and thermoperiodic treatments (compare Wareing, *4*). (iii) In forest and nursery plantings near New Haven, Conn., as indoors, long-season ecotypes grew faster than northern or mountain types, but this advantage was partly canceled by injury from early frost. (iv) Seed with 10 weeks or more of moist chilling germinated well at 12° and 17°C with either 0, 8, 12, or 16 hours of light, but, at higher temperatures or shorter periods of stratification, the photoperiod had a marked influence; optimal length of day for germination seemed to be longer at 27° than at 17°C (*7*).

The responses of seed and seedlings to light and temperature are pertinent to basic physiological problems of morphogenesis and to field ecology, forestry, and horticulture of *Tsuga* and other trees.

JERRY S. OLSON
HANS NIENSTAEDT*
Connecticut Agricultural Experiment Station, New Haven

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* Present address: Lake States Forest Experiment Station, U.S. Forest Service, St. Paul, Minn.

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Studies with Muscle Relaxant Labeled with Iodine-131

A search has been made for compounds that produce neuromuscular block and that can also be labeled with iodine-131 so that their movements in muscle may be studied in conjunction with their pharmacological effects (*1*). The compound, decamethylene 1,10-bis(2-iodoethyl dimethyl ammonium) dichloride has been prepared (*2*), and this may be regarded as a substitution product of decamethonium; it has been termed "iodocholinium." This compound resembles decamethonium in its action on the isolated guinea pig diaphragm. Decamethonium is known to produce an initial neuromuscular block which is followed by some recovery and the development of a slow secondary block that takes at least 3 hours for completion (*3*). Iodocholinium acts similarly but more slowly. In doses of 3 μg/ml, it gives a slow block which is still increasing even after 12 hours.

The uptake of the drug was studied by soaking diaphragm muscles from guinea pigs in saline containing subparalytic (3 μg/ml) doses of labeled compound, the muscles being removed at intervals for analysis. The temperature was 38°C, and the saline was renewed frequently. Radioactivity of the muscles expressed in counts per minute, per gram increased continuously for at least 12 hours, and this is consistent with the pharmacological findings. The uptake was surprisingly high, and it corresponds, after 1 hour, to 2.5 μg/g of muscle. After 12 hours it had reached 14 μg/g, and this indicates that each gram of tissue had concentrated an amount of drug contained in some 4.5 ml of external solution. The volume of extracellular space is less than 0.3 ml/g and cannot account for results of this magnitude.

The presence of *d*-tubocurarine in a paralytic dose of 5 μg/ml markedly altered the entry of labeled compound. Pairs of diaphragms were used to test this action. It was found that in every case (16 pairs) the uptake of labeled compound was markedly diminished by the presence of *d*-tubocurarine. This was apparent after 1 hour; after 12 hours, the uptake with curarine was less than half of that found in controls. Certain tissues on which the compound had no obvious pharmacological effect were also studied. In the case of rabbit bladder muscle and rabbit tendon, curarine had no significant effect on the uptake of the labeled compound.

The finding that curarine diminished the entry of labeled iodocholinium into guinea pig diaphragm may be of interest in discussions regarding the mechanism of action of curarine and the well-known antagonism between this drug and the depolarizing agents (*4*). The use of labeled compounds may also provide some direct information regarding the reaction between drugs and their receptor sites in muscle.

R. CREESE
D. B. TAYLOR
B. TILTON
Department of Pharmacology, University of California Medical Center, Los Angeles

References and Notes

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2. We are indebted to H. D. Baldridge, Naval Medical Research Institute, Bethesda, Md., for a specimen of the corresponding dichloro compound from which the labeled derivative was prepared by refluxing it with excess radioactive sodium iodide in acetone for 48 hours in accordance with a suggestion made by Seymour Freis, also of NMRI.
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Effects of Gibberellic Acid on Growth of Kentucky Bluegrass

Crab grass [*Digitaria sanguinalis* (L.) Scop.] that was nearing the end of its seasonal development at Yonkers, N.Y., was stimulated to renewal of growth by a single application of gibberellic acid. Replicated plots of plants were sprayed until the foliage was moistened with aqueous solutions containing 10 and 100 μg of the acid per milliliter. The plants had been mowed and were about 8 cm tall when they were sprayed on 10 Sept. 1956. By 1 Oct., control plants that had been sprayed with water had assumed the usual autumnal red color and were about 13 cm in height. On the other hand, plants that had been sprayed with gibberellic acid remained green, and those that had been treated with 100 μg/ml had elongated to a height of 26 cm. No weight determinations were made on these plants.

After these observations had been made, an Australian patent application was received (*1*). It deals in part with the effects of gibberellic acid in several plant tests. Data are presented showing that gibberellic acid, applied in the spring as a spray to unspecified pasture plants in the field, produced an increase in dry weight, especially when it was used with fertilizer. Although details are not given, the application also states that gibberellic acid induced the growth of grass under conditions of low light intensity and low temperatures when growth was not expected.

These observations suggested that it would be of value to undertake additional tests with gibberellic acid for inducing the growth of grass, especially during an unfavorable time of the year (*2*). Plots of Kentucky bluegrass (*Poa pratensis* L.) at Greenfield, Ind., were fertilized with a granulated fertilizer (10-10-10) on 23 Oct. 1956, and sprayed once with water (control) or with freshly made solutions of gibberellic acid 3 days later. The plants were in the slow-growth stage common at this time of year.

Within 4 days, the grass that had been treated with gibberellic acid began to grow again as revealed by brightening of the green color and development of new shoots. Plants were harvested by clipping about 4 cm above the ground on 10 Nov.,