.18 0.25
USA	1980 1982 1985 1986	0.36 0.033 0.036 0.019	1.8 0.17 0.18 0.1

Country	Year	Daily intake, ì g/kg bw	% of ADI
	1988	0.025	0.13

Dietary intake of DDT from human breast milk by infants (Table 17). Levels of DDT in breast milk can provide an assessment of the integrated exposure of women to DDT, which is largely due to food contamination. Breast milk is also the sole source for most infants and, consequently, levels of DDT are an important safety concern. Data provided by the GEMS/Food programme (WHO, 1996) from 39 countries show that DDT is present in virtually every sample of breast milk tested.

Table 17. Estimated dietary intakes of DDT for infants from breast milk (WHO, 1996).

Country	Year	Intake, ì g/kg bw	
		Median	Mean
Australia	1974	16.4	
	1978	9.1	
	1980	5.5	
	1981		5.0
	1982	5.0	
	1990	1.6	
	1991	3.6	
Belgium	1976		12.7
	1982		5.4
Brazil	1987 (Sao Paolo)		4.2
	1987 (Rural)		2.0
Canada	1967		17.4
	1970		9.2
	1975		5.3
	1981		4.7
	1982		4.5
	1982		4.5
	1986	1.0	1.4
China	1982		30.5
Colombia	1987(R)		9.0
Croatia	1981-1982		9.9
Slovakia	1971-1974		33.2
	1989-1992	6.4	8.4
Denmark	1982	4.3	
	1982	4.9	
Ethiopia	1994(R)		35.3
Egypt	1985-1986		6.9
Finland	1982		3.7
France	1974		13.6
	1986		9.9
Germany	1973-1974		11.6
(FRG/West)	1984		6.3
	1984-1987		3.7
	1988		3.1
	1989		3.2
	1990		2.6
	1991		2.4
	1992-1993		1.6
Germany	1979		12.3
(GDR/East)	1980-1981		23.4
	1984-1988		5.8
	1989-1990		12.4
	1990		11.7
	1990-1991		6.2
	1990-1991		10.8

Country	Year	Intake, ì g/kg bw	
		Median	Mean
Greece	1974-1975		41.3
	1983		0.2
Guatemala	1983	41.4	
Hong Kong	1985	40.0	47.2
Hungary	1975-1976		16.15
India	1980	45.6	
	1982	36.7	
	1983		29.8
	1986	62.0	
	1990(R)	17.3	
Iran	1992-1993	1.2	0.7
Iraq	1984(Baghdad)		19.2
Italy	1978		18.4
	1983-1984(Rome)		7.2
	1982-1985		6.6
	1985		6.1
Japan	1980	4.4	
	1981	4.7	
	1982	4.7	
	1983	3.5	
	1984	3.5	
	1985	2.9	
	1989	3.3	
	1991	2.9	3.6
	1992	2.4	1.9
Kenya	1983-1985		7.7-85.3
The Netherlands	1979		10.9
Nigeria	1987		17.4
Norway	1981-1982		4.1
	1986		2.6
	1988		3.7
Poland	1979		45.4
	1987(R)		25.0
Rwanda	1983		18.9
South Africa	1987		68.5
Spain	1979-1982(Madrid)		2.7
Sweden	1981		4.6
	1983	5.6	
	1983		5.6
	1986(Sundsvall)	2.5	2.6
	1986(Göteborg)	2.5	2.5
	1986(Uppsala)	2.5	3.0
	1987(Borlange)	2.0	2.4
Tunisia	1982		17.4
Turkey	1984-1985(Ankara)		16.7
	1984-1985(Adana)		48.1
	1984-1985(Kocaeli)		15.0
Uganda	1994(R)		14.7
USA	1979		8.6
	1983		9.5
	1984-1987(Hawaii)		2.5
UK	1980	3.7	
	1979-1980		8.6
	1982		7.8
	1988	0.025	0.1
Yugoslavia	1984-1985(Serbia)		7.6
Zimbabwe	1989(Harare)		26.9

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NATIONAL MAXIMUM RESIDUE LIMITS

The Meeting was informed of the following national MRLs (next page) for DDT in animal products.

Definition of the residue: sum of *p,p′*-DDT, *o,p′*-DDT, *p,p′*-DDE and *p,p′*-TDE (*p,p′*-DDD).

Country	Commodity	MRL, mg/kg
Australia	Meat (fat)	5
European Union	Meat[1,2]	1
	Milk[3]	0.04
	Eggs[4]	0.1
Norway	Young bovine animal (fat)	1
	Pig (fat)	1
	Sheep (fat)	1
	Lamb (fat)	1
	Hen (fat)	1
	Reindeer (fat)	1
	Moose (fat)	1
Poland	Meat and meat products (fat)	1
	Milk and milk products	0.04
	Eggs	0.1

[1] In fat

[2] The maximum level of the residues in meat and meat products are expressed on the basis of fat. In the case of foodstuffs with a fat content of 10% or less by weight, the residue is related to the total weight of the boned foodstuff. In such cases, the maximum level is one-tenth of the value related to the fat content, but must be no less than 0.01 mg/kg.

[3] In determining the residues in raw cow's milk and whole cream cow's milk, a fat content of 4% by weight should be taken as a basis. For raw milk and whole cream milk of other animal origin the residues are expressed on the basis of the fat.

For other foodstuffs

- with a fat content of less than 2% by weight, the maximum level is taken as half that set for raw milk and whole cream milk,
- with a fat content of 2% or more by weight, the maximum level is expressed in mg/kg of fat. In such cases, the maximum level is 25 times that set for raw milk and whole cream milk

[4] For eggs and egg products with a fat content higher than 10% the maximum level is expressed in mg/kg fat. In such cases the maximum level is 10 times the maximum level for fresh eggs

APPRAISAL

DDT was first evaluated in 1966 and has been reviewed several times since. The JMPR in 1993 and 1994 proposed Extraneous Residue Limits (ERLs) for carrots, eggs, meat and milks and confirmed the previous temporary ERL proposed for cereal grains. The 1995 CCPR was informed that additional data on meat were available from Australia, New Zealand and the USA and decided to keep the proposal for meat (1 mg/kg) at Step 3 pending the evaluation of these data by the 1996 JMPR. The 28th (1996) Session of the CCPR advanced all ERLs except that for meat to Step 8. The existing CXL for meat, 5 mg/kg (fat), was converted to a temporary limit in 1993.

No information was supplied by governments on registered or recommended uses of DDT on crops or animals. Some countries allow its limited use for public health applications.

The Meeting received national residue survey data on DDT in meat from Australia, Germany,

New Zealand, Norway, Thailand, the UK and the USA.

The British annual report on residue monitoring for 1994, further data on dairy products from New Zealand and on commodities of plant origin from Norway and Spain were also provided. Information on residues and dietary intakes of DDT was made available by Global Environment Monitoring System - Food Contamination Monitoring and Assessment Programme (GEMS/Food) of WHO. Because no request was made for these data by the CCPR however, the Meeting could not conclude that a complete database was available to support re-evaluations of ERLs for commodities other than meat and proposed to postpone such evaluations to a later periodic review.

Definition of the residue: Sum of *p,p′*-DDT, *o,p′*-DDT, *p,p′*-DDE and *p,p′*-TDE (*p,p′*-DDD).

The residue is fat-soluble.

Meat. Residues of DDT and its metabolites in most of the many samples analysed were at very low levels, but in some samples of meat fat were higher than the proposed ERL of 1 mg/kg.
From Australia, results of 91,747 analyses of meat fat were available from 1989-1994, and 51 samples (0.06% of the total) of which 29 were beef, 1 deer, 1 horse, 13 sheep and 7 pork, contained residues above 1 mg/kg. In 3 samples the residues were higher than 5 mg/kg.

In Germany, 1653 samples of fat of meat were analysed in 1993. Only 1 sample of sheep fat and 2 samples of bacon (0.2% of the total number) contained residues in the ranges 1.1-2 and 2.1-5 mg/kg respectively.

Analyses of 1568 and 28,640 meat fat samples were available from Norway (1990-1994) and Thailand (1993-1994) respectively. All residues were lower than 1 mg/kg.

In the USA, 31 (0.08%) of 38,420 meat fat samples from 1991-1994 contained residues higher than 1 mg/kg (4 samples with residues above 5 mg/kg).

In UK monitoring in 1994 74 samples of lamb fat were analysed and none contained residues exceeding 1 mg/kg.

In a monitoring programme in New Zealand, from July 1990 to June 1994 analysis of a total of 4682 samples of meat fat from lambs, sheep, calves, cattle, pigs, deer and goats showed residues above 1 mg/kg in 1.6%, above 2 mg/kg in 0.43%, and above 5 mg/kg in 0.04% of the samples. In a separate survey of 403 lambs from a region with a history of DDT use 33%, 18% and 3% of the fat samples contained residues above 1,2 and 5 mg/kg respectively.

The following Table shows the distribution of DDT residues higher than the proposed ERL of 1 mg/kg.

Animal	No. of samples	Distribution of DDT residues in %		
		>1 mg/kg	>2 mg/kg	>5 mg/kg
Lambs	965	1.9	0.2	-
Adult sheep	548	2.2	0.7	-
Adult bovines	739	0.68	-	-
Suckling calves	1211	2.5	0.82	0.08
Pigs	925	1.1	0.43	0.11
Deer	227	0.88	-	
Goats	67	-	-	
Lambs from a region where DDT	403	33	17.6	3.2

Animal	No. of samples	Distribution of DDT residues in %		
was historically used				

In all, 162,102 samples of meat fat were analysed in Australia, Germany, Norway, Thailand, the UK and the USA, and residues above 1 mg/kg were found in 85 samples (0.05%). The samples from New Zealand belonged to a different population. Excluding the lambs from the region with a known DDT history, 1.6% of the 4682 samples analysed were higher than the proposed ERL of 1 mg/kg; 0.43% higher than 2 mg/kg and 0.04% higher than 5 mg/kg.

The GEMS/Food database for meat fat shows low levels of DDT residues in most countries, but maximum residues were found of 2 mg/kg in the former Soviet Union (1991), 4.1 mg/kg in China (1990), 7 mg/kg in Egypt (1993), 4.1 mg/kg in India (1989) and 91 mg/kg in Spain (1994). These figures are insufficient to support a revision of the proposed ERL, because some relevant information (e.g. number of samples analysed, explanation of extreme values) is not given.

RECOMMENDATIONS

On the basis of the residue data received from the government of New Zealand, the Meeting concluded that the ERL of 1 mg/kg for DDT in meat (fat) recommended by the 1993 JMPR should be increased to 5 mg/kg, thus confirming the existing temporary CXL.

Definition of the residue for compliance with MRLs and for estimation of dietary intake:

Sum of *p,p′*-DDT, *o,p′*-DDT, *p,p′*-DDE and *p,p′*-TDE (*p,p′*-DDD).

The residue is fat soluble.

Commodity		Recommended ERL, mg/kg	
CCN	Name	New	Previous
MM 0095	Meat	5 (fat)	1 (fat)

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