

dying, heart failure on admission, as determined clinically and radiologically, being nearly as likely to result in death from arrhythmia as in death from failure. Patients suffering late arrhythmic death were, however, much more ill than the survivors, having a greatly increased incidence of shock and heart failure, and a greater incidence of transmural infarction, particularly involving the anterior part of the heart. A detailed analysis of our 70 cases of late arrhythmic death showed that, excluding a few who had clearly diagnosable reinfarction, all but four had radiological evidence of interstitial or pulmonary oedema on admission, or heart failure, hypotension, or a major arrhythmia during the first few days after admission.

It is doubtful whether long-term E.C.G. monitoring of all patients at risk of late arrhythmic death is economically feasible or psychologically desirable, and it is probable that the yield in lives saved will be considerably less than by the institution of early intensive care as practised by Pantridge and his colleagues. It is also true that ventricular fibrillation complicating heart failure or shock has a poor prognosis in spite of monitoring and resuscitation (Robinson, 1965). Nevertheless, it is thought that arrhythmic death in patients who are recovering from circulatory failure is in many cases preventable with anti-arrhythmic drugs, and the logical use of E.C.G. telemetry (Cerkez *et al.*, 1965) is in this group of patients.

It is now our practice, in a four-bedded coronary care unit which has opened at Green Lane Hospital since this study was completed, to readmit patients who have had heart failure or major arrhythmia during their three to seven days of initial monitoring from the ward to the unit if their condition deteriorates. Warning signs of impending death from ventricular fibrillation are taken to be further chest pain not quickly relieved by trinitrin, a fall in blood pressure, or irregularity in the pulse which was not present before. Nurses are instructed to feel the pulse at the wrist of all coronary patients for a full minute and to report irregularities and ectopic beats. As late arrhythmic death occurs so seldom in uncomplicated cases, it can be argued that it is unnecessary to keep these

patients in hospital for more than a week, and that mobilization and rehabilitation may be correspondingly accelerated.

We are grateful to the visiting physicians of Auckland, Green Lane, and Middlemore Hospitals for allowing patients under their care to be studied, and to the medical registrars for accurate recording of information. Dr. P. W. T. Brandt, radiologist to the cardio-logical and cardiothoracic surgical units at Green Lane Hospital, kindly reviewed all the chest x-ray films. Facilities for the transfer of data to punch cards and analysis of the results were provided by the medical statistics unit of the Auckland Hospital Board.

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Organochlorine Pesticide Residues in Human Fat in Great Britain

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Summary : In order to assess the trend in the body load of organochlorine pesticide residues in Great Britain, between July 1965 and June 1967 samples of fat were taken during routine necropsies on 247 subjects over 3 years old and on 44 stillborn or premature babies and infants below the age of 3. The levels of the three main pesticides, B.H.C., dieldrin, and D.D.T., were lower than those found in an earlier survey carried out in 1963 and 1964. No marked differences were observed in levels throughout Britain, but the levels in man were higher than those in women. Britain compares favourably with other countries in which similar surveys have been done.

Introduction

The presence of organochlorine pesticide residues in human body tissues continues to attract considerable attention. Originally a matter of curiosity and concern, the determination of national mean concentration levels of these pesticides in

human fat has now come to be regarded more as a method of measuring the degree of exposure to which a population is subjected. Useful information can be derived from each set of results and also from any trends that may become apparent from year to year. The effects of the general withdrawal from use of certain pesticides, or the introduction of new compounds into agricultural and veterinary practice, can be followed by such studies.

Between 1965 and 1967 at least 15 publications have appeared giving results of analyses of samples of human fat from such widespread sources as, for example, India (Dale *et al.*, 1965), Israel (Wassermann *et al.*, 1965), Denmark (Wiehe, 1966), New Zealand (Brewerton and McGrath, 1967), and New Orleans (Hayes *et al.*, 1965). All of these papers tell much the same story ; that these organochlorine pesticide residues are omnipresent. The papers differ, however, in reporting mean concentration levels, varying sometimes by orders of magnitude according to country.

In Britain an early study in 1961 was confined to South-east England (Hunter *et al.*, 1963). In 1963 and 1964 a further study, instigated by the Advisory Committee on Pesticides and Other Toxic Chemicals, was carried out jointly by

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the Ministry of Health and the Laboratory of the Government Chemist. This study covered selected centres in England and Wales (Egan *et al.*, 1965). A second and larger joint study by these two bodies has now been carried out and the field has been extended to include Scotland. The results obtained are reported and discussed in this present publication.

Experimental Methods and Materials

Between July 1965 and June 1967 247 samples of human perirenal fat, each of not less than 5g., were collected from subjects over 3 years old during the course of routine post-mortem examination by pathologists; one biopsy sample removed during surgical treatment of one of us was also examined. In addition, 44 further post-mortem samples were taken from either prematurely born or stillborn babies or from infants up to 3 years old.

All the specimens were placed in specially cleaned and prepared glass containers and stored at -20°C . while awaiting analysis.

Samples of fat were first freed from any non-fatty material and dried with cellulose tissue. The pesticide residues were extracted from the samples with hexane and cleaned-up by the method of de Faubert Maunder *et al.* (1964), which includes a dimethylformamide-hexane partition and passage through a column of prepared alumina. The final solutions were then examined by gas-liquid chromatography on silicone and Apiezon columns (Simmons and Tatton, 1967) using electron-capture detection. Results for some of the samples were confirmed by a thin-layer chromatographic method (Abbott *et al.*, 1964).

Results

The 248 samples from subjects over 3 years old comprised 157 male and 91 female specimens. The results are summarized in Table I. As is usually the case in this work, the distributions tend to be skew, and the geometric means, which are likely to be more meaningful than the arithmetic means, have also been inserted.

Of the B.H.C. isomers found, beta-B.H.C. was predominant in all samples, usually to the extent of 90 to 95% of the total B.H.C., the remainder being the alpha and gamma isomers in roughly equal proportions. The ratio of *pp'*-D.D.T. to its initial breakdown product or metabolite, *pp'*-D.D.E., varied with individual samples but in any particular grouping, whether by sex, geographic origin, or age group, was fairly constant at about 1 part *pp'*-D.D.T. to 2.6 parts of *pp'*-D.D.E. A very similar ratio was obtained in a United States study (Hoffman *et al.*, 1967) of 994 specimens taken in the Chicago area. Small amounts of *pp'*-T.D.E., a further breakdown product of *pp'*-D.D.T., were also observed in some samples, but overall it amounted to less than 2% of the total D.D.T. and its derivatives.

The variability between individual results did not differ significantly from that observed in the previous survey (Egan *et al.*, 1965). Table II compares the results from that earlier work with those obtained in the present study. In Table II the results have been divided to show any differences attributable to sex. It is apparent that since 1964 there has been a decline in the mean levels for all the pesticide residues found in the human fat of both sexes in the U.K. This decline amounts overall by 1966-7 to about 35% of the amounts found in 1963-4 for B.H.C. isomers, and about 20% for dieldrin and total D.D.T. Mean concentrations of B.H.C. isomers show little difference for the sexes but differentiation is more noticeable in the dieldrin results. It is even more marked when total D.D.T. results are compared, the male subjects showing levels about 50% higher than females. Hoffman *et al.* (1967) obtained similar differences in the D.D.T. contents of men and women in the U.S.A.

The effect of geographical location is shown in Table III. For this purpose Great Britain was divided into three areas: England south of a line drawn from the Bristol Channel to the Wash, England north of this line and Wales, and Scotland. On the whole no significant differences can be seen between the results for the three areas. Differences, according to sex, in levels of D.D.T. compounds are perhaps greater in samples from Southern England, with only slight variations apparent with respect to the other pesticides. Results obtained in

TABLE I.—Mean Pesticide Residue Levels in Human Fat in Great Britain (1965-7). 157 Male and 91 Female Subjects Over 3 Years Old (parts per million)

	Total B.H.C.	Heptachlor Epoxide	Dieldrin	<i>pp'</i> -D.D.E.	<i>pp'</i> -D.D.T.	Total D.D.T.*
Arithmetic mean	0.31	0.04	0.21	2.0	0.78	3.0
Range	0.01-1.88	0.0-0.40	0.1-1.0	0.04-9.6	0.03-3.1	0.08-13.0
Standard error of mean	0.01	—	0.01	—	—	0.1
Median value	0.29	—	0.20	—	—	2.9
Geometric mean	0.25	—	0.17	—	—	2.5
95% confidence limits for geometric mean	0.22-0.27	—	0.15-0.19	—	—	2.3-2.7

* The total D.D.T. has been calculated by adding the *pp'*-D.D.T. equivalent of the *pp'*-D.D.E. found to the *pp'*-D.D.T. found as such.

TABLE II.—Distribution of Organochlorine Pesticides in Human Fat by Sex and Period. 1965-6 : 57 males, 30 females. 1966-7 : 100 males, 61 females (parts per million)

	1st Year 1965-6		2nd Year 1966-7		Whole Period 1965-7	
	Male	Female	Male	Female	Male	Female
B.H.C.*:						
Beta-B.H.C.—arithmetic mean	0.37	0.36	0.23	0.23	0.28	0.28
—arithmetic mean	0.40	0.38	0.25	0.26	0.31	0.30
—Geometric mean	—	—	—	—	0.24	0.25
—Range	0.11-1.9	0.21-0.81	0.01-0.68	0.04-0.70	0.01-1.9	0.04-0.81
Heptachlor epoxide†:						
Arithmetic mean	0.042	0.036	0.046	0.030	0.045	0.032
Range	0-0.15	0-0.08	0-0.40	0-0.08	0-0.40	0-0.08
Dieldrin‡:						
Arithmetic mean	0.25	0.21	0.23	0.17	0.23	0.18
Geometric mean	—	—	—	—	0.18	0.15
Range	0.05-1.0	0-0.45	0.01-0.80	0.03-0.50	0.01-1.0	0-0.50
D.D.T.§:						
<i>pp'</i> -D.D.E.—arithmetic mean	2.6	2.0	2.0	1.5	2.2	1.6
<i>pp'</i> -D.D.T.—arithmetic mean	0.98	0.82	0.74	0.61	0.83	0.68
—Arithmetic mean	3.9	3.0	3.0	2.2	3.3	2.5
—Geometric mean	—	—	—	—	2.8	2.2
—Range	0.37-13.0	0.87-8.1	0.08-8.5	0.21-4.7	0.08-13.0	0.21-8.1

* The arithmetic means for total B.H.C. isomers in the 1963-4 survey (Egan *et al.*, 1965) were: male 0.43 p.p.m., female 0.40 p.p.m.

† In the 1963-4 survey (Egan *et al.*, 1965), a trace of heptachlor epoxide, not exceeding 0.10 p.p.m., was detected in most samples of both sexes.

‡ The arithmetic means for dieldrin in the 1963-4 survey (Egan *et al.*, 1965) were: male 0.27 p.p.m., female 0.23 p.p.m.

§ The arithmetic means for total D.D.T. in the 1963-4 survey (Egan *et al.*, 1965) were: male 3.7 p.p.m., female 2.7 p.p.m.

Somerset in 1965 showed slightly higher dieldrin levels but lower results for D.D.T. and B.H.C. compounds (Cassidy *et al.*, 1967).

TABLE III.—Mean Pesticide Residues in Human Fat by Geographical Location of Subjects (parts per million)

	Southern England		Northern England and Wales		Scotland	
	Male	Female	Male	Female	Male	Female
Beta-B.H.C. ..	0.27	0.28	0.29	0.33	0.28	0.24
Total B.H.C. ..	0.30	0.30	0.32	0.36	0.30	0.25
Heptachlor epoxide ..	0.05	0.03	0.04	0.03	0.04	0.03
Dieldrin ..	0.25	0.17	0.23	0.18	0.22	0.18
Total D.D.T. ..	3.4	2.2	3.2	2.3	3.3	2.9
pp'-D.D.E. ..	2.3	1.4	2.1	1.5	2.3	1.9
pp'-D.D.T. ..	0.85	0.64	0.80	0.59	0.82	0.78
No. of subjects ..	66	39	43	20	48	32

The observed distribution of the results by age, sex, and pesticide residue level is depicted in Table IV, in which the figures show the percentage of the total falling in each age group. The 41 to 60 age group contains the greatest percentage of the total having residues in the higher ranges.

TABLE IV.—Distribution of Pesticides in Human Fat by Age, Residue Level, and Sex

Pesticide	Residue Range (p.p.m.)	Age Group in Years					
		5-40		41-60		Over 60	
		Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)
Total B.H.C.	0-0.10	13	13	9	5	10	7
	0.11-0.20	30	30	21	18	21	11
	0.21-0.30	27	40	10	27	23	24
	0.31-0.40	24	13	17	27	17	29
	Over 0.40	6	4	43	23	29	29
Dieldrin	0-0.10	37	30	18	18	15	25
	0.11-0.20	31	61	33	37	31	39
	0.21-0.30	23	9	13	18	31	27
	0.31-0.40	6	—	21	18	14	9
	Over 0.40	3	—	15	9	9	—
Total D.D.T. equivalent	0-0.20	35	52	25	41	26	52
	2.1-3.0	23	31	20	18	30	27
	3.1-4.0	17	13	18	32	21	7
	4.1-5.0	14	4	20	5	17	9
	Over 5.0	11	—	17	4	6	5

Table V gives the results of the analyses of samples from prematurely born or stillborn babies and infants under 3 years old. It is apparent that the foetus in the womb receives some of its mother's ingested pesticides through the placental barrier. This passage of organochlorine pesticides through the placental barrier to the foetus has been shown by Hathway (1965) to occur in rabbits. Thus the child starts its extrauterine life with significant concentrations of these pesticide residues already stored in its fat. There is a decline in these levels during the first three months after birth; this may be due in some measure to the rapid increase in fat content of the infant in the first months of its extrauterine life compared with the generally sparse fat of the foetus, the pesticides present at birth being thus diluted. Such a decline could also be the result of a change to bottle-feeding on cow's milk rather than breast-feeding. Human breast milk contains substantially higher quantities of pesticides than cow's milk in Great Britain (Egan *et al.*, 1965), so that any effects due to this change of feed would vary according to the source of the milk. It is also evident that subsequent transfer to a more adult diet leads to increases in the levels found.

TABLE V.—Organochlorine Pesticide Residues in Fat of Infants Under 3 Years Old—1965-7 (parts per million)

Age Group	No. of Samples		Beta-B.H.C.	Total B.H.C.	Dieldrin	pp'-D.D.E.	pp'-D.D.T.	Total D.D.T.
Prematurely born, stillborn, or died within 24 hours ..	23	Arithmetic mean	0.12	0.13	0.09	0.65	0.24	0.96
		Range	0-0.55	0-0.55	0-0.25	0.07-1.8	0-0.55	0.12-2.6
1 day to 3 months ..	11	Arithmetic mean	0.10	0.13	0.07	0.48	0.19	0.72
		Range	0.02-0.31	0.03-0.31	0.02-0.17	0.04-1.2	0.05-0.40	0.09-1.7
3 months to 1 year ..	10	Arithmetic mean	0.12	0.15	0.11	0.50	0.26	0.81
		Range	0.04-0.30	0.06-0.36	0.04-0.30	0.15-0.90	0.08-0.70	0.25-1.6

Conclusions

It is gratifying to be able to record that the mean concentrations of the three main pesticides, B.H.C., dieldrin, and D.D.T., in the human body in Great Britain have decreased over the last few years. It is worth noting that a decline has also been observed concurrently in the levels of these organochlorine pesticide residues in fatty foods consumed in this country (Egan *et al.*, 1966; Ministry of Technology, 1962-7). The decline in the dieldrin content of some of our home-produced food-stuffs is undoubtedly due to the abandonment in recent years of many of the previously approved uses of aldrin and dieldrin. It is significant that this observed decline of the B.H.C., dieldrin, and D.D.T. contents of our food has its parallel in their decline in our body fat and indicates that dietary sources are probably the main factor in determining the levels in human fat in this country.

It is difficult to account for the differences between the mean levels for the sexes except on the grounds that either males in general eat heavier and fattier meals than females or that women usually carry a larger amount of adipose tissue distributed over their persons than do men.

As mentioned earlier, the problem of organochlorine pesticide residues in human tissue is world-wide. Table VI compares the results of the present survey, for subjects over 3 years old, with those reported in recent years. It will be observed that while there is a general uniformity of dieldrin content at about the 0.2 p.p.m. level the D.D.T. results are much more variable.

TABLE VI.—Dieldrin and D.D.T. Residues in Human Fat in Various Countries

Country	Period	No. of Samples	Mean Residues (p.p.m.)			Ref.
			Dieldrin	pp'-DDE	pp'-DDT	
U.K. ..	1961/2	131	0.21*	—	—	Hunter <i>et al.</i> (1963)
U.S.A. ..	1961/2	30	0.15	3.8	1.1	Dale & Quinby (1963)
U.S.A. ..	1961/2	130	—	7.8	4.0	Quinby <i>et al.</i> (1965)
U.S.A. ..	1962/3	282	—	7.4	2.9	Hoffman <i>et al.</i> (1964)
U.S.A. ..	1962/3	64	0.11	—	—	Hoffman <i>et al.</i> (1964)
U.K. ..	1963/4	65	0.26	2.0	1.1	Egan <i>et al.</i> (1965)
Israel ..	1963/4	254	—	10.7	8.5	Wassermann <i>et al.</i> (1965)
India ..	1964	24	0.03	11.6	13.6	Dale <i>et al.</i> (1965)
U.S.A. ..	1964	25	0.29	6.9	1.7	Hayes <i>et al.</i> (1965)
U.K. ..	1964	100	0.21	2.3	1.0	Robinson <i>et al.</i> (1965)
Canada ..	1966	27	0.22	2.7	1.1	Brown (1967)
U.K. ..	1965-6	101	0.23	1.5	1.1	Cassidy <i>et al.</i> (1967)
New Zealand	1966	52	0.27	3.8	1.5	Brewerton & McGrath (1967)
Denmark ..	1966	17	0.20	2.5	0.60	Weihel (1966)
U.S.A. ..	1966	71	0.22	6.7	2.8	Fiserova-Bergerova <i>et al.</i> (1967)
U.S.A. {	1962/6	994	—	7.0	2.6	Hoffman <i>et al.</i> (1967)
U.S.A. {	1962/6	221	0.14	—	—	Hoffman <i>et al.</i> (1967)
U.K. ..	1965/7	248	0.21	2.0	0.78	This paper

* Only geometric mean calculated.

Thus in India and Israel, where much D.D.T. is used for public health reasons, the levels of total D.D.T. equivalent are about 20 p.p.m. In the U.S.A., where D.D.T. has a wide-spread pesticide usage, about 8 to 10 p.p.m. of D.D.T. compounds are found in human fat.

Thus, compared with most other countries in which similar studies have been made, D.D.T. residues in human fat in Great Britain remain at a very low level, and indeed there has been an apparent decline in the general levels of all the pesticide residues. This could be regarded as a comparatively satisfactory state of affairs.

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Tinea Incognito

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Summary: Fourteen cases are described in which the local application of corticosteroid preparations to ringworm infections of the skin have resulted in unusual clinical pictures. A kerion-like lesion due to *Trichophyton rubrum*, intertriginous infections simulating candidiasis and due to *Epidermophyton floccosum*, and pictures resembling poikiloderma, papular rosacea, and indeterminate leprosy are among the changes that were seen in these patients.

Introduction

Dermatology has been greatly helped in recent years by the introduction of a variety of potent therapeutic agents. While this has often meant that diseases are easier to control it has also resulted in an increase of iatrogenic disease.

Corticosteroid ointments tend to be used as a dermatological panacea and the misuse of these powerful agents is often the cause of commonly observed iatrogenic skin disease. While the frequently disastrous results of the systemic abuse of corticosteroids have been well documented there are few references to the problems that result from their inappropriate topical application (Grice, 1966).

Dermatologists have become increasingly aware that the clinical appearance of some rather common skin diseases may be rendered almost unrecognizable by topical steroids and particularly by the use of their fluorinated derivatives. This applies especially to those dermatoses in which the use of these compounds is normally contraindicated.

A principal action of corticosteroids is to suppress inflammation, and when administered systemically they can hinder immune responses. In this way they may contribute significantly to the morbidity of infective disease of all types, specific examples being bacterial infections such as tuberculosis,

viral infections such as chicken-pox, and fungal diseases such as ringworm (Kligman, Baldridge, Rebell, and Pillsbury, 1951). Extensive tinea corporis is a well-documented complication of Cushing's disease (Canizares, Shatin, and Kellert, 1959). Thus it is surprising to find that corticosteroids are not infrequently used in the management of infective skin disease. This situation probably derives in part from the tendency of patients to indulge in self-medication with hoarded ointments. In most instances, however, it would appear to stem from the recognition, by doctors, of the undoubted ability of steroids to provide prompt relief of symptoms by the suppression of inflammation. Systemic immune responses can usually contain the infection, and patient satisfaction is assured. This appertains especially in herpes simplex, when the risk of promoting keratitis is often disregarded.

Impetigo, scabies, and specifically ringworm infections are also often mistakenly treated by local corticosteroid preparations and sometimes even by systemic administration. The bizarre clinical pictures which ensue can tax the most expert diagnostician. The following cases illustrate the difficulties resulting from the use of local corticosteroids in the treatment of superficial fungus infections.

Case Reports

Case 1.—A West Indian woman aged 31 complained of an irritating rash that started in the groins and spread to the adjoining thighs. She had been given Synalar (fluocinolone acetonide) and Betnovate (betamethasone-17-valerate), which brought transient symptomatic relief only. On examination there were well-defined patches which were non-scaly, depigmented, purplish, and telangiectatic. Fungal mycelium was seen in a scraping of the involved skin and *Epidermophyton floccosum* was grown from skin scales. She was treated with half-strength Whitfield's ointment and was clear after three weeks.

Case 2.—A woman aged 71 had a rash on the feet and ankles for the previous year. She had used betamethasone under poly-

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