tive. In one four-limb receptive field, antagonism was observed between inputs which were individually excitatory. This cell responded to extension of either forelimb with rotation to the right. Summation was noted between the two forelimbs. In addition, swinging either hind limb to the right, with knee flexed, was excitatory. Summation was noted between the hind limbs. However, when both the fore and hind limbs were simultaneously moved to the right, the cell failed to respond. Antagonism of this sort cannot be explained by simple convergence of S1 cells with single-joint receptive fields. This implies an intermediate stage of convergence within area 5.

Intermodality convergence between touch and kinesthesis was observed in nine cells in area 5. Both excitatory convergence and antagonism were noted. Excitatory convergence was demonstrated by the cell of Fig. 2. In addition to joint input, this cell responded to deep cutaneous stimulation of the dorsal, ulnar surface of the contralateral hand (Fig. 2A). Other cells showed inhibition of a kinesthetic response by touch.

Seven area 5 cells (9 percent) showed simpler properties reminiscent of those found in S1. These included contralateral, circumscribed, cutaneous receptive fields and rotation of single contralateral joints. We also encountered seven cells (9 percent) responding to tactile stimulation alone whose receptive fields resemble those commonly associated with S2 (*6*), that is, wide cutaneous receptive fields which were ipsilateral or bilateral, frequently involving a whole limb or involving symmetrical fields on the two sides of the body.

In conclusion, our survey of receptive fields of single units in area 5 suggests the presence of an organizational hierarchy within the somatosensory system. It is postulated that multijoint receptive fields of area 5 cells result from convergence of a population of S1-like cells with single-joint receptive fields. This conclusion is supported by the anatomical demonstration (*8*) of a strong, bilateral projection from S1 to area 5. The complex properties of certain area 5 cells having multilimb receptive fields suggests a further modification of somatosensory information within area 5. Therefore, it would appear that the basic organization of the somatosensory system bears some analogy to that of the visual system (*7*). In both systems, complex receptive fields are formed by summation and antagonism among inputs converging from cells with simpler receptive fields.

F. H. DUFFY
J. L. BURCHFIEL
Seizure Unit and Division of Neurophysiology, Department of Neurology, Children's Hospital Medical Center, and *Department of Neurology, Harvard Medical School, Boston, Massachusetts 02115*

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9. Physiological flexion describes the position of a limb assumed during withdrawal or avoidance and includes individual joint positions that are, strictly speaking, anatomical extension. In the lower limb, this involves ankle dorsiflexion and in the upper limb, posterior rotation of the shoulder and dorsiflexion of the fingers and wrist. Similarly, physiological extension means limb positions assumed for postural support. This includes ankle dorsiflexion, anterior shoulder rotation, and dorsiflexion of fingers and wrist.
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DDT Tissue Retention: Sudden Rise Induced by the Addition of Aldrin to a Fixed DDT Intake

Abstract. *The oral administration of aldrin to male and female beagles, whose diet already included a fixed, regular oral dosage of DDT, resulted in a dramatic rise in the concentrations of DDT, DDE, and DDD in blood and fat.*

It has been suggested that "a physiologic equilibrium has been reached with the present level of exposure to DDT and that continued exposure at this level will result in no additional tissue accumulation in humans" (*1*).

The degree of hepatic microsomal enzyme activity plays a dominant role in the metabolism and therefore in the half-life of certain drugs. Since the organochlorine pesticides are potent stimulants of this activity, any significant and unrecognized increase in hepatic microsomal enzyme activity could lead to disastrous effects. Thus it is vitally important to recognize, as early as possible, conditions or factors capable of markedly increasing hepatic microsomal enzyme activity.

This preliminary report of experiments with pure-bred beagles demonstrates that the concentration of DDT (*2*) and its metabolites ("total DDT") in blood and abdominal fat can rise sharply when aldrin (*2*) is added to an oral dosage of DDT, which has been maintained at a constant level for a period of months.

Eight beagles (four males and four females, aged 2 to 3 years), were fed a dose of recrystallized DDT (12 mg/kg by capsule, on 5 days of a week). When, after 10 months, a relatively stable plateau had been reached in the concentration of DDT and its metabolites in blood and abdominal fat, the dogs were given, in addition to the dose of DDT, a dose of aldrin (0.3 mg/kg by capsule, on 5 days of a week for 8 weeks). Samples of blood from the saphenous vein and abdominal fat (by biopsy) were taken from all dogs every 2 weeks and analyzed by gas-liquid chromatography, according to the method of Radomski and Fiserova-Bergerova (*3*).

The mean concentrations of DDT and its metabolites in the blood of the male dogs over the 7-week period immediately prior to the administration of aldrin were as follows: *p,p'*-DDT, 81 parts per billion (ppb); *p,p'*-DDE, 2 ppb; and *p,p'*-DDD, 7 ppb (*2*). In the blood of female dogs the mean concentrations were as follows: *p,p'*-DDT, 79 ppb; *p,p'*-DDE, 2 ppb; and *p,p'*-DDD, 7 ppb. The addition of aldrin to the intake of DDT induced an immediate

Table 1. Effect of aldrin on the retention of DDT and its metabolites in the blood and abdominal fat of dogs. Dosage: *p,p'*-DDT (purity, 99+ percent), 12 mg/kg by mouth; aldrin (purity, 95 percent), 0.3 mg/kg by mouth; both pesticides were administered by capsule on 5 days of a week. Parts per million, ppm; parts per billion, ppb.

Compound fed	Weeks	Blood					Fat				
		p,p'-DDT (ppb)	*p,p'*-DDE (ppb)	*p,p'*-DDD (ppb)	"Total DDT" (ppb)	Dieldrin (ppb)	*p,p'*-DDT (ppm)	*p,p'*-DDE (ppm)	*p,p'*-DDD (ppm)	"Total DDT" (ppm)	Dieldrin (ppm)
Four male beagles (mean values)											
DDT	−9	127	2	7	136	<1					
DDT	−8	103	2	8	113	<1					
DDT	−7	80	1	5	86	<1					
DDT	−6	81	3	7	91	<1					
DDT	−5	96	3	9	108	<1					
DDT	−4	96	2	8	106	<1	184	<4	20	204	<3
DDT	−3	68	1	5	74	<1					
DDT	−2	81	2	9	92	<1	192	6	12	210	<1
DDT	−1	69	2	7	78	<1					
DDT plus aldrin	0										
DDT plus aldrin	+0.5	183	10	18	211	12	267	5	16	288	6
DDT plus aldrin	+2	502	13	31	546	59	455	9	17	481	24
DDT plus aldrin	+3	607	20	34	661	66	845	26	44	915	47
DDT plus aldrin	+4	634	14	33	681	81					
DDT plus aldrin	+5	558	25	41	624	83	949	28	42	1019	64
DDT plus aldrin	+6	610	33	60	703	106					
DDT plus aldrin	+7	643	37	78	758	115	794	44	97	935	65
DDT plus aldrin	+8	633	38	67	738	104					
DDT plus aldrin	+9	895	49	76	1020	141	789	32	33	854	57
Four female beagles (mean values)											
DDT	−9	118	1	7	125	<1					
DDT	−8	92	2	10	104	<1					
DDT	−7	67	<1	5	72	<1					
DDT	−6	94	3	9	106	<1					
DDT	−5	89	3	10	102	<1					
DDT	−4	85	1	7	93	<1	258	4	15	277	<3
DDT	−3	69	2	4	75	<1					
DDT	−2	79	3	10	92	<1	239	7	14	260	<1
DDT	−1	75	2	7	84	<1					
DDT plus aldrin	0										
DDT plus aldrin	+0.5	160	6	21	187	11	287	5	19	311	3
DDT plus aldrin	+2	190	5	15	210	26	234	4	9	247	11
DDT plus aldrin	+3	305	7	23	335	33	413	7	13	433	14
DDT plus aldrin	+4	403	9	25	437	52					
DDT plus aldrin	+5	450	15	35	500	64	606	12	24	642	30
DDT plus aldrin	+6	440	16	43	499	68					
DDT plus aldrin	+7	583	25	74	682	113	411	15	62	488	32
DDT plus aldrin	+8	480	25	55	560	89					
DDT plus aldrin	+9	719	36	80	835	120	548	15	21	584	37

rise in the concentration of DDT in the blood. During the first 3 days the concentrations of total DDT more than doubled in both male and female dogs. During the subsequent 9 weeks the concentration of total DDT in the blood of male dogs rose to 11 times the former plateau, whereas in the females the increase was ninefold (Table 1). After the addition of aldrin to the intake of DDT, the ratio of DDE to DDT in blood increased from 0.025 to 0.055 in males, and from 0.025 to 0.050 in females.

Over a period of 9 weeks, the mean concentration (in parts per million) of total DDT in abdominal fat after the addition of aldrin to the intake of DDT increased four- to fivefold in male dogs and doubled in females. When aldrin was ingested in addition to DDT, the ratio of DDE to DDT in fat rose from 0.026 to 0.04 in the males, whereas in the females it remained approximately 0.03.

A group of four male and four female beagles served as controls. They were also fed doses of DDT (12.0 mg/kg by capsule on 5 days of a week for 14 months). After plateaus were reached, the concentrations of total DDT in the blood and fat of these dogs remained relatively constant for 6 months, whereupon this experiment was discontinued.

At this time one can only speculate about the mechanism responsible for the sudden and unexpected rise in the concentrations of DDT and its metabolites in blood and fat when aldrin is added to the dietary intake. Since the intake of DDT was kept constant, the increased retention of this compound and its metabolites is obviously related to a reduced excretion rate. Although the mechanism responsible for the augmented retention has not been completely clarified, it appears that alterations in the rate and extent of absorption by the liver cells and clearance by way of the bile play a more dominant role than solubility of DDT and its metabolites in body lipids or changes in the rate of DDT metabolism (*4*).

WILLIAM B. DEICHMANN
WILLIAM E. MACDONALD
DEWEY A. CUBIT
Department of Pharmacology and *Research and Teaching Center of Toxicology, University of Miami School of Medicine, Coral Gables, Florida 33124*

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