


Gummigranulat som kilde til miljøgifter

JPI
OCEANS

 **Forskningsrådet**

 **Framsenteret**

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 **NTNU**

 **NIVA**

 **Akvaplan
niva**

 **ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA**

 **NILU**

 **SINTEF**

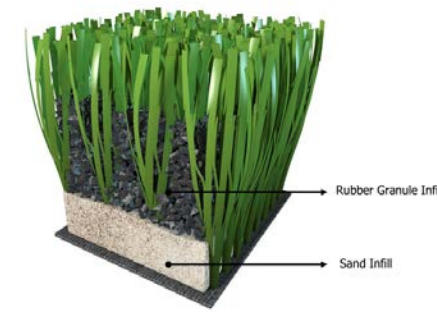
'End-of-life' bildekk



- Fine Engineering 0 – 1.2 mm
- **Medium Infill 1 – 2.8 mm**
- Large Flexible 2.5 – 4.0 mm

Granuler fra fotballbaner

100-120 tonn/bane



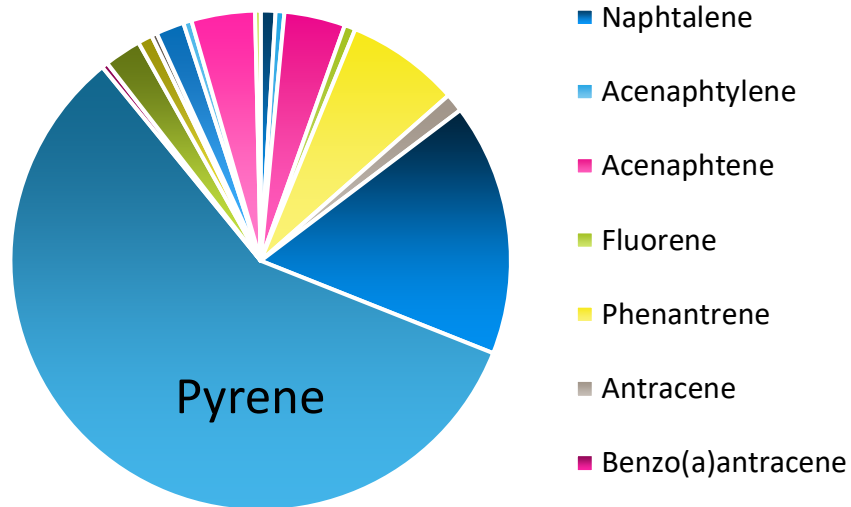
1-3 tonn/bane
tapt **hvert år**

I Norge:
2000 tonn
tapt **hvert år**

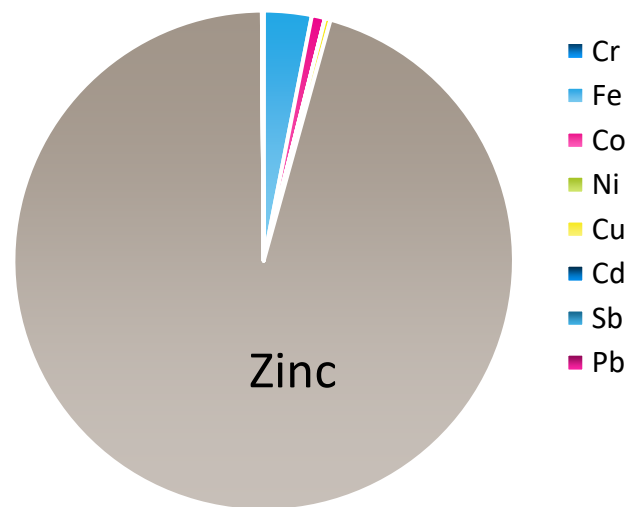


Miljøgifter i gummigranuler

PAH



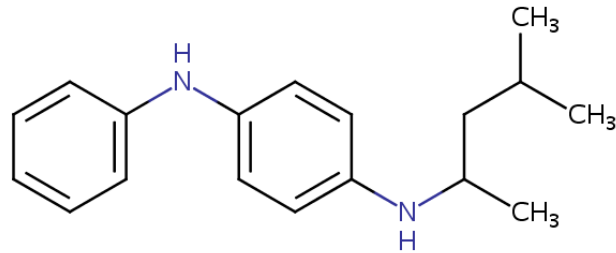
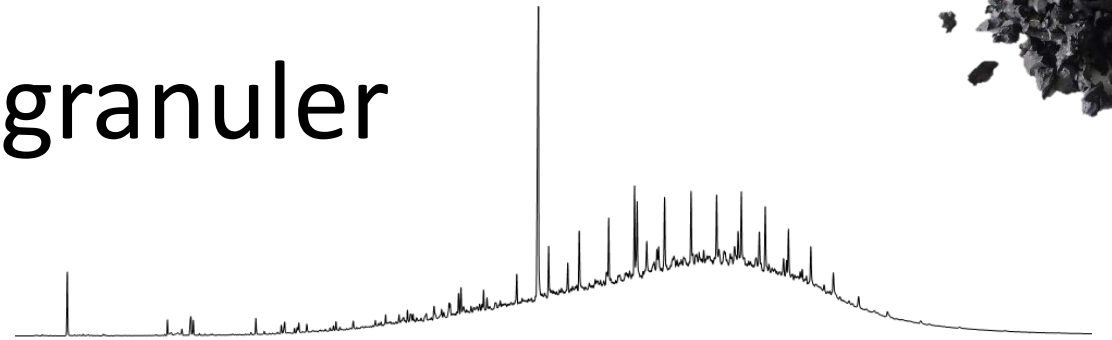
Metaller



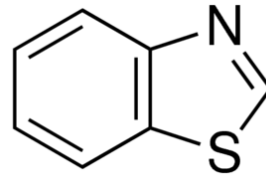
+ Tilsetningsstoffer

>10 000 mg/kg Zn
(1 %)

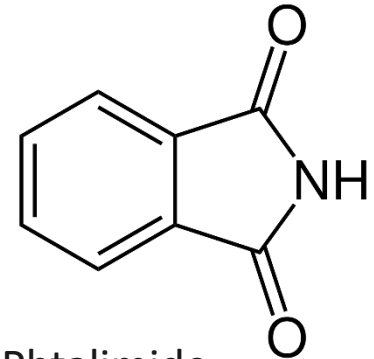
Tilsetningsstoffer i gummigranuler



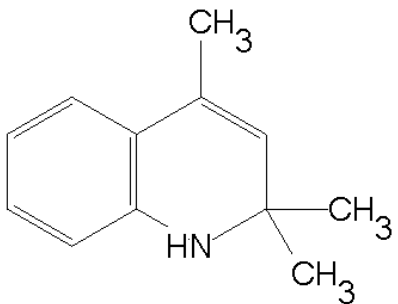
N-(1,3-Dimethylbutyl)-*N'*-phenyl-*p*-phenylenediamine



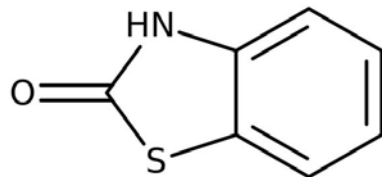
Benzothiazole



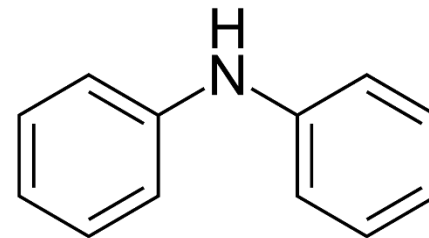
Phthalimide



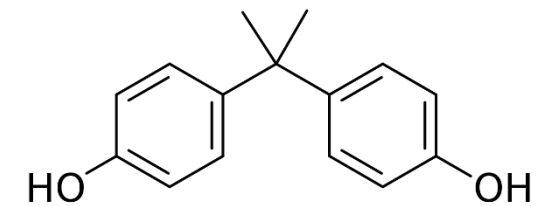
1,2-Dihydro-2,2,4-trimethyl-quinoline



2(3H)-Benzothiazolone

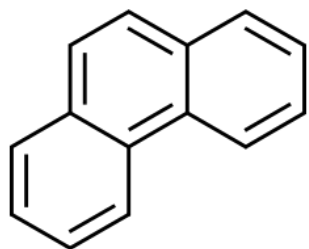


Diphenylamine

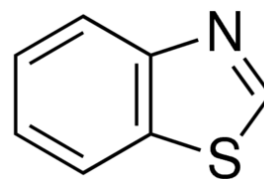


Bisphenol A

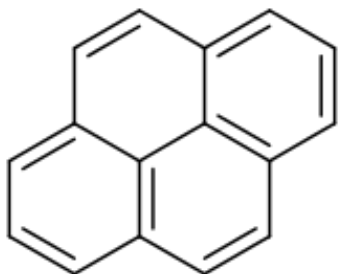
Representative konsentrasjoner



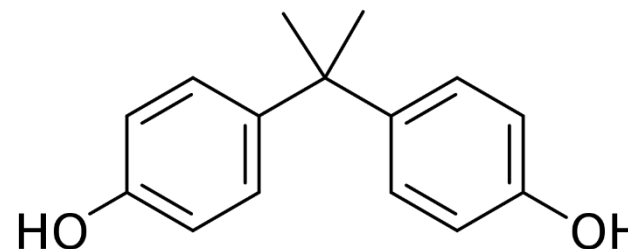
Phenanthrene: 6 mg/kg



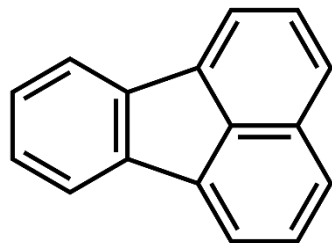
Benzothiazole: **105 mg/kg**



Pyrene: 24 mg/kg

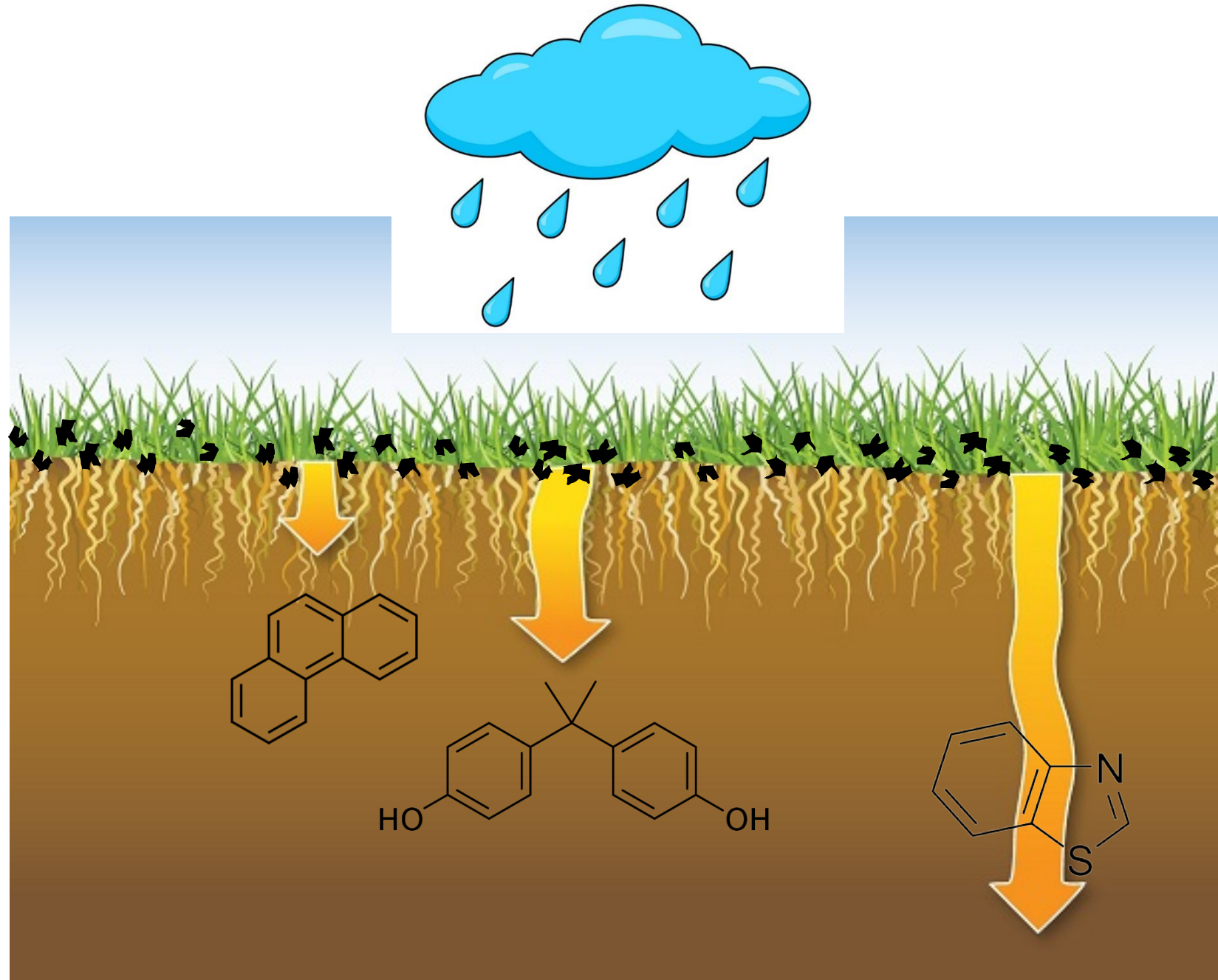
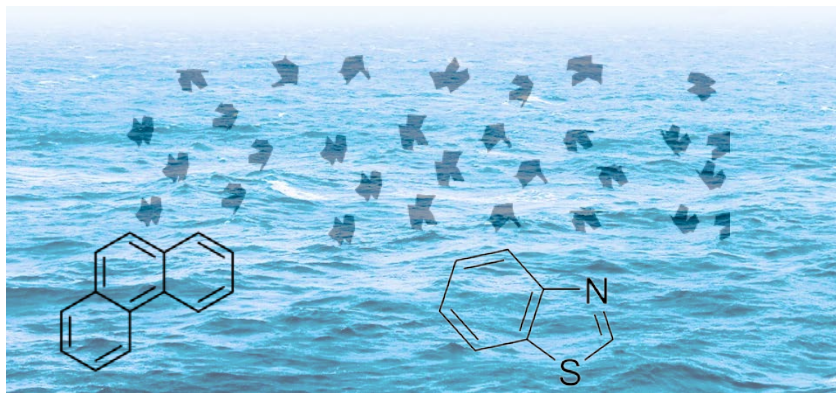


BPA: 3 mg/kg

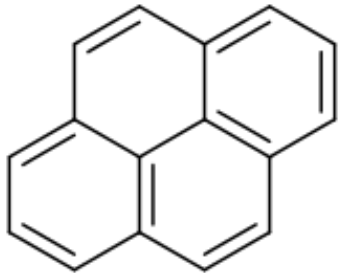
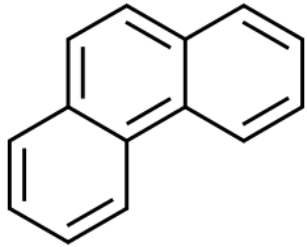


Fluoranthene: 7 mg/kg

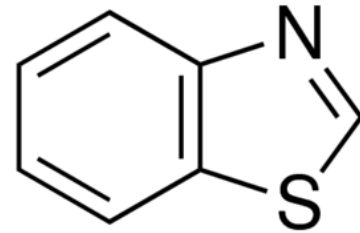
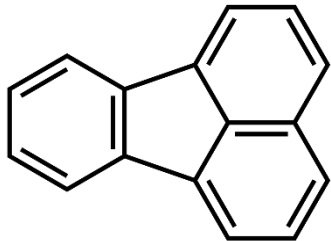
Utlekking



Hva løses i vann?



< LOD

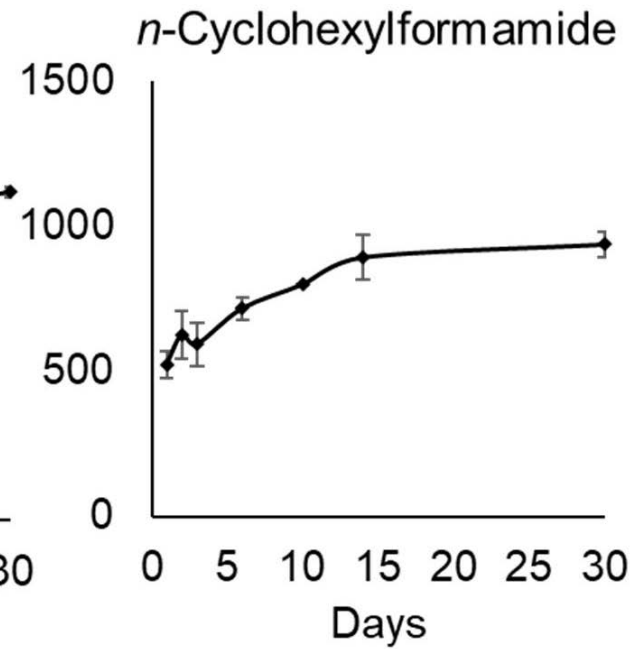
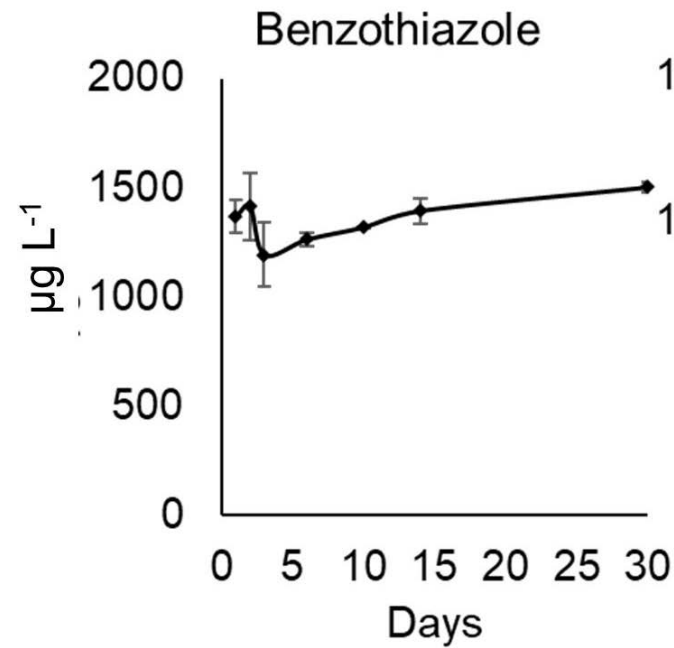
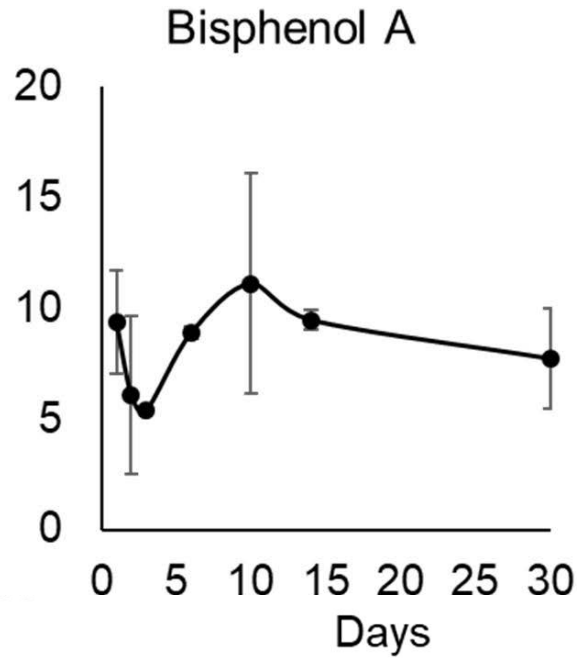
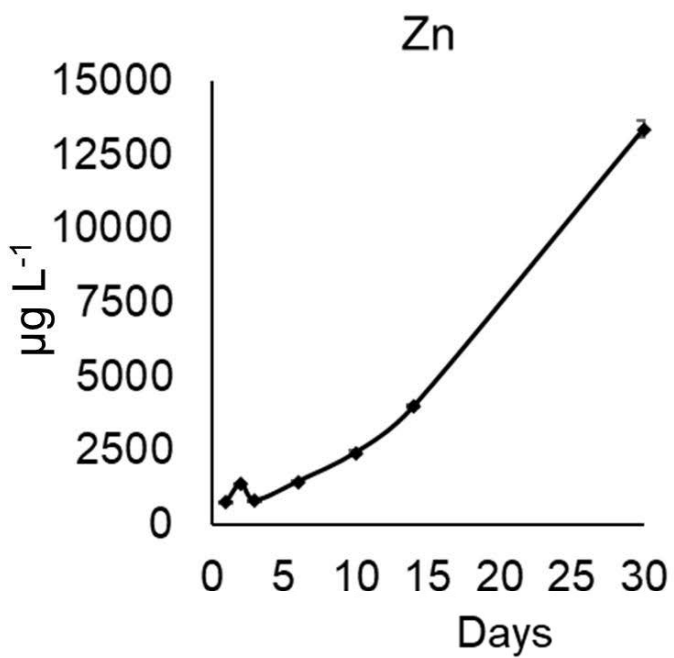


20-120 mg/kg

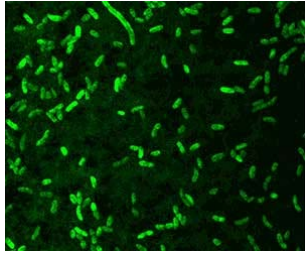


800-1200 mg/kg

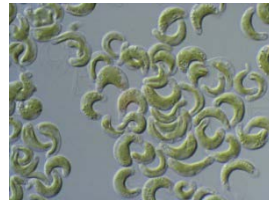
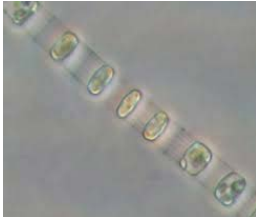
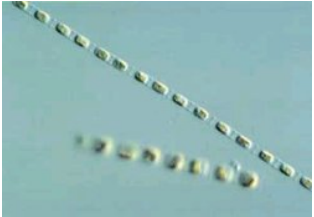
Hva løses i vann?



Giftighet av løste forbindelser?



Bakterier



Mikroalger
(marine og ferskvann)

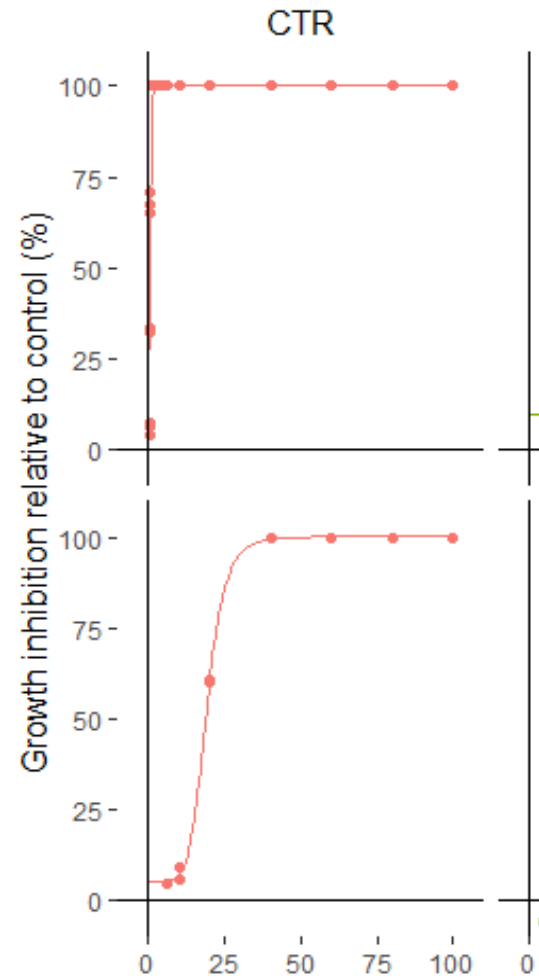
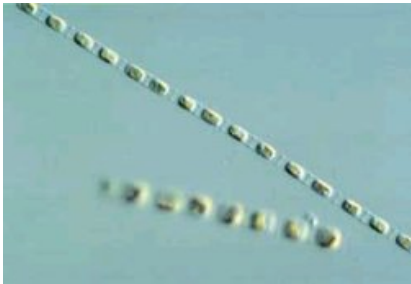
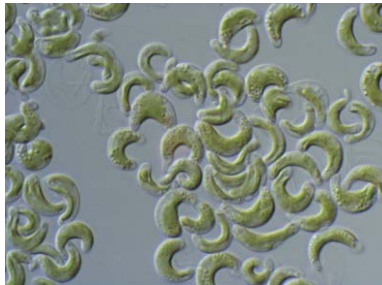


Zooplankton



Blåskjell

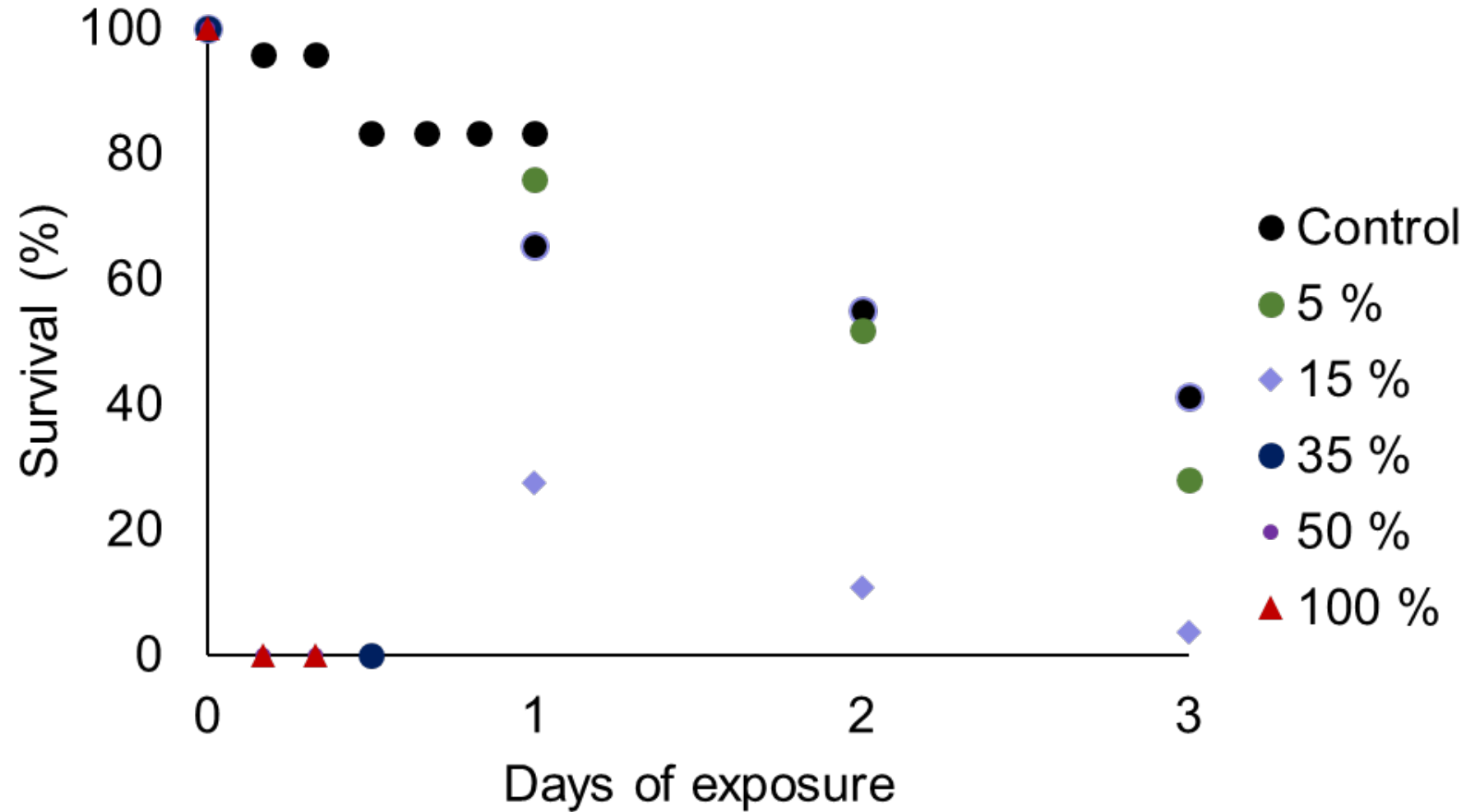
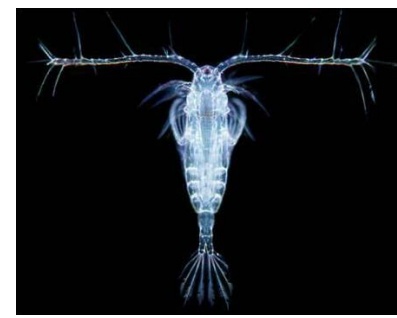
Mikroalger - vekstinhibisjon



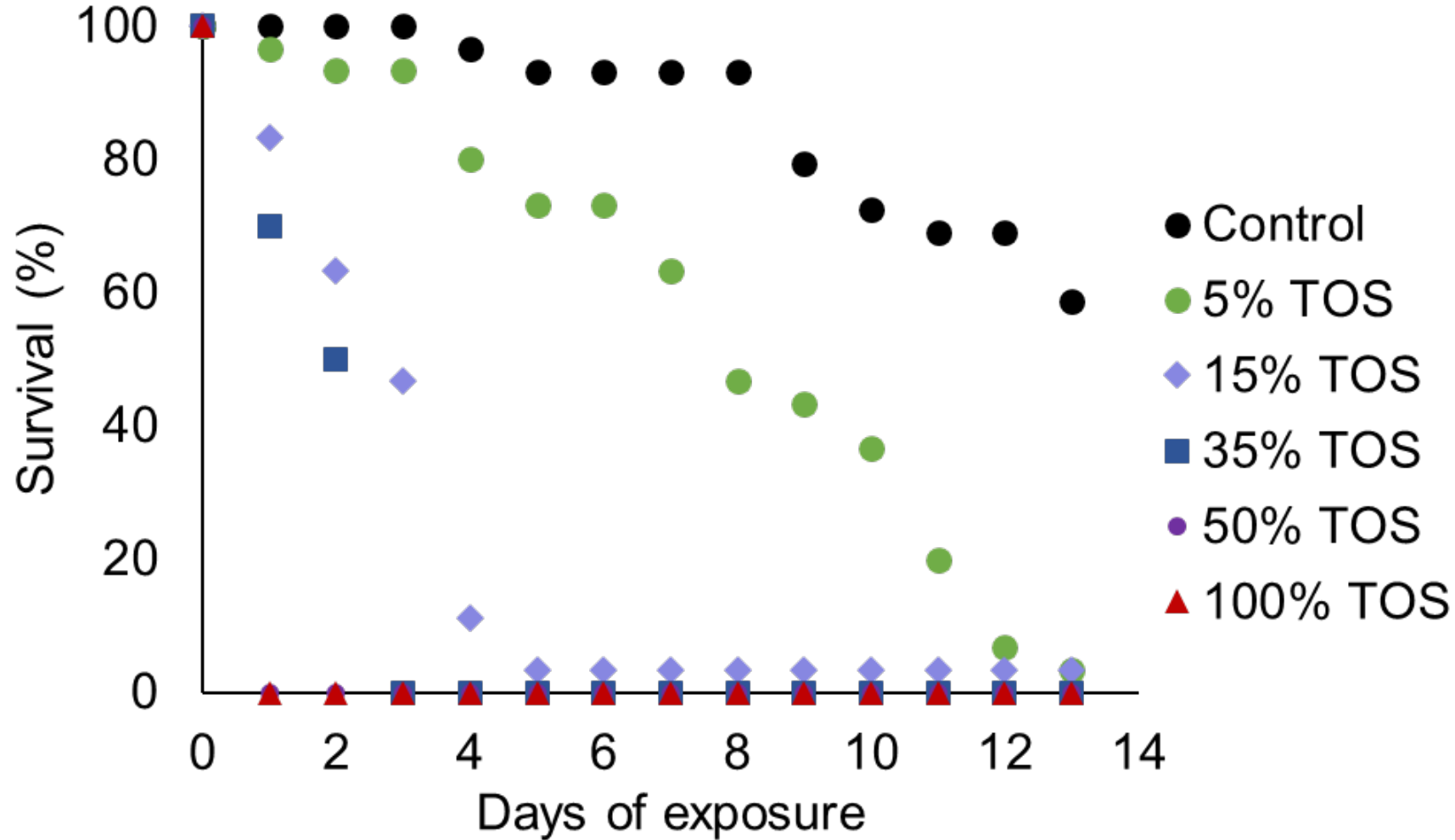
Ferskvann

Marin

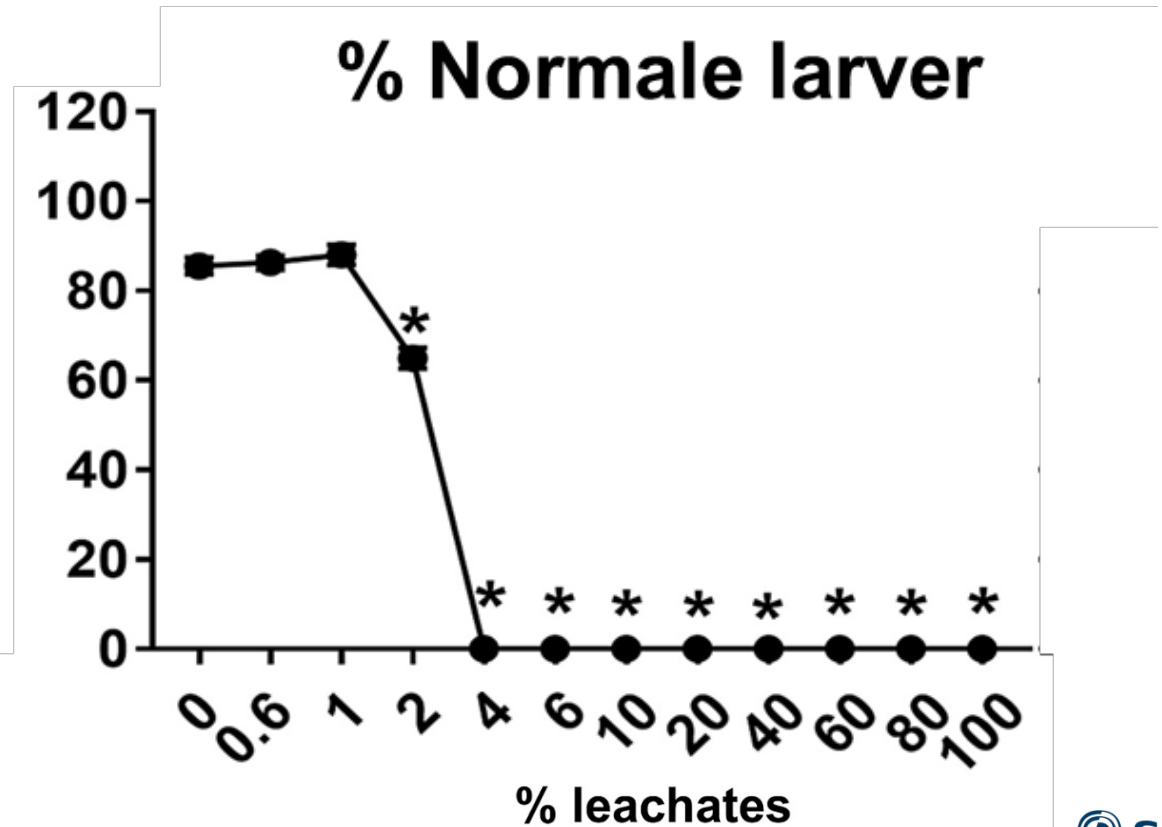
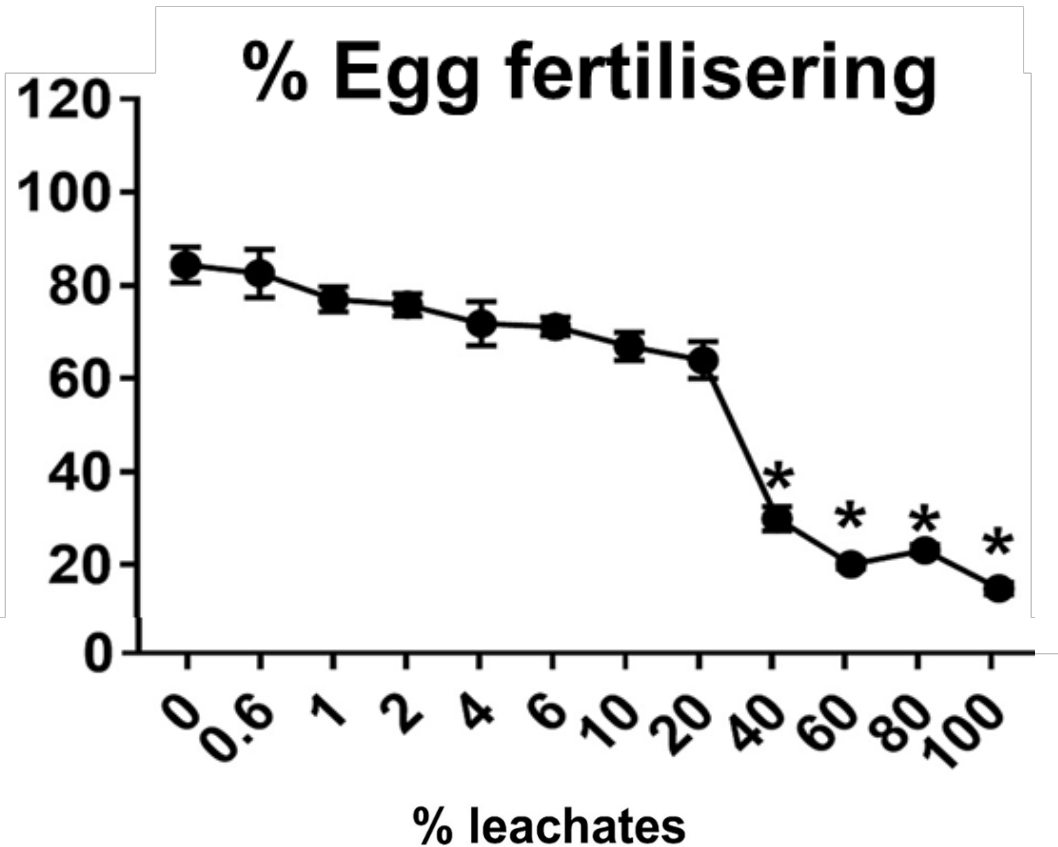
Acartia Longiremis



Calanus finmarchicus



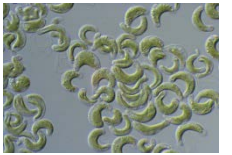
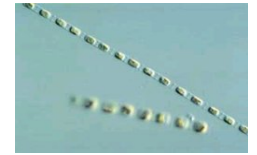
Mytilus galloprovincialis



En kjapp oppsummering

- Gummigranuler sprer seg lett til miljøet
- Metaller og tilsetningsstoffer lekker lett ut i både ferskvann og sjøvann
- Kjemikaliecocktailen i gummigranuler er bekymringsverdig
- Vi må hindre at gummigranuler spres til miljøet

Takk for oppmerksomheten



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