tation for apple scab control must await the results of further experiments, which are in progress.

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SEEDS FOR THE STUDY OF ROOT AND ROOT-HAIR STRUCTURE IN BOTANICAL LABORATORIES

IN connection with studies made of the invasion of the bunch grass prairies by weeds, extensive germinations were made with *Bromus tectorum* L., one of the most common and abundant weeds invading deteriorated prairies in western Montana.

Under ordinary laboratory conditions, *B. tectorum* germinates easily in two days, giving usually from 90 to 98 per cent. germination. Its very fine single seminal root appears to me a most excellent material for the study of root-hair structure in undergraduate laboratories. All zones of the young primary root can be easily seen under both low and high powers of the microscope. The root-hairs stand out very clearly and prominently, giving a full series from the youngest epidermal cell just bulging out to the fully developed hair, in which streaming of protoplasm is usually evident.

A very convenient way, without the use of blotters, is to scatter the seed in the moist chamber, in which water has been poured to a depth of say one half to one mm. The chamber may be placed either in a lighted or in a darkened place; in two or three days the roots will be of the proper length. The seeds will also germinate if dropped in a tumbler-full of water.

I'll be glad to send on the receipt of a mailed and stamped envelope enough seed for any size class.

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SPECIAL ARTICLES

ACTION OF KETENE ON THE PITUITARY LACTOGENIC HORMONE

IN their study of the acetylation of pepsin, Herriott and Northrop[1] found that the primary amino groups play no significant role in the activity of the pepsin molecule. Later, White[2, 3] reached the same conclusion in a study of insulin and emphasized the importance of the tyrosine molecule in all hormones of protein nature. In contrast with their conclusions we have found that the primary amino groups in the lactogenic hormone appear to be important for its biological activity.

The lactogenic hormone contains 0.53 per cent. amino nitrogen, as determined by Van Slyke gasometric apparatus. Herriott and Northrop have shown that amino groups are acetylated by ketene at room temperature in not more than five minutes, whereas the phenolic hydroxyl groups remain unchanged.[4] We have also found that ketene treatment for five minutes at room temperature was sufficient to block all amino groups in the lactogenic hormone. If the reaction is carried out at 0° C, for five minutes, only 30 per cent. of the amino groups is acetylated. The acetylation is achieved by passing a constant stream of ketene into a suspension which contains 10 mg protein per cc in pH 5.6 M acetate buffer. Ketene is obtained by the improved type of generator designed by one of us.[5]

All ketene experiments were done with a preparation of lactogenic hormone (Li-P)[6] which, as Table I shows, gives a pronounced reaction when a total dose of 1 mg is injected intramuscularly into one-month-old squabs.

It will be seen from the results in Table I that the free amino groups in lactogenic hormone are essential for its activity. The results of the present work are in contrast with those secured by Stern and White[7] in the acetylation of insulin, and are especially interesting because of several striking similarities in the two hormones. Stern and White treated insulin with the same reagent—ketene—under conditions similar to those here employed, and found that the free amino groups of insulin played no significant role in its phar-

TABLE I

Lactogenic preparation (Li-P)	Amino groups acetylated per cent.	Dose/ Squab mg	Number of squabs	Crop sac reactions
Untreated	0	1.0	3	pronounced
Acetylated at 0° for 5 minutes	30	1.0	3	2 minimal 1 negative
Acetylated at 20° for 5 minutes ...	100	1.0	6	negative
	100	4.0	6	negative

[1] R. M. Herriott and J. H. Northrop, *Jour. Gen. Physiol.*, 18: 35, 1934–35.

[2] K. G. Stern and A. White, *Jour. Biol. Chem.*, 122: 371, 1938.

[3] A. White, Cold Spring Harbor Symposia on Quantitative Biology, 6: 262, 1938.

[4] There is as yet no experimental evidence to show that the phenolic hydroxyl of tyrosine in the lactogenic hormone is also important for its biological activity.

[5] C. H. Li, SCIENCE, this issue, page 143.

[6] The authors are most grateful to Dr. W. R. Lyons for the potent preparation of lactogenic hormone employed. The minimal effective dose was 0.2 mg when divided into four daily doses and administered intramuscularly. We have had the opportunity of studying a similarly potent preparation of adrenotropic hormone, due to the kindness of W. R. Lyons and H. D. Moon. The activity of adrenotropic hormone is not destroyed by ketene by five minutes of treatment. This method may conveniently eliminate the lactogenic activity in adrenotropic fractions.

[7] *Loc. cit.*