THE ANALYSIS OF *E. COLI* IMMUNOSENSOR OUTPUT FOR THE ASSESSMENT OF COLI INDEX IN NATURAL WATER

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Escherichia coli (*E. coli*) is a common mammalian intestinal bacteria, which is used as an indicator organism for the determination of faecal pollution in fresh water. Currently the microbiological quality of bathing water is assessed using microbiological cultivation, serving as the "gold standard" for the evaluation of water quality, but the acquisition of results is slow and takes several days. Modern alternatives like qPCR allow enumeration of bacteria in a more time-efficient mode, but still require sophisticated lab equipment and sample transportation. In regards of on-site automated monitoring, immunobiosensors possess high potential to replace the abovementioned lab - based methods. However, a biosensor response can be generated by antigens of both live and decayed bacteria, and it is potentially affected by similar species present on the environment. This makes the interpretation and direct comparison of biosensor results with microbiological coli - index problematic, and requires further studies to understand which particular factors are affecting the biosensor signal. Up to now, biosensors have not been used for practical applications.

In the current study, biosensor results were compared with the enumeration of *E. coli* cells with microbiological cultivation and qPCR. The median biosensor results were about 4 times higher than the qPCR results and 40 times higher than the results of microbiological cultivation [1]. We also identified which specific bacteria and on which cell decomposition level could generate a measurable signal of an *E. coli* immunobiosensor in real bathing waters. As an average, the signal of cultivable *E. coli* formed only ~ 10 % of the "pure" biosensor signal. The determination of the signal caused by intact but non-cultivable *E. coli* was based on the results of qPCR analyses. This signal was bigger and formed ~ 30% of the specific signal as an average. The remaining 60% of the biosensor signal was most probably caused by the *E. coli* cell fragments and all forms of coliforms.

References:

[1] E. Jõgi, I. Väling, T. Rinken, Assessment of bathing water quality with an E. coli immunosensor, Int. J. Environ. Anal. Chem. (2020). https://doi.org/10.1080/03067319.2020.1786549.

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