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origin. In the Australian samples, residues derived from DDT (dicophane) were at levels broadly similar to those in home-produced mutton fat, but in the New Zealand samples these residues were markedly higher. Beef fat from home-killed animals tended to have lower residues of BHC and dieldrin than did the corresponding mutton fat samples over the period 1963-69. The cattle examined were approximately evenly divided between store-fed animals and those predominantly grass-fed. This might have given some indication as to the source of the residues detected, but in fact the mean residue levels for the two sets of samples were very similar. Imported beef samples examined were mainly of Argentinian origin until 1969. Residues in these samples tended to be variable, but in general BHC and dieldrin levels were somewhat higher than in home-produced beef fat, while DDT-derived residues were slightly lower. The results for mutton and beef fats are summarized in Table II; those for butter are listed in Table III.

By 1970 the high concentrations of dieldrin, at one time so characteristic of home-produced mutton fat, were no longer found, and the annual arithmetic mean was down to 0.01 mg/kg. It was also apparent that the residue levels in home-produced beef, and in the major imports of beef and mutton, were either stable or tending to decrease, and continuous monitoring was suspended. The examination of New Zealand mutton fat was continued at a reduced level and Yugoslav and Irish beef fats were also sampled at a low rate.

With the entry of the UK into the European Economic Community (EEC) in January 1973, up-to-date data were needed to provide evidence on which the merits or otherwise of alternative control procedures could be discussed. In consequence, the sampling of home-produced mutton and beef fats was resumed towards the end of 1973, a limited sampling scheme for the fat of these and other meats imported from within the EEC having been started somewhat earlier.

Residues of hexachlorobenzene are normally negligible in UK-produced animal fats and no serious attempt had been made in the earlier surveys to record the trace quantities sometimes encountered. However, this compound assumes more importance among those residues found in the produce of some other countries.

There is also strong presumptive evidence for the presence of traces of polychlorobiphenyls (PCB) in the fatty products and these have also been estimated. As early as 1963, a series of unknown compounds was observed during the course of residue analyses; subsequently these were recognized as indicating the presence of PCB compounds (*New Scientist*, 1966). Peaks suggestive of the presence of PCB were recognized on the chromatograms given by occasional samples of bulk milk early in 1967; whilst originally relatively insignificant in size, more prominent peaks appeared as the year progressed. Two samples of the 19 examined between July and September 1967 contained an estimated 0.002 mg PCB/l, calculated on a whole-milk basis, while two out of 18 samples examined between October and December of the same year contained 0.005 mg PCB/l and 0.015 mg PCB/l. The bulk samples continued to give occasional PCB-type chromatographic traces during 1968, but no sample contained an amount of PCB in excess of an estimated 0.002 mg/l. Again, during 1969, PCB-type traces occurred erratically, the estimated maximum PCB content for the year being 0.003 mg/l. Some results obtained as part of the 1970–72 Total Diet Study are shown in Table IV; in this, 55 samples of each of the seven food groups comprising the total diet were examined, making 385 samples in all. PCBs were detected in only the 13 samples of milk and cereals indicated. The only other food in which PCBs were noted consistently was fish within the meat and fish group. The results for samples taken in 16 individual towns and cities in the UK and the Channel Islands during the period between April and September 1971 are shown in Table V. The levels of PCB compounds when they occur in foods are thus very low. The highest value found in the milk samples in 1967, if converted to an "in fat" basis, is 0.5 mg PCB/kg, which is well below the temporary tolerance level set in the USA.

ii. *Other Pesticides*

Limited surveys have also been made of specific organophosphorus insecticide residues in particular crops, including demeton-methyl and dimethoate residues in Brussels sprouts, lettuce, green peas, French-beans, potatoes and strawberries (Lee, 1968a), and malathion in imported cereals (Hill & Thompson, 1968; Thompson & Hill, 1969b). Similarly, potatoes and carrots have been examined for aldrin and dieldrin residues (Lee, 1968b), as have welfare foods (dried full-cream milk, cod-liver oil and concentrated orange juice) (Ruzicka, Simmons & Tatton, 1967), eggs and poultry (Findlay & Hamilton, 1968; Holmes, Simmons & Tatton, 1968), and

TABLE IV. Estimated concentrations of polychlorobiphenyls (PCB), expressed in mg/kg, in total diet samples in the UK, in 1970–71

Sample group	Location, and estimated concentration of PCBs in the period:			
	Oct. to Dec. 1970	Jan. to Mar. 1971	Apr. to June 1971	July to Sep. 1971
Cereals	Norwich, 0.10; Newcastle, 0.01	Norwich, 0.05	Norwich, 0.04	Norwich, 0.02
Meats	ND	London, 0.02	ND	ND
Green vegetables	ND	Torquay, 0.01	ND	ND
Milk	Aberdeen, 0.002; Glasgow, 0.002; Sheffield, 0.002	Aberdeen, 0.002; Brighton, 0.002; Liverpool, 0.002	ND	ND

ND: PCBs not detected in any sample, nor were they detected in these four periods in the three remaining groups: fats, fruits and preserves, and root vegetables

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ABLE V. Estimated PCB concentration (mg/kg) of the composite fish component samples of the total diet in the British Isles, in 1971

Location	Apr. to June 1971	July to Sep. 1971
berdeen	<0.01	<0.01
elfast	0.02	<0.01
righton	<0.01	NS
ardiff	0.01	<0.01
ookstown	0.06	<0.01
dinburgh	<0.01	<0.01
ilasgow	<0.01	0.08
kley	<0.01	NS
iverpool	<0.01	<0.01
ondon	<0.01	0.05
Newcastle	0.03	0.01
Norwich	0.02	0.03
t Helier (Jersey)	0.01	NS
heffield	<0.01	NS
hrewsbury	<0.01	<0.01
Torquay	0.05	<0.01

Abbreviation:
NS: No sample received

cereals, pulses and nuts (Hill, Fishwick & Thompson, 1973). Oth-- limited surveys have been made of bromide residues in cer and pulses (Thompson & Hill, 1969a; Hill & Thompson, 1973) and of triphenyltin residues in potatoes (Thomas & Tann, 1971).

b. Toxic Metals

Ruzicka & Egan (1971) have recently reviewed the occurrence of traces of mercury, lead, cadmium, arsenic and selenium in food.

i. *Mercury*[2]

The two reports on mercury published to date by the Working Party on the Monitoring of Foodstuffs for Heavy Metals have indicated an average dietary intake of 5–10µg mercury/day and that this intake is largely determined by the fish component of the diet (Ministry of Agriculture, Fisheries and Food, 1971, 1973b). Most food-stuffs, with the exception of certain coastal fish and shell-fish, contain very low concentrations of mercury, mainly in the form of methylmercury compounds. After publication of the supplementary report it was recommended that monitoring for mercury should be confined to periodic total diet studies during the following five years and that particular areas of contamination by mercury, notably discharges into waters where fish might be affected, should be sought out. Total diet studies are thus in progress, with those for 1974 currently being evaluated; at the same time, fish are being monitored continuously for traces of heavy metals by the Ministry of Agriculture, Fisheries and Food.

The tolerable weekly intake of mercury by adults was provisionally set at 0.3mg by the Joint FAO/WHO Expert Committee on Food Additives in 1971 (World Health Organization, 1972), the corresponding figure for methylmercury c ounds (included in the above) being 0.2mg for each a..., as shown in Table VI.

ii. *Cadmium*[3]

Three thousand, five hundred samples of food-stuffs were examined for the survey described in the report (Ministry of Agriculture, Fisheries and Food, 1973a); in most of these the concentrations of cadmium were below the limit of detection (0.01 mg/kg). In those samples in which cadmium was detected, the concentrations generally did not exceed 0.04 mg/kg. Higher concentrations were, however, found in some animal kidneys and fresh vegetables, but these were significantly lower than those found in certain shell-fish. The brown body meat of crabs has been found to contain a relatively high concentration of cadmium, ranging from 0.78mg/kg to 21mg/kg, compared with that of the white claw meat in which the average was 0.24mg/kg and the range was 0.13mg/kg to 0.33mg/kg. Crawfish, lobsters and nephrops, of which only the white meat is eaten, contained relatively small concentrations, with a maximum of 0.75mg/kg. With few exceptions, molluscs generally contained only small concentrations. The total diet studies conducted as described above also showed that few of the samples contained concentrations above the limit of detection and practically all the milk samples had less than 0.005mg cadmium/l. As a result, the cadmium content of the total diet sample cannot be estimated precisely and is better expressed in terms of the likely range of concentrations. On this basis, the cadmium concentration of the average diet is probably between 0.01 mg/kg and 0.02 mg/kg, corresponding to a weekly intake by each person of about 0.1mg to 0.2mg. The survey was able to distinguish areas that were particularly polluted, by means of the range of values found in locally grown crops or in local shell-fish. Crops grown near to a metal refinery were found to contain higher than average values of cadmium, and coastal estuaries used for the dumping of refinery waste contained molluscs with above average levels of cadmium. Because the consumption of shell-fish by people in the UK is low, the contribution of cadmium to the average diet from this source is negligible. In general, it was felt that cadmium intake in the country as a whole posed no hazard to health and it was recommended that no statutory limits for the amounts of cadmium in food were necessary. The monitoring of cadmium in the UK continues through the Total Diet Study.

iii. *Lead*[4]

The Working Party on the Monitoring of Foodstuffs for Heavy Metals completed the survey of lead in food in 1972 (Ministry of Agriculture, Fisheries and Food, 1972). Unlike mercury, lead is widely distributed in foods (Egan, 1972), although the amounts found are dependent on the nature of the

TABLE VI. Amount of the weekly intake of trace metals (expressed in mg/person) in the total diet

Trace metal	Provisional tolerable weekly intake *	Weekly intake assessed by dietary surveys
Mercury		
Total mercury	0.3	0.035–0.070
Methylmercury (expressed as mercury)	0.2	—
Lead	3.0 (Adults only)	1.4
Cadmium	0.4–0.5	0.10–0.21

* Data from World Health Organization (1972)

[2] See Magos, pp. 241–245 of this Bulletin.—ED.
[3] See Webb, pp. 246–250 of this Bulletin.—ED.
[4] See Clayton, pp. 236–240 of this Bulletin.—ED.