Thank you for your attention

Supporters:
Prof. Dr. Jörg Simon
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Prof. Dr. Harald Kolmar
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Sponsors:

iGEM 2013 TU Darmstadt

Problem  Solution  Detection
iGEM 2013 TU Darmstadt

Problem

Solution

Detection
Problem: mycotoxins

- produced by mould fungi
- 25% of the cereals worldwide are contaminated with mycotoxins
- very toxic products: approx 10 μg/kg chronic dosage
Effects of mycotoxins

- hepatotoxic
- hemorrhagic
- carcinogenic
- causing neural tube defects

Aflatoxin B1

Fumonisin B1
Mycotoxin detection

- established methods: ELISA and HPLC-MS
- expensive equipment
- time consuming
- need for trained personnel
Our Vision
Animation
Results mKate

- Fluorescence under UV light
- Excitation spectrum (max. at 579 nm)
Results LssM Orange

- Fluorescence under UV light
- Excitation spectrum (max. at 415 and 453 nm)
Result: toxicity

Growth curve
Fluorometer

- no: high voltage, laser, optical filters and amplifier
- needs high priced software
Fluorometer to go...

- cost: 35 Euro
- easy to use, small and lightweight
- can be powered via smartphone, normal 9V battery or solar energy
- open source
The detection app

- free available on google play

- communication via Bluetooth or USB

- intuitive and simple handling
The detection app
Biosafety

• safe use of the handheld outside the lab
• self containment in case of spill
• no special training before use
• working even in case of human error
Biocontainment: A light-induced kill switch (LIKS)

- production of PezT toxin in present of blue light
- activated by FRET measurement or spill
- effective within minutes
Human practice

1. survey: opinion about different aspects of biotechnology in everyday life

2. survey: validation of the acceptance towards our detection system

201 people participated:
55% online
45% interviewed in person
Statistic analysis

- Biotechnology in food products has a negative reputation
- More acceptance for pharmaceutical products and fundamental research

![Biotechnology in relation to various products](image)

- Positive attitude towards biotechnology for quality assurance

![Genetic engineering for quality assurance](image)
Statistic analysis

**Would you buy food, whose quality was tested with the help of GMO’s?**

- Yes 89%
- No 11%

Risks and benefits of biotechnology are perceived as balanced.

Strongest concerns:

- Risk of accidental release into environment,
- Unforeseeable consequences for health and environment
Take home...

- 3 Bio Bricks submitted
- Modelling
  - statistical data
  - LssM Orange structure
- Safety
- Android App
- Fluorometer to go
- Human Practice
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Sponsors:
High sensitivity

An optical sensing approach based on light emitting diodes

Radovan Stojanovic¹ and Dejan Karadagić²
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An Inexpensive LED-Based Fluorometer Used to Study a Hairpin-Based DNA Nanomachine

Hanwen Yan
Led sensing

An optical sensing approach based on light emitting diodes

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![Diagrams](image-url)
LED are spectral-selective

Sun photometer with light-emitting diodes as spectrally selective detectors

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Light-emitting diodes (LED’s) can function as light detectors with a spectral bandpass similar to the diode’s spectral emission band,¹ typically 25–35 nm at the half-maximum points. This means that LED’s can serve as detectors in miniature sun photometers that measure precipitable water and atmospheric turbidity at wavelengths from 555 to 940 nm.
LSSmOrange/mKate

A

Fluorescence (a.u.)

Wavelength (nm)

0 20 40 60 80 100

400 500 600 700 800

LSSmOrange
mKate2

B

Fluorescence (a.u.)

Wavelength (nm)

500 600 700

Fluorescence max. at 572 nm
Excitation at 440 nm

C

FRET

caspase-3

Fluorescence max. at 572 nm
Excitation at 440 nm
Back up
Back up