In view of these findings we propose that ten segments of SS RNA associate with viral proteins to form a particle which can only replicate a limited number of SS RNA species. Before replication of other SS RNA species can occur, certain sequential changes in the structure of such particles are necessary. These changes would result in particles more closely resembling virions as judged by increased resistance of the inner proteins to chymotryptic digestion and altered sedimentation rates. One of the first particles formed is probably DS RNA polymerase 3, since this particle resembles virions the least.

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*p*H, Salinity and Temperature Tolerance of Lake Magadi *Tilapia*

THERE are several species of *Tilapia* isolated in the alkaline lakes of the Great Rift Valley of Africa, living in extreme conditions of temperature, salinity and *p*H. One of these fish, the Lake Magadi *Tilapia* (*Tilapia grahami*), lives in the lagoons and alkaline volcanic springs around the margin of Lake Magadi in Kenya[1]. The main salts of the springs, and the lake, are carbonate and bicarbonate of sodium.

To continue with studies on osmoregulation and acid-base balance in *Tilapia grahami*, we made some observations on its tolerance to changes in *p*H, salinity and temperature. Each of the three series of experiments was carried out on different fish as were the individual experiments within each series. Each experiment involved four to six medium-sized fish 3 to 5 cm long, which were kept in a glass jar. The fish were caught in nets in a lagoon (Fish Springs[1]) and were transported to Nairobi in water taken from the same lagoon, which had *p*H values of 9.8 to 10.1, osmolarity of 518 to 600 mOsm per kg H_2O and a temperature, measured on different days, of 35.2 to 38.0° C.

In Nairobi, some fish were transferred to tap water, which was well tolerated. Others were transferred to dilute solutions of hydrochloric acid of *p*H 3 to 6 or sodium hydroxide (of *p*H 8 to 12) in tap water. Those exposed to a *p*H of 3 to 4 or a *p*H of 12 died within 2 to 6 h. Fish kept at *p*H values between 5 and 11 showed no ill effects after 24 h. Throughout the experimental period the *p*H was regularly measured and adjusted by adding acid or base. Most experiments of this type were performed at 22° to 23° C, but similar *p*H tolerance limits were found in a few fish studied at 35° to 36° C during the first day after they had been brought from the lagoon.

Tolerance to salinity changes was tested at 22° to 23° C in 2 to 6% solutions of sodium chloride in tap water. Fish kept in 2 to 3% solutions were apparently in good condition after 24 h, those in 4% solution were alive after 8 to 10 h but died soon afterwards. Those maintained in greater concentrations died within a few hours.

Temperature tolerance was tested in fish kept in water from the lagoon. At 10° to 12° C the fish died within 1 to 2 h, but they survived after 24 h at 16° C. Temperatures of 22° to 23° C were well tolerated for several days. The upper limit for temperatures tolerated for at least 24 h seemed to be about 40° C. If the fish had been kept at 22° to 23° C for some days, however, immediate transfer to water of moderately high temperatures (35° to 36° C) was lethal.

Our study indicates that the ability of *T. grahami* to survive in alkaline waters is superior to that known for any other fish, while acid waters (*p*H 5) and salinity changes have been shown to be equally well tolerated by adult individuals of several freshwater and euryhaline species[2]. The range of thermal tolerance of *T. grahami* is less than that previously demonstrated in the desert pupfish, *Cyprinodon*[3], but the upper lethal temperatures are about the same. Previous observations have indicated that individuals of *T. grahami*, particularly brooding females, during their movements between the different pools may survive transient exposure to water temperatures of 40° to 44° C (compare refs 1 and 4).

In addition to high *p*H, salinity and temperature, the Lake Magadi *Tilapia* seems to be faced with low levels of dissolved oxygen. Preliminary measurements, obtained with the azide modification of the iodometric method[5], showed oxygen levels of 1.1, 2.2 and 3.3 mg l^{-1} in water from outlets of hot spring, main lagoon and shallow pool, respectively. Fish were observed in all these locations. Those used in our experiments were caught in the main lagoon; large individuals seemed to prefer the more shallow pools. Large amounts of free carbon dioxide also seem to be well tolerated as the fish showed no ill effects when kept in water from the lagoon while the water was acidified to *p*H 5 by dropwise addition of hydrochloric acid. Addition of strong acids to waters with a high bicarbonate content can produce concentrations of carbon dioxide which are fatal to other species of fish[2].

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