AMP[7,8], presumably due to either its superior ability to penetrate the cell membrane or greater resistance to inactivation by phosphodiesterase. That 1 water-injected virgin did ovulate suggests the requirement for mating to precede ovulation[4,5] is not entirely inviolable.

By preventing the degradation of cyclic nucleotides, a phosphodiesterase inhibitor such as aminophylline (theophylline$_2$-ethylenediamine) should elevate endogenous levels of cyclic AMP, and thus be a likely agent to mimic the effect of a cyclic AMP injection. Indeed, ovulation was induced in 45% of the females injected with 10 µg aminophylline (table). A simultaneous injection of aminophylline and dibutyryl cyclic AMP, however, did not elevate the response beyond that observed with dibutyryl cyclic AMP alone.

A role for cyclic AMP in tsetse ovulation is also suggested by the effectiveness of cholera toxin. Cholera toxin, a potent stimulant of adenylate cyclase in insects[9] as well as vertebrates[10], caused 33% of the virgin females to ovulate within the 24-h test period (table).

Thus, 3 lines of evidence suggest an important role for cyclic AMP in tsetse ovulation. We cannot yet eliminate the possibility that cyclic AMP exerts its effect by stimulating the release of ovulation hormone from the brain, but it is quite likely that we have bypassed the release of ovulation hormone and have mimicked the effect of the hormone directly on the target tissue. Like many other neurohormones[11-13], the ovulation hormone possibly uses cyclic AMP as a 2nd messenger in triggering its response within the ovary.

In most insects ovulation is followed immediately by oviposition, but the tsetse female has evolved a unique reproductive strategy in which the fertilized egg and resulting larva are retained within her uterus[14,15]. Nutriment is channeled to the larva from a female accessory gland that has been highly modified for 'milk' production[16]. At intervals of about 9 days, the female gives birth to a fully grown 3rd instar larva that immediately burrows into the soil and pupariates. In a normal 9-day pregnancy cycle, parturition and ovulation occur closely together: within 1 h of expulsion of the larva, a new egg is ovulated[14,15]. Similar endocrine events possibly stimulate the muscular contractions responsible for both ovulation and parturition. In several virgin females, eggs were not only ovulated but also expelled from the uterus following injection of either cholera toxin or dibutyryl cyclic AMP. Moreover, pregnant females injected with 0.5 µg cholera toxin during the 2nd pregnancy cycle had a high incidence of premature parturition: 57% of the females (N = 21) aborted within 2 days. An injection of 25 µg dibutyryl cyclic AMP caused 37% abortion (N = 16). Among the controls injected with 1 µl distilled water, only 5% of the pregnant females (N = 18) aborted within 2 days. Our preliminary evidence thus suggests that elevation of cyclic AMP levels may be involved in tsetse parturition as well as ovulation.

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Hemolymph regulation to hyposaline and hypersaline conditions in *Gammarus oceanicus* (Crustacea: Amphipoda)

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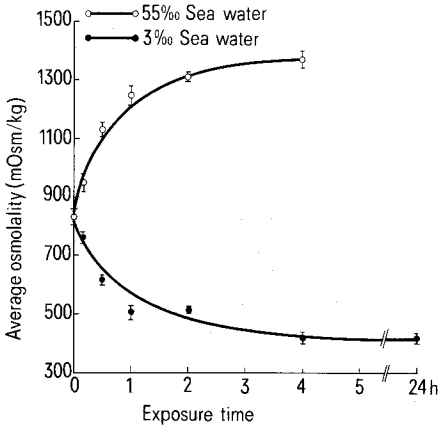
Summary. Specimens of *Gammarus oceanicus* were exposed to sea water at salinities of 3‰ and 55‰ for various periods of time up to 24 h. *G. oceanicus* can regulate in hyposaline sea water and reached a new steady state after 4 h exposure to 3‰ sea water. Its ability to regulated in hypersaline conditions is limited and no animals survived longer than 6–8 h in 55‰ sea water. These results are discussed with respect to salinity conditions in the intertidal zone.

In a recent study, it was necessary to obtain hemolymph osmolality values for *Gammarus oceanicus* exposed to hyposaline and hypersaline conditions for various lengths of time. *G. oceanicus* is the most abundant *Gammarus* species and often the most numerous intertidal macroscopic animal between the northern Gulf of Maine and Newfoundland[3], but its ability to osmoregulate is poorly understood. *G. oceanicus* has been exposed to various hyposaline conditions for 24 h and its hemolymph molality recorded[4]. The present study reports values for hemolymph osmolality in animals exposed to hyposaline and hypersaline conditions for short time intervals.

Materials and methods. Male *Gammarus oceanicus,* larger than 20 mm in length from the rostrum to the base of the telson were exposed to either 3‰ diluted sea water or 55‰ 'Instant Ocean' salts in distilled water at a temperature of 12–13 °C. They were initially collected from 32‰ sea water. The animals were exposed for periods of 10 min, 30 min,

1 h, 2 h, and 4 h in both solutions, and also for 24 h in the 3‰ sea water. The animals died after 6–8 h exposure to 55‰ sea water and this was not due to the use of 'Instant Ocean' salts since *G. oceanicus* survives for many days in less saline solutions of this preparation. After the appropriate exposure period, the animals were gently dried with Kimwipes and hemolymph was removed from between the head and first peraeonal segment with a 5-µl pipette. 10 µl of hemolymph, from animals determined to be in stage C of the molt cycle[5], was diluted in 340 µl of distilled water. The osmolality of the diluted hemolymph was then measured on a Fiske OM osmometer.

Results and discussion. The average hemolymph osmolality of *G. oceanicus* exposed to 32‰ sea water was 833 mOsm/kg which is in close agreement with the previously obtained value (0.88 M/kg or 880 mOsm/kg) for *G. oceanicus* and *Marinogammarus finmarchius*[4], both marine species. After 24-h exposure to 3‰ sea water, the animals continued to maintain hemolymph osmolality at 420 mOsm/kg (figure). It is not surprising that *G. oceanicus* can regulate hemolymph osmolality in such low salinity sea water since they can be found in salinities as low as 2.5‰ sea water[6].



Change in average hemolymph osmolality of *G. oceanicus* with time, after exposure to 3‰ and 55‰ sea water. Time O hemolymph osmolality was measured in animals taken from 32‰ sea water and used as controls. The brackets represent data variability (±SEM).

Previously, it was found that the hemolymph concentration of *G. oceanicus* reached a new steady-state about 12 h after transfer from 35‰ sea water[4]. In our experiments, only 4 h were required to reach the new steady-state value. These differences are probably due to experimental procedure.

The symmetry of the curve in the figure and leveling off of hemolymph osmolality with time at a value (1370 mOsm/kg) less than that of 55‰ sea water (1700 mOsm/kg) suggest an ability to regulate in hypersaline waters. The inability to survive prolonged exposure may reflect a limit to its regulatory ability or a failure of some other physiological mechanism (e.g. ion balance). *M. finmarchius* did not regulate its hemolymph osmolality in hypersaline conditions[4].

Extremely hyposaline conditions in the intertidal zone may be encountered at low tide during a rain storm or in freshwater runoff whereas extremely hypersaline conditions in the intertidal zone may occur in tide pools because of evaporation due to long periods of bright sunlight. The ability to regulate in both environments is clearly advantageous. The poor ability of *G. oceanicus* to regulate in hypersaline conditions is sufficient to allow the animal time to escape or tolerate these conditions for the short time interval that hypersalinity exists (2–4 h) before the incoming tide restores normal salinities. Animals may be exposed to freshwater runoff or rainfall for periods much longer than this and they thus require a strong ability to regulate hemolymph osmolality in low salinity water.

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A correlation of responses of the resistance and capacitance vessels of the intestine and kidney to changes of impulse in postganglionic nerves under pressor reflexes

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Summary. The responses of resistance vessels of the intestine and kidney were induced by high amplitude impulses (over 15 µV), while those of capacitance vessels in these organs were induced by low amplitude impulses (15 µV and lower) of postganglionic sympathetic fibres.

Our previous paper[1] has shown the relationship between changes of the high amplitude efferent impulses in the splenic nerve and the responses of the resistance vessels of the spleen, and between the low amplitude impulses and the responses of capacitance vessels in this organ. The aim of the present work is to study these relationships in the small intestine and kidney.

Method. Experiments were performed in 32 cats anaesthetized with urethane and α-chloralose (1 g/kg and 20 mg/kg). Responses of the resistance and capacitance vessels of the small intestine and kidney were studied by the method described previously[1]. Responses of the resistance vessels were estimated according to changes of the total peripheral resistance, those of the capacitance vessels, according to changes of blood content in the organ under constant blood volume perfusion. Action potentials in central ends of small branches of the corresponding sympathetic nerves were recorded simultaneously with the vasomotor responses. Reflexogenic reactions were induced by clamping both common carotid arteries for 30–40 sec. Ganglioblocking agent hexonium was given i.v. (2 mg/kg). Heparin was used to prevent blood coagulation. Experimental data were