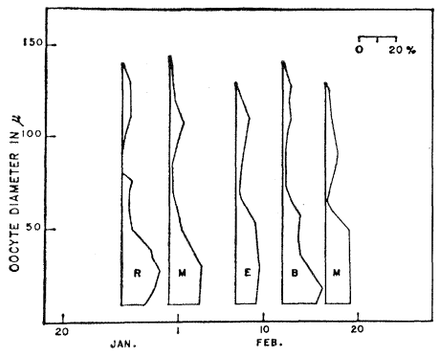


Fig. 1. Averaged oocyte size frequencies in the ovaries of *O. validus* collected in 1961 from McMurdo Sound [McMurdo Station (*M*) and Cape Evans (*E*)] and in 1965 from Robertson Bay (*R*) and the Balleny Islands (*B*).

son of *O. validus*, as found at McMurdo Sound, is most probably an adaption synchronizing the presence of the slowly developing demersal bipinnaria larvae with phytoproduction, which occurs almost exclusively during the summer months throughout antarctic waters.

The difference in light conditions between the Balleny Islands and McMurdo Sound is even more striking than between Hallett Station and McMurdo Sound; the sun never sets for more than 24 hours at the islands, while it is below the horizon for over 3 months at McMurdo Sound. Moreover, at 274 m it seems unlikely that perceptible light reached the animals on the islands' site, except perhaps in midsummer. Thus it seems certain that the reproductive periodicities of *O. validus* are not under direct photoperiodic control.

The water temperature at 247 m near the Balleny Islands site was +0.8°C, while it was 1.4°C at Robertson Bay; the former temperature was higher than any recorded at the McMurdo Sound collecting sites, which ranged between −2.2° and −1.4°C. Such temperature differences make it also unlikely that changing sea temperatures play any role in synchronizing reproduction of *O. validus*.

Onset of the summer phytoproduction period, however, appears to be very well defined throughout antarctic waters. In McMurdo Sound the main bloom of summer phytoplankton begins quite suddenly in December at McMurdo Station (*2*) and Cape Evans (*3*). At Mawson also (67°36′S, 62°53′E), at nearly the same latitude as the Balleny Islands, the summer phytoplankton bloom begins in December (*4*). Since individual *O. validus* are in reproductive synchrony throughout their distribution, as indicated by the Balleny Islands sample, it seems most likely that phytoproduction itself somehow acts directly to synchronize reproduction.

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24 March 1966

## Reserpine: Inhibition of Olfactory Blockage of Pregnancy in Mice

Abstract. *Failure of pregnancy in newly mated female mice exposed to fresh urine from alien males is prevented by administration of reserpine, at 6.25 micrograms per day per female, on days 1 to 5* post coitum*—that is, throughout the period of exposure to male urine and for 2 more days. Since reserpine is known to suppress the inhibitory center in the hypothalamus controlling the release of prolactin, inhibition by reserpine of the blockage of pregnancy provides a strong direct indication of hypothalamic mediation in the male-induced failure of pregnancy in mice.*

Recent reports (*1*) indicate that male urine is the immediate source of the pheromones that cause failure of ovoimplantation in newly mated female mice closely exposed to alien males (*2, 3*). Unlike that of normal females, urine of spayed and androgenized females can block pregnancy in newly mated females, which fact indicates that the pheromones implicated are either urinary-excretion products of androgens or the products of some androgen-dependent gland (*4*). Blockage of pregnancy can be prevented in females closely exposed to males or male urine by the administration of exogenous prolactin (*5, 6*) or progesterone (*6*), or by the presence of a functioning ectopic pituitary graft (*6*). Hence the immediate endocrine cause of the blockage of pregnancy appears to be the failure of secretion of prolactin by the anterior pituitary, with consequent failure of corpus luteum development and with return of the female to estrus as if no mating has occurred.

Table 1. Inhibition in newly mated Parkes-strain females, by injection of reserpine, of male-induced blockage of pregnancy. One form of treatment was exposure (Exp) of the females to fresh urine of CBA males. Some controls were injected with normal saline. Numbers of subjects appear in parentheses.

| Treatment | Females (No.) | |
|---|---|---|
| | Returned to estrus | Remained pregnant or pseudo-pregnant |
| Exp + reserpine (54) | 8 | 46 |
| Exp + saline (54) | 44 | 10 |
| None (21) | 3 | 18 |

This report deals with the inhibitory effect of reserpine, injected in the females, on the male-induced blockage of pregnancy in newly mated mice. All breeding mice were outbred albinos of the Parkes strain. Females were separated from males when vaginal plugs were found (day 0) and were housed singly; 24 hours later (day 1 of pregnancy) they were: (i) exposed to fresh urine from 12 CBA males (*7*) on days 1 to 3 and injected with reserpine (Serpasil, Ciba; 6.25 μg/day each) on days 1 to 5—that is, throughout the period of exposure to male urine and for two more days; (ii) exposed to similar urine on days 1 to 3 and injected with normal saline, 0.5 ml/day each, on days 1 to 5; or (iii) left undisturbed. Vaginal smears from all females were examined daily, and a return of vaginal cornification within day 7 *post coitum* was taken to indicate failure of pregnancy (*2, 6*).

The results (Table 1) clearly demonstrate that reserpine can suppress the male-induced failure of pregnancy. Reserpine is known to suppress the inhibitory center in the hypothalamus that controls the release of prolactin (*8*). Moreover, administration of reserpine inhibits the gonadotrophic cells and stimulates the luteotrophic cells of the anterior pituitary (*9*). Thus it is

likely that the inhibition by reserpine of the olfactory blockage of pregnancy results from the release of prolactin from the anterior pituitary, which counteracts the accelerating influence of the pheromones produced by male mice on estrus in females (*10*). My results are direct evidence of hypothalamic mediation in the male-induced olfactory blockage of ovo-implantation in mice.

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## Gibberellic Acid: Effects of Feeding in an Artificial Diet for Honeybees

Abstract. *Complete larval and pupal development occur in colonies of honeybees when adult bees are allowed to feed upon an artificial diet containing gibberellic acid. In the absence of gibberellic acid larvae die in the 3rd or 4th day of development.*

Pollen is the natural food of adult honeybees, *Apis mellifera* L., whereas larvae are fed on royal jelly or worker jelly secreted by glands in the head of nurse bees. Efforts to find substitutes for pollen have failed or have had only limited success (*1*). The failure to maintain larval rearing in a caged laboratory colony when adults are fed simple, inexpensive artificial foods has hindered study of the physiology of caste differentiation, nutrition, and behavior in honeybees.

We have developed a semi-defined diet which permits excellent egg-laying by the queen and allows larval development to an age of 3 to 4 days. However, for larvae to develop beyond the age of 4 days and pupate normally, we have had to add a minimum of 7.5 percent by weight of natural pollen or certain appropriate fractions of pollen to the artificial diet (in preparation). We now report that we have been able to rear bees through more than one generation by replacing all pollen in an artificial diet (Table 1) with gibberellic acid (*2*).

Small colonies of bees were confined outside in screened cages (1.8 by 1.8 by 1.8 m) and given 60 percent sugar syrup as desired. A fresh cake of food (20 g) was supplied to each colony daily (Table 1). Data showing the area of brood (eggs, larvae, and pupae) being reared by three colonies receiving 0.85 mg of gibberellic acid per gram of dry food compared with the control colony (colony 4) are given in Fig. 1. The control colony received the same artificial base diet fortified by addition of 7.5 percent natural pollen. Brood-rearing activities decreased in all colonies during late August 1965, which may possibly be the result of environmental factors. During the latter part of September and early October brood rearing in all colonies with the exception of colony 2 was stable, with 60 to 80 square inches (1 $in^2$ = 6.45 $cm^2$) of brood being maintained. In all colonies larvae developed beyond the 4th day of age and, after 2 weeks' feeding on the gibberellic acid diet, all stages of brood development were present in each colony. Al-

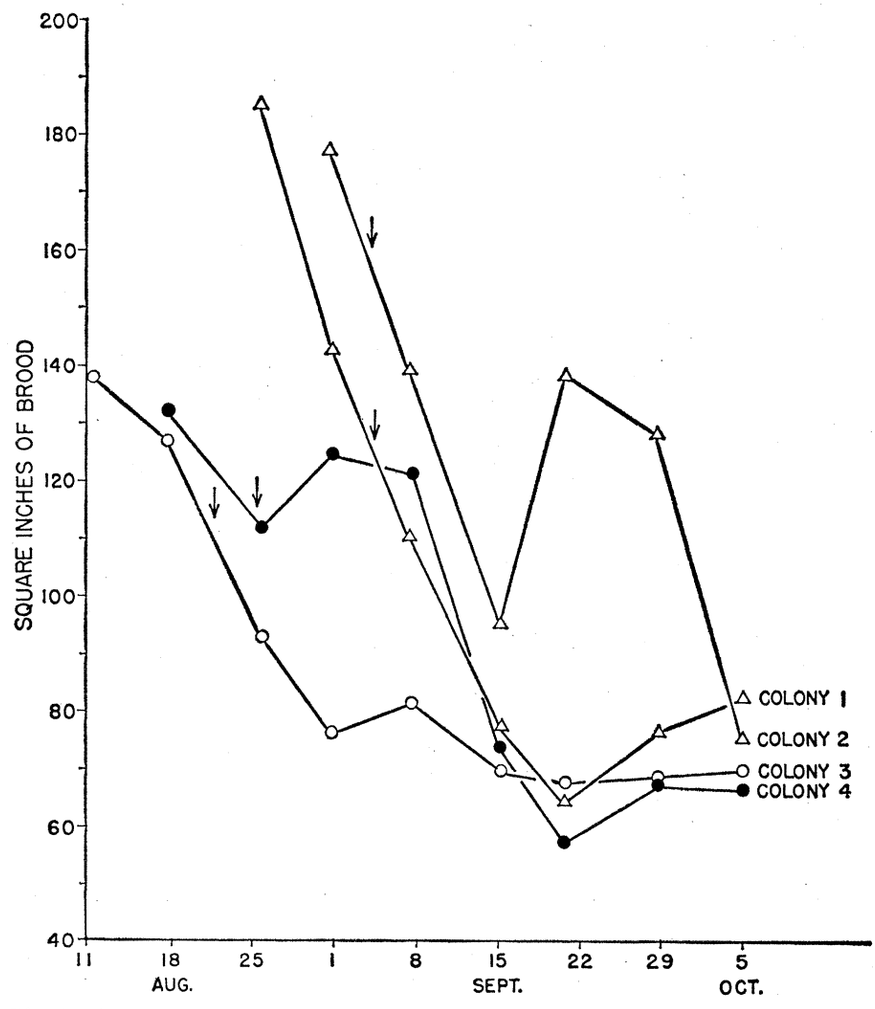


Fig. 1. The total square inches (1 $in^2$ = 6.45 $cm^2$) of brood in all developmental stages present in colonies feeding on an artificial diet containing gibberellic acid. The arrows indicate the dates on which the experimental diet was first fed. All stages of brood development were present in all colonies when the experiment was terminated on 11 October 1965. ○—○, Gibberellic acid (0.85 mg) plus traumatic acid (1 mg) per gram of dry diet; ● — ●, Artificial diet plus 7.5 percent mixed whole pollen; △—△, 0.85 mg of gibberellic acid per gram of dry diet.