



Product innovation: understanding food safety hazards and how to control them

Proteins for Food & Health seminar

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CSIRO AGRICULTURE & FOOD
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Overview

- Drivers of NPD and innovation
- HACCP & hazards associated with novel proteins
- Microbiological food safety
 - Preservation toolkit – risk mitigation
 - The hurdle approach to food preservation
 - The Food Safety Objective (FSO)
 - Validation: challenge & shelf-life testing
- Allergens & food safety



Staying on trend in 2019!

**Clean
label**

**Plant derived
proteins**

**Health &
wellbeing**

**High
protein**

**Certified
organic**

**Natural
Animal
welfare**

Snacking

FRESH!

Convenience

Sustainable



Image source: Natural Marketing Institute

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Hazards associated with novel proteins

The role of HACCP in your products' safety

- All businesses should seek to have a Food Safety Program
 - Outlines how a business will identify, control and manage food safety hazards during manufacture
- | | |
|---|--|
| Hazard

Analysis

Critical

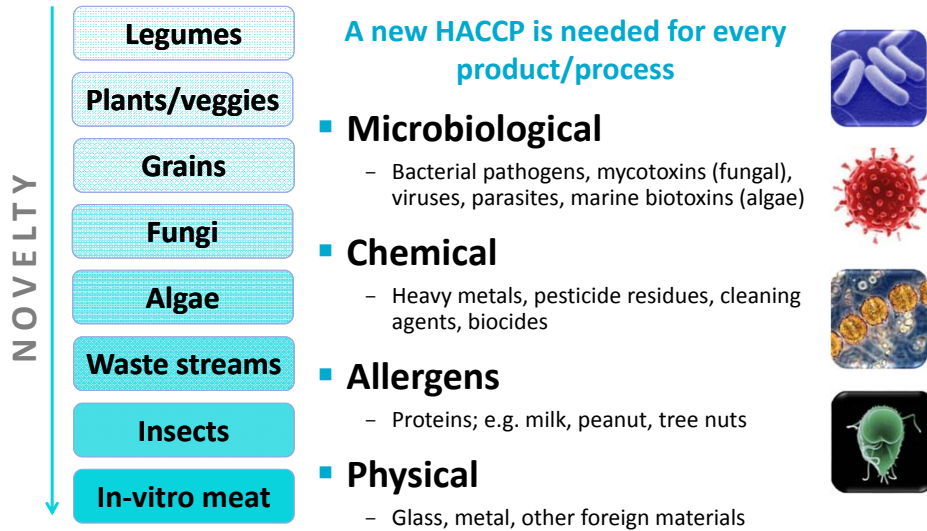
Control

Point | <ul style="list-style-type: none"> ■ What are the potential hazards for your product/process? (microbiological, chemical, allergen & physical) ■ What is the risk & potential consequence of each hazard? ■ What can be implemented to mitigate (prevent or reduce) risk? <ul style="list-style-type: none"> – Identify where in the process to apply control -
Critical Control Points – Identify which factors to control -
Critical Control Factors ■ Monitoring: how do we know we are applying control measures appropriately? |
|---|--|

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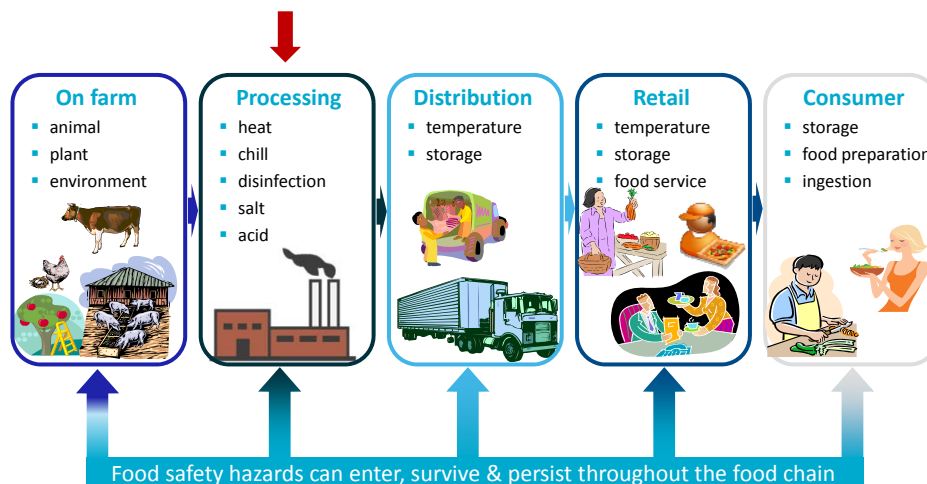
Hazards associated with novel proteins



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Opportunity for hazards, through-chain



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Food preservation toolkit: *the options*

Inhibiting/delaying growth of microorganisms

- **Reduce temperature:** freezing, chilling
- **Reduce available water (water activity):** drying, curing (salting), conserving (sugar)
- **Reduce pH:** acidifying, fermenting
- **Preservatives:** antimicrobial compounds, organic/inorganic acids, smoke
- **Removal/Replacement of oxygen** (vacuum/modified atmosphere packaging)



Inactivating microorganisms

- **Physical processing:** heat (pasteurisation/canning), pressure (HPP)
- **Chemical sanitisers:** chlorine & other chemicals to surface inactivate microorganisms
- **Some formulations:** e.g. mayonnaise (acid, salt, pH, water activity)

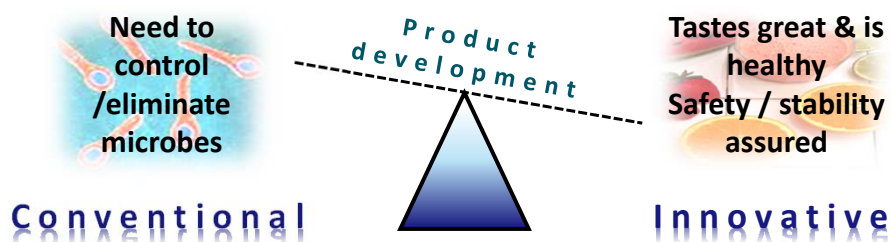
Intrinsic: in the food **Extrinsic:** outside the food **Processing:** applied to the food

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Microbiological safety - *finding the balance*

Meeting our Food Safety Objectives without compromise



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The hurdle concept – a holistic approach

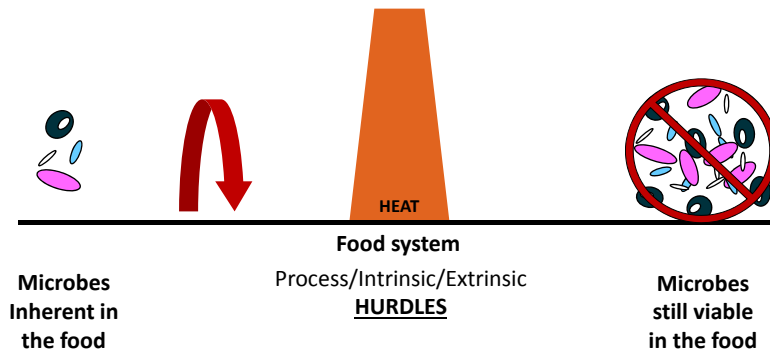


Figure adapted from Leistner & Gould, 2002

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The hurdle concept – a holistic approach

Food safety & stability is dependant on the interplay between processing, intrinsic & extrinsic factors...as well as the microbes in there to start

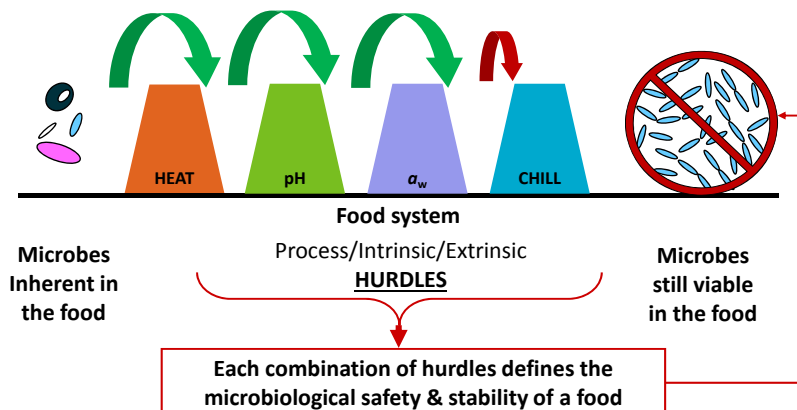


Figure adapted from Leistner & Gould, 2002

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The hurdle concept – a holistic approach

Making a change to any of these hurdles can destabilise the system!

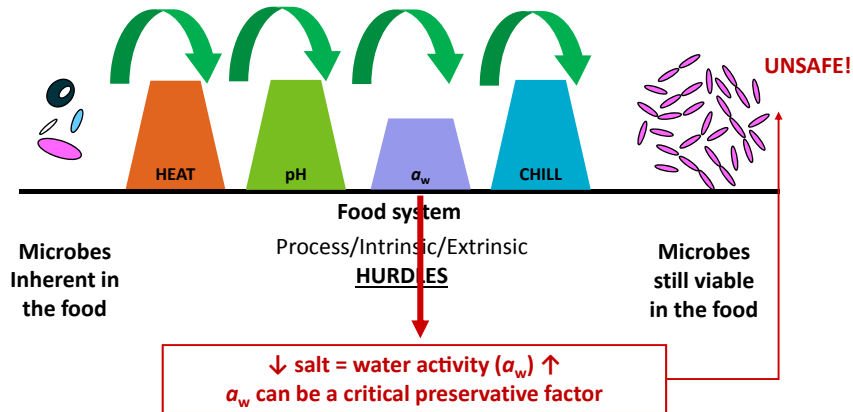


Figure adapted from Leistner & Gould, 2002

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The hurdle concept – a holistic approach

With innovative processing & novel/natural preservatives there is a real opportunity to for exciting NPD for healthier foods

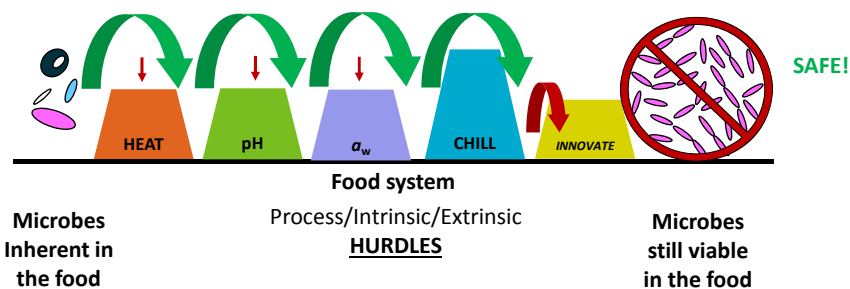


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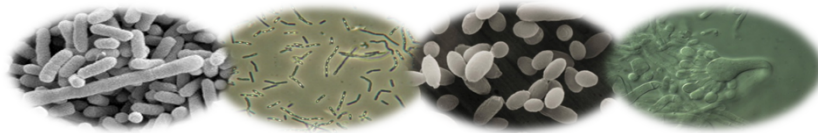
Smarter food safety

OLD – prescriptive, inflexible

- Traditional food safety based on adherence to prescriptive approaches to achieve compliance
 - Inflexible - prescribe approach for achieving the goal
 - Difficulties arise for validating novel technologies – constrains innovation

NEW – smarter, more flexible → innovation

- (ICMSF, 1998) proposed new scheme for management of microbial hazards in foods
 - The **Food Safety Objective (FSO)** approach – defines the goal
 - Flexible - does not prescribe approach for achieving the goal
 - Permits demonstration of equivalence of control measures* – supports innovation



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The Food Safety Objective

$$H_0 - \Sigma R + \Sigma I \leq \text{FSO}$$

- H_0 = initial level of the hazard
- ΣR = hazard reduction (inactivation or removal)
- ΣI = hazard increase (growth or recontamination)

All expressed in \log_{10} units

FOOD SAFETY OBJECTIVE

The maximum frequency &/or concentration of a [microbiological] hazard in a food at the time of consumption

Which bugs/how many?

How do we kill them?

How do stop them?



A through chain approach

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How to validate a process – A challenge!

Challenge test

How your product will perform if faced with a 'worst case' microbe scenario
CHALLENGED

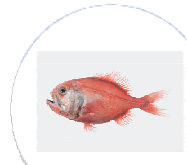
Shelf-life study

How your product will perform given the microbes in it at the time of production
NOT CHALLENGED

- Deliberately inoculate with a **specific microorganism** at a known concentration
- Includes both pathogenic (**safety**) & spoilage (**stability**) microorganisms
- **Challenging performance** related to –
 - **Formulation hurdles** (pH, a_w , salt): **Inactivation** / **Inhibition**
 - **Process efficacy** (thermal, HPP, chemical sanitisation): **Inactivation**
 - **Shelf-life conditions** (atmosphere, packaging, temperature, time): **Inhibition**

Allergens

- Allergens are proteins found in common food ingredients
- Food allergies affect 2% of Australian adults but are estimated to affect around 6-8% of children
- 1 in 10 babies aged 12 months now have food allergy in Australia



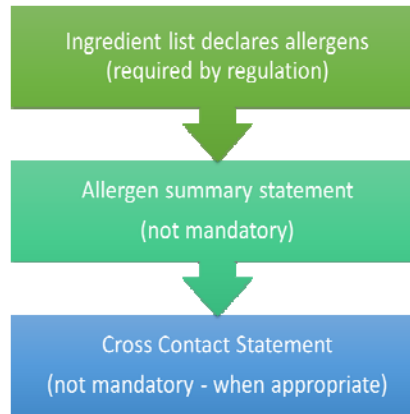
Allergens required to be labelled in Australia

- | | |
|--|--------------------------------------|
| – Cereals containing gluten – wheat, rye, barley, oats and spelt | – Peanuts |
| – Crustacea | – Soybeans |
| – Egg | – Sesame seeds |
| – Fish | – Tree Nuts |
| – Milk | – Lupin |
| | – Added Sulphites (10m g/kg or more) |

Allergen labelling requirements (FSANZ)

Allergen labelling is required when present as:

- an ingredient; or
- an ingredient of a compound ingredient; or
- a food additive or component of a food additive; or
- a processing aid or component of a processing aid.



Slide acknowledgement: Fiona Fleming

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FSANZ guidance on novel foods

- Novel foods and novel food ingredients are regulated under Standard 1.5.1 – Novel Foods in the Food Standards Code
- A novel food cannot be sold as food or used as a food ingredient **unless it is listed in the Standard**
- FSANZ is currently reviewing the requirements in the Food Standards Code for novel foods
- www.foodstandards.gov.au/industry/novel/Pages/default.aspx



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Summary

Consumer demands & a focus on healthier foods are driving new product development & innovation in the food industry

NPD must be approached with food safety front & centre; includes HACCP for identifying microbiological, chemical, physical & allergen hazards

Microbiological food safety incorporates an understanding of the hurdle concept & food safety objectives & applying strategies to reduce risk

Challenge testing plays a critical role in assessing the microbiological safety & stability of foods

Allergens are proteins that can cause reactions in consumers; be aware that novel proteins sources may introduce new allergen hazards. Check with FSANZ

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Thank you

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