OXYGEN UPTAKE IN THE BRINE SHRIMP *ARTEMIA* IN RELATION TO SALINITY

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ABSTRACT

The rate of oxygen consumption of *Artemia* has decreased with decrease in salinity and in freshwater the 0_2 consumed was least. The probable reasons for such decrease have (been discussed.

The brine shrimps; inhabit salt lakes and ponds, which generally undergo major seasonal changes in oxygen concentration, temperature and salinity, After the recording for the first time of *Artemia* in India by Kulkarni (1953), considerable work has been done on the oxygen consumption and respiratory metabolism of the speciesi Gilchrist (1956, 1959) attempted to find the relation of the oxygen consumption of *Artemia salina* and salinity. The influence of salinity and temperature upon respiratory behaviour of the brine shrimp nauplii was done by Engel and Angelovic (1968). The respiratory physiology of *Artemia salina* after acclimation to different oxygen concentration was studied by Vos et al (1979) and Deciair et al (1980).

Adult and matured specimens were used for the experiment. The cysts were hatched in 35% seawater at 29°C under continuous aeration. The nauplii were grown in 60-1 ak-water lift-operated raceways according to the method of Sorgeloos (1976). They were fed twice a day on a suspension of *Acetes* extract. Five hundred specimens were selected for measuring oxygen uptake in each salinity concentration and their total wet weight was noted. The seawater was collected from the main seashore near Bombay and its salinity was measured with salinometer. The different salinity media *(37%$_0$* 'o *Q%,)* were prepared by mixing seawater and ffeshwater as per the Indian Standard Institution (ISI) method; and at each salinity concentration oxygen content was recorded. Five-litre incubation jars were used for measuring oxygen uptake. Before introducing the *Artemia* for experimental conditions, its lethal concentration (LC 50 value) for low salinity was observed. The oxygen was determined by Winkler's method (Welsh and Smith 1961) and the values obtained were expressed as m!0_2 ,/g/h.

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Data on oxygen uptake capacity in different saline media is presented in table 1 from which it is observed that the oxygen consumption was decreasing with decrease in salinity concentrations. The lethal tolerance capacity, i.e. LC 50 value, in lowest concentration of seawater was 0.1%. The *Artemia* generally select the media wherein the salinity is always high (60 to 80 ppt). There are reports of *Artemia* culture in salt pans/lakes where salinity has been above 160% (Kulkarni 1953). This perhaps shows that *Artemia* can thrive better where O2 content is very low. In actue abnormal conditions it undergoes dormancy by forming cysts. The *Artemia* is always hyperosmotic to the medium below 25% seawater and hyposmotic above it. Croghan (1958) found that *Artemia* could survive over a wide range of salinity, from 10% seawater to crystalizing seawater brine, but it died in distilled water within 24 h.

TABLE 1. *Oxygen uptake in* Artemia *in relation to varying salinities at temperature* 26° t 1°C.

Salinity pressure of media *(%0)*	Oxygen concentrations of media ml 0_2/1	*Rate of oxygen uptake in ml 0,/g/h
37	3.82	0.739 ±0.033
30	4.25	0.456 ± 0.015
20	4.83	0.323 ± 0.026
10	5.50	0.195 ± 0.013
5	5.76	0.092 ± 0:004
0 (freshwater)	5.90	0.043 ± 0.006

In spite of the fact that in the diluted seawater in our experiment the oxygen concentration was more, *Artemia* could not consume much. As the animals were brought to the lower concentration of seawater, oxygen uptake capacity of the animal also decreased. In freshwater, even though large amount of Ok was available, the oxygen consuming capacity of *Artemia* was very much reduced. This may be due to the animal losing control over the antennary glands and which in turn affecting its osmotic balance. Also, blood may have become diluted beyond the required limit, resulting in a physiological stress. The present findings are in agreement with the work of Buddenbrock (1948) on *Maja verucosa*, a stenohaMne crustacean, in which O2 uptake has decreased with dilution of medium. Gilchrist (1956) has reported that there was no significant change in respiratory rate of *Artemia salina* from 35% seawater to 14% brine.

Three types of haemoglobins (Hb III > Hb II > Hb I) are reported to be present in *Artemia* (Van den Branden et al 1978). These haemoglobins are adapted to cope with different environmental pC>2 values, Hb I being more efficient in oxygen-rich water and Hb III in very poorly oxygented water (Van den Branden et ail 1978); According to Vos et al (1979), under hypoxic condition haemoglobin type -III was produced and there was more formation of lactic acid in *Artemia salina*. If this be the case, in fresh water conditions in our experiment maximum Oi could have been used by producing Hb I, which, however, did not happen, j On the other hand, when the animal was transferred to freshwater, 100% mortality \vas observed within 24 h. Identical observation was made by Croghan (1958) while working with *Artemia salina*. This perhaps indicates that apart from oxygen concentration certain amount of salinity is needed in the medium to produce Hb I for oxygen to be utilized.

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