



Natural Solutions for Food Safety

IMPACT

Improved Pathogen Control Technologies (FRST)

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agresearch

Aim of IMPACT Programme

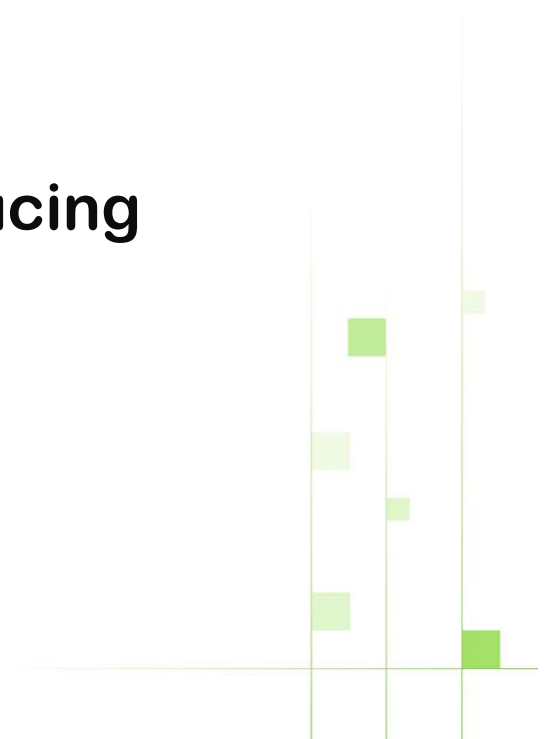
- Identify **novel methods of biocontrol** which will provide industry with viable alternatives for pathogen control
- To determine **effective delivery** protocols
- Provide a platform for **rapid response** to future pathogens



Target Outcome



- 50% reduction of *E.coli* 0157:H7 by 2012
- Focus is *E.coli* 0157:H7 but can be applied to other Shiga Toxin producing *E.coli* (STEC's)



Objective : Biocontrol by controlling bacterial communication or signalling



Hypothesis

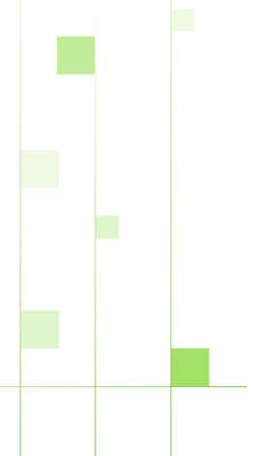
- **Signalling-related activities are important** for pathogen survival/growth on meat and meat products
- A **novel target** for biocontrol strategies

Research Foci

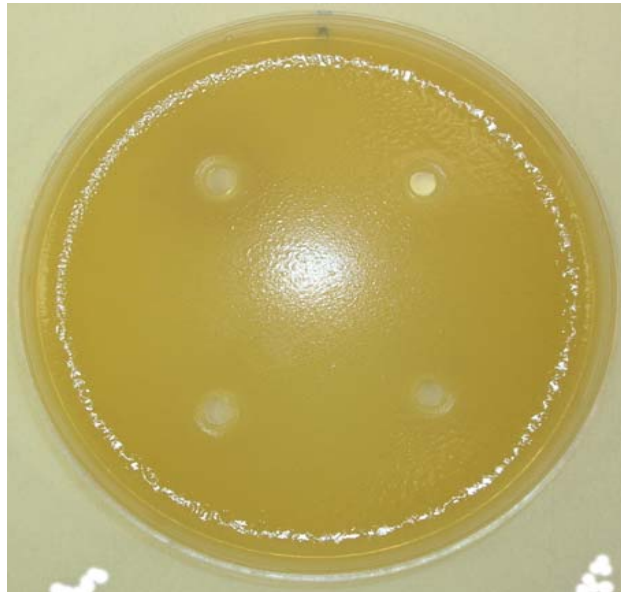
- **Identification** of signal molecules produced by microorganisms
- Examine the **effect** of signal molecules on bacterial behaviour

Research Outcomes

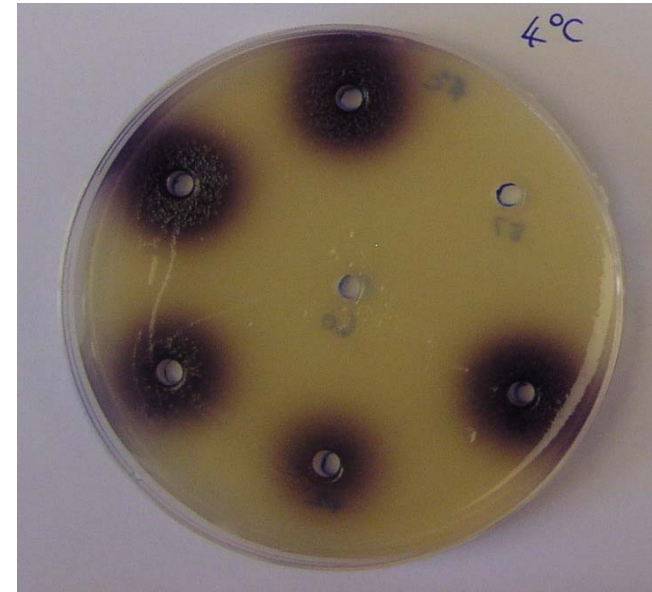
- **Interventions** that target bacterial communication as a biocontrol



Bacterial communication is the target.....

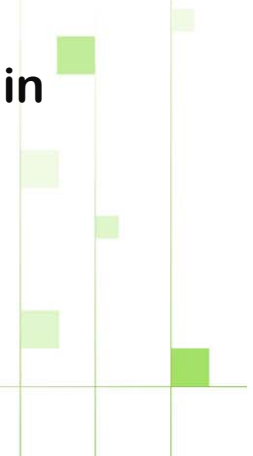


Negative



Positive

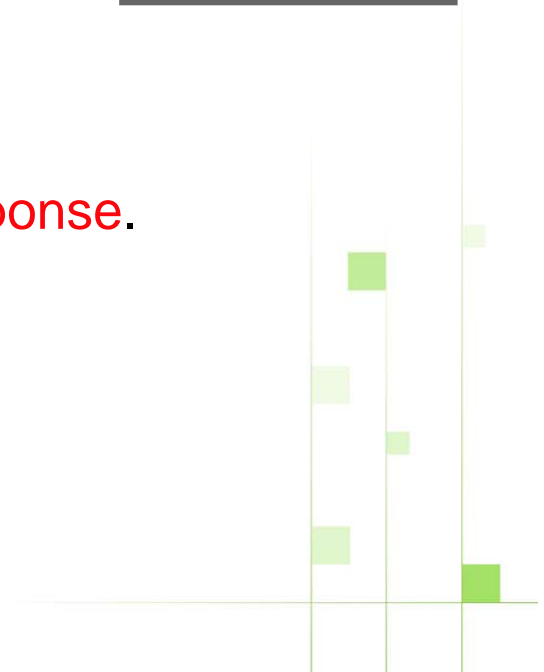
- Bacterial communication promotes cooperative behaviour within bacterial communities
- Behaviour is density dependent



What can we do?



1. **Breakdown** of the signal molecule.
2. Signal **antagonists/modification** of the signal.
3. **Mimics** of signal molecules.
4. Use other signals to cause an **inappropriate response**.

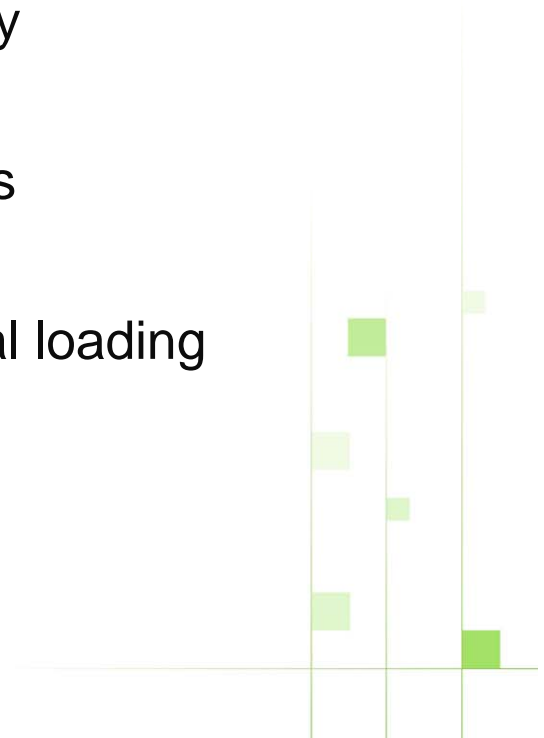




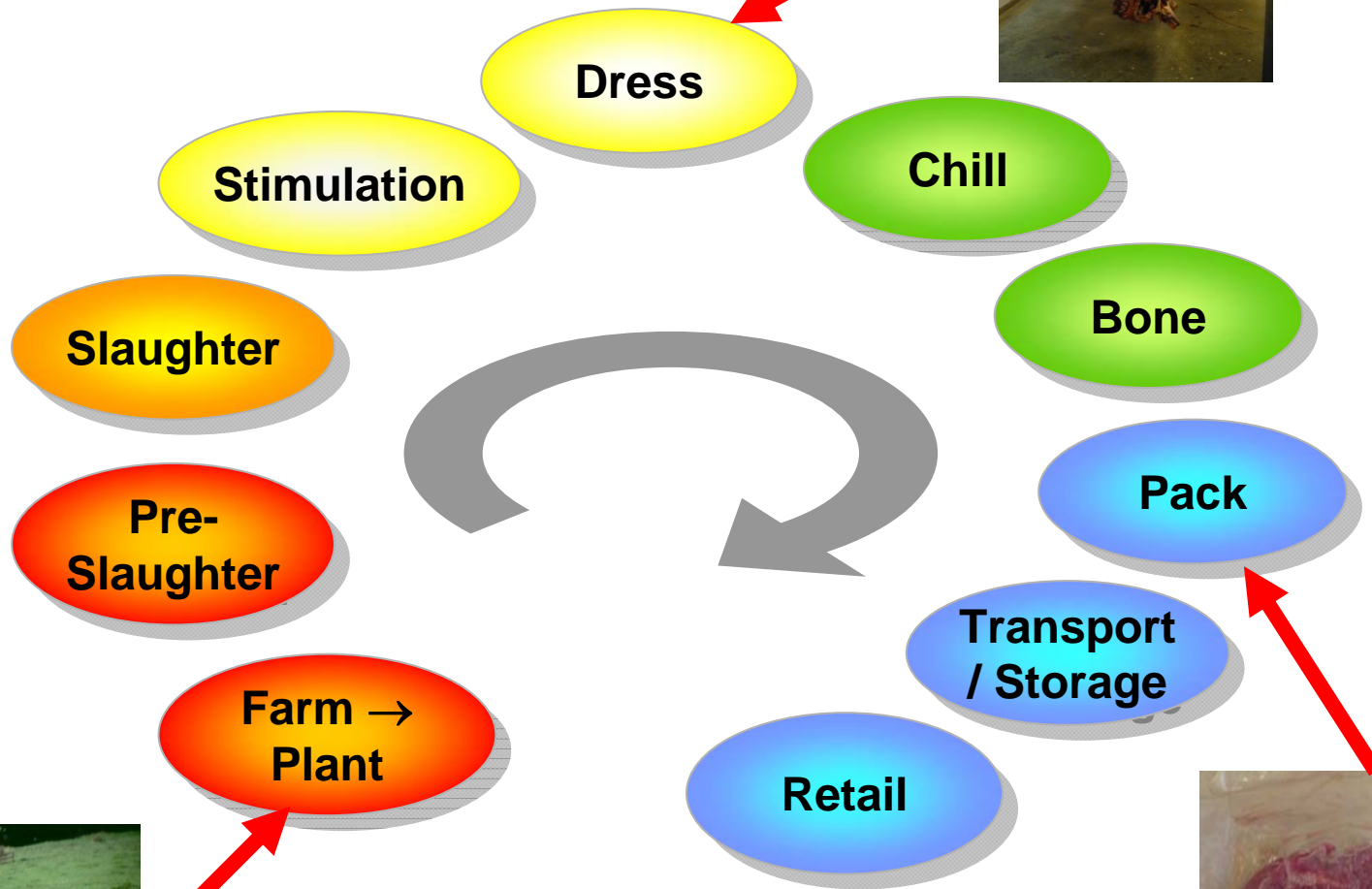
This will allow us to manipulate bacteria to our advantage by.....



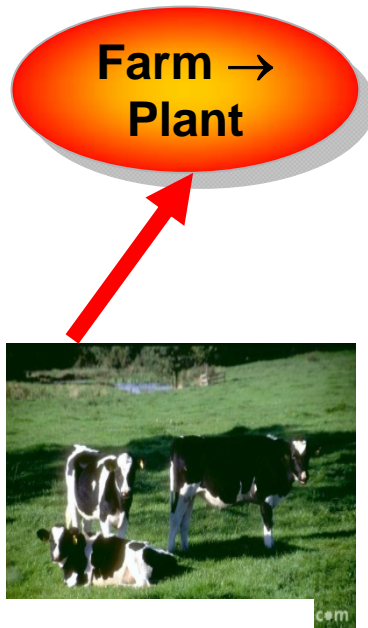
- Interfering with the communication between bacteria and their co-ordinated behaviour
- Controlling their growth and reducing their viability
- Preventing the bacteria from attaching to surfaces
- Make it easier for interventions to reduce bacterial loading



Target areas



Signalling of *E.coli* 0157:H7

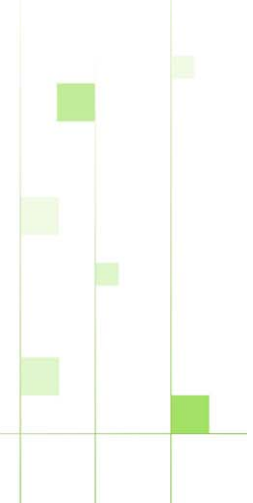


- Investigate bobby calves and cull cows : Isolation of *E.coli* 0157:H7
- Tissue samples : investigate stress molecules capable of modulating *E.coli* 0157:H7 attachment and motility
- Isolate signalling molecules from bacteria associated with meat



Signalling of cold tolerant Enterobacteriaceae

- Enterobacteriaceae: Able to grow at chill temperatures and cause blown-pack spoilage after a period of temperature abuse
- Investigate the production of signalling molecules: bacterial communication at different temperatures
- Isolate these signalling molecules and characterise
- Investigate the ability of these molecules to affect the growth and adherence characteristics of other microorganisms i.e. *E.coli* 0157:H7



Looking to the Future



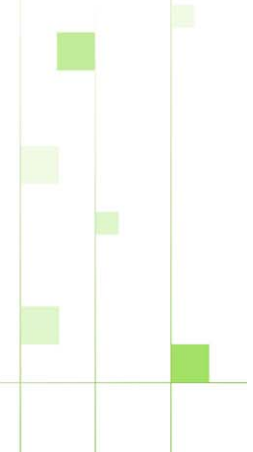
Intervention On Farm



Both Motility and Adherence are
Signalling Regulated

Target of Intervention -
Prevent adherence of *E.coli* O157:H7 to
the rectum of the cow

Target Outcome – Break the carriage
and shedding cycle in cull cows



Looking to the Future



Intervention On Plant



Bacterial Growth and Survival
Signalling Regulated

Target Intervention – Prevent
growth of bacteria on the meat surface

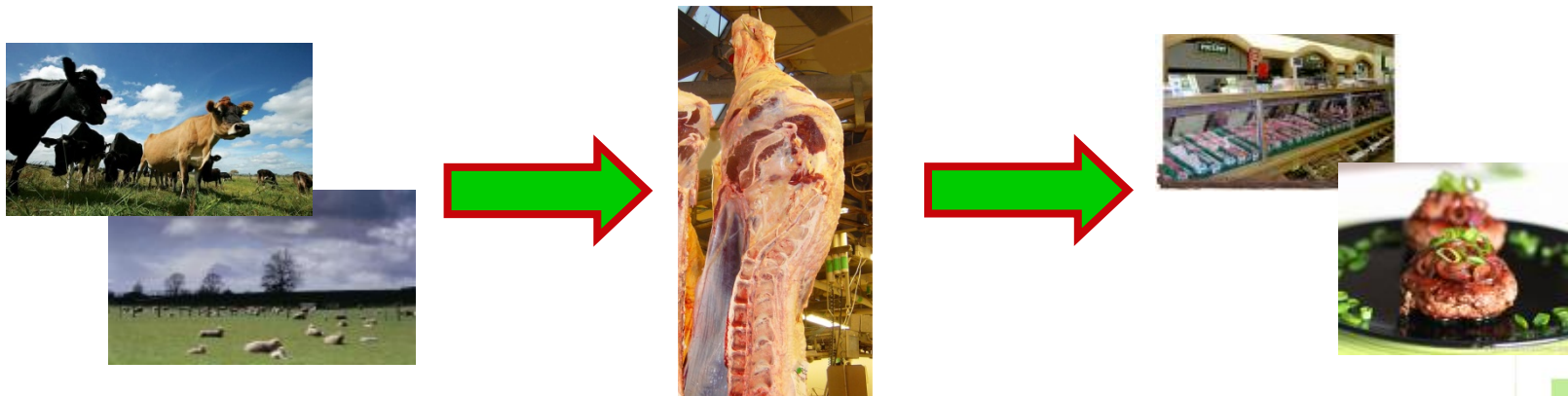
Target Outcome – Possibly an ‘environmentally
green’ carcass spray based on bacterial signalling
compounds



Outcomes of IMPACT Programme

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- Novel, cost effective **biocontrol strategy** based on bacterial communication
- **Effective delivery** methods and points for a signalling biocontrol



- Platform for a **rapid response** to future pathogens: i.e. non 0157 STEC's