IGEM TEAM TÜBINGEN PROJECT 2020

WHY HEAVY METALS?

Not only in emerging and developing countries, but also in the industrialized countries, the consequences of human influence on the environment can be felt directly. This is evidenced by increased levels of organic pollutants and increased concentrations of heavy metals in the air and in water, some of which even exceed the permissible limit values [1]. This poses a significant health problem, with an estimated 8 million people in emerging and developing countries dying from the effects of heavy metal poisoning in 2012 [2]. These numbers illustrate the need for safe disposal of heavy metals, the basis of which is their reliable identification.

WHY BIOSENSORS?

The conventional analytical methods for the detection of heavy metals work very specifically and are very sensitive. However, the often highly complex devices required for this are very expensive to purchase and maintain and require experienced personnel in handling and evaluating the results. This severely limits the handling of these devices in developing countries.

Biosensors provide an alternative approach. Basically, this is a sensor that is equipped with biological components. The main advantages of biosensors are that they are inexpensive to manufacture and much easier to use. A relatively high level of sensitivity has already been demonstrated with various biosensors [3]. These properties predestine biosensors for future use in structurally weak regions.

HEAVY METALL BIOSENSORS

OUR PROJECT

As part of the iGEM-2020 competition, we decided to genetically modify an *E.Coli* strain so that it can act as a biosensor for heavy metals. We are working on inserting the reporter gene for a red fluorescent protein in *E.Coli*, which is expressed as soon as the bacteria are exposed to heavy metals. We use riboswitches as heavy metal binding sites that mediate the expression of the reporter gene. Riboswitches are RNA sections of the 5´-UTR which, depending on the binding of ligands, regulate the transcription of a gene or translation of a mRNA. The experimental approaches are not yet particularly mature in connection with riboswitches that bind heavy metals, so we hope that our project will contribute to current research and provide a platform for further approaches.

REFERENCES

[1] Qiaoqiao Zhou, Nan Yang, Youzhi Li, Bo Ren, Xiaohui Ding, Hualin Bian, Xin Yao (2020): "Total concentrations and sources of heavy metal pollution inglobal river and lake water bodies from 1972 to 2017" Global Ecology and Conservation Volume 22, June 2020, e00925

[2]https://www.Pureearth.Org/wpcontent/uploads/2019/01/pe_pollutionknowsnobordersonline.Pdf (02.5.2020;18:23)

[3] Chiye Zhang, Saika Siddiqui, Pablo Morales Navarrete, Jie Yuan (2020): "An Integrated Whole-Cell Detection Platform for Heavy Metal Ions" IEEE Sensors Journal Volume 20, issue 9

igem_tuebingen

team@igem-tuebingen.de   https://igem-tuebingen.com/index