ECOTOXICOLOGICAL METHODS FOR MONITORING THE EFFECTS OF MICROPOLLUTANTS IN WATERS

I Fekete-Kertész[1], M Molnár[1], Zs M Nagy[1], E Nikolett[1], E Greipel[1], É Fenyvesi[2], K Gruiz[1]

Contact: fekete.kertesz.ildi@gmail.com

[1] Department of Applied Biotechnology and Food Science, Budapest University of Technology and Economics, 1111 Budapest, Gellért square 4, Hungary

[2] CycloLab Cyclodextrin R&D Laboratory Ltd., 1097 Budapest, Illatos street 7, Hungary

ABSTRACT

Three different aquatic testorganisms*: Daphnia magna* (water flea), *Lemna minor* (common duckweed) and *Heterocypris incongruens* were applied to measure the effect of three emerging pollutants. A pharmaceutical (Na-diclofenac), a pesticide (metazachlor) and a psychoactive compound (nicotine) were tested in different concentrations. Innovative toxicity endpoints were used to reach higher sensitivity. In case of *D. magna* the heartrate was determined, in case of *L. minor* the total chlorophyll content and in case of *H. incongruens* the average velocity and the total distance of the movement. Results show, that these innovative toxicity endpoints are more sensitive, than the commonly applied endpoints. The moving behaviour and heart rate of crustaceans were the most sensitive endpoints, with clear effects observed even at the µg/L level of some pollutants (diclofenac, β-estradiol, nicotine, triclosane) revealing the sublethal stresses caused by exposure to these emerging pollutants.

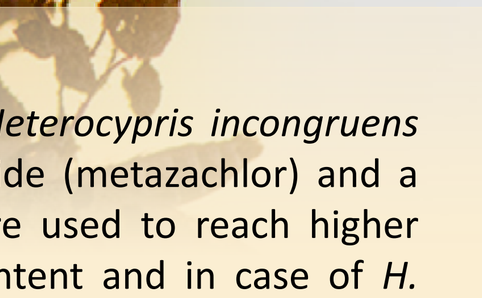
DAPHNIA MAGNA IMMOBILISATION TEST

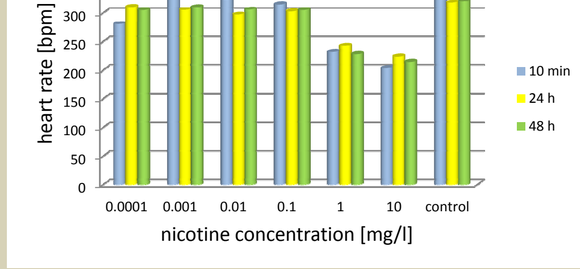
No immobilisation effect was observed in case of metazachlor and diclofenac. Nicotine had immobilisation effect on *D. magna*, 10 mg/L concentration immobilised 80% of the testorganisms, 1 mg/L concentration immobilised 20% of the testorganisms.

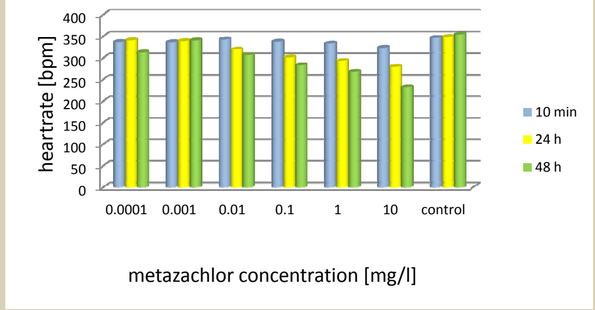
DAPHNIA MAGNA HEARTRATE TEST

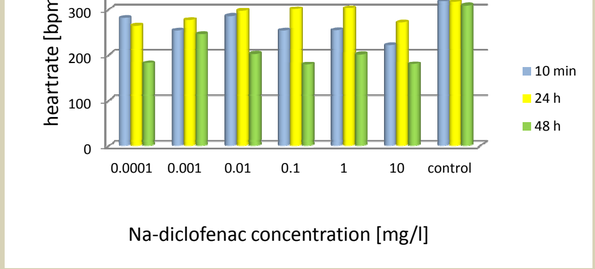
All of the tested substances had toxic effect on *D. magna* after different contact times. Result showed that Nicotine was the most toxic chemical substance.

http://wodumedia.com



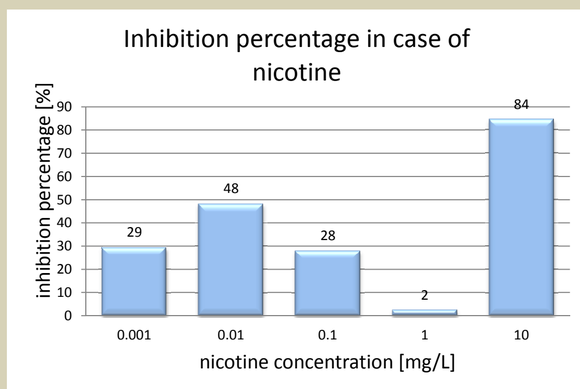


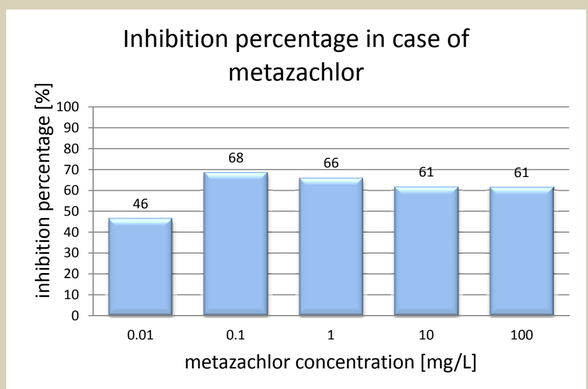


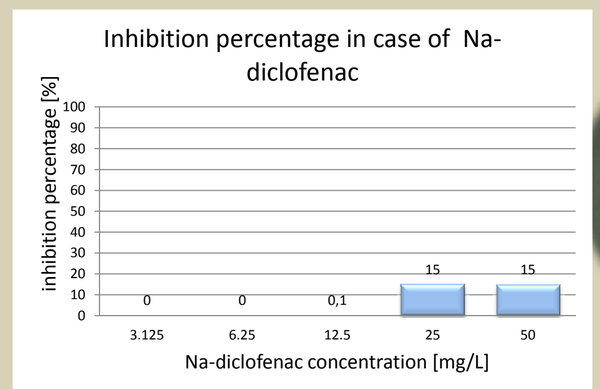


LEMNA MINOR REPRODUCTION INHIBITION TEST

Nicotine and metazachlor had toxic effect on *L. minor*, but Na-diclofenac did not show significant toxic effect.







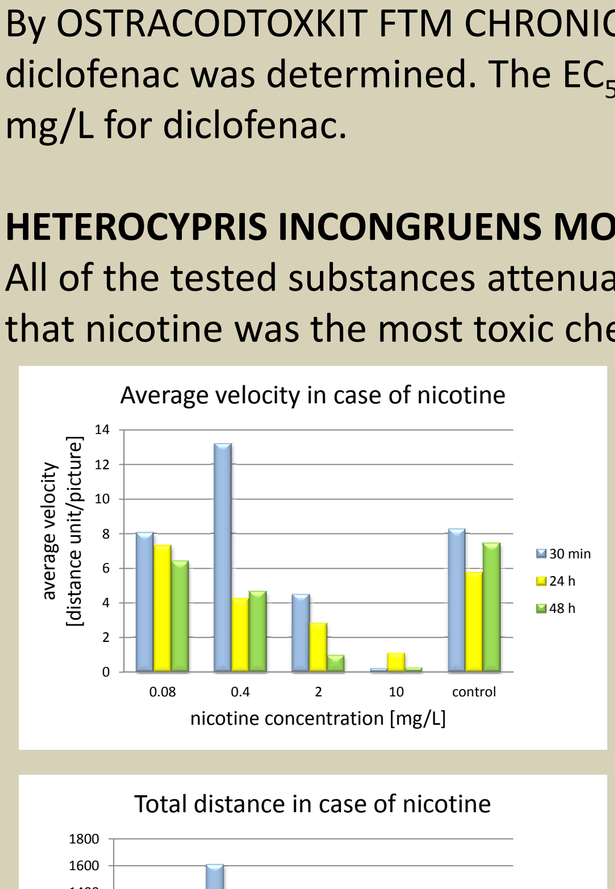
http://www.aquaticplantcentral.com

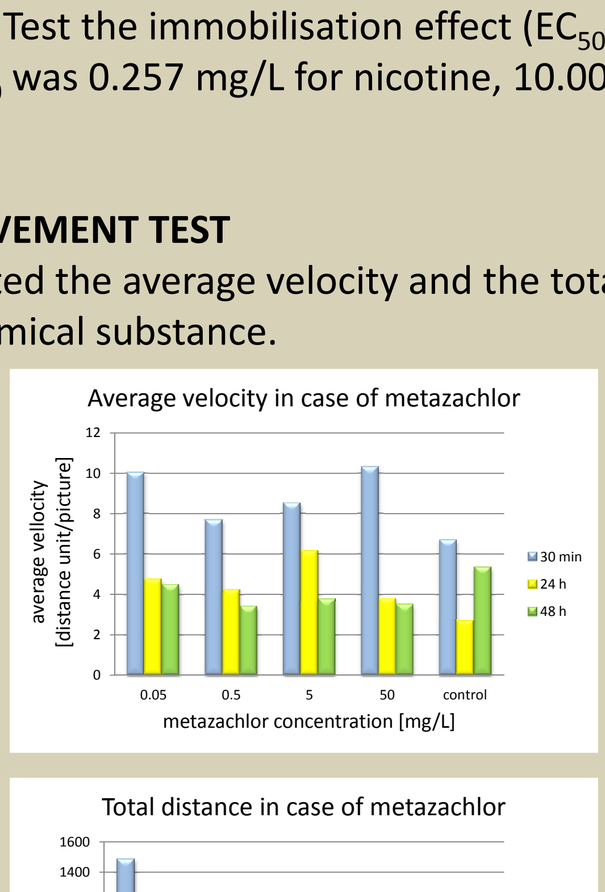
HETEROCYPRIS INCONGRUENS IMMOBILISATION TEST

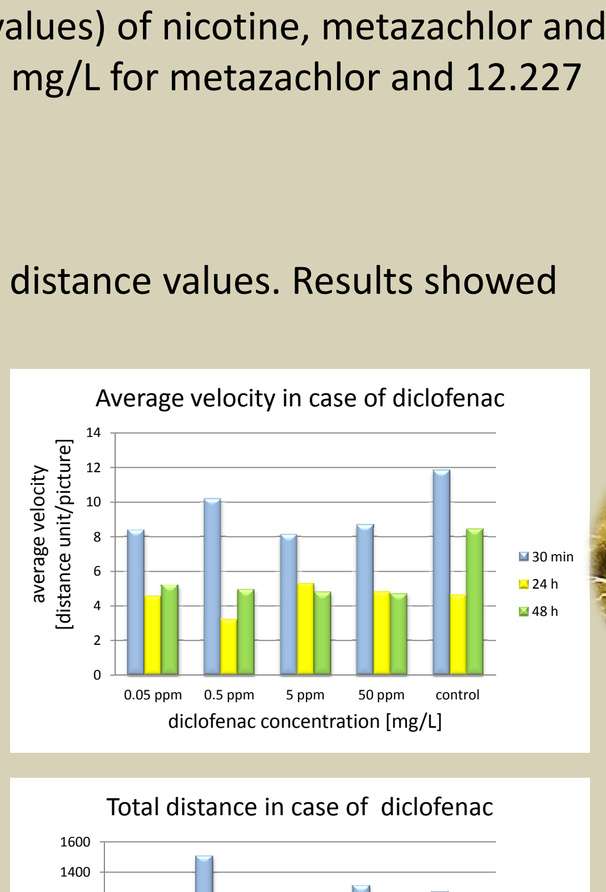
By OSTRACODTOXKIT FTM CHRONIC Test the immobilisation effect (EC_{50} values) of nicotine, metazachlor and diclofenac was determined. The EC_{50} was 0.257 mg/L for nicotine, 10.000 mg/L for metazachlor and 12.227 mg/L for diclofenac.

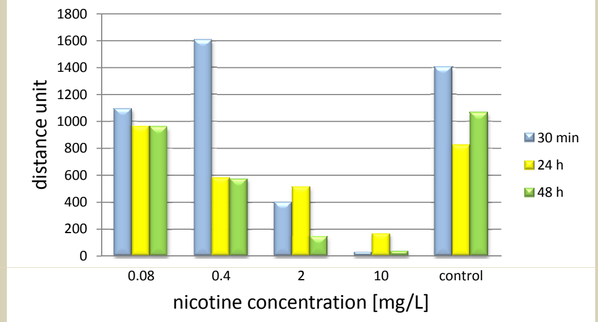
HETEROCYPRIS INCONGRUENS MOVEMENT TEST

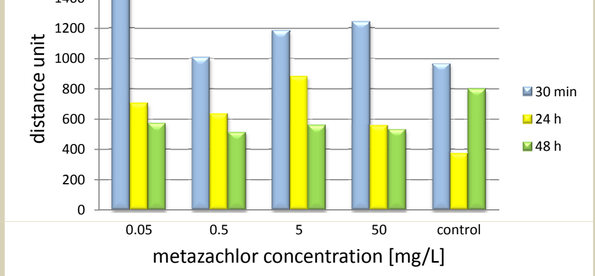
All of the tested substances attenuated the average velocity and the total distance values. Results showed that nicotine was the most toxic chemical substance.

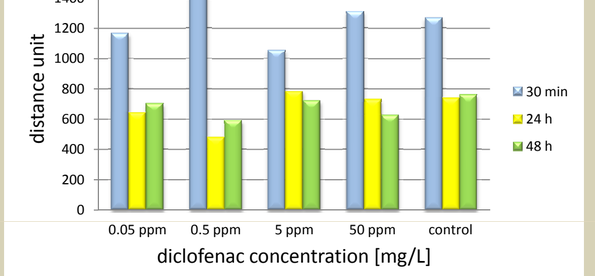




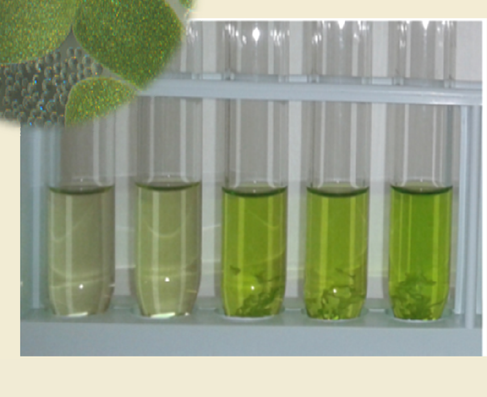








http://www.aquaticplantcentral.com



http://www.lbm.go.jp

http://www.aquarium-kosmos.de

http://www.lbm.go.jp

DISCUSSION

Comparative assessment of environmental toxicology tests was carried out to find new, more sensitive endpoints for testing the toxic effect of emerging micropollutants found in freshwater ecosystems. The three most sensitive environmental toxicology tests and their results are presented here, namely the *Daphnia magna* heartbeat rate test, the *Lemna minor* reproduction inhibition test with the determination of chlorophyll content and the *Heterocypris incongruens* movement test. These newly developed procedures with sub-lethal endpoints offered the possibility for easy and quick estimation of environmental toxicity. Furthermore an important conclusion of the research is that there is no universal toxicity test to detect the effect of all types of chemical substances; reliable risk assessment of micropollutants requires a battery of bioassays.

ACKNOWLEDGEMENT

The financial support of National Innovation Office (TECH_08-A4/2-2008-0161, CDFILTER and TECH_09-A4-2009-0129, SOILUTIL project) is greatly acknowledged.