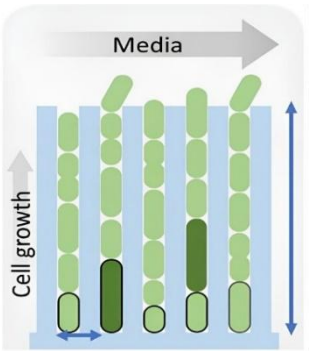
MICROfluidic devices for long term AntiMicrobial Response characterisation

M. Karoui, M LBPA ; S. Bensalem, LuMIn ; B. Bartenlina, C2N

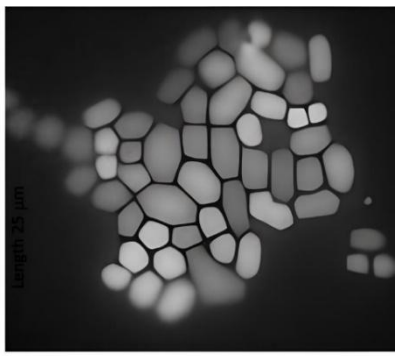
Bacteria are capable of achieving a wide range of growth rates depending on their environments, and the variability in growth rates directly affects susceptibility to antibiotics. For example, in *Escherichia coli*, fast-growing cells are more sensitive to DNA-damaging antibiotics than bacteria that grow slowly. Bacteria show high phenotypic heterogeneity at the single-cell level in their response to antibiotics, leading to transient antibiotic tolerance and long-term resistance. It is, therefore, essential to quantify and understand the bacterial response to antibiotics at the single-cell level while controlling precisely their growth rate. Changes in growth rate affect not only antibiotic susceptibility but also cell size. Indeed, bacterial volume can vary from 0.5 to 3 mm^3 depending on nutrient availability. Moreover, bacterial size and shape vary under antibiotic treatment: antibiotics that target the chromosome, such as ciprofloxacin, lead to elongated cells, whereas antibiotics that target the cell wall, such as meropenem, lead to rounded and flat cells.

This project aims to develop new microfluidics devices, with a precision of approximately 100 nanometers, that can handle trapping and long-term imaging of bacteria in variable growth conditions and levels of antibiotic exposure.

Contact : Meriem.elkaroui@ed.ac.uk



Channel (variable width)



Bacteria change shape under antibiotic exposure