Using this procedure, the amounts of ethylene produced by several varieties of apples have been determined and are shown graphically in Fig. 3. This

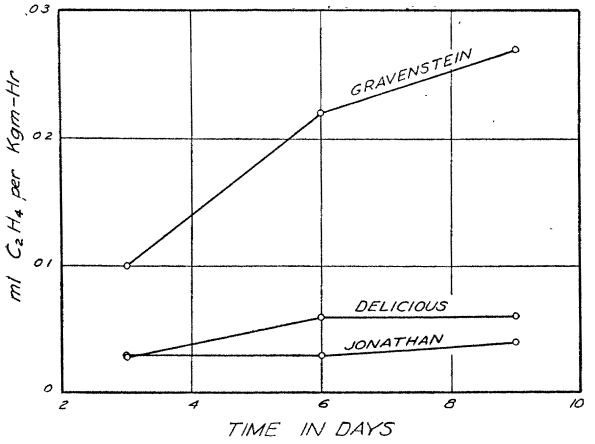

FIG. 3. Ethylene produced by 3 varieties of apples at 65° F, determined by micro-bromination method.

method has the distinct advantage in that a small amount of fruit can be enclosed in a vessel and the ethylene evolved accurately and rapidly determined at regular intervals during the course of any experimental treatment to which the fruit may be subjected. A detailed description will be presented in a forthcoming publication.[1]

BERT E. CHRISTENSEN
ELMER HANSEN
VERNON H. CHELDELIN
J. B. STARK

OREGON STATE COLLEGE,
CORVALLIS, OREGON

ROLE OF HORMONES IN THE SEXUAL REACTION OF HETEROTHALLIC ACHLYAS

THIS communication, a preliminary report of experimental work on an undetermined species of *Achlya*, a genus of the Saprolegniales, more clearly establishes the role of hormones as activators and coordinators in the sexual reaction in the phycomycetous fungi. These hormones, or specific sexual substances, would fall into the group of diffusion hormones or diffusion activators according to the classification of Huxley.[1]

The sexual reaction in this heterothallic species is under hormonal control at least until the time of the formation of the basal wall of the oogonium. In the time which elapses between the approximation of the ♂ and ♀ mycelia and the formation of the basal wall of the oogonium, four specific substances are involved: two produced by the ♀ initiating specific responses in the ♂, and two produced by the ♂ bringing about specific reactions in the ♀. These hormones and their specific actions are summarized in Table 1:

TABLE 1*

Hormone	Produced by	Affecting	Specific action(s)
A	♀-vegetative hyphae	♂-vegetative hyphae	Induces formation of antheridial branches
B	♂-Antheridial branches	♀-Vegetative hyphae	Initiates the formation of oogonial initials
C	♀-Oogonial initials	♂-Antheridial branches	(1) Attracts antheridial branches (2) Induces, in connection with a thigmotropic response, the delimitation of antheridia
D	♂-Antheridia	♀-Oogonial initials	Brings about the delimitation of the oogonium by the formation of a basal wall

* See Fig. 1.

The evidence for these specific substances may be considered under a number of headings as follows:

(1) The sequence of events and the time intervals involved indicate a hormonal coordinating mechanism (see diagram). The time intervals may be varied by changing environmental conditions, but they always

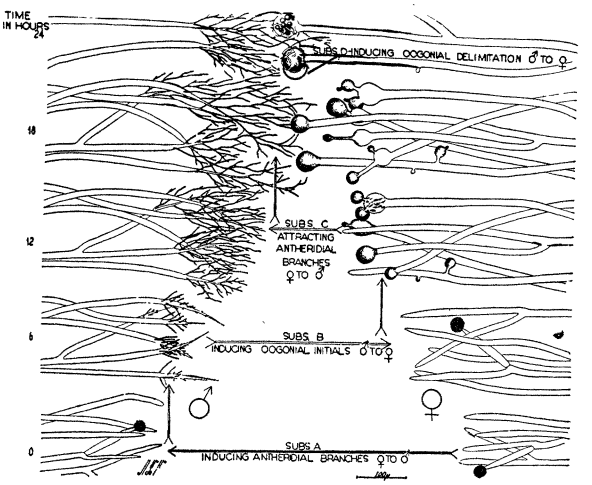

FIG. 1

remain proportionately the same and no change in the sequence has ever been observed.

(2) Telomorphotic (distance) responses regularly occur in both ♂ and ♀. (The formation of antheridial hyphae, the first step in sexual reaction, often occurs in a mating on a nutrient agar media when the ♂ and ♀ mycelia are as much as 6 mm apart, a distance 7.5 times greater than that shown in the accompanying diagram). These distance reactions, all essentially similar, have been observed in the following experi-

[1] Published with the approval of the Monograph Publication Committee, Oregon State College Research Paper No. 14.

[1] J. S. Huxley, *Biol. Rev.*, 10: 1935.

mental conditions: (*a*) In matings of ♂ and ♀ on various nutrient media; (*b*) in water culture matings; (*c*) in matings on agar in which the two sexually opposed strains were separated by a dialyzing Cellophane membrane; and finally (*d*) in single water cultures in water in which the opposite strain had previously grown, the water having been passed through a Seitz bacteriological filter. In this particular case a ♀ will only react when placed in water in which a ♂ has previously given the initial sexual reaction.

(3) The effects of variations in the composition of the medium offers a third body of evidence. By changing the composition of the medium the reaction can be stopped at times coinciding with the specific actions of the several hormones. These effects may depend either on the production of the substances involved or the ability of the opposed strains to react to them.

(4) Further evidence is furnished by interspecific matings between this species and *Achlya bisexualis* Coker. In each of the two reciprocal matings, *A. bisexualis* ♂ × *A. Sp.* ♀ and *A. bisexualis* ♀ × *A. Sp.* ♂, partial incompatibility is encountered. In the former the reaction stops at the time of differentiation of antheridia, while in the latter the female fails to produce oogonial initials in response to the substance produced by the exceedingly plentiful antheridial branches. These differences indicate a rather high degree of specificity of the hormones. Complete incompatibility would result if the ♂ were unable to react to hormone A of the ♀.

All the plants used in this work remain perfectly sterile in single culture, oogonia and antheridial branches forming only when ♀ and ♂ mycelia are brought together. Adequate controls have been employed throughout. A full account of the work which is summarized here will be published in the near future with complete data and methods.

The role of hormones as activators and coordinators in the sexual reaction is outlined in the accompanying diagram. On different media and under different experimental conditions the time and space intervals involved are considerably varied.

JOHN R. RAPER

HARVARD UNIVERSITY

VITAMIN C TREATMENT IN LEAD POISONING

IN a certain industrial plant where the lead hazard was exceptionally great, due largely to dust and spray, 400 workmen were examined clinically and with a differential blood count. About 40 per cent. showed distinct lead absorption or poisoning.

Of these 160, a group of 34 was selected for treatment with vitamin C (ascorbic or cevitamic acid), a treatment suggested by the bad condition of gums common to scurvy and severe lead poisoning. Half of this group was given 100 mg of vitamin C daily (but no extra calcium) for several weeks. With practically all of them there was a marked gain in vigor, color of skin, cheerfulness, blood picture, appetite and ability to sleep well. The basophilic aggregation test of Dr. C. P. McCord also indicated improvement. A typical case is reported below.

Workman Number One: Clinically diagnosed by one of us (E. J. A., a physician) as chronic lead poisoning. The man showed marked tremors, sleeplessness, a bad blood picture (differential count of white cells), nervousness. He was underweight and easily fatigued and had a sallow complexion. After five weeks of vitamin C treatment the tremors had disappeared, his complexion had greatly improved, his blood picture was encouraging, he enjoyed normal sleep, was cheerful and not easily tired.

The other half of the group of 34 continued their previous calcium gluconate treatment to drive toxic lead into the bones and supplemented this treatment with 100 mg vitamin C daily. They gained in health but not so well as the 17 men given vitamin C alone.

At this stage the research was transferred to Oberlin College, where 14 local house painters were examined. Judged by the combined evidence of a clinical examination and a differential blood count, half of these men showed enough lead absorption to call for treatment or greater precautions. Three of them were studied intensively for several weeks with careful analysis of urine for lead and vitamin C. Each was given 200 mg of vitamin C daily, in one case totaling 6,800 mg.

The chart for Painter Number One, as rather typical of all three, is reproduced here. This man, a painter and sprayer, was diagnosed by a physician experienced in observation of lead poisoning as a chronic case. After only four days of vitamin C treatment he felt pleasantly lazy and sleepy but not

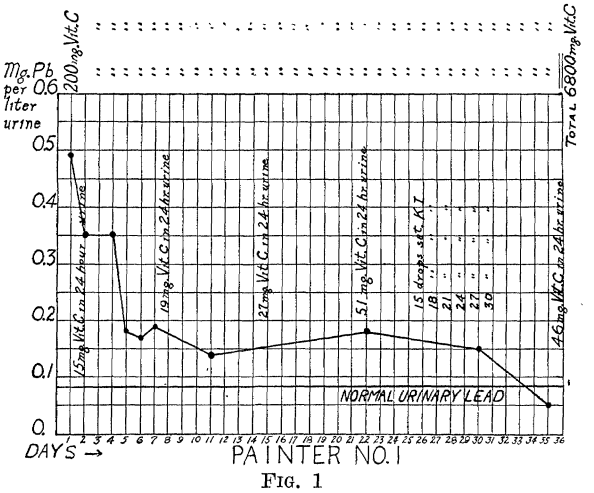

FIG. 1