

ASPECTS OF IONIC TRANSPORT MECHANISMS IN CRAYFISH *ASTACUS LEPTODACTYLUS*

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SUMMARY

1. During the uptake of chloride from an external choline chloride solution, electroneutrality appears to be preserved by excretion of base, but base excretion independent of chloride absorption also occurs.
2. Sodium ion uptake from sodium sulphate solutions is compensated by excretion of hydrogen ions, but this has been established only in animals adapted to distilled water.
3. In animals preadapted to running water, the sodium ion influx can be abolished almost totally by amiloride without diminishing ammonium excretion.
4. The net fluxes of sodium and chloride are inhibited by acetazolamide and cyanide.
5. These results are interpreted as indicating that Na^+ and Cl^- are absorbed chiefly in exchange for H^+ and HCO_3^- , and are discussed in relation to an exchange diffusion mechanism.

INTRODUCTION

Crayfish can absorb Na^+ and Cl^- from dilute solutions, principally through the gills (Krogh, 1939; Koch, Evans & Schicks, 1954; Bryan, 1960*b*; Shaw, 1960*a, b*; Bielawski, 1964). Krogh found that the amounts of sodium and chloride absorbed were not necessarily equal. In experiments where the accompanying ion was impermeant it was possible to deduce that an endogenous ion of the same charge as that absorbed must be released in order to preserve electroneutrality.

Krogh suggested that the ion exchanged for Na^+ might be NH_4^+ in ammonotelic animals such as teleosts and crustacea. This proposal has found some experimental support (Shaw, 1959, 1960*a, b*; Maetz & Garcia-Romeu, 1964). However, ammonium excretion appears to be independent of the Na^+ concentration of the medium in crayfish, carp and trout (Shaw, 1960*b*; De Vooy, 1968; Kerstetter, Kirschner & Rafuse, 1970) and acetazolamide (Diamox) reduces the Na^+ flux without inhibiting the release of NH_4^+ (Kerstetter *et al.* 1970).

The possibility therefore arises that H^+ rather than NH_4^+ is exchanged for Na^+ in ammonotelic animals, as in the ureotelic frogs studied by Garcia-Romeu, Salibian & Pezzami-Hernandez (1969) and by Garcia-Romeu & Ehrenfeld (1972). Maetz, however, has found that in goldfish sodium absorption is correlated with the sum of the equivalents of H^+ and of NH_4^+ excreted (1973).

