DECAPSULATION OF ARTEMIA CYSTS: A SIMPLE TECHNIQUE FOR
THE IMPROVEMENT OF THE USE OF BRINE SHRIMP IN
AQUACULTURE

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ABSTRACT

of Artemia cysts: a simple technique for the improvement of the use of brine

Although it is a common practice in different disciplines of fundamental research on
the brine shrimp, and despite the very interesting applications that it offers for the use of
Artemia in aquaculture, the "decapsulation" technique, which removes the outer layer of
the cyst shell of Artemia, is not known to shrimp and fish aquaculturists.

The present paper describes the technology developed by the authors for the routine
decapsulation of Artemia cysts. The advantages which result from the use of decapsu-
lated cysts in aquacultural hatcheries are discussed.

INTRODUCTION

While the live nauplii of the brine shrimp Artemia salina are excellent food
for most fish and crustacean larvae, the non-hatched cysts and their empty
shells, if not separated from the nauplii, often cause problems when Artemia
is used in aquacultural hatcheries. Indeed, the cysts or cyst shells which are
ingested by a predator cannot be digested and may cause blockage of the
gut or have other deleterious effects (Herald and Rackowicz, 1951; Morris,
1956; Rosenthal, 1969; J.E. Shelbourne, cited by Provasoli, 1969; Stults,
1974). Moreover, as the external surfaces of cyst shells carry spores of bac-
teria, plant and even animal species (Gilmour et al., 1975; A.S. Agostino,
personal communication, 1977), serious infections can occur in fish or crusta-
cean cultures after the addition of mixed suspensions of nauplii and cysts
or cyst shells) (Shelbourne, 1984; MacFalin et al., 1987).

For these reasons, when Artemia nauplii are used as a live food source in
aquaculture, the nauplii are usually separated from the hatching debris. How-
ever, the separation techniques are in many cases not very efficient or
require the use of special separator boxes (see review by Sorgeloos and Per-
soone, 1975).

In view of these problems, it is surprising that the technique of Nakanishi
et al. (1962), improved by Morris and Afzelius (1967), which removes the
outer part of the shell of Artemia cysts without affecting the viability of the
embryos, has not yet been applied on a large scale for aquaculture purposes.

This study concerns a practical application of Artemia cyst decapsulation
in aquaculture. Part of the research was carried out at the Tigbauan Station
of the Southeast Asian Fisheries Development Center in the Philippines, and
the technique described below is now utilized there on a routine basis.

TECHNICAL PROCEDURE

The hard, dark brown, external layer of a cyst, the chorion (Fig.1), which
can be removed in a hypochlorite solution, is lipoproteinaceous and is im-
regnared with haemazine, a derivate of haemoglobin (Dutrieu, 1960; 
Linder, 1960; Anderson et al., 1970). It has numerous interconnected canals 
which are filled with air and are in contact with the surface of the cortical 
layer. According to Mathias (1937) this alveolar layer contributes to the 
buoynance of the cyst.

The dry cysts are hydrated in a funnel-shaped container (minimum ratio 
of height to width of the water column is 7 : 3) with tap water or sea water 
and kept in continuous suspension by aeration from the bottom. After 1 h, 
the suspension is diluted with an equal volume of commercial hypochlorite 
("Chlorox", "Eau de Javel", "Oldrox", "Sanichlor" or another brand) to 
obtain a final concentration of active ingredients of 2.12% (most commercial 
brands contain 5.25% active ingredients). The oxidation process starts imme-
diately and, as the chorions dissolve, a gradual colour change is observed in 
the cysts from dark brown via white to orange.

Within 7–10 min, the chorions disappear completely and the decapsulated 
cysts should then be filtered immediately and thoroughly washed with tap 
water or sea water in order to remove all traces of hypochlorite. The treated 
cysts are now either incubated directly for hatching or, after immediate 
dehydration in a brine solution, stored for later use. The dehydration is per-
formed by transferring the decapsulated cysts into a saturated solution of 
sodium chloride in tap water or sea water. After agitation by bubbling air 
through the solution for 3–4 h at room temperature, the dehydrated cysts 
are concentrated and distributed into smaller vials, containing a saturated 
brine solution. Studies undertaken to determine the most appropriate con-
ditions for storage of decapsulated cysts revealed that the hatching efficiency 
of cysts (exposed to optimum hatching conditions) does not decrease with 
storage if decapsulated cysts are stored at temperatures of −4°C or lower 
(maximum preservation period tested to date: 8 weeks).

While studying the possibility of decapsulating cysts at high densities, 
substantial temperature increases were experienced in the medium during the 
oxidation process and this limits the density and the total quantity of cysts 
that can be treated in one single container without affecting the viability of the 
embryos. From previous research, however, we know that as long as the 
temperature of the medium is kept below 40°C, the hatching efficiency 
remains maximal (Sorgeloos et al., 1976).

The standard technique that has been worked out assures successful 
treatment at any density not exceeding 1 g/15 ml tap water or sea water and 
with no more than 200 g of cysts. It should be mentioned that this proce-
dure was developed in a tropical climate where temperatures of the tap water 
are up to 27°C.

Decapsulation of larger quantities of cysts is possible either at lower cyst 
densities or with cooling of the suspension of hydrated cysts to keep the tem-
perature of the medium during the decapsulation process below 40°C; for 
example, 1 kg of San Francisco Bay cysts can be successfully decapsulated in


