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POSTER PRESENTATIONS

[69] RECORDING MICROBIAL SIGNALS IN SOIL: DEVELOPING GENETIC MEMORY DEVICES FOR DETECTION OF SPECIALIZED METABOLITES IN MICROBIOMES

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Microbes reside in complex microbiomes, where secreted specialized metabolites play a major role in interspecies communication. However, investigating the role of specialized metabolites in microbial signaling is currently limited to methods that are disruptive and affected by detection limits. The aim of our research is to engineer soil-dwelling microbes capable of recording the presence of bioavailable specialized metabolites ***in situ*** in soil and rhizosphere microbiomes. This approach provides an ultrasensitive, non-disruptive alternative to existing methods, which additionally allow for both spatial and temporal investigations of signals ***in situ***. The sensors function by inferring an irreversible genetic switch in the presence of the metabolite in question, which is catalyzed by a tightly controlled integrase.

We have developed a handful of different sensors responding to pico-nanomolar concentrations of ecologically relevant metabolites. Each sensor has been tuned to avoid leaky expression in the absence of inducing metabolite in ***E. coli***. Sensor sensitivity and responsiveness were analyzed with flow cytometry to generate response curves. Additionally, we have transferred our sensors to the soil- and rhizosphere compatible bacterium ***P. putida*** KT2440 and determined their effectiveness with flow cytometry. Finally, we have changed the output to genetic memory and verified the efficiency and orthogonality of the sensors with qPCR.

Whole-cell biosensors hold an immense potential to detect and record signals in natural environments. They are highly tunable genetic devices that serve as a promising alternative method for ***in situ*** investigations of natural products in complex environments such as soil- and plant microbiomes.