Ribbonase: A novel riboswitch based fluoride sensor. Recently isolated fluoride riboswitch characterised in both E. coli and B. subtilis. This de-represses transcription in the presence of fluoride ions.

Two sensitivity ranges:
- Chloroform treatment permeabilises the cells. This allows free entry of fluoride ions to detect concentrations around the WHO safe fluoride level.
- Intact cells are sensitive to higher concentrations in the range of the current levels of fluoride groundwater contamination in Nepal and Bangladesh. Immersing B. subtilis in fluoride brings their bases in response to fluoride over a 3-day growth period. WHO (World Health Organization) guidelines for fluoride in drinking water are 0.7-1.5 mg/L.

RiboSenses uses little in the iGEM community:
- Specific, and quicker response compared to inducible promoters ideal for biosensing.

Ratiometric reporter for accurate and reproducible quantification. The principle: Normalisation of an inducible signal to a constitutive one, to take into account variations in culture density, size and productivity. This requires two reporter channels.

Bacterial lux operon doesn't require a substrate (firefly luciferase requires luciferin). Problem: Ratiometric - needs two channels. No mutations needed.

Characterisation:
- Inducible signal is eCFP constitutive signal is eYFP.
- Response compared to constitutive channel.

Fluorescent construct:

- Characterisation with increasing OD600, YFP increases proportionally while CFP stays unchanged.

Biologger:
- A cheap, arduino based, ratioluminometer.
  1. Rotary design allows reading of multiple biosensors.
  2. Open-sourced and open platform.
  3. Two applications: one for PCs and the one for Android devices.

Biosensor: A genetic circuit for biocontainment. The inducer dropping approach is less prone to the rapid expression of CFP.

Bacillus subtilis spores: long term, user-friendly storage.
- B. subtilis forms long-lived, dormant spores, stored at ambient temperature.
- When required, a simple protocol and germination medium (supplied) is used to reactivate the spores. The sensor can be loaded into Biologger.
- Overexpression of the B. subtilis spo0A operon reduces the germination period to speed the biosensing process.
- Biocontaminated Chemical and genetic control systems have been considered.

Our system involves a ratiometric output allowing reliable measurements. Our electronic ‘Biologger’ device negates the need for expensive, bulky equipment. Sporduino is a prototype marketable product and so we have considered its storage, distribution and safe operation.