MRI AND BACTERIA AS DIAGNOSTIC TOOLS
THE ROAD TO OUR SOLUTION

TUMOR IMAGING

MRI scan of latter stages of brain cancer
Photograph by Zephyr/Science Photo Library
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CHEMICAL EXCHANGE SATURATION TRANSFER
ORGANIC CONTRAST AGENTS
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THE ROAD TO OUR SOLUTION
BACTERIA BASED CANCER THERAPIES
Our Solution
The Sensor
Sense the hypoxic environment

Contrast Agents
Generate contrast on an MRI scanner

The Chassis
Integrate the sensor and contrast agents

Safety
Ensure patient safety
The Sensor

Oxygen

Inactive FNR

Active FNR

Promoter
CEST Protein

Contrast Agents
The Chassis
Safety
The Sensor

Steady states of the FNR model

Response to Change in Oxygen Concentration

Shift to low oxygen concentration
Fluorescence of anaerobic samples

- Anaerobic
- Aerobic

Fluorescence (a.u.) vs. Wavelength (nm)
The Sensor

**ANAEROBIC EXPRESSION**

**INTENSITY INCREASES OVER TIME**

**Peak EGFP Fluorescence Over Time**

*Shift to anaerobic environment*

Fluorescence (a.u.)

Time (hours)
Contrast Agents

// High Lysine Ratio

// Practicality

// Molecular Dynamics Simulations
Contrast Agents

THE SELECTION

// 1ETF
// 1G70
// 1PJN

// Human Protamine 1

// Poly Arginine-Glycine
// Poly Arginine-Serine
// Poly Threonine-Lysine
// Poly Lysine-Serine
AEROBIC EXPRESSION

NATIVE PROTEINS ARE CLEARLY EXPRESSED
Contrast Agents

Proteins with a high Lysine content

MRI RESULTS

- Protamine
- 1ETF
- 1G70
- P(RG)
- 1PJN
- P(TK)
- P(KS)
Contrast Agents

MRI RESULTS

![Graph showing signal vs. shift with peaks for Lysine and Protamine with 1PJJN label]
19 NEW BIOBRICKS:

- A FUNCTIONAL ANAEROBIC PROMOTER
  (BBa_K1123000)

- 9 CEST PRODUCING PROTEINS
  (BBa_K1123013 – BBa_K1123021)

- 9 COMPLETE TUMOR VISUALIZATION CONSTRUCTS
  (BBa_K1123001 – BBa_K1123009)
The Safety Locks

AVOIDING AN IMMUNE SYSTEM RESPONSE


The Safety Locks

THE KILL SWITCH

1. The CEST protein producing E.Coli express thymidine kinase which phosphorilates the prodrug ganciclovir.

2. Cellular kinases further phosphorilate ganciclovir monophosphate into the active drug.

3. The activated drug is incorporated into the DNA, leading to replication halt and cell death.

TK

GCV

PP

GCV

Activated drug, Guanosine analog

CELL DEATH

E. Coli

Inactive prodrug

The Sensor
The Chassis
Contrast Agents
Safety
The Safety Locks

THE KILL SWITCH MODEL

The Chassis

Safety

Define the chassis

The Sensor

Contrast Agents
BACTERIA AS DIAGNOSTIC TOOLS: WILL SOCIETY ACCEPT THE IDEA?
Bringing the world of synthetic biology into everybody’s home.

Removing the reservations people have about synthetic biology by removing faulty data.

Collaborating and collecting data across the globe.
Welcome to the homepage of Synthetic Facts. Our goal is to provide an accurate and reliable source of information regarding the field of synthetic biology leading to the promotion of the field across the globe. This in turn will lead to a reduction in the number of Synthetic Facts available to misdirect those interested in the field of synthetic biology.

**True**

Bacteria can be safely used as therapeutic drugs for oncology therapies.

Oncotherapy treatments based on tumor-targeting bacteria constitute an exciting research field; even though they have proven to be more effective than current oncology therapies, the risk of a mutation occurring within the DNA of the bacteria could compromise the safety aspect of this type of treatment.

Learn more...

**True**

There is a website that tests Synthetic Biology 'facts' for their validity.

There is one now!

Learn more...

**False**

GM is just another form of mutation breeding and is nothing to worry about.
Human Practices

SYNTHETIC FACTS

21 Initial Facts To Be Checked.
12 Main Topics.
10 Facts Are Officially Checked, Uploaded And Available.

SyntheticFacts.tue.nl
FINAL CONCLUSIONS
We have established the foundations for a new bacterial application.

“Synthetic Facts” will continue to give reliable and unbiased information.
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