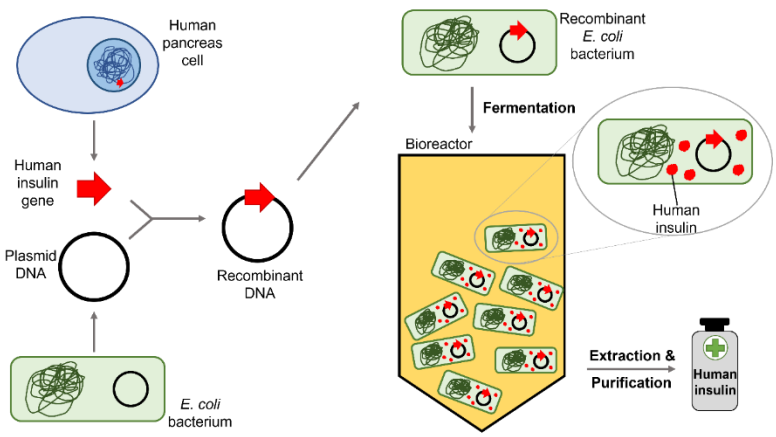
Better Biotherapeutics

Patrick Ingle and Raquel Rodrigues: SBRC – Nottingham

Synthetic biology seeks to create or redesign new biological parts or systems already found in nature. Its approaches have enormous medical potential in the form of biotherapy. Biotherapeutics are medicines which are obtained from biological sources, rather than from chemical synthesis. They can be divided into two main groups: biologics, which contain small molecules produced by microorganisms and live biotherapeutic products, which contain whole, live microorganisms.

The first licensed biotherapeutic was human insulin in 1982. This was produced using recombinant DNA technology by cloning and expressing the genes encoding human insulin in *E. coli*. Prior to this, insulin had been harvested from the pancreas of cows and pigs. In the following decades, hundreds of biotherapeutics have been brought to market, including monoclonal antibodies, hormones and growth factors, for the treatment of chronic diseases such as cancers and rheumatoid arthritis.



One of the main challenges associated with cancer therapy is the fact that cancer cells are, in fact, human cells that escape control and multiply too much. They are almost indistinguishable from healthy cells, so cancer treatments frequently affect normal cells in addition to tumours, leading to severe side effects. One way to make cancer therapies targeted is to use bacterial spores as delivery vehicles. These "hibernating" bacteria will remain inactive in most of our body and become activated exclusively in certain tumours due to the lack of oxygen. Therefore, if we engineer bacteria to deliver a cancer treatment, that treatment will affect only tumours and side effects will be minimised.

SBRC-NOTTINGHAM is a UKRI BBSRC/EPSRC funded, Synthetic Biology Research Centre led by Professor Nigel P. Minton at the University of Nottingham, UK. SBRC–Nottingham aims to provide new technologies in the form of engineered bacteria and processes that together can be used at scale by industry and medicine to improve the health of our population and our planet.

For more information visit:
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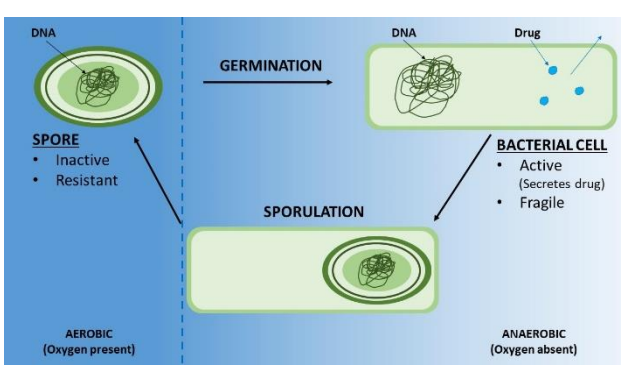
Researchers at the SBRC-Nottingham are studying the spore-forming bacterium *Clostridium spp*. to deliver therapeutic drugs in a targeted manner. Spores are inactive versions of bacteria that can survive under conditions that would normally kill them – as if the bacteria were hibernating to survive. The bacteria studied at the SBRC-Nottingham cannot tolerate oxygen, so if spores are administered to a patient, they will remain inactive until they find a spot in our body that lacks oxygen. This allows the targeted delivery of therapeutics to specific organs, avoiding side effects, which is particularly useful in cancer therapy.



About us

Patrick Ingle *is a postdoctoral research fellow in the health group within the SBRC-Nottingham. His research interests are in bacterial sporulation/germination and understanding how resident gut microbes provide colonization resistance against bacterial pathogens.*

Raquel Rodrigues *is a postdoctoral research fellow in the SBRC. She studies sporulation in harmless bacteria with the aim of improving a targeted therapy for cancer.*

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