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The Quest to Elucidate DNA Transformation in *Neisseria gonorrhoeae*: from understanding to applications

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### Background

The emergence of antibiotic-resistance strains in *Neisseria gonorrhoeae* (Ng) is one of the biggest global health concerns. Often, resistance in bacteria arises through horizontal gene transfer. In Ng, this process can mainly be achieved through DNA transformation. It is well known that Ng's competence has a close association to Type IV pili (T4P), which in Ng's case, serves as a multi-functional tool. While the link between DNA transformation and T4P has been extensively studied, there remains a gap in understanding the dynamics of the process, especially its dismantling into DNA uptake, transport, integration and maintenance in the cell.

### Aim/Methods

In this study, we aim to look at DNA transformation in Ng by decoupling DNA uptake from DNA integration. We labelled DNA molecules to look at DNA uptake quantitatively and qualitatively. At the same time, we investigate pili activity through labelled pili and micropillars. The study aims to converge quantitative understanding between pili activities and DNA uptake. With these information, we aim to map out the quantitative nature of DNA uptake and DNA integration.

### Results

Although this is still an ongoing investigation, our result not only supports some of the existing hypotheses and findings in the field but also provides some different insights into the process of DNA uptake. We are able to observe the dynamics of T4P and DNA uptake into the cell body. Current results point towards interesting relationships between pili and DNA uptake. We have incidentally developed useful molecular biology tools for Ng and possibly other naturally-competent bacteria.

### Conclusions

Through our quest to understand DNA transformation in Ng, it became apparent that DNA transformation conserves many mysteries to be unravelled. We are able to map out some relationships between DNA uptake and transformation through our observations and provide some insights into the process, either from the point of view of understanding transformation or molecular biology applications.