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Key Achievements

- Design of novel probiotic drug delivery system for L-DOPA: using synthetic biology to develop personalised medicine.
- Assembly of an entirely synthetic auto regulated vector
- Eight Biobricks submitted and characterised while improving two existing ones
- Kinetic modeling and flux balance analysis shaping lab work
- Extensive integration of human practices into scientific work
- The first inter-european team and successful collaboration with other iGEM teams

Problems with current treatments:
- Expensive, multiple side effects, wear off over time, cause dyskinesia

"I think once people are on medication...it becomes a major preoccupation," - Julia, 63, parkinson’s sufferer

How DopaDoser is better:
- Continuous drug delivery, less invasive, fewer side effects, fewer doses

"I can choose to be governed by the illness or I can choose not to be" (Julia, 63)

Social Impact

Interviews...
- Two Parkinson’s patients on Parkinson’s disease: ‘...you do not want to turn your life into a therapeutic exercise.’ (Julia, 63)
- Duodopa® still has considerable side effects and elaborate aftercare where DopaDoser probiotics will be less invasive, more affordable thus more accessible

Outreach & Sociology...
- Compared public opinion of synthetic biology between Austria and the UK

Research...
- DopaDoser brings personalised medicine one step closer to reality
- DopaDoser as a drug delivery in probiotics strain is economically viable

Methodology

Experimental design and enzyme expression for the pathway development of L-DOPA and Dopamine

Kinetic modeling including 40 parameters and over 20 equations showed that L-DOPA expression by the system is compatible with Duodopa® therapy.

L-DOPA and dopamine biosynthesis in E.coli Nissle 1917 and BL21: AADC = aromatic amino acid decarboxylase, CvATA = transaminase from Chromobacterium violaceum, CYP2D6 = Cytochrome P450 enzyme 2D6.

Autoregulatory expression system. Two quorum sensing systems for Nissle 1917 (EsaR/I, CepR/I) regulating expression of the genes of interest (BBa_K1670003_CFP, BBa_K1670003 mRFP). For the DopaDoser the genes are replaced by BBa_K1670008 (Tyrosinase) and BBa_K1670009 (Tyrosinase chaperone).

Both our quorum sensing systems work! BBa_K1670002 (CepR) and BBa_K1670003 (mRFP) show CFP emission upon induction with homoserine lactones.

L-DOPA Synthesis via Modelling:
- DopaDoser could potentially work using different diet sources provided the growth rates of relevant gut flora is regulated or constrained.
- Make it more suitable to patients’ diet and dosage requirements by application of regulation systems.

Purple pigment expression (violacein) in Chromobacterium violaceum CV026 shows, that our BBa_K1670000 (A) is not functional, however BBa_K1670004 (B) as well as our prototype pCERI (C) actually produces homoserine lactones.