with pooled CNS tissue from cotton rats of the first two passages developed characteristic flaccid paralysis; so did one of two monkeys injected with mouse brain from the fourth mouse passage.

The disease in mice and cotton rats was characterized by flaccid paralysis of fore- and hind-limbs with rapidly progressing muscular atrophy. In some, death occurred overnight, before paralysis was observed. The incubation period ranged from 4 days to 3 weeks; occasionally to 40 to 57 days. Infected mouse brain, diluted 1/1000, was infective for mice. In these characteristics and in its nonpathogenicity in adult mice by peripheral routes, and also in regard to the type of lesion produced in the CNS of mice and cotton rats, the agent is indistinguishable from the Lansing strain of poliomyelitis virus.[5] Its pathogenicity appears to be quite different from that described by Jungeblut and Sanders[6] for their rodent-adapted SK-strain. The relation to the cotton rat-acclimated poliomyelitis strains of Toomey and Takacs[7] is uncertain.

Identification by neutralization tests: Mixtures of serum and varying dilutions of Lansing virus- or Strain MEF1-infected mouse brains were incubated for 1 or 2 hours at room temperature or 37° C. and injected intracerebrally into mice (Rockefeller Institute strain). The results, as summarized in Table 1,

TABLE 1

RESULT OF INTRACEREBRAL NEUTRALIZATION TESTS IN MICE

Animal	Source of serum: Convalescent after infection with	Virus (infected mouse brain): MEF1	Lansing
Rhesus monkeys	MEF1—Monkey CNS	+	+
	MEF1 + 2—Monkey CNS	+	+
	MEF2—Monkey CNS	+	+
	MEF6—Monkey CNS (Rh. No. 3710)	0	0
	MEF6—Monkey CNS (Rh. No. 3711)	N.T.	0
	MV—Philadelphia	+	N.T.
	MEF1—Mouse CNS	+	+
	Lansing—Cotton rat CNS*	+	+
Cotton rats (Pool)	MEF1 { Mouse CNS / Cotton rat CNS	+	N.T.
Mice (Pool)	MEF1 { Mouse CNS / Cotton rat CNS	+	N.T.

+ = Neutralization.
0 = No neutralization.
N.T. = Not tested.
* = Lansing antiserum supplied by Dr. Max Theiler.

indicate cross-neutralization between the MEF1 strain (before and after cotton rat and mouse passage) and Lansing virus. The MEF1 strain was also inactivated by MV-Philadelphia poliomyelitis monkey antiserum. Theiler's (mouse encephalomyelitis) virus was not neutralized by Strain MEF1 monkey antiserum. Serum from Strain MEF2-convalescent monkeys neutralized Strain MEF1 as well as Lansing virus.

Strain MEF6 failed to induce antibody against either Lansing or MEF1 virus. The simultaneous presence of at least two serologically unrelated poliomyelitis viruses in one epidemic area would limit the usefulness of the mouse neutralization test for an epidemiological study of human sera from convalescents and contacts. Nevertheless, a variety of human convalescent sera received from Major Van Rooyen have been tested against Lansing virus. The significance of the results would depend on the outcome of similar tests planned with sera from healthy individuals of the Middle East Forces.

Attempts to transfer virus from other cases into rodents are being made.

Summary: Three strains of poliomyelitis virus were isolated by monkey passage from cases occurring among the Middle East Forces of the British Army. One was indistinguishable from the Lansing strain, since it was transmitted to rodents and was serologically identical. The second was also serologically of the Lansing type, but thus far transfer to rodents has failed. The third was apparently not related to the Lansing or the first strain and passage to rodents has been unsuccessful. Thus, two apparently unrelated poliomyelitis viruses were isolated from the same epidemic area.

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[5] C. Armstrong, *Pub. Health Rep.*, 54: 1719, 1939; *Pub. Health Rep.*, 54: 2302, 1939; R. D. Lillie and C. Armstrong, *Pub. Health Rep.*, 55: 718, 1940.

[6] C. W. Jungeblut and M. Sanders, *Jour. Exp. Med.*, 72: 407, 1940.

[7] J. A. Toomey and W. S. Takacs, *Proc. Soc. Exp. Biol. and Med.*, 45: 364, 1940; 46: 22; 319, 1941; 47: 123, 1941.

THE MECHANISM OF AUXIN ACTION

A NUMBER of studies on the relation of plant auxins to enzyme activity[1,2,3] have been carried out in this laboratory. It has been reported that the activity of certain dehydrogenases from *Avena* coleoptile tissue is not accelerated when synthetic auxins are added to the functioning enzyme systems. Commoner and Thimann[4] have reported stimulation by auxin of the total oxygen uptake of excised, living coleoptile segments. A different approach to the problem, though less direct than the first mentioned, has yielded promising results, and since the work has had to be discontinued, we are reporting preliminary findings now.

[1] J. Berger and G. S. Avery, Jr., *Am. Jour. Bot.*, 30: 290–297, 1943.

[2] Ibid., 30: 297–302, 1943.

[3] Ibid., in press.

[4] B. Commoner and K. V. Thimann, *Jour. Gen. Physiol.*, 24: 279–296, 1941.

Segments from 3-day-old *Avena* coleoptiles are soaked in distilled water or in a 10 mg per liter indoleacetic acid solution for 15 to 24 hours; cell-free enzyme extracts are made from these segments, and the dehydrogenase activities determined by methods already described.[1,3]

Of the four dehydrogenases tested, alcohol dehydrogenase is outstanding in its increased activity. Thus, in a series of fourteen experiments in which conditions of detail were deliberately varied in an effort to discover the maximum auxin stimulation, marked acceleration of alcohol dehydrogenase activity was found in six, and definite increase in malic dehydrogenase activity in four. Glutamic and *iso*citric dehydrogenase activities were not increased in any of the tests; this fact is significant because it indicates that the marked stimulation of the alcohol enzyme is specific, and not a reflection of general increased metabolic activity. The data in Table 1 are indicative of the results obtained. The average increase in activity, in those experiments which yielded positive results, was about 200 per cent. for the alcohol enzyme and 150 per cent. for the malic enzyme.

TABLE 1

EFFECT OF INDOLEACETIC ACID ON DEHYDROGENASE ACTIVITY IN *Avena* COLEOPTILE EXTRACTS. THE COMPOSITION OF THE VARIOUS REACTION MIXTURES IS APPROXIMATELY THE OPTIMUM REPORTED IN PREVIOUS PAPERS FROM THIS LABORATORY[1,2,3]

Molar concentration of substrate	Substrate	pH	Decolorization time in minutes (Thunberg technique)			
			Expt. 1		Expt. 2	
			Water-soaked	Soaked in indoleacetic acid, 10 mg/liter	Water-soaked	Soaked in indoleacetic acid, 10 mg/liter
0.05	Na-*l*-malate	7.8	4.3	4.5	11.0	7.0
0.10	Ethyl alcohol	7.8	34.5	13.0	23.5	12.0
0.03	Na-*l*(+) glutamate	6.8	17.0	19.0	12.5	12.5
0.003	Na citrate*	6.8	17.0	18.5	17.5	16.0

* The same result was obtained in other experiments when *iso*citric acid was used as substrate.

These findings are particularly interesting when considered along with some of those of Commoner and Thimann.[4] They report that low concentrations of iodoacetate inhibit completely the growth of *Avena* coleoptile segments, but depress the respiration by only 10 per cent. This small iodoacetate-sensitive respiration thus appears to be in control of growth. Of the four *Avena* dehydrogenases tested to date in this laboratory, only the alcohol dehydrogenase is highly sensitive to iodoacetate.[3] This suggests the possibility that the alcohol dehydrogenase activity is closely concerned with control of growth. The present finding that alcohol dehydrogenase activity is affected the most by auxin, is consistent with the suggested important role of this enzyme in growth.

It is also reported[4] that maximum auxin stimulation (of growth and respiration of *Avena* coleoptile segments) occurs when malate is added. The acceleration of malic dehydrogenase activity in extracts from segments soaked in auxin also points to a connection between auxin action and malate metabolism. This relationship, however, does not appear to be as intimate as that of auxin and the alcohol enzyme, as interpreted from the preliminary results reported in this study.

Commoner and Thimann are the first to report auxin stimulation of respiration. In view of the fact that other workers have been unable to demonstrate such stimulation, it is perhaps worthy of mention here that we have confirmed some of their[4] work. For example, small but reproducible stimulation in oxygen uptake (Warburg apparatus) has been observed when auxin is added to the sucrose solution in which *Avena* coleoptile segments are floated.

Various mechanisms of auxin action have been suggested in the past decade. Of these, it seems to us that the most likely role is that of enzyme activation. The stimulation of alcohol dehydrogenase activity upon auxin treatment of plant tissue is evidence in this direction.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

NEW MICROTOME AND SECTIONING METHOD FOR ELECTRON MICROSCOPY[1]

ONE of the principal limitations to the usefulness of the electron microscope is the extremely poor penetrating power of the electron beam. Although capable of very fine resolution, over one hundred times that of the light microscope, the electron microscope is limited in use to the examination of material that exists either as thin particles such as finely divided powdered crystals, etc., or to replicas in thin films of irregular surfaces. In the examination of solids, aside from the dispersion of the finely divided ones, no successful technique has been devised heretofore for the production of thin sections.

In the sectioning of biological materials such as tissues, a section thickness of ten microns may be satisfactory for light observation, but for penetration and

[1] We wish to acknowledge the helpful cooperation of the Buhl Foundation.