TABLE III.—*Tuberculin Tests in the Rural Districts of Örebro County*

Age in Years	Non-reactors	Age in Years	Non-reactors
1-5 ..	90%	30-40 ..	11%
5-10 ..	83%	40-50 ..	6%
10-15 ..	83%	50-60 ..	4%
15-20 ..	35%	60-70 ..	4%
20-25 ..	23%	>70 ..	6%
25-30 ..	16%		

groups, especially in the rural districts. The administrative area of Örebro, where these investigations have been conducted, has many big industries and good communications. It is therefore probable that the high number of non-reactors found there is not an exceptional phenomenon but one applicable to many other districts both in Sweden and in other countries. If the B.C.G. vaccination of all non-reactors should meet with organizing difficulties, it could be initially confined to the newborn and to school-children just before the age of puberty. In addition, of course, all medical students, probationer nurses, and other hospital staff ought to be vaccinated, for it has been established by numerous investigations that these fall victims to tuberculosis to a greater extent than others.

Tuberculin Control and Revaccination.—Every vaccinated person ought to be tuberculin-tested six to seven weeks after the vaccination. Should the reaction not be positive, revaccination ought to be done. Later on controls should also be undertaken now and then to see whether the tuberculin reaction is still positive, and in case of need vaccination should be repeated. Children vaccinated at birth may be conveniently controlled in the first and the last form at school. Probationer nurses and other hospital staff should be controlled before they start service at a sanatorium or other hospital ward where the risk of infection is particularly great.

Summary and Conclusions

The harmlessness of B.C.G. is established beyond doubt. If Wallgren's method is used and the vaccine in a dose of 0.05 mg. is injected strictly intracutaneously, large abscesses very seldom appear (0.8%). Small abscesses occur in about 7.8%. They heal, however, relatively soon and without giving any persistent lesions. In newborn infants abscesses occur much more rarely (2.3%) than in older children and in adults. Nor does B.C.G. vaccination involve any other unpleasant effects. Birkhaug's needle-puncture method cannot be recommended.

The newborn become tuberculin-positive after vaccination to the same extent as older children and adults, subsequently remaining positive for several years.

Of the 22,413 B.C.G.-vaccinated cases during the period 1942-7, only one developed tuberculosis—a pleuritis in a probationer nurse who was tuberculin-negative in spite of two B.C.G. vaccinations.

In other places where B.C.G. vaccination has been employed to a great extent a definite impression has been made that it gives good protection against tuberculosis, although on account of the absence of controls this cannot be regarded as proved.

In earlier investigations published conjointly with Hedvall I have shown that pulmonary tuberculosis in adolescents often develops in connexion with a recent primary infection. Several other Scandinavian investigators have arrived at a similar view. Hyge's investigation of a tuberculosis epidemic in a school would seem to have placed it beyond all doubt that B.C.G. vaccination can prevent a development of progressive pulmonary tuberculosis in the majority of cases.

B.C.G. vaccination of all newborn infants and the vaccination of non-reactors, first proposed by Heimbeck, ought for this reason to be utilized to the greatest possible extent.

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EXPOSURE TO D.D.T.

BY

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AND

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Since 1943 some millions of people must have been exposed to D.D.T. in various forms and for varying periods of time, and it would appear from common experience that poisoning from D.D.T. in its insecticidal forms is most unlikely. Individual cases of poisoning have been recorded, but the effects of any solvent or vehicle used have seldom been completely ruled out. This applies especially to the common mixture of D.D.T. in kerosene.

In July, 1946, D.D.T. residual spraying on a large scale was started in Abadan, South Iran. The solvent used was commercial kerosene, and fairly frequent chemical examinations showed that a concentration of D.D.T. ranging from 3 to 4% was being obtained. Also in use was a 2.5% solution of D.D.T. in "black oil" (a mixture of 75% gas oil and 25% fuel oil), which meant that there were three broad groups of exposed persons—the sprayers, the "black oilers," and the mixers.

The sprayers were young men of the sweeper class who were trained to apply D.D.T. in kerosene to the walls of quarters and outhouses as a residual spray. The apparatus used was a standard "Four Oaks" knapsack spraying machine with a fine nozzle. The sprayers were organized in gangs, each gang being responsible for the spraying of a given housing area once every two months. The exposure was twofold—by the skin and by inhalation.

The "black oilers" were trained searchers for mosquito larvae. They carried a 1-litre can full of 2.5% solution of D.D.T. in gas-oil-fuel-oil mixture, and when they found mosquito larvae they sprinkled this solution on the breeding-place and reported it on returning to the office at night. The exposure was by the skin only.

The mixers prepared both solutions in a yard. The first step was to prepare a sludge of D.D.T. by crushing the powder in solvent in a 4-gallon (18-litre) tin and transferring the sludge to a 30-gallon (136-litre) drum of solvent. Difficulty in obtaining rapid solution was experienced, especially in the winter, which accounts for the fluctuation in the final concentrations obtained. The exposure in this case was by the skin only.

After nine months of this fairly continuous exposure it was felt that an opportunity presented itself of attempting to assess the occurrence of any deterioration in health. Accordingly, those who had been exposed to D.D.T., numbering 32 in all, were clinically examined and the results recorded on a standard card. A control group of 36 sanitary workers were examined by the same means. The sanitary

workers earn the same wages, eat the same food, have the same living conditions, and only varied to any real extent in respect of age (see Table I).

TABLE I.—*Comparison of D.D.T. Workers and Sanitary Workers by Age*

Years	D.D.T. Workers	Sanitary Workers
15-	13	10
20-	5	—
25-	2	—
30-	2	1
35-	1	3
40-	—	1
45-	2	3
50-	1	3
55-	—	7
60-	3	3
65-	—	—
70-	—	1
Total	29	32
Mean	28.7 years	41.4 years
S.D.	15.1	18.0

Three ages in the D.D.T. group and four in the sanitary group were not recorded. It must be remembered, too, that these ages are as stated by the subject, who relies on memory only.

A member of the chemical and development staff of the Anglo-Iranian Oil Co., Ltd., had previously worked out a method of estimating D.D.T. or its degradation product D.D.A. The method devolved on the isolation and estimation of organically bound chlorine in the urine, and to this end all the D.D.T.-exposed workers were admitted to hospital and a 24-hour sample of urine collected in chemically clean bottles. The control group were not, of course, admitted to hospital. The chemical method was subsequently discovered to be substantially similar to that of Smith and Stohlman (1944).

Results of Investigation

Both groups suffered from trachoma, with or without conjunctivitis, but not more frequently than occurs in the general population of South Iran. Dental caries was considerably commoner in the control group, as would be expected from the difference in age. Three workers in the control group and one worker in the exposed group were sufficiently under suspicion at clinical examination to necessitate examinations of sputa for tubercle bacilli. These were negative. The spleen was enlarged in three workers of the control group and in none of the exposed group.

The control group showed no evidence of any abnormality in the central nervous system, while nine of the D.D.T. group were reported as showing "tremor of the hands." The D.D.T. workers had been exposed for a mean period of nine months, the standard deviation being 2.3. The comparative ages of the groups are shown in Table I, while the records of weight are shown in Table II. Table III gives a comparison of the groups by systolic blood pressure.

TABLE II.—*Comparison of D.D.T. Workers and Sanitary Workers by Weight*

Lb. (Kg.)	D.D.T. Workers	Sanitary Workers
70- (31.75)	1	2
80- (36.29)	4	4
90- (40.82)	4	5
100- (45.36)	9	3
110- (49.89)	5	8
120- (54.43)	4	7
130- (58.97)	5	4
140- (63.50)	—	1
150- (68.04)	—	1
160- (72.58)	—	—
170- (77.11)	—	1
Total	32	36
Mean	109.1 ± 3.0 lb.	113.6 ± 3.7 lb.
S.D.	16.9	22.0

Difference between means = 4.5
S.E. of diff. between means = 4.73

TABLE III.—*Comparison of D.D.T. Workers and Sanitary Workers by Systolic Blood Pressure*

Mm. Hg	D.D.T. Workers	Sanitary Workers
100-	1	1
110-	5	9
120-	10	4
130-	7	6
140-	3	4
150-	2	3
160-	1	1
170-	2	—
180-	—	—
190-	—	1
200-	—	—
210-	—	1
Total	31	35
Mean	133.4 ± 3.0 mm. Hg	140.4 ± 4.4 mm. Hg
S.D.	17.0	25.9

Difference between means = 7.0

S.E. of diff. between means = 5.4

In one case in each group the blood pressure was not recorded.

Discussion

According to Neal and von Oettingen (1946), who have so far given the best summary on the subject, there has been no case of poisoning by D.D.T. itself. These observers make it a point that in all the reported cases of poisoning, either by the skin or by ingestion through the intestinal tract, the effect of the solvent has not been ruled out. Gordon (1946), who conducted field observations in West Africa similar to those reported here, reached the conclusion that kerosene was much more irritant than D.D.T. and put up a plea for a less toxic solvent. In our experience in Abadan—a large petroleum products refinery—we know that kerosene can cause vesication of such severity as to resemble second-degree burns, especially under circumstances which allow of the clothes being soaked in it. The D.D.T.-exposed workers often suffered from vesication where the shoulder straps of the "Four Oaks" sprayer chafed the skin. This condition, however, decreased in frequency as time went on, which leads us to think that kerosene is the offending agent and not D.D.T. It is our experience that kerosene skin-effects behave in this manner—a fact also noted by Gordon.

Cameron and Burgess (1945) give the signs and symptoms of D.D.T. poisoning as decrease in body weight, anorexia, muscular weakness, and fine tremors. In the workers observed there was no significant difference between the groups as regards weight (see Table II). Enlargement of the liver was found more often in the control group, and was almost certainly the result of chronic malaria. The blood-pressure findings are statistically insignificant. Muscular tremors were recorded in the exposed group, but bias cannot be ruled out, as it was impossible to organize the investigation so that the clinical examiner was unaware whether he was examining an exposed worker or a sanitary worker.

The urine in no case showed organically bound chlorine. West and Campbell (1946) report that after prolonged exposure D.D.T. or D.D.A.—di(*p*-chlorophenyl)acetic acid—appears in the urine and increases progressively to a steady level of excretion. They further state that only a small fraction of the amount absorbed is excreted in the urine and bears no regular relationship to it. It would appear, therefore, that this is an uncertain method of estimating exposure or absorption.

Conclusion

Buxton (1945) stated "without reserve and in simple words" that D.D.T. in its insecticidal form was perfectly safe. Other observers have since confirmed this, and our results are added confirmation from the field. Protective clothing in the form of oil-proof capes, masks, and gloves has been offered to these workers, but it is impossible to

insist on their use under the conditions pertaining in Abadan, where the maximum shade temperature may rise to 123° F. (50.55° C.), and was maintained during the summer of 1947 at a daily average of over 110° F. (43.3° C.) for two months. The only equipment they would consent to use was overalls and goggles, and the latter but rarely. These workers therefore have spent their working days with D.D.T. in oil solution in contact with the skin of their hands, arms, and shoulders. They also inhaled it in fine droplets or mist as it emanated from the "Four Oaks" sprayer.

So far as this investigation goes there is no reason to believe that the continual use of D.D.T. in kerosene in a concentration of 3.1% gives rise to any toxic effects. We agree with Gordon (1946) that it is unfortunate that kerosene is the commonest, cheapest, and most readily available solvent, and would add our voice to his plea for the use of a less noxious solvent, or for the increased use of emulsions where these are practicable.

Summary

Iranian workers engaged in handling D.D.T. in oily solution were examined clinically and compared with a control group of sanitary workers, especially as regards weight and blood pressure, without significant difference being observed.

It would seem that intoxication is most unlikely to arise from exposure to D.D.T. in oily solution under the conditions of use described here, where the wearing of protective clothing is impossible.

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TRAUMATIC PSEUDO-CYST OF THE PANCREAS WITH PLEURAL EFFUSION REPORT OF TWO CASES

BY

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The general features of cysts and fluid collections in relation to the pancreas are well known. The two cases here reported were associated with a left-sided pleural effusion and appear to be unusual enough to warrant publication.

Case 1

An R.A.F. sergeant aged 20 was crushed between two motor vehicles on Nov. 28, 1945, and was admitted to an R.A.F. general hospital on the same day. He was found to have multiple injuries, the most important of which were fractures of the left side of the pelvis and of the lower end of the right radius. There was no apparent fracture of the ribs. He was at first treated in a plaster spica, and the wrist was immobilized in a plaster cast after reduction of the fracture. As reduction of neither fracture remained satisfactory, on Dec. 7 the wrist was again manipulated, and the left leg was placed in a Thomas's splint with extension by skin traction. Four days later the patient complained of pain in the left lower chest and his temperature rose to 101.4° F. (38.55° C.). The pyrexia gradually abated, but by Dec. 13 it was apparent that he had a considerable left pleural effusion. This was confirmed by x-ray examination: no rib fracture could be seen in the film. Pleural fluid

to the amount of 10 ml. was aspirated for diagnostic purposes. It contained many red cells; of the leucocytes present 52% were polymorphonuclears and the remainder lymphocytes. As the fluid continued to increase, 1,090 ml. of blood-stained fluid was aspirated on Dec. 17 and 400 ml. on Jan. 5, 1946.

His temperature subsided after the initial fever, but rose to 100° F. (37.8° C.) on Jan. 7. He had no abdominal symptoms or physical signs until Jan. 8, when a swelling was noticed in the left upper abdomen. This swelling rapidly increased in size and on the 9th presented a smooth, well-demarcated semi-circular edge which reached the midline in the epigastric region and extended downwards almost as far as the umbilicus. It appeared to originate beneath the left costal margin, did not move with respiration, and was dull on percussion. A radiograph of the chest showed that a moderate-sized pleural effusion was still present, and a film of the abdomen showed a dense smooth shadow in the left upper abdomen which displaced the stomach to the right and the intestine downwards. The left pleural cavity was aspirated, but only 20 ml. of deeply blood-stained fluid could be withdrawn.

Various possible diagnoses were entertained at this time, but the presence of a rapidly enlarging abdominal swelling could not be readily reconciled with a pleural effusion becoming gradually more deeply blood-stained. It was thought that there might be a delayed rupture of the spleen, with a haematoma in the lesser sac. The abdomen was explored through a left subcostal incision under general anaesthesia on Jan. 9. A very large cystic swelling was found to be occupying the left side of the upper part of the abdominal cavity. It was about 8 in. (20 cm.) in diameter and presented between the stomach and the transverse colon, displacing the former to the right and the latter downwards. The spleen, in the region of its hilum, was adherent to the thick wall of the cyst. The cyst wall was anchored to the anterior parietal peritoneum and was drained by a large tube brought out through a separate stab incision. The cyst contained about 1,100 ml. of clear yellowish fluid with a slightly green tinge. The diastatic index of the fluid was 10 units, and small amounts of trypsin were present, but no lipase.

The patient made an uninterrupted recovery from the operation. By connecting the drainage-tube to a bottle beside the bed excoriation of the skin was entirely avoided. By the 46th post-operative day the fistula had become dry and remained permanently so.

During convalescence the pancreatic function was further investigated. There was normal splitting of the faecal fat, and the glucose-tolerance curve was normal. The haemothorax progressively diminished after operation. On Jan. 16, 150 ml. of blood-stained fluid was aspirated; eight days later only 15 ml. could be removed, and no further aspiration was needed. By March 5 the patient was feeling very well. A radiograph of the chest showed that the effusion had completely disappeared. He was discharged on March 25, and when seen again on April 8 he had no abdominal symptoms and his wound remained soundly healed.

Case 2

An airman aged 21 was crushed between a wall and a motor vehicle on Nov. 20, 1945, while serving in Germany. He was admitted to a British general hospital and underwent laparotomy on the same day. A ruptured spleen was removed and an intussusception of the small intestine was reduced. At first he made a good recovery from the operation, but eight days later he developed a cough with blood-streaked sputum. A left-sided pleural effusion was discovered, and 16 days later, on Dec. 14, 850 ml. of orange-coloured fluid was aspirated. He was evacuated by air on Dec. 31, and was admitted to an R.A.F. general hospital in this country.

He complained only of occasional cramp-like pain in the left lower chest and upper abdomen. On examination he was rather thin, but the only definite abnormality was a left pleural effusion, confirmed by x-ray examination. On Jan. 3, 1946, 10 ml. of the fluid was aspirated for diagnostic purposes. It contained fairly numerous leucocytes, of which 92% were lymphocytes. It was sterile on culture. He had few symptoms, but showed little clinical improvement. On Jan. 16, 57 days after his accident, he vomited once, and himself noticed a swelling in his abdomen. None had been present when he was examined four days before, but now there was a large swelling in the left