

Virus-Hämagglutination in Gemischen von Mucoprotein und Polysaccharid

		Konzentration des Mucoprotein (–log)								
		4,0	4,3	4,6	4,9	5,2	5,5	5,7	6,0	Ø
Konzentration des Polysaccharids (–log)	4,0	±	+	++	++	++	++	++	++	++
	5,0	0	0	±	+	++	++	++	++	++
	6,0	0	0	0	0	0	0	0	++	++
	Ø	0	0	0	0	0	0	0	++	++

0 = keine Agglutination; ± = teilweise Agglutination; + = Agglutination; ++ = rasche Agglutination.

grössere Reihe von derartigen Polysaccharid-Kombinationen untersucht; unter diesen ist die gleiche antagonistische Wirkung des Mucoproteins Gottschalk gegenüber der leukocytenwanderungsfördernden Fraktion aus Schwangernharn, die wir früher beschrieben haben, vorhanden.

Als zweiter Test wurde die Hemmung der Virus-hämagglutination benützt. Das Gottschalksche Mucopolysaccharid ist in diesem Test primärer Wirkstoff, während das Shearsche Polysaccharid hier unwirksam ist.

Technik. Die Mucoprotein- und Polysaccharidlösungen wurden in 0,9% NaCl hergestellt und in Verdünnungsreihen angelegt. Entsprechend obigem Schema wurden die Gemische mit je 0,1 cm³ der Komponenten hergestellt. Nach 1¼ h Kontakt bei Zimmertemperatur wurden die Proben regelmässig mit 0,1 cm³ Allantoisflüssigkeit von Influenza-PR₈ infiziertem Hühnerembryo (30 min bei 56° inaktiviert) beschickt. Die Endkonzentration des Indikatorvirus entsprach 4 Hämagglutinationsdosen. Hierauf wurde jede Probe mit 0,1 cm³ 1,6% Hühnererythrocyten versetzt. Ablesung der Hämagglutination nach 1 h Stehenlassen bei Zimmertemperatur.

Die Untersuchungen an Influenzavirus ergaben, dass die durch Gottschalk-Mucoprotein hervorgerufene Hemmung der Virushämagglutination durch steigende Dosen von Shear-Polysaccharid aufgehoben werden kann. Die beigefügte Tabelle zeigt eindeutig diese Beziehung der beiden Stoffe.

Es kann somit kein Zweifel bestehen, dass zwischen diesen beiden Stoffen grundsätzlich ein antagonistisches Verhältnis besteht. Wirkungsmechanismus und Einzelheiten dieser Reaktion sollen abgeklärt werden. Es scheint uns eine Mitteilung dieser Befunde angezeigt, da wohl anzunehmen ist, dass ähnliche antagonistische Beziehungen zwischen «Polysacchariden» auch bei anderen biologischen Systemen von Bedeutung sein können.

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Summary

Shear's Polysaccharide and Gottschalk's Virus-receptor-Mucoprotein are biological antagonists. The latter inhibits the stimulation of leucocytic migration produced by the former. Inhibition of virushaemagglutination by Gottschalk's Mucoprotein is reversed by Shear's Polysaccharide.

Inhibition of Ovary Development in Worker Bees by Extraction Fluid of the Queen

In preliminary experiments¹ it was observed that inhibition of the ovary development in worker bees (*Apis mellifica* L.) was due to direct contact between these bees and a queen, either a living or a dead one. During this contact these bees show a typical behaviour: touching with their antennae and licking with their tongue the body of the queen.

After extraction in acetone or ethanol a queen loses her inhibitory effect. Moreover, every sign of attractiveness to the worker bees has disappeared: she is no longer touched and licked by the bees. After impregnation with the extraction fluid both attractiveness and inhibitory effect are present again: the queen is touched and licked by worker bees as before extraction. In control experiments extraction fluid of *worker bees* was tested in combination with extracted queens. These experiments further substantiate the hypothesis constructed previously¹ concerning the explanation of the inhibition of ovary development in worker bees by a substance present on the body of the queen. It may be mentioned that similar experiments performed with termites² point in the same direction.

The use of different extraction methods in our experiments with queens of honeybees reveals a fatty acid character of the inhibiting substance. The results of only one of the experiments are given in the table and the photographs.

Test object	Percent developed ovaries in groups of 50 worker bees
Queenless (control)	82
Queen extracted with acetone	84
Extracted queen impregnated with extraction fluid of queens	18
Extracted queen impregnated with extraction fluid of worker bees	75

Experiments were carried out in order to obtain detailed information concerning the inhibitory mechanism. Extracts of both queens and worker bees were applied not only to extracted queens but also to other objects: worker bees, drones and pieces of wood. In all these cases the *behaviour* of the worker bees pointed to discrimination between these two extracts. When using the ovary development as a testing-method, however, results were in some cases less conclusive.

¹ A. P. DE GROOT and St. VOOGD, *Exper.* 10, 384 (1954).
² M. LÜSCHER, *Z. vgl. Physiol.* 34, 123 (1952).

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.

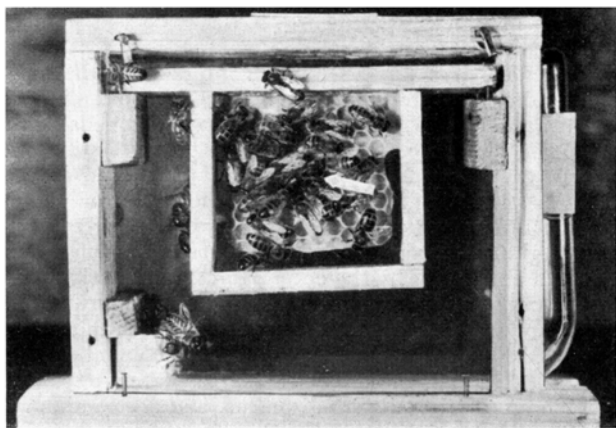


Fig. 1a.—Extracted queen impregnated with extraction fluid of queens (arrow indicates queen).

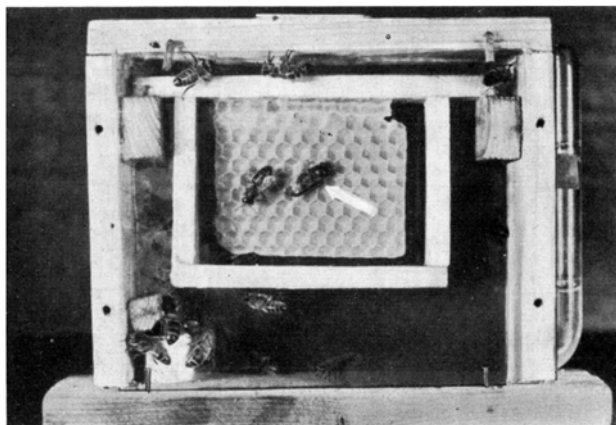


Fig. 1b.—Extracted queen impregnated with extraction fluid of worker bees (arrow indicates queen).

The opinion of BUTLER¹ 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 monoamine 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 phenylethylamine⁴. 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 FURCHGOTT⁵. Sixteen minutes after the application of 10^{-3} molar iproniazid a reduction of 60.6% (± 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 dibenamine⁶. In agreement

¹ IHH, 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).