In order to obtain more differentiated information about the relation between behaviour of worker bees and degree of ovary development, experimental groups of about 50 bees were observed at regular intervals and those individuals were marked, which touched and licked the impregnated object under observation. These marking experiments led to the peculiar result that during the observational period (2–3 weeks) only a certain number of bees were regularly active, touching and licking the object, whereas others were not marked at all. Ovary development in the former group was less than in the latter one. Obviously under these experimental conditions distribution of the inhibiting substance is lacking or at least insufficient to inhibit the ovary development.

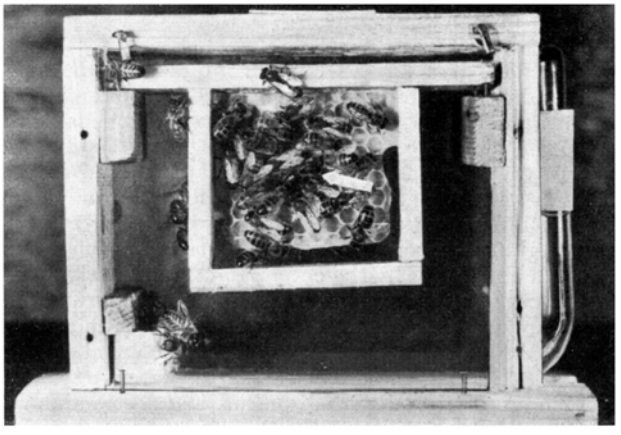

Fig. 1*a*.–Extracted queen impregnated with extraction fluid of queens (arrow indicates queen).

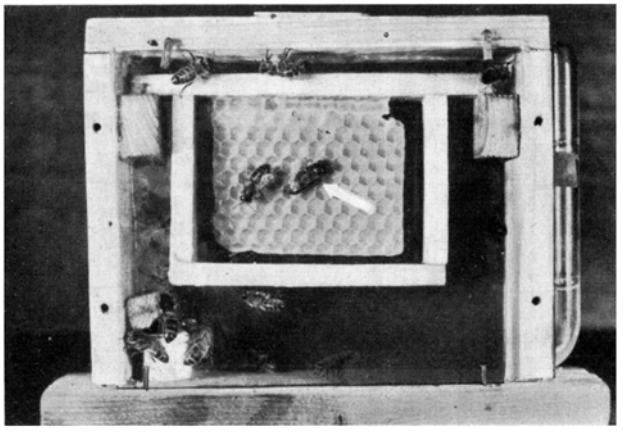

Fig. 1*b*.–Extracted queen impregnated with extraction fluid of worker bees (arrow indicates queen).

The opinion of BUTLER[1] that bees normally obtain some substance from the body of their queen is in accordance with our results. BUTLER's results concerning sharing of the "queen substance" amongst the members of a colony, obviating the necessity of direct contact between the queen and each of the worker bees, could be verified in our experiments in so far as sharing of the inhibiting substance was found only in bees *forced* to mutual food transmission.

[1] C. G. BUTLER, Trans. R. Ent. Soc. Lond. *105*, 11 (1954).

These experiments and those of BUTLER show clearly the presence of a substance on the body of a queen, which is constantly licked by worker bees. In the present state of our experiments we are inclined to conclude that the existence of this substance is a link in the inhibitory mechanism. It is impossible even to hazard the suggestion that *only* the action of this inhibiting substance can give a satisfactory explanation of the inhibition of the ovary development.

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Zusammenfassung

Es wurde gezeigt, dass der Extrakt einer Königin die Ovarienentwicklung bei den Arbeiterinnen der Honigbiene bei geeigneter Darbietung in gleicher Weise hemmt wie der Körper der lebenden oder toten Königin selbst. Die hemmende Substanz hat den Charakter einer Fettsäure. Extrakte von Arbeiterinnen haben diese Wirkung nicht. Durch Markierungsversuche wurde festgestellt, dass in Versuchsgruppen von je 50 Arbeitsbienen nur ein Teil der Tiere die hemmende Substanz aufnimmt; bei diesen Tieren entwickeln sich die Ovarien deutlich weniger stark als bei den übrigen. Indirekte Übertragung der hemmenden Substanz (von einer Arbeiterin zur anderen) fand unter diesen Umständen also nicht oder in ungenügendem Umfang statt. Die erwähnte Substanz dürfte nur ein Glied in der Kette der Faktoren darstellen, die normalerweise zur Hemmung der Ovarienentwicklung führen.

Adrenergic Blockade by Iproniazid

It has been shown that 1-isonicotinyl-2-isopropylhydrazine (iproniazid)[1] is a potent inhibitor of mono amine oxidase *in vivo*[2] and *in vitro*[3]. It has also been shown that iproniazid is able to potentiate the pharmacological action of certain sympathomimetic amines such as tyramine and phenylethylamine[4]. In the course of these studies the possibility of another action of iproniazid on the sympathetic system arose. Iproniazid and epinephrine are structurally related in some respects so that a competition of the two compounds for adrenergic receptors might take place. In testing this assumption, responses of the circular smooth muscle of rabbit aorta in muscle bath were utilized according to the method of FURCHGOTT[5]. Sixteen minutes after the application of 10^{-3} molar iproniazid a reduction of 60·6% ($\pm$ 8·9) of the contraction produced by 10^{-7} molar epinephrine was observed (9 experiments). Removal of the iproniazid by repeated washings caused a disappearance of the inhibition as shown by a return to normal contraction of the aortic strip. The adrenergic block caused by iproniazid is therefore completely and easily reversible in contrast to that produced by dibenamine[6]. In agreement

[1] IIH, Marsilid.

[2] E. S. ZELLER, J. BARSKY, J. R. FOUTS, W. F. KIRCHHEIMER, and L. A. VAN ORDEN, Exper. *8*, 349 (1952).

[3] E. A. ZELLER and J. BARSKY, Proc. Soc. Exper. Biol. and Med. *81*, 459 (1952).

[4] E. C. GRIESEMER, J. BARSKY, C. A. DRAGSTEDT, J. A. WELLS, and E. A. ZELLER, Proc. Soc. Exper. Biol. and Med. *84*, 699 (1953).

[5] R. F. FURCHGOTT and S. BHADRAKOM, J. Pharm. and Exper. Ther. *108*, 129 (1953).

[6] M. NICKERSON, Pharm. Rev. *1*, 27 (1949).

with these observations, it has been found that iproniazid inhibits the response of the cat nictitating membrane to epinephrine.

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Zusammenfassung

1-Isonicotinyl-2-isopropylhydrazin (Iproniazid) blokkiert reversibel den Angriffsort des Adrenalins im Furchgottschen Präparat der Kaninchenaorta. Die Wirkung wird der strukturchemischen Ähnlichkeit zwischen Adrenalin und Iproniazid zugeschrieben.

Utilization of Exogenous Adenine by the Rat

We have previously speculated on the possibility of a complex path for the incorporation of exogenous purines and for biological interconversions among the purines[1]. GREENBERG[2] has made the interesting observation that in pigeon liver the purine ring of hypoxanthine may be completed after introduction of the ribose and phosphate residues. Other investigators have since presented evidence which suggests the hypothesis that ring-opened intermediates, at the riboside or ribotide level are involved in purine interconversions and synthesis.

Thus FLAVIN and ENGELMAN[3] have noted a discrepancy between specific activities of administered guanine-C^{14} and nucleic acid guanine isolated from *Tetrahymena gelii*. The possibility of exchange of the 8-carbon was ruled out by these authors based on the nutritional inertness of 2,4-diamino-5-formylamino-6-hydroxypyrimidine and 4-formamido-5-imidazole carboxamide. However, nothing is said of the possibility of ribosides or ribotides of these compounds being involved. In this connection BEN ISHAI *et al.*[4] have shown that the riboside of 4-amino-5-imidazole carboxamide is effective in promoting the growth of an *Escherichia coli* mutant. Further, there is evidence that 4-formamidoimidazole-5-carboxamide is utilized by mutants of *E. coli*[5], and that the free amine is utilized by yeast[6], *Lactobacillus arabinosus*[7], pigeon liver homogenates[8], a mutant of Ophistioma[9], and by the intact rat[10]. Finally BUCHANAN *et al.* have found that incubation of radioactive 4-amino-imidazole-5-carboxamide with inosinic acid and hypoxanthine resulted in four to five times more activity in the inosinic acid than in the hypoxanthine, showing that the elements of ribose and phosphate are added to the carboxamide prior to ring closure with 'active' formate[11].

[1] M. GORDON, Science *114*, 2952 (1951).
[2] G. R. GREENBERG, J. Biol. Chem. *190*, 611 (1951).
[3] M. FLAVIN and M. ENGELMAN, J. Biol. Chem. *200*, 59 (1953).
[4] R. BEN ISHAI, E. D. BERGMANN, and B. E. VOLCANI, Nature *168*, 1124 (1951).
[5] E. D. BERGMANN, R. BENISHAI, and B. E. VOLCANI, J. Biol. Chem. *194*, 531 (1953).
[6] W. J. WILLIAMS, Fed. Proc. *10*, 270 (1951).
[7] W. SHIVE, Ann. New York Acad. Sci. *52*, 1225 (1950).
[8] M. P. SCHULMAN, J. M. BUCHANAN, and C. S. MILLER, Federation Proc. *9*, 225 (1950).
[9] N. FRIES, S. BERGSTROEM, and M. ROTTENBERG, Physiol. Plantarum *2*, 210 (1949).
[10] C. S. MILLER, S. CURIN, and D. W. WILSON, Science *112*, 654 (1950).
[11] J. M. BUCHANAN, J. Cell. Comp. Physiol. *38*, 143 (1951).

GREENBERG has obtained similar results as mentioned above[1].

We have studied the incorporation of adenine-8-C^{13} into rat[2] purines under conditions almost identical with those used by BROWN *et al.*[3] for adenine-1,3-N^{15}. The much lower incorporation of 8-labeled adenine (Table) may be evidence for ring opening in the incorporation of exogenous purines. These conclusions are not in agreement with those in the study by MARRIAN *et al.*[4] based on doubly labeled adenine. The reports by SCHULMAN and BUCHANAN[5] and by GREENBERG[6] that the 2-carbon seems to be more labile than the 8-carbon suggest that experiments on feeding of 2,4-C^{14} and 4,8-C^{14} labeled adenine might give definitive information on the lability of the 2- and 8-carbons of exogenous adenine in the rat.

Table.–Feeding of Adenine-8-C^{13} (30 mg per kilo per day)

Fraction	Atom percent Excess C-13	Atom % C-13 calculated on basis of 100% C-13 in Adenine fed
Dietary Adenine-8-C^{13}	6·67	100·0
Allantoin	0·035	0·525
Urea	0·216	3·24
Purine Hydrochlorides	0·035	0·525

Feeding of Adenine-1,3-N^{15} (27 mg per kilo per day)[4]

Fraction	Atom percent Excess N-15	Atom % N-15 calculated on basis of 100% N-15 in Adenine fed
Dietary Adenine-1,2-N^{15}	6·29	100·0
Allantoin	0·348	5·53
Urea	0·003	0·05
Purine Hydrochlorides	0·23	3·65

75 mg of adenine-8-C^{13} was incorporated into 150 g of rat feed biscuits, the adenine having been first diluted with some glucose. Five adult male rats (Sherman strain) totalling 750 g were fed the above diet at the rate of 10 g per rat per day for three days. On the morning of the fourth day the rats were fed unlabeled diet and then sacrificed in the afternoon. The diet had been formed into wafers and dried to minimize loss during feeding. The organs were removed and frozen in dry ice methanol solution. The combined frozen organs were homogenized three times with ethanol and once with dry ether, filtering each time. The pale pink powder was stirred once with hot ethanol and filtered, and this step was repeated with dry ether. The dry powder amounted to 18 g.

17 g of dry, powdered organs were extracted with 10% sodium chloride solution and the free nucleic acids were obtained by the method of PLENTL and SCHOENHEIMER[7]. The purine hydrochlorides were obtained by the usual procedures[7].

[1] G. R. GREENBERG, Fed. Proc. *9*, 179 (1950).
[2] M. GORDON, J. Chem. Soc. *1954*, 757.
[3] G. B. BROWN, P. M. ROLL, A. A. PLENTL, and L. F. CAVALIERI, J. Biol. Chem. *172*, 469 (1953).
[4] D. H. MARRIAN, V. L. SPICER, M. E. BALIS, and G. B. BROWN, J. Biol. Chem. *189*, 533 (1951).
[5] M. P. SCHULMAN, J. M. BUCHANAN, and C. S. MILLER, Federation Proc. *9*, 225 (1950).
[6] G. R. GREENBERG, Federation Proc. *9*, 179 (1950).
[7] A. A. PLENTL and R. SCHOENHEIMER, J. Biol. Chem. *153*, 203 (1944).