



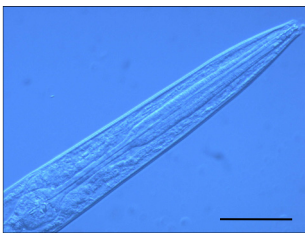
FEEDING FISH LARVAE WITH ANHYDROBIOTIC AND ENRICHED NEMATODES GROWN IN BIOREACTORS

Thomas Assheuer

Conception

- Nematodes can substitute Artemia and Rotifers as prey for fish larvae.
- Nematodes are efficiently cultured in liquid media in bioreactors.
- Nematodes are capable of anhydrobiosis. Some species can survive desiccation for long periods of time.
- Desiccated but living nematodes have excellent product convenience.
- Nematodes can serve as "micro-capsules" e.g. for PUFA. PUFA composition of liquid media influences PUFA patterns of nematodes.
- Nematodes are as easy to use by the customer as Artemia. Enrichment can be omitted.

Bacterial-feeding Nematodes

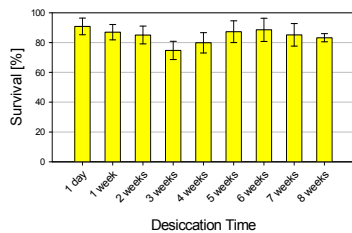


Head of bacterial-feeding Nematode NFS 30-4 (*Panagrolaimidae*, bar = 50.0 µm)

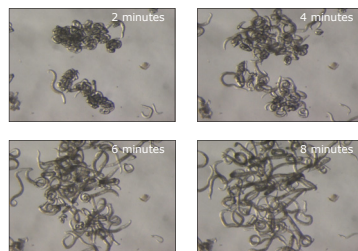


Adults and juveniles of NFS 30-4 compared to Artemia nauplii and Zoea VII larvae of *Macrobrachium amazonicum* (bar = 1.0 mm)

Anhydrobiosis of Nematodes



Survival of bacterial-feeding Nematode NFS 30-4 (*Panagrolaimidae*) after desiccation in 52.9% RH for two months (Piascheck 2008, diploma thesis).



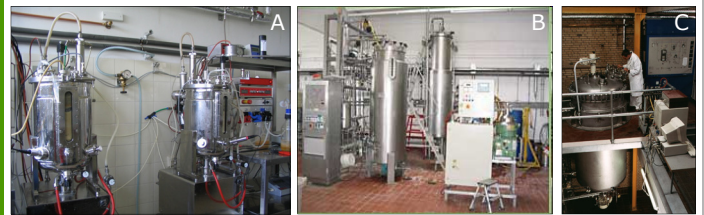
Behavior of desiccated nematode NFS 30-4 (*Panagrolaimidae*) after mixing with tap water. During anhydrobiosis the worms cluster together. They immediately start to move after rehydration.

Enrichment of Nematodes

	Aquagrow	Algamac	Control
Saturates	11.18	28.15	21.76
Monounsaturates	7.91	21.85	26.23
Polyunsaturates	28.95	77.42	76.38
n-3 polyunsaturates	2.56	4.77	6.94
n-6 polyunsaturates	18.78	49.88	43.50
n-3/n-6	0.14	0.10	0.16
DHA (22:6n-3)	0.51	0.00	1.28
EPA (20:5n-3)	1.47	3.83	3.86
ArA (20:4N-6)	5.52	19.14	11.45
22:5N-6	0.00	0.00	0.00
DHA/EPA	0.35	0.00	0.33
DHA/AA	0.09	0.00	0.11
AA/EPA	3.77	4.99	2.97

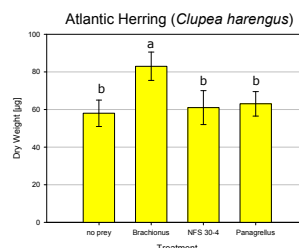
Selected fatty acid levels (mg/g DW) and ratios in nematodes. Nematodes were grown in liquid media containing 0.1 % of Aquagrow™ or Algamac™ (unpublished data, Glazer 2005). ArA is emphasized as an example where the level has been modified nearly ± 100%.

Biotechnological Production

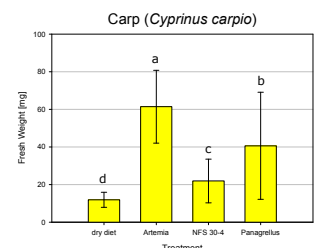


Bioreactors for production of bacterial-feeding nematodes in liquid media: A - lab scale (12 liter), B - pilot scale (500 liter), C - production plant (3,000 liter). All facilities at e~nema GmbH (Schwentinental near Kiel, Germany)

Feeding Fish Larvae



Dry weight of *C. harengus* larvae on 12th day post hatch (Tukey's HSD, $p < 0.05$; Hauss & Clemmesen 2008, unpublished data). Nematodes were applied freshly.



Fresh weight of *C. carpio* larvae on 22nd day post hatch (SNK, $p < 0.05$; Tillner & Rennert 2008, preliminary unpublished data). All treatments have been fed dry diet after the first week. Nematodes were applied freshly.

Thomas Assheuer
Institute for Phytopathology
Dept. Biotechnol. & Biol. Control
Hermann-Rodewald-Str. 9
D-24118 Kiel
Tel +49 4307 8295 272
assheuer@biotec.uni-kiel.de

Posterpresentation
at the 32nd Larval Fish Conference Kiel
4 - 7 August 2008

Acknowledgment

This work was supported by funds of:
Innovationsstiftung Schleswig-Holstein, HWT program
(www.i-sh.org/ish/Foerderung/HWT-programm.php)
and e~nema GmbH (www.e-nema.de)

Cooperation Partners

IFM-GEOMAR - Leibniz-Institute of Marine Sciences (Kiel, Germany)
www.ifm-geomar.de

IGB - Leibniz-Institute of Freshwater Ecology and Inland Fisheries (Berlin, Germany)
www.igb-berlin.de

