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Abstract

Nanosensors for Monitoring Bacterial Growth Kinetics and Response to Antibiotics †

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Miniaturized and cost-efficient methods aiming at high throughput analysis of microbes is of great importance for the surveillance and control of infectious diseases and the related issue of antimicrobial resistance. Here, we demonstrate a miniature nanosensor based on a honeycomb-patterned silicon nanowire field effect transistor (FET) capable of detecting the bacterial growth and antibiotics response in microbiologically-relevant nutrient media [1]. We determine the growth kinetics and metabolic state of *Escherichia coli* cells in undiluted media via the quantification of changes in the source-drain current caused by varying pH. Furthermore, by measuring the time-dependent profile of pH change for bacterial cultures, treated with antibiotics, we demonstrate for the first time the possibility to electrically distinguish between bacteriostatic and bactericide drug effects. We believe that use of such nanoscopic FET devices enables parameters that are not easily accessible by conventional optical methods to be addressed in a label-free format, i.e., monitoring of microbial metabolic activity or stress response.

References

1. Ibarlucea, B.; Rim, T.; Baek, C.K.; de Visser, J.A.G.M.; Baraban, L.; Cuniberti, G. Nanowire sensors monitor bacterial growth kinetics and response to antibiotics. *Lab Chip* **2017**, *17*, 4283–4293.