



# Analysis of cell powder from *in vitro* cultured fish cells

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Dr. Marina Gebert  
Fraunhofer Institution for Marine  
Biotechnology



# Health benefits of fish consumption



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Health  
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University of  
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## New Evidence for the Cardiovascular Benefits of Long Chain Omega-3 Fatty Acids

Susan N. Hansen

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**Abstract** The central role of omega-3 polyunsaturated fatty acids in cardiovascular disease prevention has been well established. However, the evidence for their benefit in other diseases is less clear. This review summarizes the evidence for the health benefits of omega-3 polyunsaturated fatty acids in diseases other than cardiovascular disease.

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REVIEW PAPER

### Neurological Benefits of Omega-3 Fatty Acids

S. C. Dyall · A. T. Michael-Titus

## The health benefits of omega-3 polyunsaturated fatty acids: a review of the evidence

C. H. S. Ruxton,\* S. C. Reed,† M. J. A. Simpson\*, & K. J. Millington†

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## Health benefits and potential risks related to consumption of fish or fish oil \*

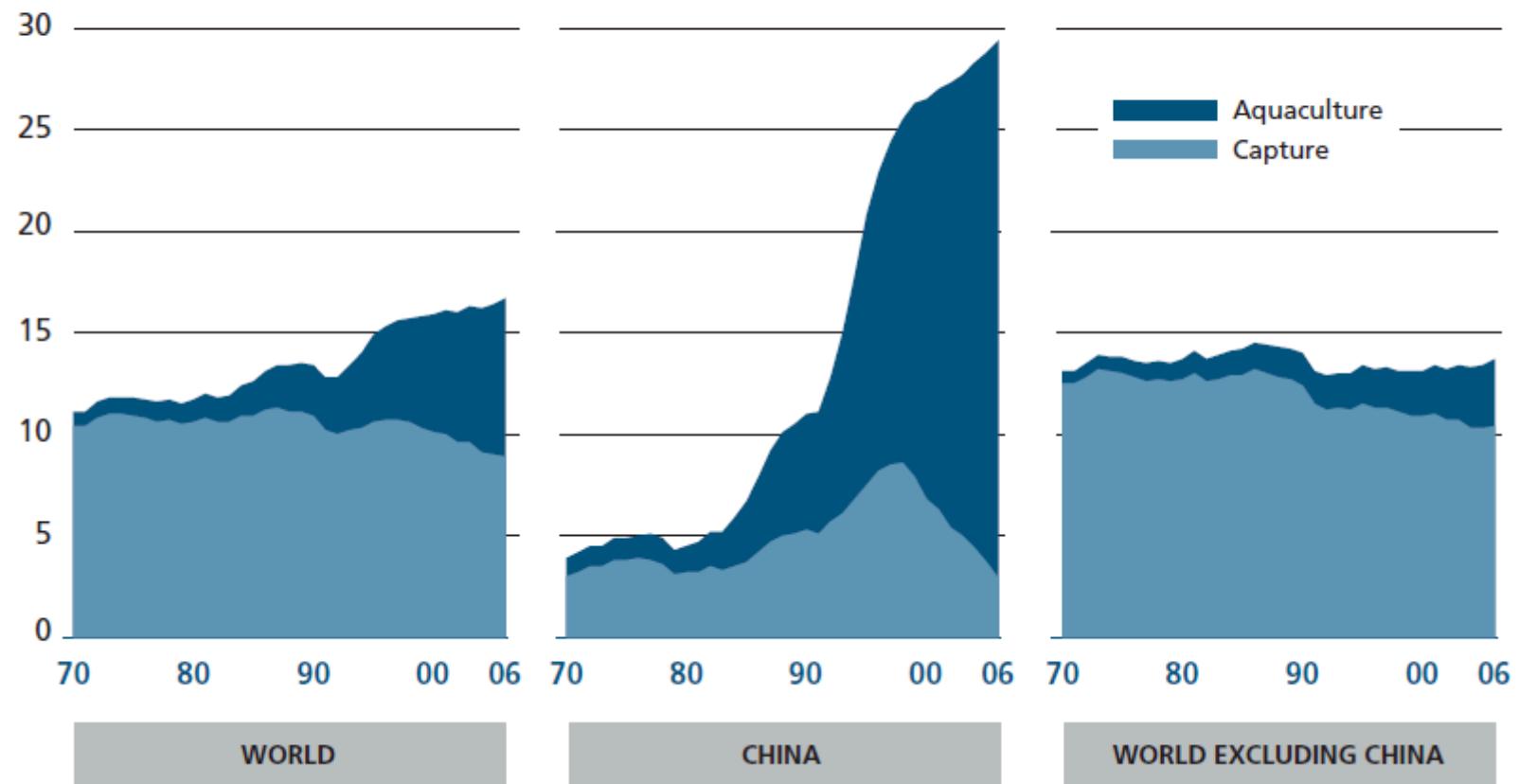
This paper is dedicated by the author in memory of his affectionate father Principal, Joginder S. Sidhu who passed away at age 68 due to myocardial infarction; his elder brother-in-law Major, Rattan S. Balwani who died at age 42 due to a massive heart attack; and his younger brother-in-law Attorney, Kamal S. Sahota who suddenly died at age 66 due to a cardiac arrhythmia.

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Received 20 May 2003. Available online 22 October 2003.

# Food fish consumption

Relative contribution of aquaculture and capture fisheries to food fish consumption

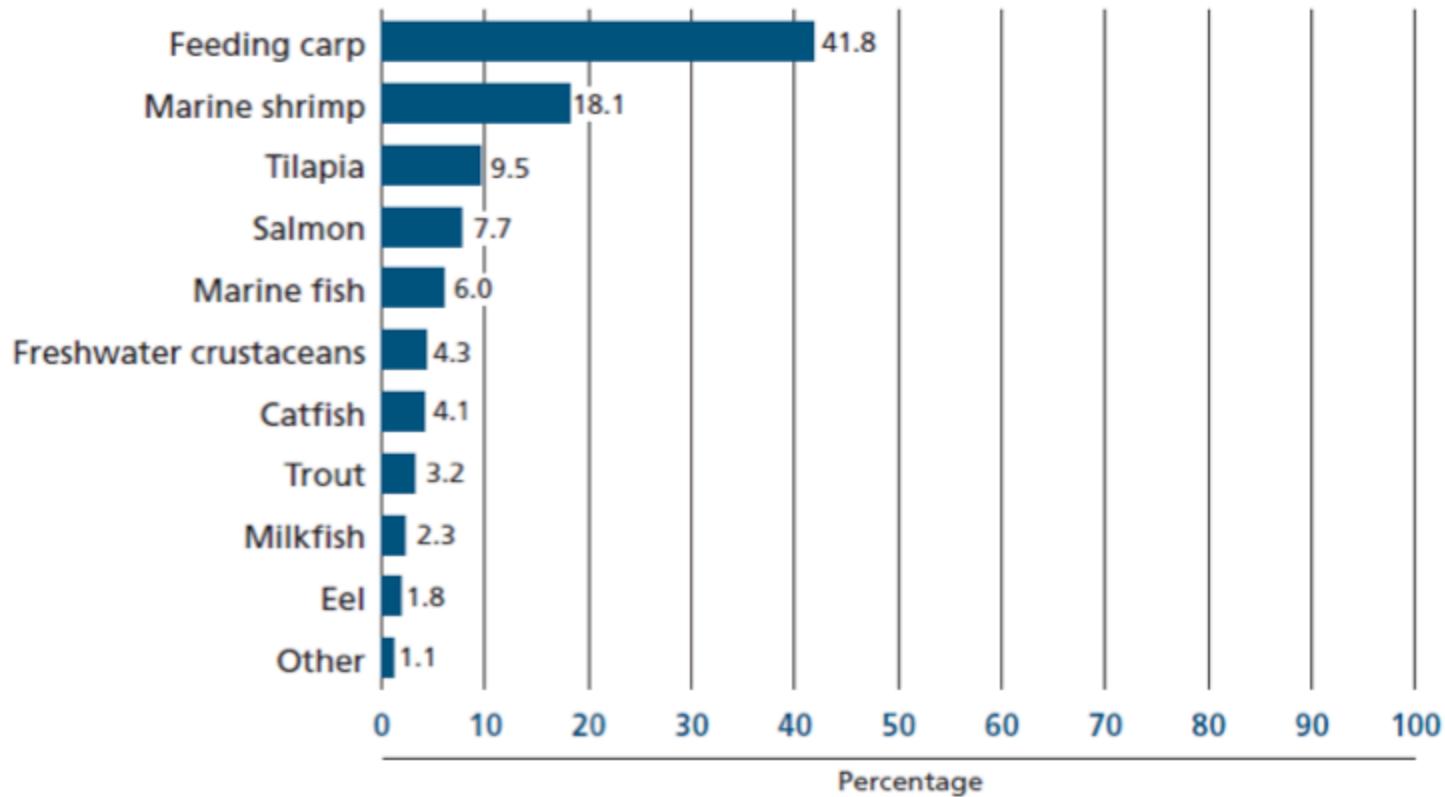
Fishery food supply (kg/capita)



Source: The State of World Fisheries and Aquaculture, 2008. FAO

# Production and use of compound aquafeed

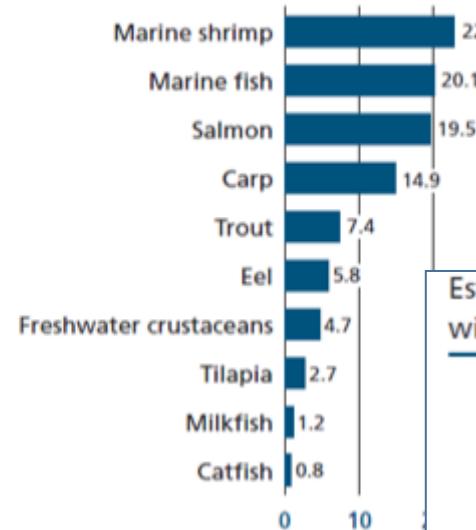
Estimated global compound aquafeed production in 2005 for major farmed species  
(as percentage of total aquafeed production, dry as fed basis)



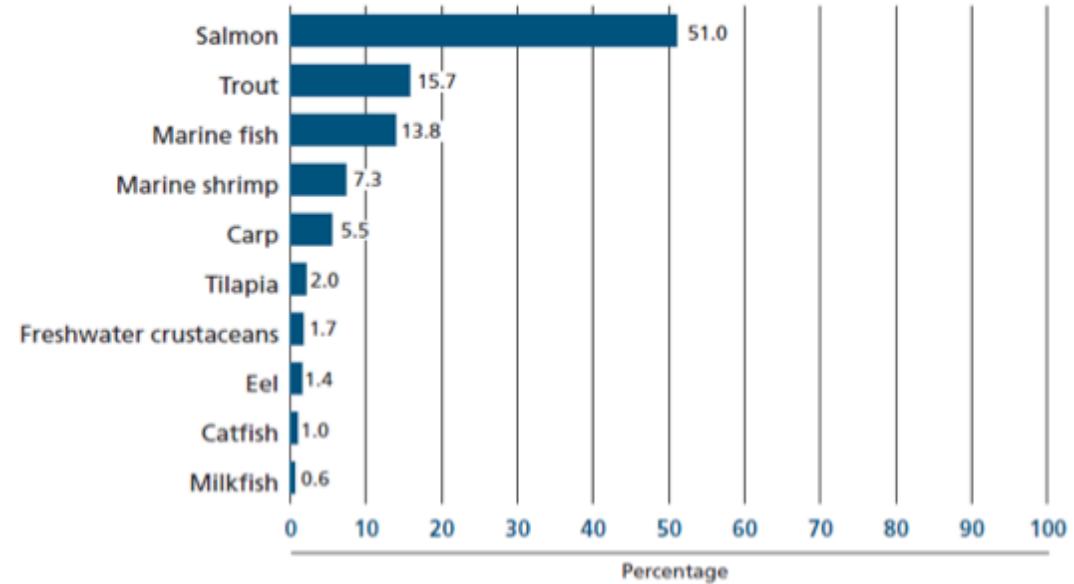
Source: Adapted from FAO. 2007. Global synthesis of feeds and nutrients for sustainable aquaculture development, by A.G.J. Tacon and M.R. Hasan. In M.R. Hasan, T. Hecht, S.S. De Silva and A.G.J. Tacon, eds. *Study and analysis of feeds and fertilizers for sustainable aquaculture development*, pp. 3–17. FAO Fisheries Technical Paper No. 497. Rome.

# Global use of fish meal and fish oil in aquaculture

Estimated global use of fishmeal (percentage of dry as fed basis) within compound aquafeeds in 2003 by major cultivated aquatic animals

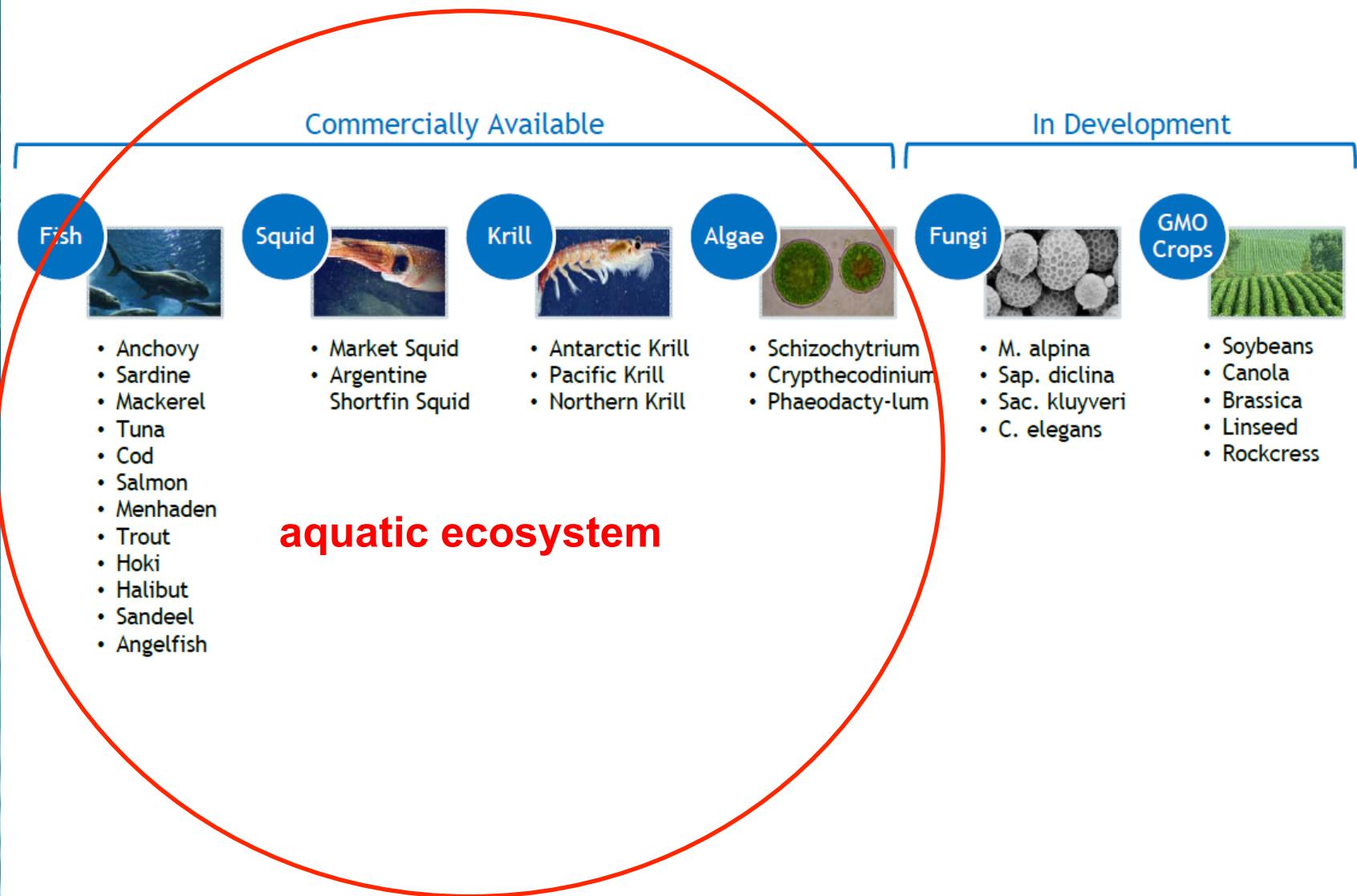


Estimated global use of fish oil (percentage of dry as fed basis) within compound aquafeeds in 2003 by major cultivated aquatic animals



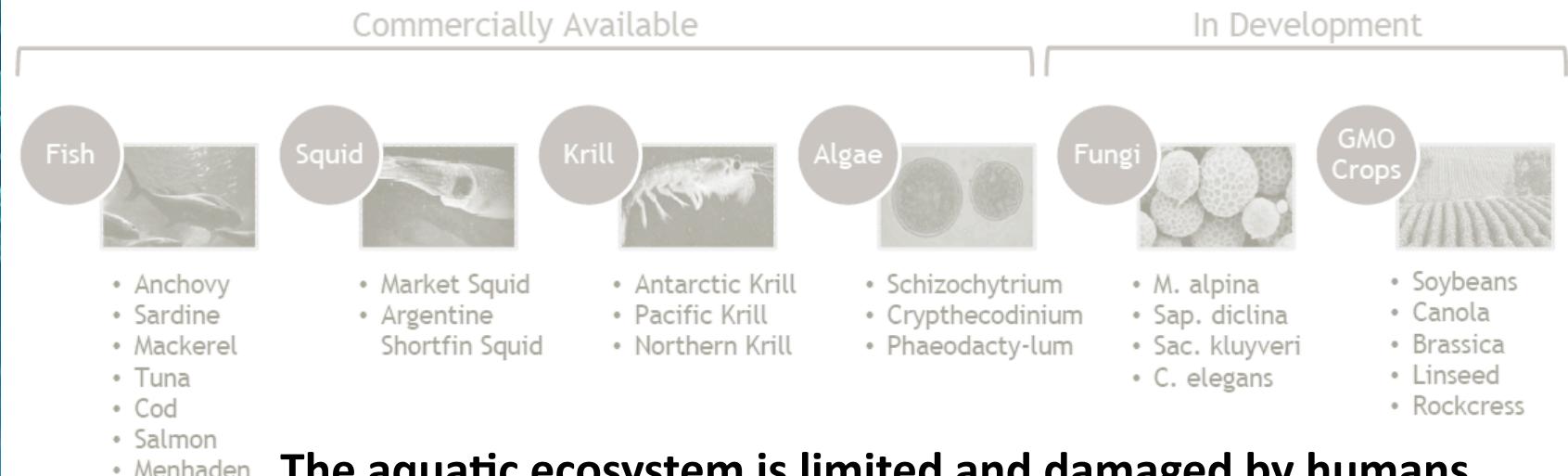
Source: The State of World Fisheries and Aquaculture, 2008. FAO

# Sources of fish meal and fish oil



Source: GOED Omega-3 Adam Ismail

# Sources of fish meal and fish oil



**The aquatic ecosystem is limited and damaged by humans**

overfishing



<http://www.webspin.org/>

heavy metals



Cd Pb Hg

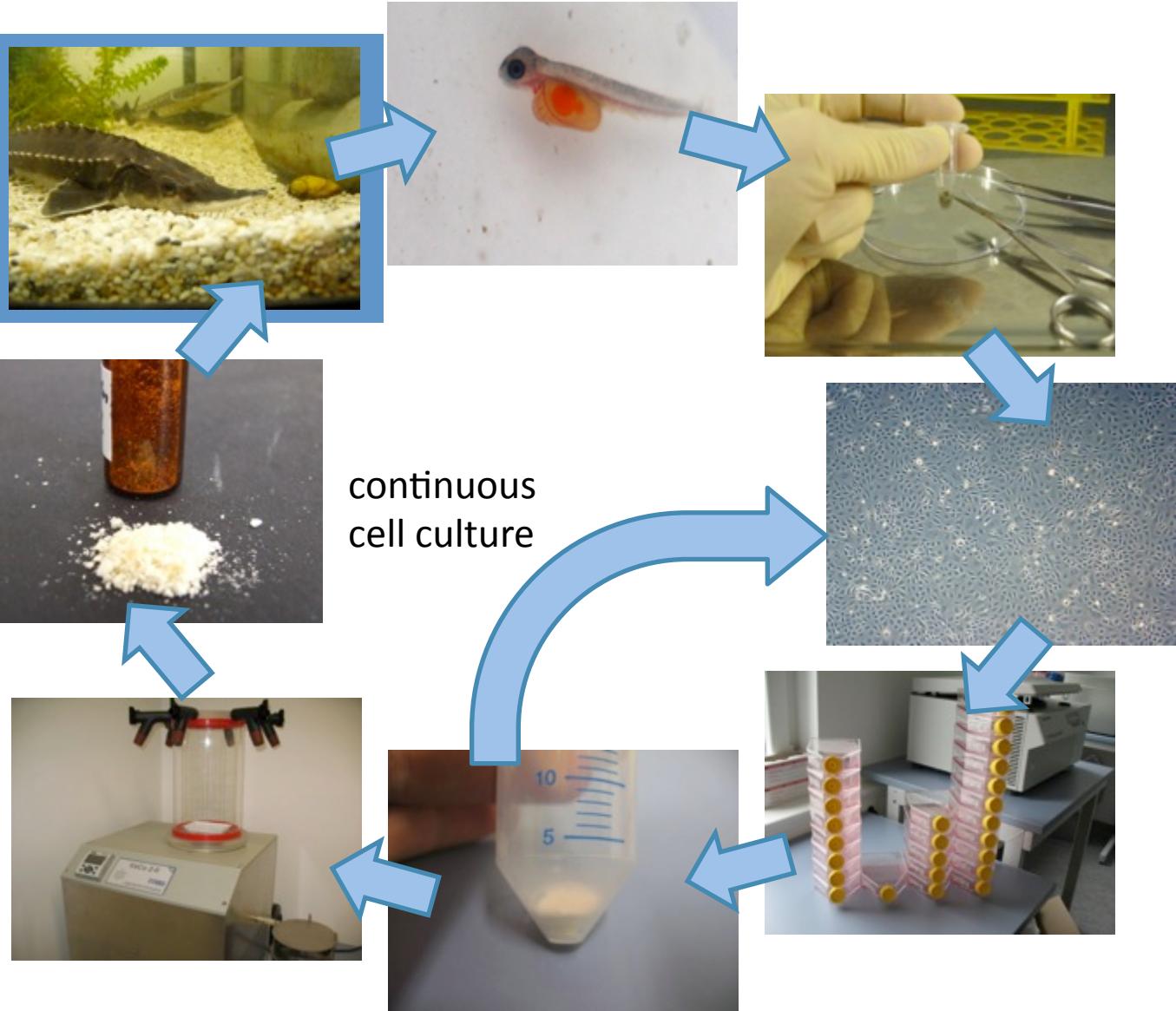
accidents



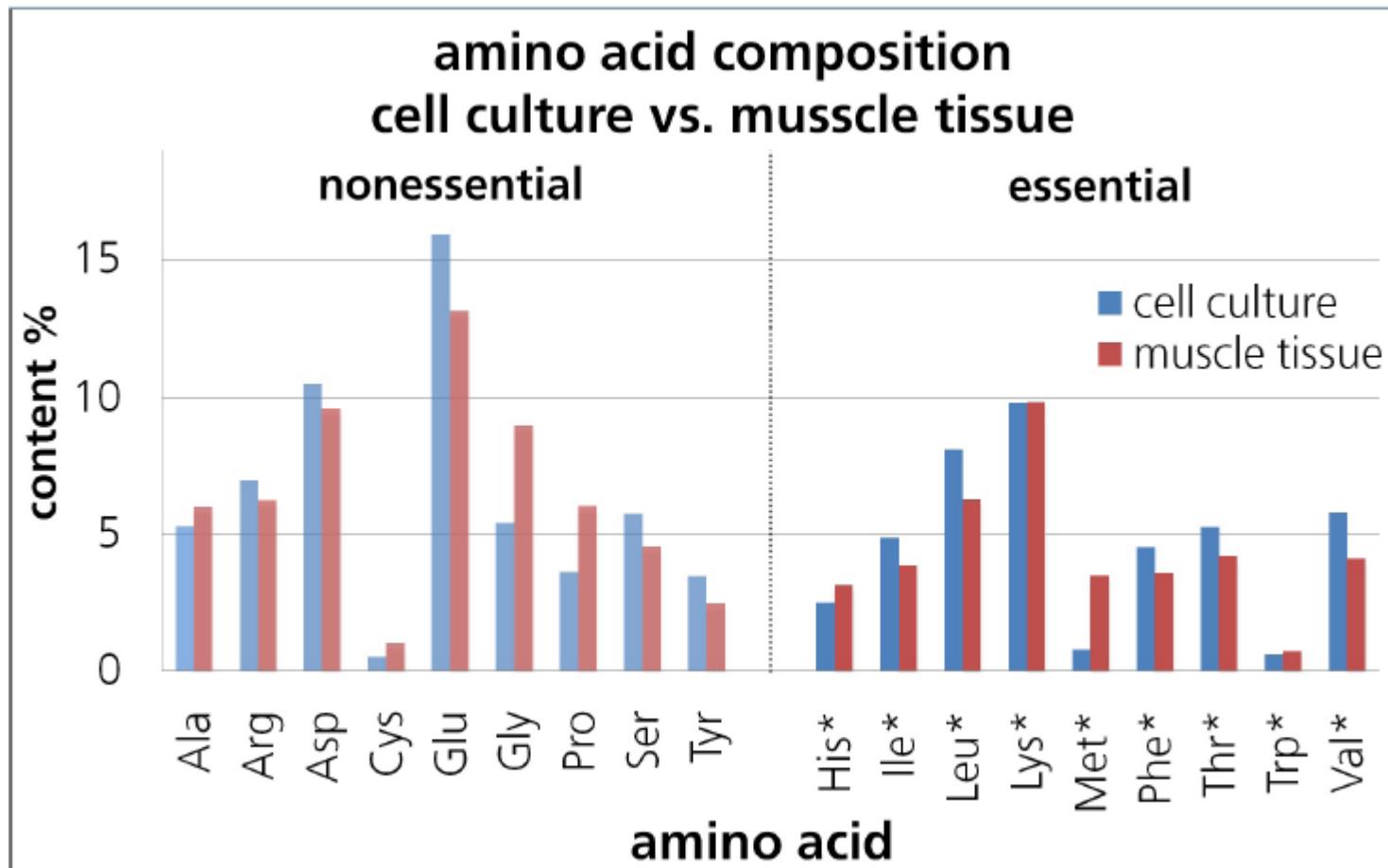
<http://static.guim.co.uk/>

# A novel source for fish meal and fish oil: fish cell culture

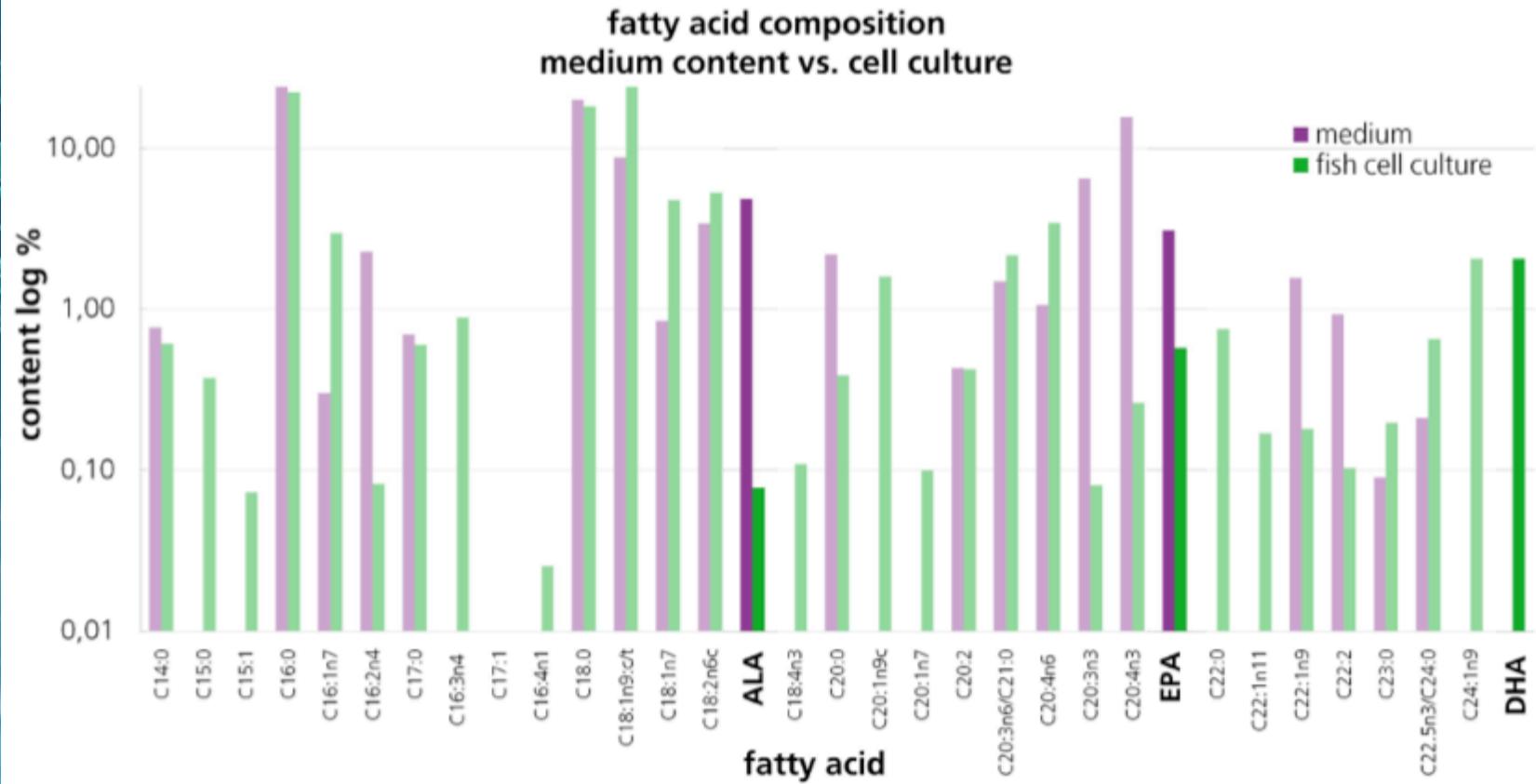
**target  
markets**  
aquaculture  
pharma  
nutr  
med



# A source of high quality protein

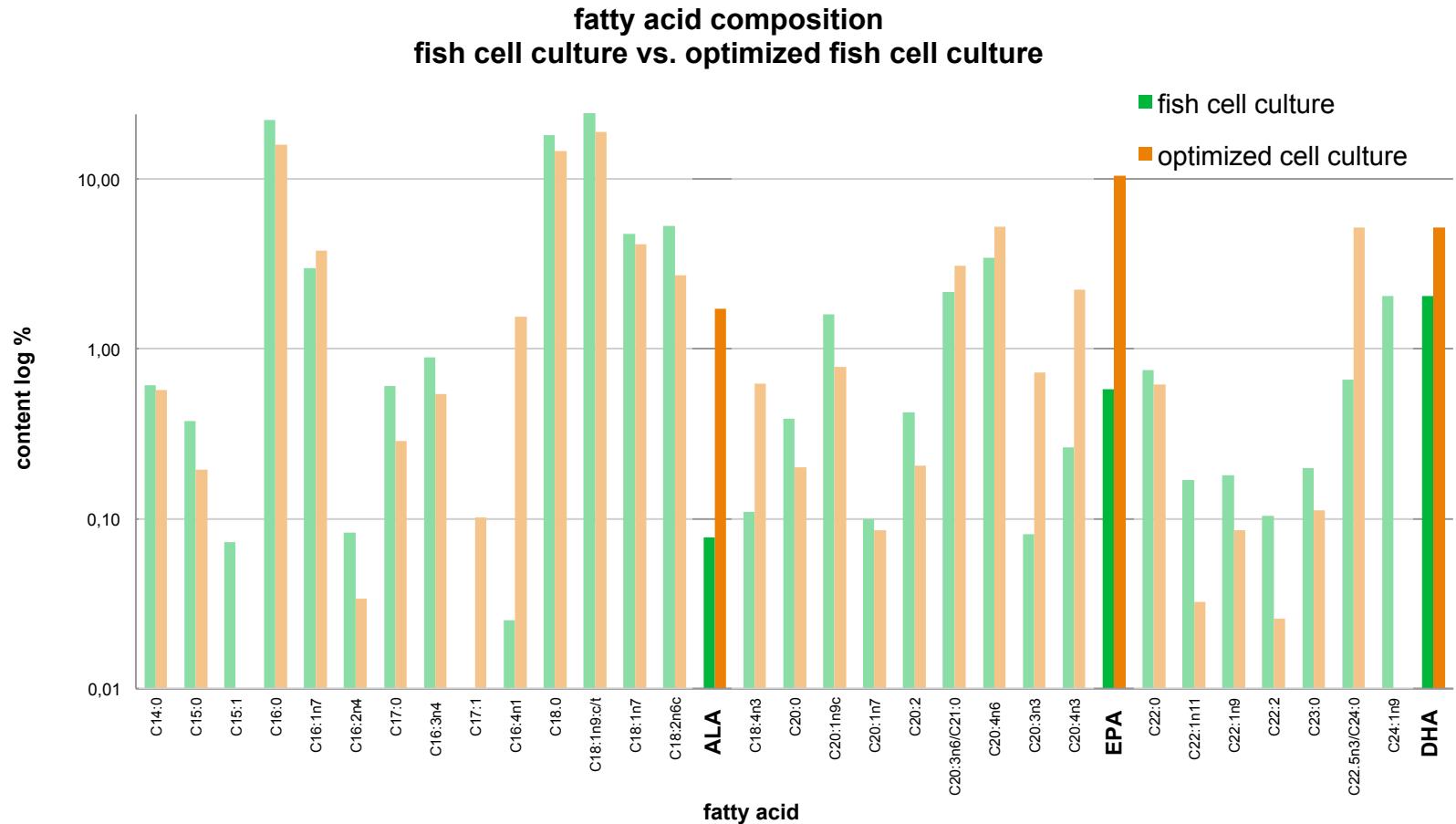


# A source of important fatty acids



Fish cells in culture are able to produce DHA

# A source of important fatty acids

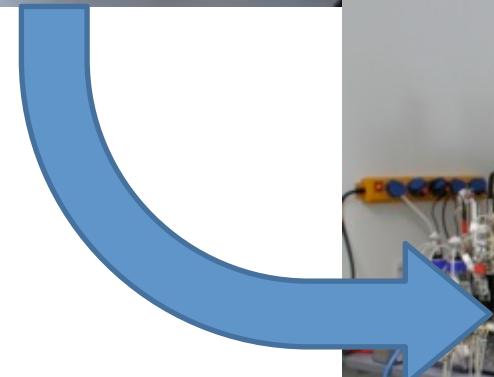
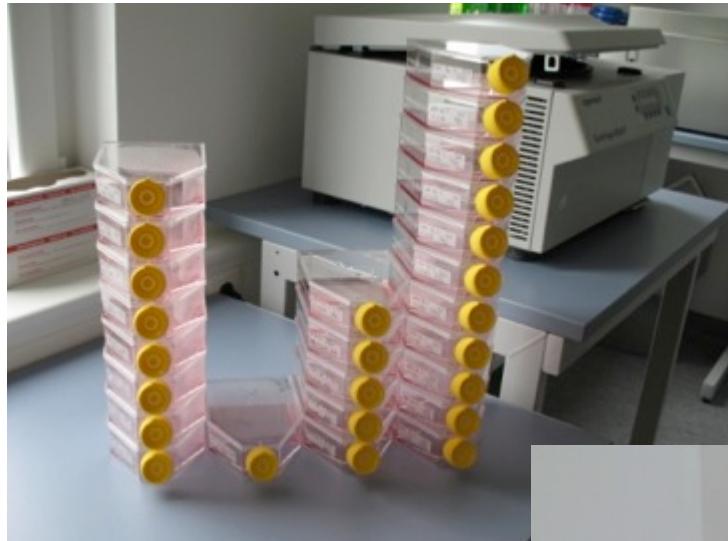


**ALA**  
0.1% -> 1.7%

**EPA**  
0.6% -> 10.4%

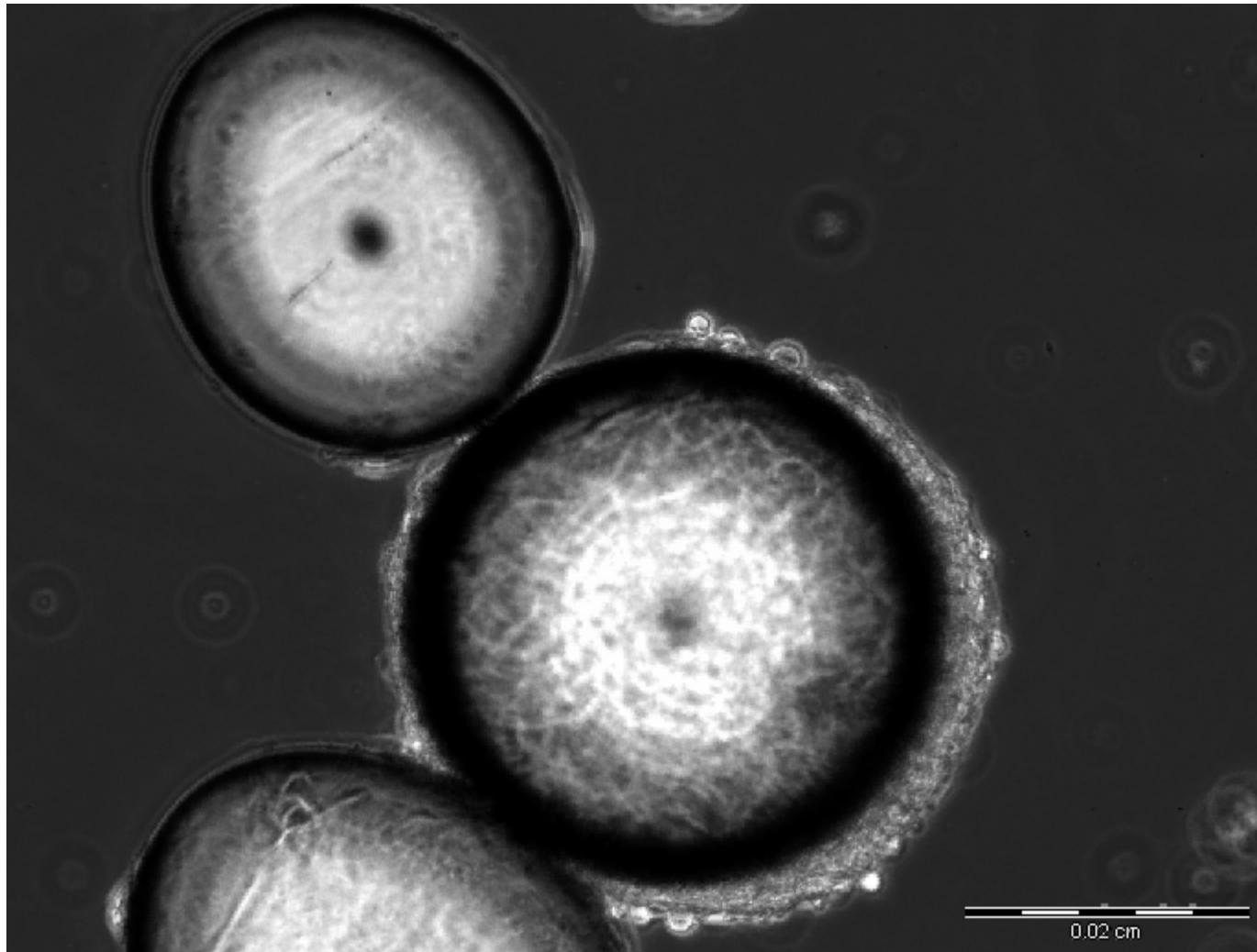
**DHA**  
2.1% -> 5.2%

# Biomass production scale up

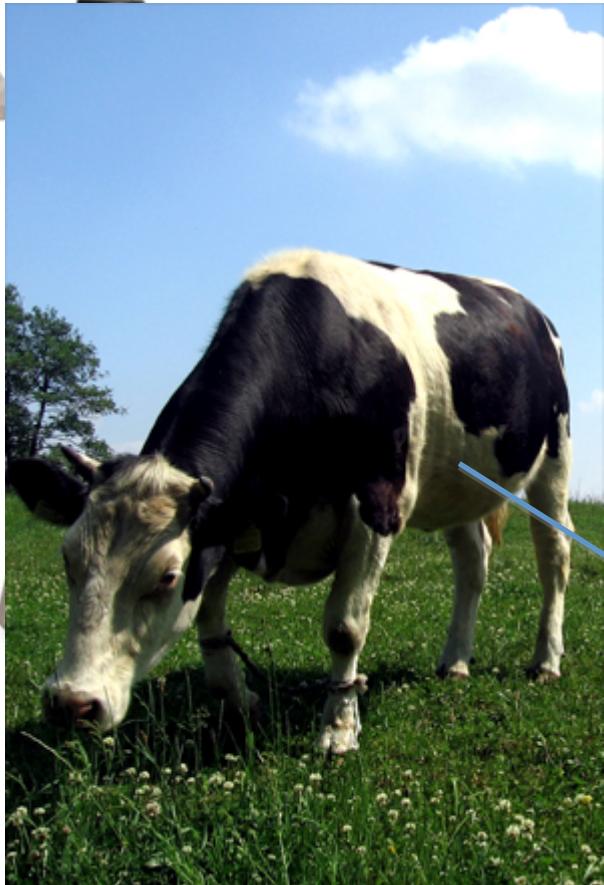


## Find appropriate scaffolds/carriers

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# Achieve high expansion rates



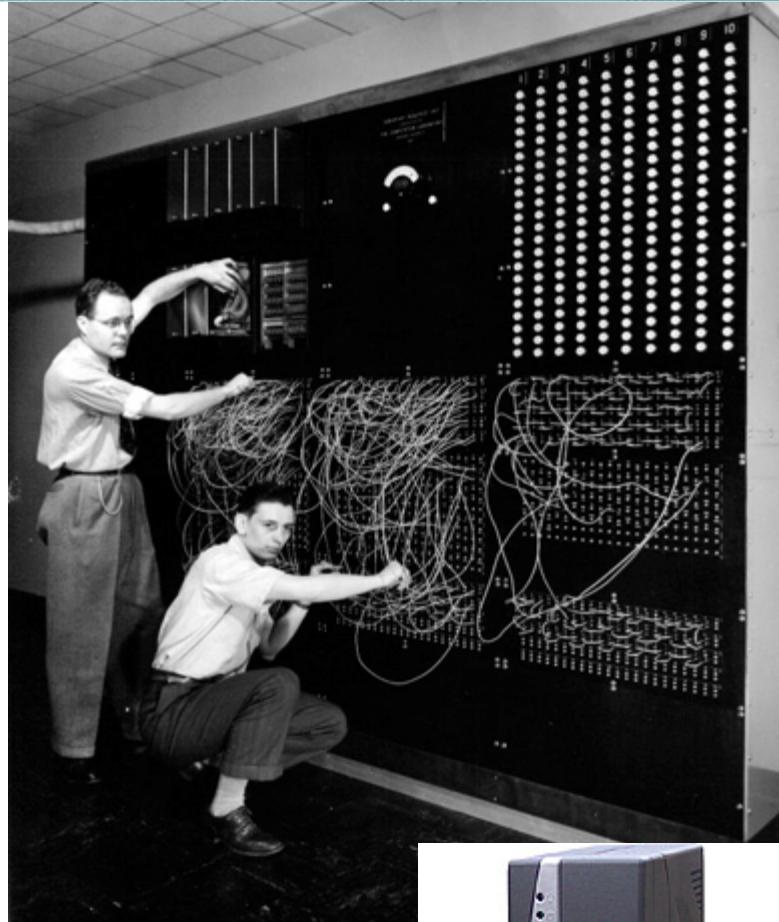
approx.  $10^{14}$  cells



-5l reactor)



# Reduce costs through mass production and enhanced technology



# Development of novel feed formulations



# Thank you!

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