action, and that aminoacetonitrile inhibits the activity of these enzymes.

Further experiments will be made in order to see if this assumption can be supported. We intend also to establish whether AAN inhibits the demethylation of DMNA *in vitro*.

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Transport of Sodium and Water by Rabbit Ileum, *in vitro* and *in vivo*

Previous studies from this laboratory[1,2] have indicated a deficiency of Na^+ ion absorption from the gastrointestinal tract in cholera[1], and an inhibition of Na^+ transport in the short-circuited frog skin in the presence of cholera stool. We are studying animal models to elucidate intestinal mucosal cell function in cholera. A difference in function has been noted when Na^+ ion transfer in the everted intestinal sac *in vitro* was compared with data from loops of the adult rabbit *in vivo*.

Table 1 shows typical data obtained with the everted rabbit ileal sac. It is evident that glutamine markedly stimulates water transport and increases the unidirectional and net transport of Na^+ ion. Although these data are from experiments specifically designed to compare the *in vitro* and *in vivo* preparations, many closely related experiments have consistently shown this stimulation in the presence of glutamine. The data in Table 1 suggest a modest stimulation of net Na^+ ion and water transport when glucose is added; this stimulation by glucose has been observed only during the late spring and summer months. Repeated efforts during the colder winter months failed to demonstrate any stimulation.

The data in Table 2 clearly show that in the rabbit ileal loop *in vivo*, glucose markedly stimulates water and sodium transport, while glutamine does not. Since the failure of glutamine to stimulate net water and Na^+ ion transport was so unequivocal, no studies of unidirectional fluxes were made in the presence of glutamine.

It should be noted that the ionic composition of the *in vitro* and *in vivo* media is not identical. The reason for this is that these two experimental models were designed in a totally separate manner and the optimal conditions for each were evolved with no original intention of comparison. Also, the fact that calcium ion was not added to the *in vitro* system and was presumably supplied by the blood to the *in vivo* system leaves unanswered in these experiments the possible role of calcium in sodium and water transport.

In comparing the data *in vitro* and *in vivo* it appears that water transport is greater in the loop than in the sac. Glutamine *in vitro* and glucose *in vivo* appear to exert their action on sodium transport by augmentation of the 'mucosa to serosa' unidirectional flux. It is of some interest that the sodium flux rates from 'mucosa to serosa'

Table 1. Sodium and Water Transport by Everted Ileal Sacs *in vitro*

Added substrate	H_2O transport (mmoles/cm²/h) M→S	Sodium transport (μmoles/cm²/h) M→S	S→M	Net M→S
None (6) (Mannitol)	0·6 ± 0·07	9·2 ± 0·78	8·7 ± 0·65	0·5 ± 0·13
Glucose (6)	0·7 ± 0·21	9·2 ± 0·34	8·0 ± 0·55	1·2 ± 0·09
Glutamine (6)	1·2 ± 0·15	12·1 ± 1·03	8·9 ± 0·90	3·2 ± 0·34

The serosal and mucosal solutions for the everted sacs of rabbit ileum contained the following electrolytes, in m.equiv./l.: Na^+, 163; K^+, 4; Mg^{2+}, 0·7; Cl^-, 70; HCO_3^-, 17; HPO_4^{2-}, 20. Mannitol 30 mM was added to adjust the osmolality to 290 milliosmols. The concentration of added glucose and glutamine was 20 mM; the control solutions contained an additional 20 mM mannitol. The *p*H was 8·0 and the gas phase was oxygen. The volume of mucosal solution was 25 ml.; the serosal solution was about 3 ml. Tracer quantities of ^{22}Na and ^{24}Na were added to the serosal and mucosal solutions respectively. Water movement was determined gravimetrically. The sacs were placed in 125-ml. flasks and shaken for 1 h in a 37° water bath. Figures in parentheses indicate the number of different animals on which the studies were performed. Studies were done in duplicate on each animal. Variations are expressed as standard errors. Note that water movement is about 1,000 times greater than that of sodium.

Table 2. Sodium and Water Transport by Ileal Loops *in situ*

Added substrate	H_2O transport (mmoles/cm²/h) M→S	Sodium transport (μmole/cm²/h) M→S	S→M	Net M→S
None (6)	12·3 ± 0·51	8·8 ± 0·13	4·6 ± 0·15	4·2 ± 0·14
Glucose (6)	19·5 ± 0·39	12·1 ± 0·17	4·8 ± 0·06	7·1 ± 0·10
Glutamine (4)	11·1 ± 3·9	—	—	4·3 ± 0·16

The solution introduced into the lumen of loops of rabbit ileum *in vivo* contained the following electrolytes, in m.equiv./l.: Na^+, 140; K^+, 10; Cl^-, 105; HCO_3^-, 35. The concentration of added glucose and glutamine was 25 mM. The *p*H of this solution was 8·0. 5-ml. volumes, at 37° C, were placed in the loops for 15 min. The animal was labelled with ^{22}Na and tracer quantities of ^{24}Na were added to the mucosal fluid.

are nearly identical for the two preparations. The 'serosa to mucosa' rate is much lower in the *in vivo* preparation and the net flux is therefore greater, even in the absence of added glucose or glutamine.

The mechanism for this disparity of stimulation by added substrates *in vivo* and *in vitro* remains unexplained. Rabbit ileum vigorously oxidizes carbon-14 labelled glutamine to CO_2 *in vitro*, but it also converts labelled glucose to CO_2, although at a lesser rate (unpublished data). Therefore, there is no question of limited permeability to glucose *in vitro*. Presumably the permeability of ileum to glutamine should be at least as adequate *in vivo* as *in vitro*.

Although no mechanism has been elucidated, these data indicate the necessity for the exercise of considerable caution in extrapolating data obtained from the everted sac *in vitro* to the preparation *in vivo*.

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PHYSIOLOGY

High-precision Repetitive Firing in the Insect Optic Lobe and a Hypothesis for its Function in Object Location

We have encountered, in the optic lobe of the insect *Calliphora erythrocephala*, a layer of elements firing spontaneously at a very constant rate of about 50 spikes per sec. The observed waveform depends on the position of the pick-up electrode and on the temperature, bnt in a given spike-train the rise-time is constant within 20 μsec. A photograph of a typical spike is shown in Fig. 1. In these experiments (more than a hundred), the animals were intact except for a small window cut in the back of the head, and were able to survive for many hours.