

Research topics concerning fish nutrition

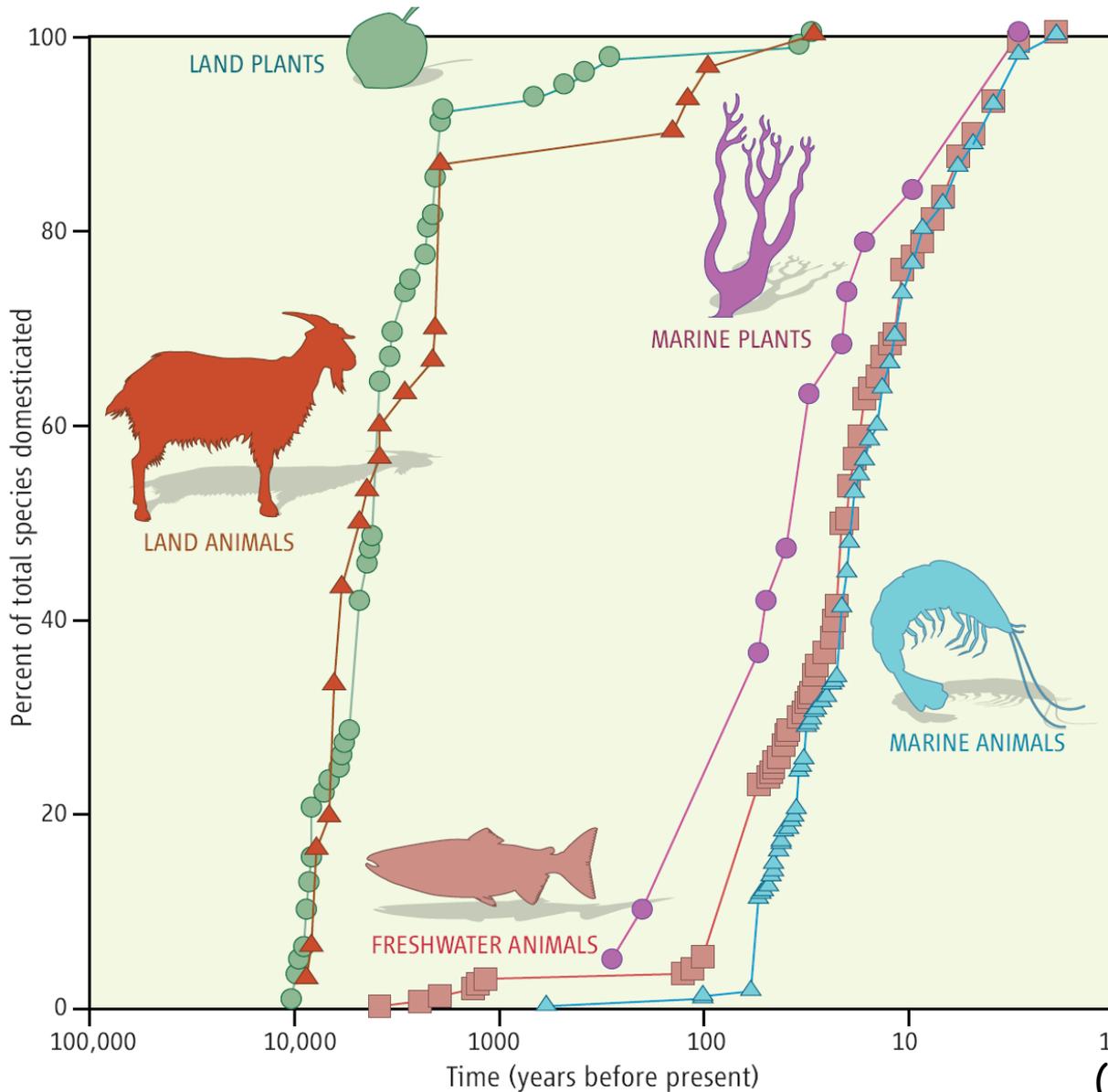
(Department of Fisheries and Hydrobiology)



- Mendel University in Brno, Czech Republic
- Department of Fisheries and Hydrobiology



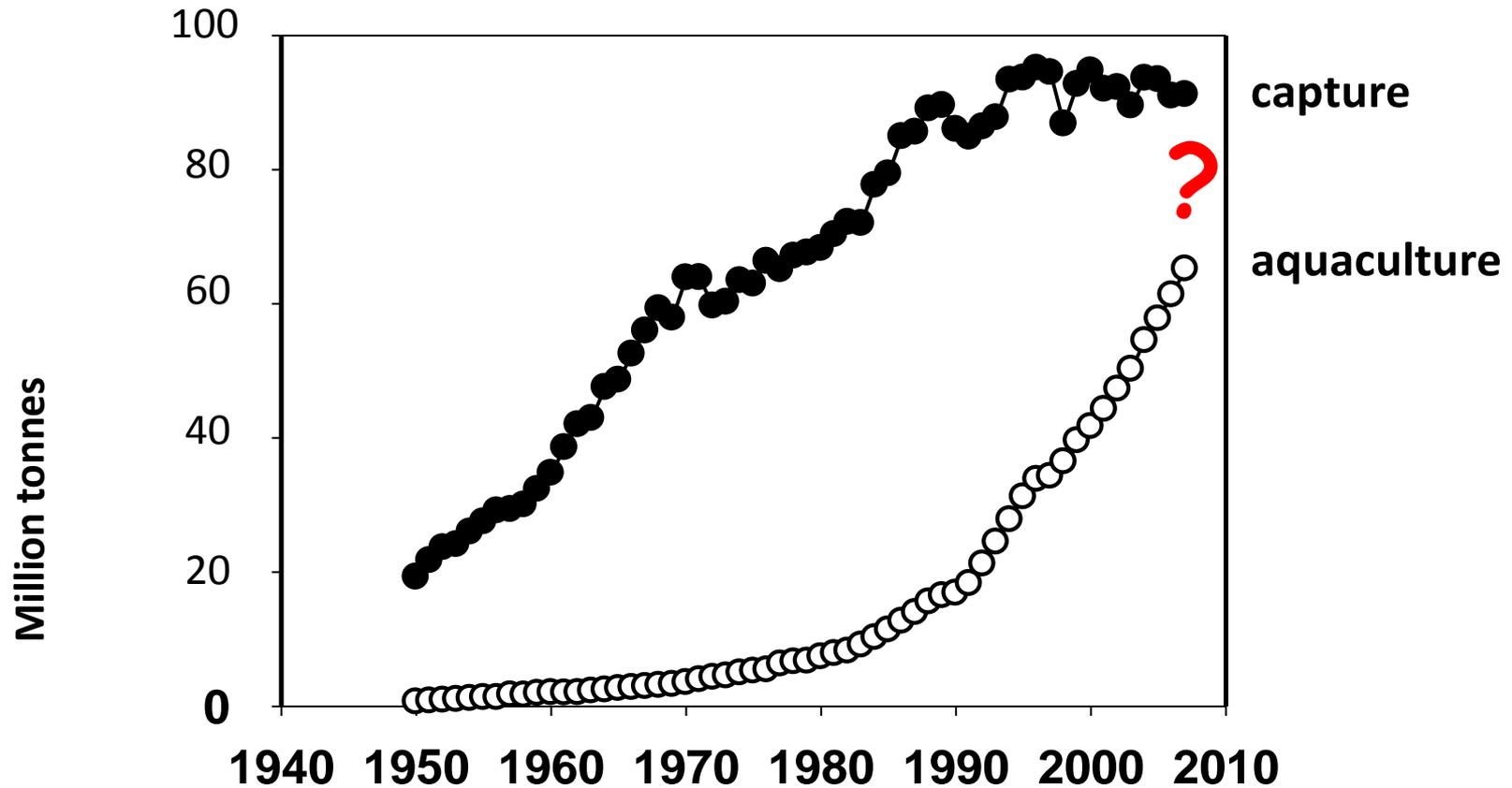
Rapid domestication



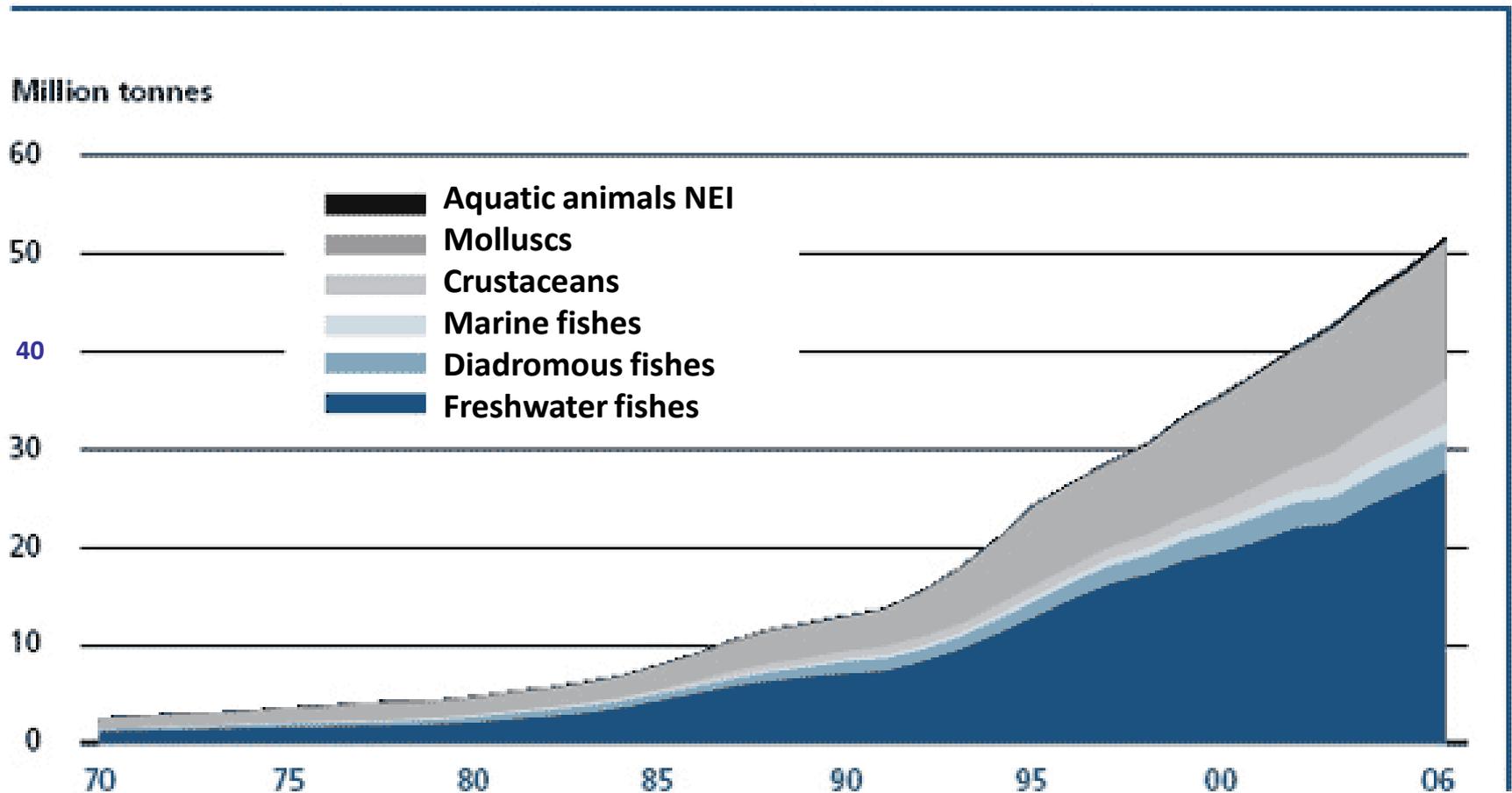
Aquaculture is the youngest sector of animal and plant production with the fastest growth!

(Duarte et al. 2007, Science)

World fisheries and aquaculture production



Trends in world aquaculture production: major animal species groups



Research concerning fish nutrition

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- **Aims of the research:**
 - to prepare optimal fish diets according to nutrition requirements of certain fish species
 - to optimize feeding strategy (hydrochemistry, feeding during winter)
 - to use prospective components in fish diets (nutrition value, price)
 - to influence the quality of fish meat (FA, AA)

Research concerning fish nutrition

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- **Fish species:**
 - cyprinids (common carp, tench, bream)
 - percids (perch, pikeperch)
 - European catfish, rainbow trout

Alternative protein sources used in fish diets

- **Animal protein:**
 - maggot meal, poultry by-product meal (problem: warm-blooded animals), polychaetes etc.
- **Plant protein:**
 - **terrestrial plants:** soybean meal, cottonseed meal, rapeseed, lupins, distillers grains, corn gluten meal
 - **aquatic plants:** green algae, *Lemna minor*
 - **cyanobacteria?**

Cyanobacterial water blooms

- worldwide source of (toxic) biomass -

(Brno, CR 2003)



Fish diet containing cyanobacterial biomass



to investigate impacts of fish diet containing microcystin (MC-LR) on physiological parameters of Nile tilapia (*Oreochromis niloticus*).



Focusing on:

- (1) **MC-LR accumulation** (HPLC)
- (2) **stress** (stress hormone **cortisol**, glucose, **glycogen**)
- (3) **growth** (**growth rate**, gene expression of **growth hormone (GH)**, insulin-like growth factor I (IGF-I))

Experimental fish diets

4 fish diets:

Control - commercial diet

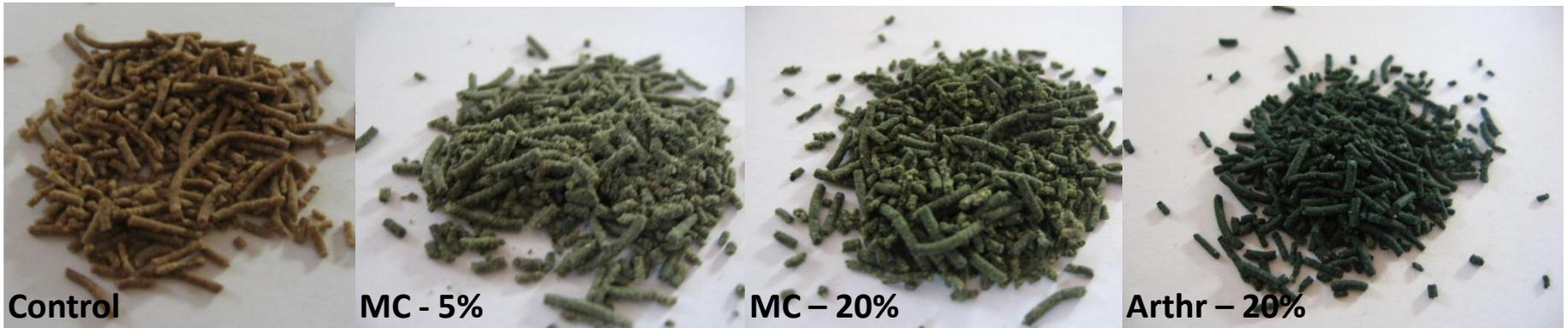
MC - 5 % - 5 % dry cyanobacterial biomass of *Microcystis* species

MC - 20 % - 20 % dry cyanobacterial biomass of *Microcystis* species

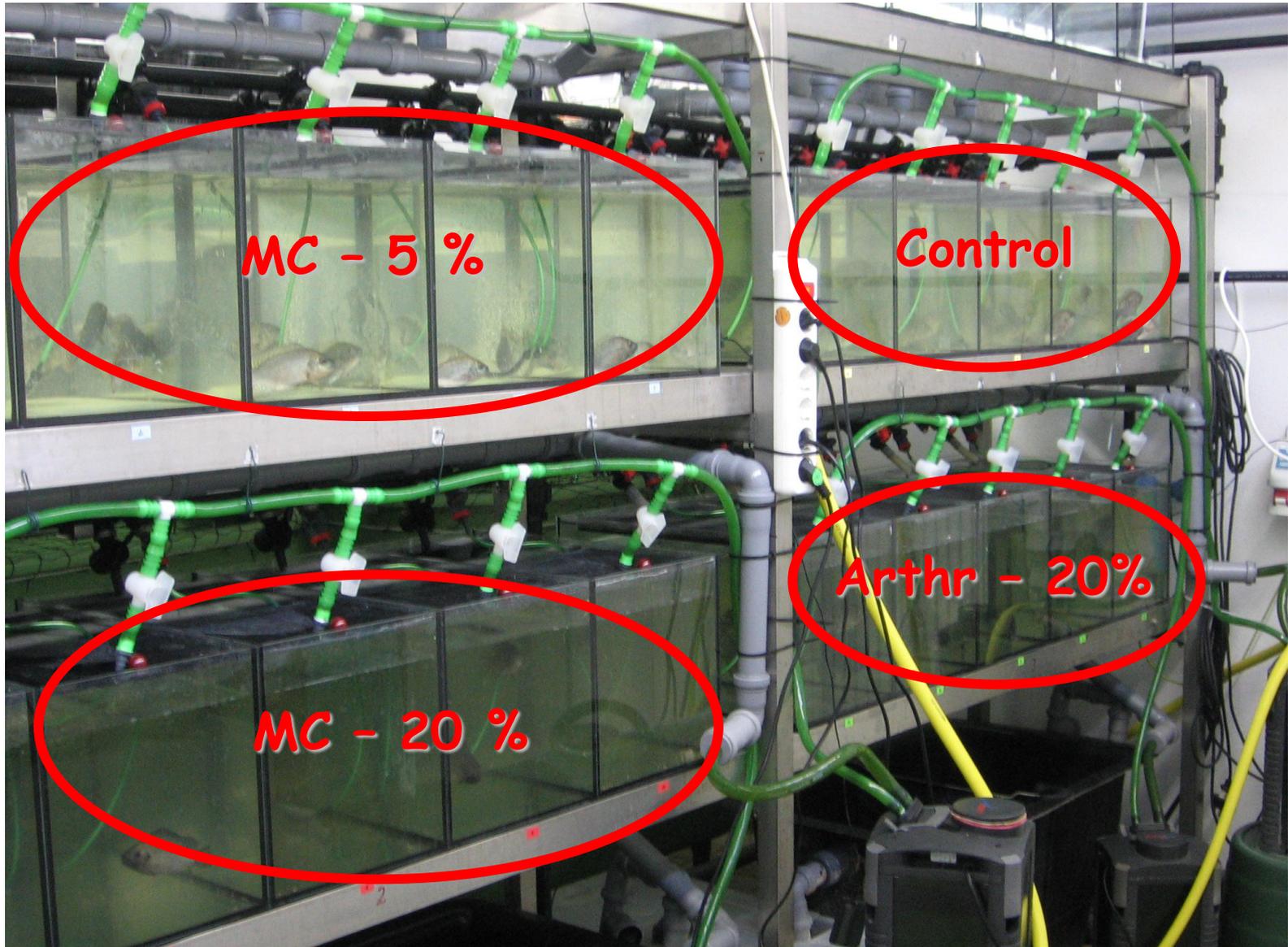
Arthr -20% - 20 % dry cyanobacterial biomass (*Arthrospira* sp.)

Fish diet MC-5% and MC-20% contained

4.92 $\mu\text{g MC-LR.g}^{-1}$ and 19.54 $\mu\text{g MC-LR.g}^{-1}$, respectively.

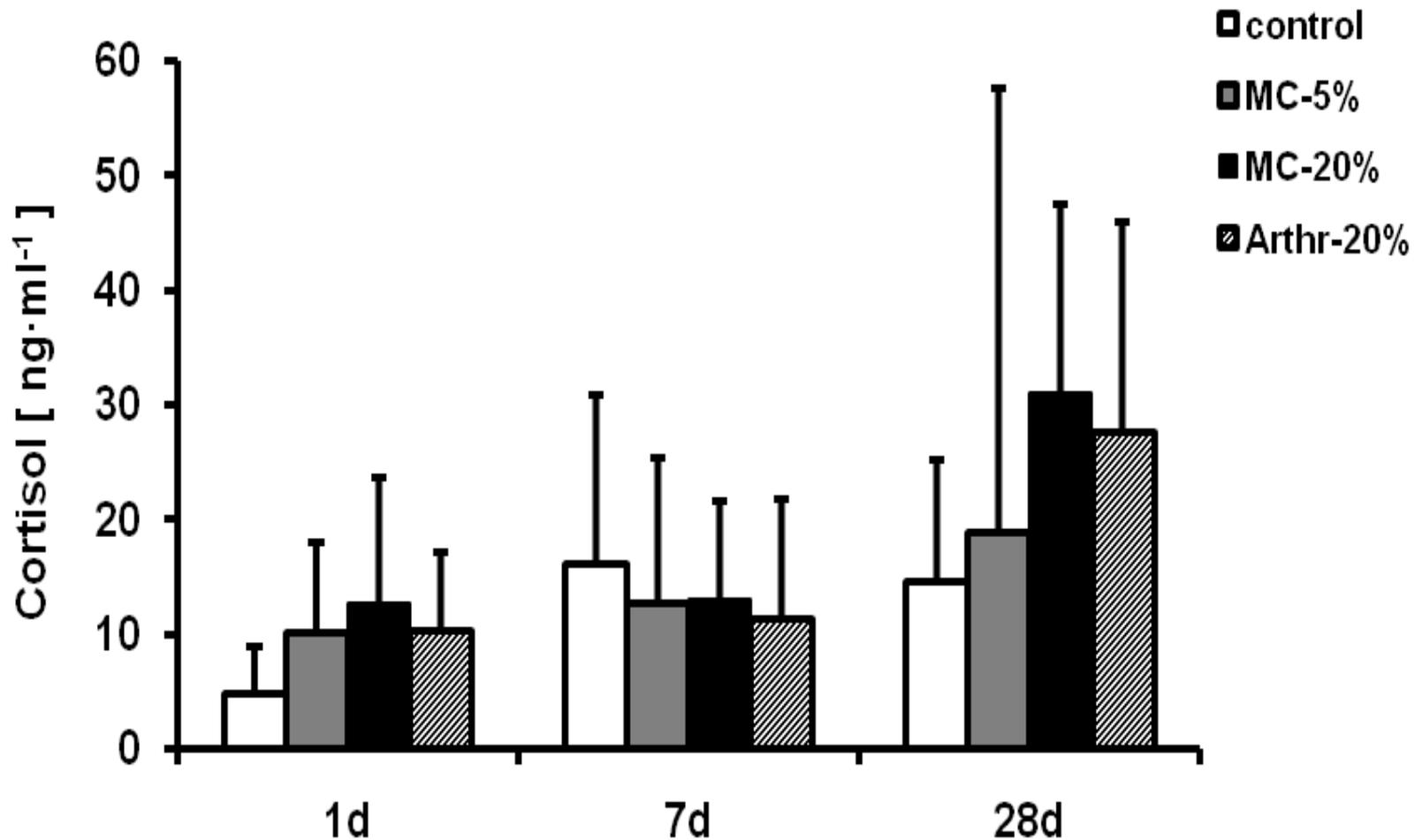


4 separated closed recirculation systems



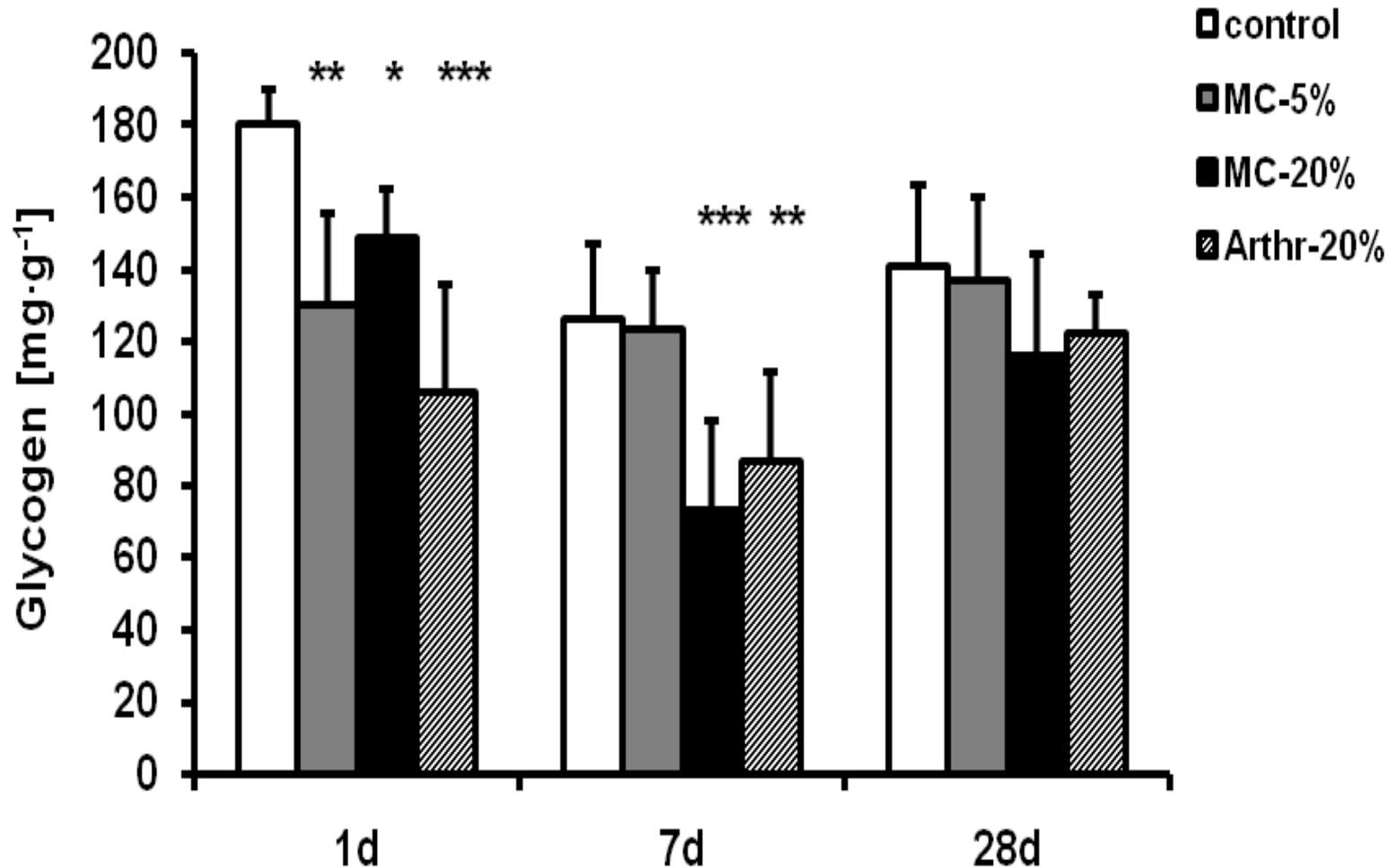
Cortisol

mean \pm SD, n=8

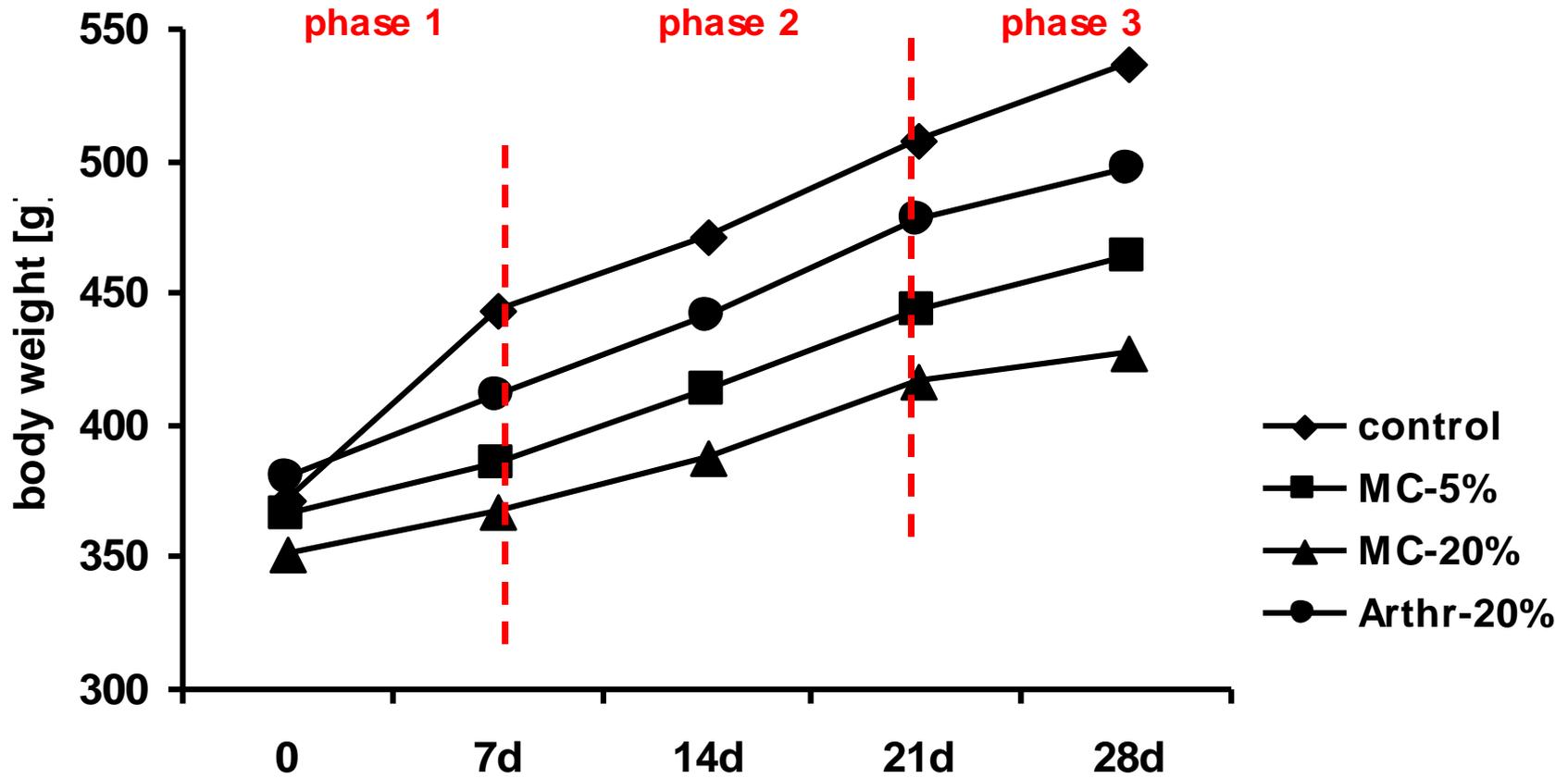


Liver glycogen

mean \pm SD, n=8

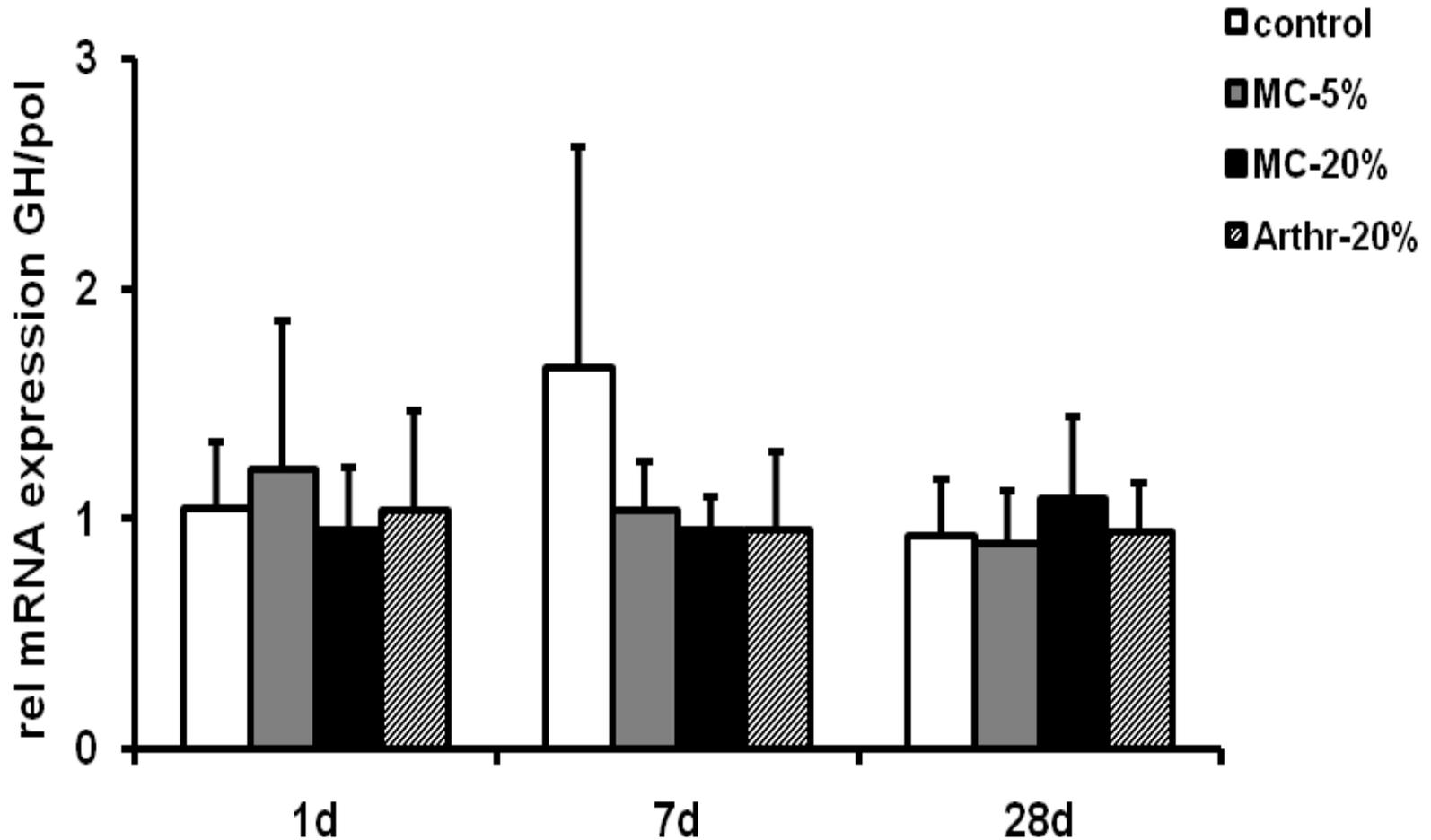


Growth rate



Growth hormone

mean \pm SD, n=8



Findings and conclusions

- **MC-LR accumulation:** below the detection limit in muscle -> eatable for humans?
- **Stress:** negligible to moderate stress in Nile tilapia regardless whether the diet contains the hepatotoxin MC-LR!
- **Detoxication:** no impact on detoxication systems!
- **Growth:** lower growth only for MC-20% vs control!

It seems to be feasible that dried cyanobacteria biomass containing MC-LR might be used in fish diets for Nile tilapia.

However, it is necessary to determine digestibility, nutrition value and the bioavailability of nutrients present in cyanobacteria for different fish species.

Thank you for your attention!

- **Acknowledgement:**

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