Application of antibiotic sensitive bioassays to assess water and waste water quality

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INTRODUCTION
The potential toxicity of surface waters in The Netherlands is monitored with a battery of bioassays. This test battery is responding well to compounds causing narcotic effects [1], but more attention should be paid to compounds with a specific mode of action, like antibiotics. The aim of the present study was therefore to develop and apply antibiotic sensitive bioassays. To this purpose we compared the sensitivity of three bioassays (with a green alga, a cyanobacterium and bacteria) to six antibiotics.

METHODS
Algae tests: a 96-wells application of the PAM test. Measures photosynthetic efficiency of green algae and cyanobacteria with Pulse Amplitude Modulated fluorescence (Yield).

Bacteria test: a 96-wells application of the multi-bacteria screening test. Measures growth inhibition of 5 bacterial strains (sensitive to specific antibiotic groups) using optical density in 5 separate plates.

Test compounds: Sulfamethoxazole, Trimethoprim, Flumequine, Tylosin, Streptomycin, Oxytetracycline.

RESULTS
Using photosynthetic efficiency as an endpoint, the cyanobacterium was more sensitive than the green alga to Streptomycin (left panel) and Sulfamethoxazole (as expected). In contrast, Tylosin (right panel) and Oxytetracycline were more effective to the green algae.

Comparison of sensitivities

![Comparison of sensitivities](image)

For all test compounds the multi-bacteria screening test was more sensitive than the PAM test (green and cyan), except for Tylosine.

CONCLUSIONS
1. The PAM algae test not always responded conform the expected algal species specific sensitivities.
2. The bacterial test was more sensitive than the PAM test.
3. The bacterial test is a promising tool to screen water samples for the presence and effects of specific groups of antibiotics.

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References