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# Omega-3 fatty acids are also important to the lobster's brain

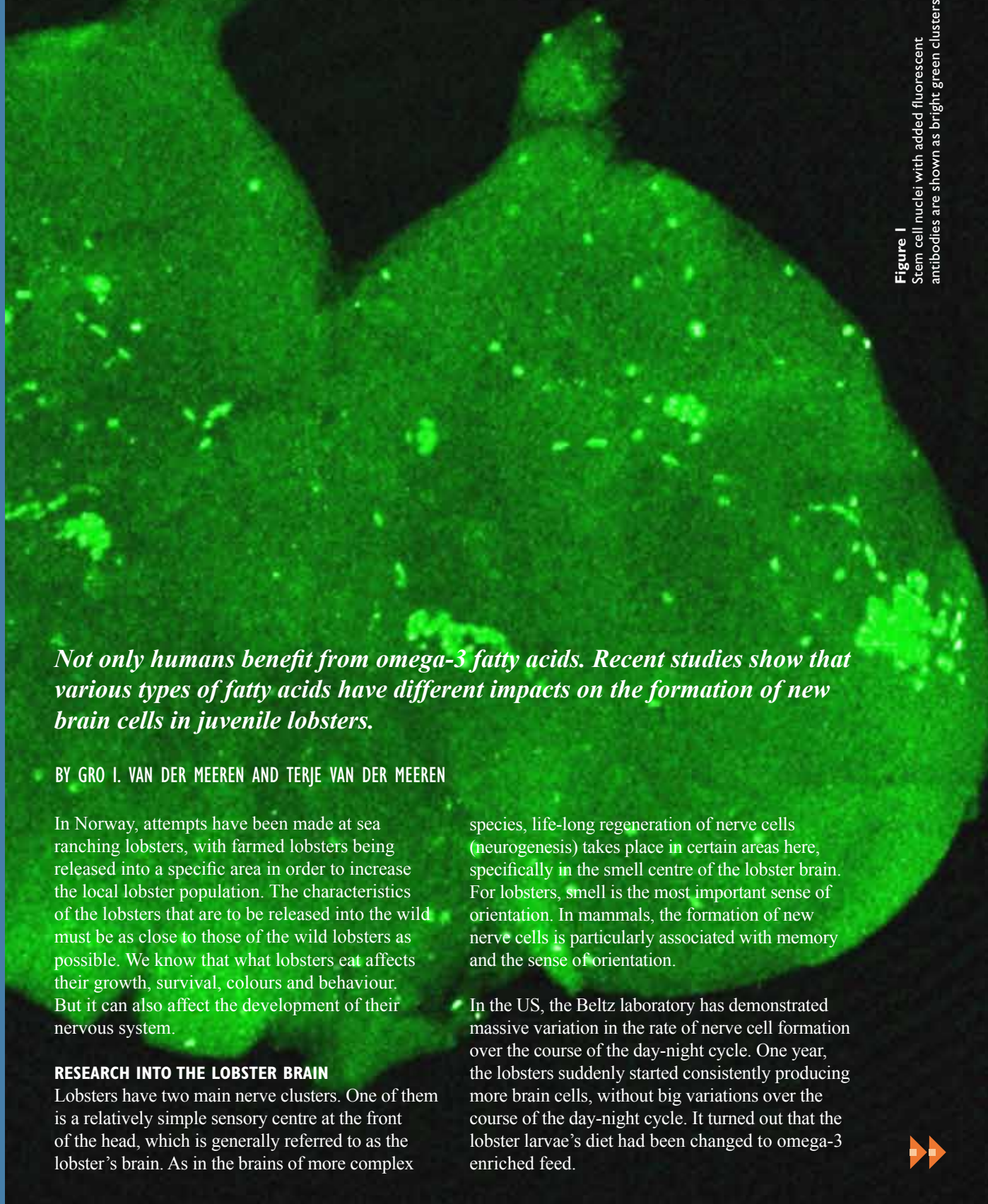

**Figure 1**
Stem cell nuclei with added fluorescent antibodies are shown as bright green clusters.

***Not only humans benefit from omega-3 fatty acids. Recent studies show that various types of fatty acids have different impacts on the formation of new brain cells in juvenile lobsters.***

BY GRO I. VAN DER MEEREN AND TERJE VAN DER MEEREN

In Norway, attempts have been made at sea ranching lobsters, with farmed lobsters being released into a specific area in order to increase the local lobster population. The characteristics of the lobsters that are to be released into the wild must be as close to those of the wild lobsters as possible. We know that what lobsters eat affects their growth, survival, colours and behaviour. But it can also affect the development of their nervous system.

## RESEARCH INTO THE LOBSTER BRAIN

Lobsters have two main nerve clusters. One of them is a relatively simple sensory centre at the front of the head, which is generally referred to as the lobster's brain. As in the brains of more complex species, life-long regeneration of nerve cells (neurogenesis) takes place in certain areas here, specifically in the smell centre of the lobster brain. For lobsters, smell is the most important sense of orientation. In mammals, the formation of new nerve cells is particularly associated with memory and the sense of orientation.

In the US, the Beltz laboratory has demonstrated massive variation in the rate of nerve cell formation over the course of the day-night cycle. One year, the lobsters suddenly started consistently producing more brain cells, without big variations over the course of the day-night cycle. It turned out that the lobster larvae's diet had been changed to omega-3 enriched feed.

Retur: Havforskningsinstituttet, Postboks 1870 Nordnes, NO-5817 Bergen, Norway

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## DIETARY EXPERIMENTS WITH SELECTED OMEGA-3 FATTY ACIDS

When scientists from the Institute of Marine Research spent time as visiting researchers at the Beltz laboratory, it was an opportunity to look more closely at the impact of omega-3 fatty acids in the diet of juvenile lobster. The fatty acids EPA (Eicosapentaenoic acid) and DHA (Docosahexaenoic acid) are known to be very important to all types of animals, affecting mental health and the nervous system, amongst other things. Special feed enriched with specific amounts of EPA and DHA was tested on the juvenile lobsters to see whether it affected the formation of new brain cells. We also looked at the growth and survival rates of the lobsters.

We found that lobsters given only DHA or DHA in combination with EPA formed fewer new brain cells than lobsters given only EPA or linseed oil, which was given to the control group. However, the DHA group had a slightly higher survival rate. There was no significant difference between the growth rates of the groups. The experiment was done over a short period of time (approx. one month) and included so few specimens that the survival and growth rate results are unreliable. However, it is totally clear that DHA had a limiting impact on the number of new cells.

## WHAT CAN WE LEARN FROM THIS?

This study has shown that the omega-3 fatty acid DHA has a demonstrable effect on the formation of new nerve cells.

It was previously known that crustaceans kept in isolation and without sensory inputs cease to develop new brain cells. This is also true of depressed humans. However, it is not certain that a high rate of cell production is necessarily ideal. Nor do we know to what extent the newborn brain cells survive the four to six months it takes for them to become integrated nerve cells (neurons) transmitting signals to other nerve cells in active neural networks.

Before making any detailed recommendations on the ideal lobster feed, we must look at the impacts right up until the nerve cells become mature neurons. We must also discover whether, and how, this affects behaviour and abilities such as foraging and reactions to predators and competitors. A Canadian study has shown that the behaviour of juvenile lobsters changes if they are given omega-3 enriched feed, but it did not reveal anything about the impacts of the individual fatty acids. This, along with our results, demonstrates clearly that omega-3 fatty acids are important to the lobster diet. The exciting thing about this research on crustaceans is that it may teach us more about how the individual components of our food have a direct impact on our own brains.

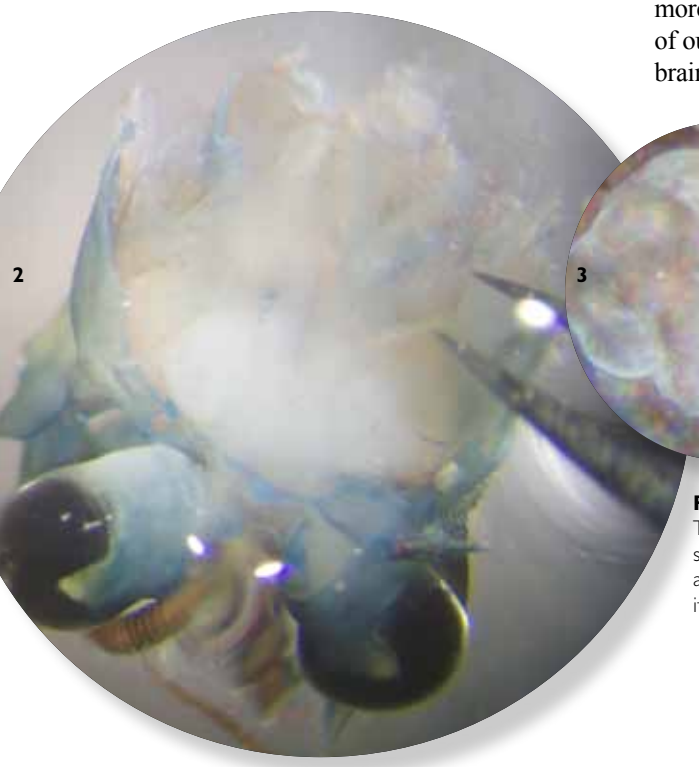


**Figure 2** The lobster's sensory centre, at the front of its head.

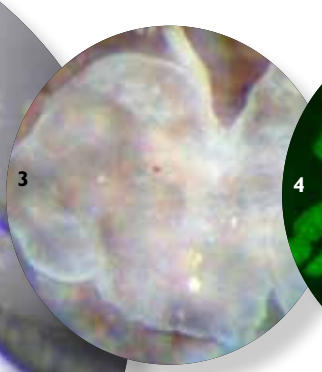


**Figure 3** Brain extracted from a juvenile lobster.

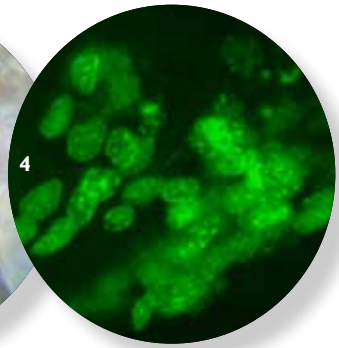


**Figure 4** The microscope image show newborn cells in juvenile lobster.

INSTITUTE OF MARINE RESEARCH
HAVFORSKNINGSINSTITUTTET

**INSTITUTE OF MARINE RESEARCH**
Nordnesgaten 50
P.O. Box 1870 Nordnes
NO-5817 Bergen – Norway
Tel.: +47 55 23 85 00
Fax: +47 55 23 85 31

www.imr.no

**TROMSØ DEPARTMENT**
Sykehusveien 23
P.O. Box 6404
NO-9294 Tromsø – Norway
Tel.: +47 55 23 85 00
Fax: +47 77 60 97 01

**FLØDEVIGEN RESEARCH STATION**
NO-4817 His – Norway
Tel.: +47 55 23 85 00
Fax: +47 37 05 90 01

**AUSTEVOLL RESEARCH STATION**
NO-5392 Storebø – Norway
Tel.: +47 55 23 85 00
Fax: +47 56 18 22 22

**MATRE RESEARCH STATION**
NO-5984 Matredal – Norway
Tel.: +47 55 23 85 00
Fax: +47 56 36 75 85

**PUBLIC RELATIONS AND COMMUNICATION**
Tel.: +47 55 23 85 38
Fax: +47 55 23 85 55
E-mail: informasjonen@imr.no
Research group:

**CONTACTS**
Gro I. van der Meeren
E-mail: gro.van.der.meeren@imr.no
Tlf: +47 55 18 22 68

Terje van der Meeren
E-mail: terje.van.der.meeren@imr.no
Tlf: +47 56 18 22 62
Research group:

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