viele Dressursitzungen. Damit erscheint die Gabe des unbedingten Reizes nach der Injektion im Abstand von mehreren Sitzungen zur Vermeidung einer Gedächtnisauslöschung für die farbliche Gedächtnisübertragung gerechtfertigt. Die nach Injektion zuerst auftretende Erhöhung der Aktivität der Empfänger kann als erste Gedächtnisreaktion interpretiert werden, wie frühere Untersuchungen zur geruchlichen[7] und optischen Dressur belegen.

Die deutlich positiven Reaktionen der Empfängergruppen nach der Injektion sind nicht so stark wie die letzten Differenzdressuren der Spendergruppen, entsprechen aber dem gut positiven Verhalten einer Dressurgruppe. Besonders bemerkenswert erscheint uns die Tatsache, dass durch die Gedächtnisübertragung die starke Spontanbevorzugung von rotem Licht bei gleichzeitigem Angebot von grünem Licht nicht nur schwächer, sondern sogar umgekehrt wird. Ähnliche Resultate erzielte UNGAR[3] bei Gedächtnisübertragungen von Ratten auf Mäuse. Die Ergebnisse nach der Vergessenspause bedürfen einer Überprüfung durch Vergessenstests mit normalen dressierten Tieren, ehe vergleichende Aussagen über den Gedächtnisverlust bei injizierten Tieren gemacht werden können.

Nach unseren bisherigen Ergebnissen ist eine chemische Übertragung des Farbgedächtnisses auf nicht dressierte Tiere wahrscheinlich. Weitere Untersuchungen zum Farb- und Geschmacksgedächtnis sind durchgeführt und werden an anderer Stelle ausführlich beschrieben.

Summary. 36–48 h after the i.p. injection of a low molecular brain extract prepared from colour-trained goldfishes into naive goldfish, these recipients show positive reactions comparable to those shown by the donors. 12–24 h after the injection, the recipients showed an increased activity. No changes in behaviour have been noticed in the recipients of i.p. injections of low molecular brain material from untrained donor fish.

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[7] H. P. ZIPPEL, in Vorbereitung.

The Effects of Salt Stress on the Cerebral Neurosecretory System of the Grasshopper, *Melanoplus sanguinipes* (F.) (Orthoptera)[1]

Only limited information is available on insect osmoregulation and the work that has been reported presents a conflicting and confusing picture. The cerebral neurosecretory system has been variously reported as loaded with[2–6] or depleted of[7,8] stainable material after dehydration. For example, after the injection of 1% NaCl into the cockroach, *Periplaneta americana*, the corpus cardiacum (CC) was depleted of neurosecretory colloid, but this material accumulated in the CC and in the neurosecretory tracts after the injection of distilled water[8]. However, in another cockroach, *Blaberus giganteus*, the entire neurosecretory system accumulated massive amounts of stainable colloid under the stress of dehydration[4,5]. And in *Schistocerca gregaria* the neurosecretory system contained much more material in saline-injected individuals than in controls[6].

As part of an investigation of the endocrinology of reproduction in the grasshopper, *Melanoplus sanguinipes*, we tested the reactions of this insect to salt stress. We used newly emerged adult females, less than 12 h old. One group was injected with 20–50 µl of 2.5% NaCl, and another group with 40–50 µl of distilled water, daily, or on alternate days, for a period of 12 days. These insects were sacrificed on days 2, 3, 7, 10, and 12, and their neurosecretory systems examined using a performic acid-victoria blue (PAVB) whole mount technique[9], and compared with normal adult females of the same ages. Mortality was high (80–90%) among the salt-injected insects, but enough survived for the duration of the experiment to make our observations meaningful. The amount or frequency of the injections did not alter the results.

In specimens sacrificed 2 or 3 days after the first salt injection, the neurosecretory cells and their tracts were clearly visible in the whole mounts (Figure 1). The CC and the nervi corporis cardiaci (NCC) contained some

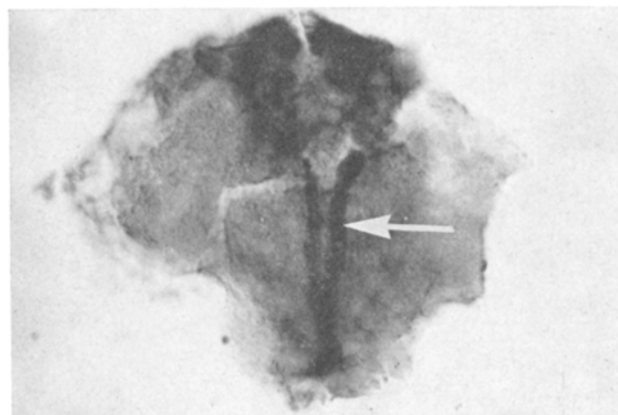

Fig. 1. Dorsal view of the brain showing the neurosecretory cells of the pars intercerebralis and their tracts (arrow). The insect had received a daily injection of 50 µl of a 2.5% NaCl solution for 3 days. PAVB, whole mount; approx. × 120.

[1] Contribution No. 345 from the Research Station. The technical assistance of Mrs. JENISE SAUCIER is gratefully acknowledged.
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neurosecretory product, but were not heavily loaded with material; the corpora allata contained no stainable colloid. 7 days after the first salt injection, and in all the salt-injected insects examined on subsequent days, the progressive accumulation of neurosecretory product in the cerebral cells, their axons, the NCC, and the CC could be clearly seen. Indeed, 12 days after the first salt injection, these endocrine components, especially the NCC and the CC, were very heavily loaded with massive amounts of stainable colloid (Figures 2 and 3). However, even in these heavily loaded specimens, the corpora allata and the nervi corporis allati contained no neurosecretory colloid.

By comparison, in specimens 12 days after the first injection of distilled water, the neurosecretory systems were barely visible in the whole mounts. The NCC and the CC contained some stainable product (Figure 4), but the amount was far less than in salt-injected or normal females of the same age. We never saw an accumulation of stainable product in the neurosecretory systems of water-injected insects.

Thus it seems obvious that the cerebral neurosecretory cells in the grasshopper do respond to salt stress. However, the accumulation of stainable material (which we assume to be neurohormone or its protein carrier) after desiccation can be variously interpreted, indicating either the retention of a diuretic factor or the over-production of an anti-diuretic one. We tend to favour the former hypothesis, as the endocrine systems are depleted of material in water-injected insects, and in normal females of the same age, at a time when their neurosecretory cells are likely actively involved in stimulating oogenesis. However, these effects on water balance may also be indirectly due to neurosecretory effects on general metabolic functions. These possibilities are currently under investigation.

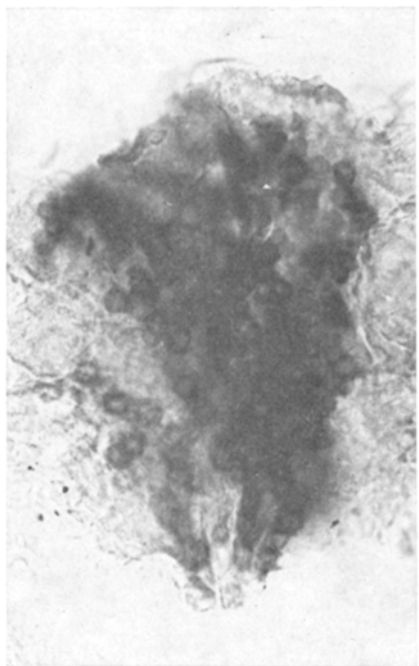

Fig. 2. The cerebral neurosecretory cells from an insect that had received saline injections (50 µl) daily for 12 days. A very large number of cells containing stainable granular material are visible. PAVB, whole mount; approx. × 120.

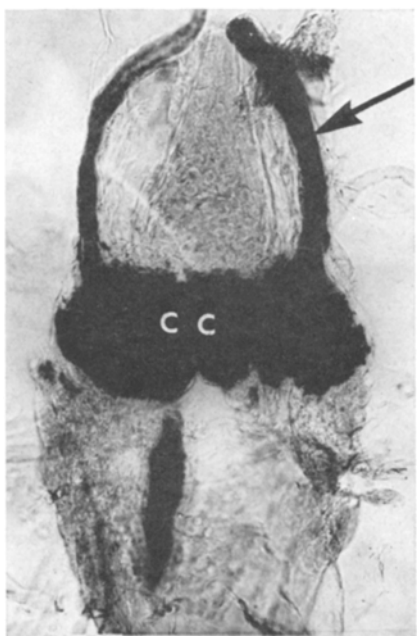

Fig. 3. Dorsal view of a whole mount of the area of the corpus cardiacum (cc) of the same insect as Figure 2. Note the very heavy accumulation of stainable product in the cardiacum and especially in the NCC (arrow). PAVB; approx. × 125.

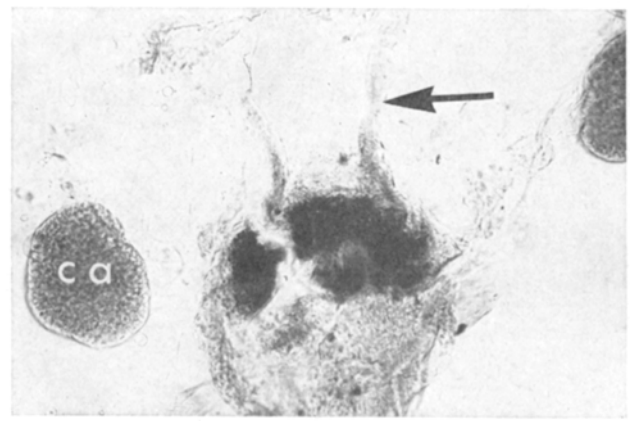

Fig. 4. A whole mount of the corpus cardiacum and corpus allatum (ca). This insect had been injected with 50 µl of distilled water daily for 12 days. The NCC (arrow) are almost devoid of material and the amount in the corpus cardiacum is much reduced. PAVB; approx. × 100.

Résumé. Après injection d'une solution de NaCl, il y a accumulation du produit de neurosécrétion du *Melanoplus sanguinipes*. Nous croyons que cette accumulation est peut-être liée à la rétention d'une substance diurétique par ces insectes.

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Saskatoon (Saskatchewan, Canada), 8 April 1969.

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