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de la formation et de la recherche DEFR

Agroscope

Listeria

Artisanal cheese factory approach

Nicolas Fehér

Workshop

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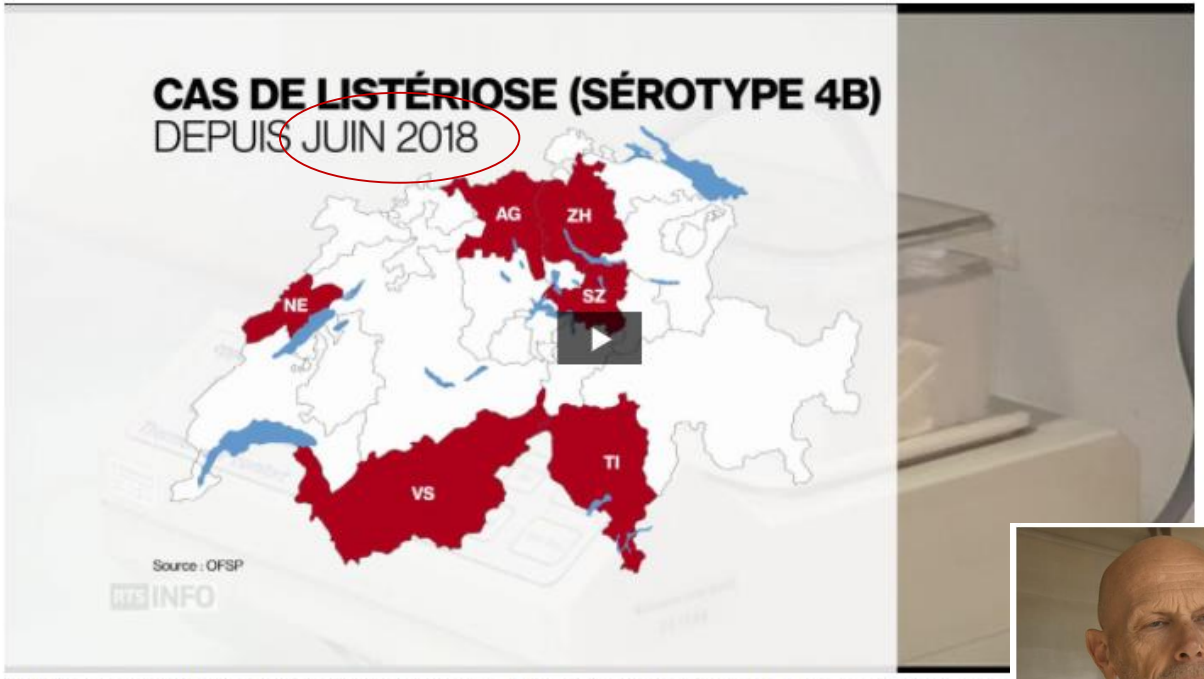
Suisse Modifié le 16 octobre 2018 à 17:00

Un nombre inhabituel de cas de listériose a été enregistré en Suisse



La listériose qui touche 6 cantons suisses a déjà infecté 12 personnes, dont 2 sont décédées. / 12h45 / 4 min. / le 16 octobre 2018

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Listeria
FACE Conference 2023 Workshop

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Identifying the source using whole-genome sequencing

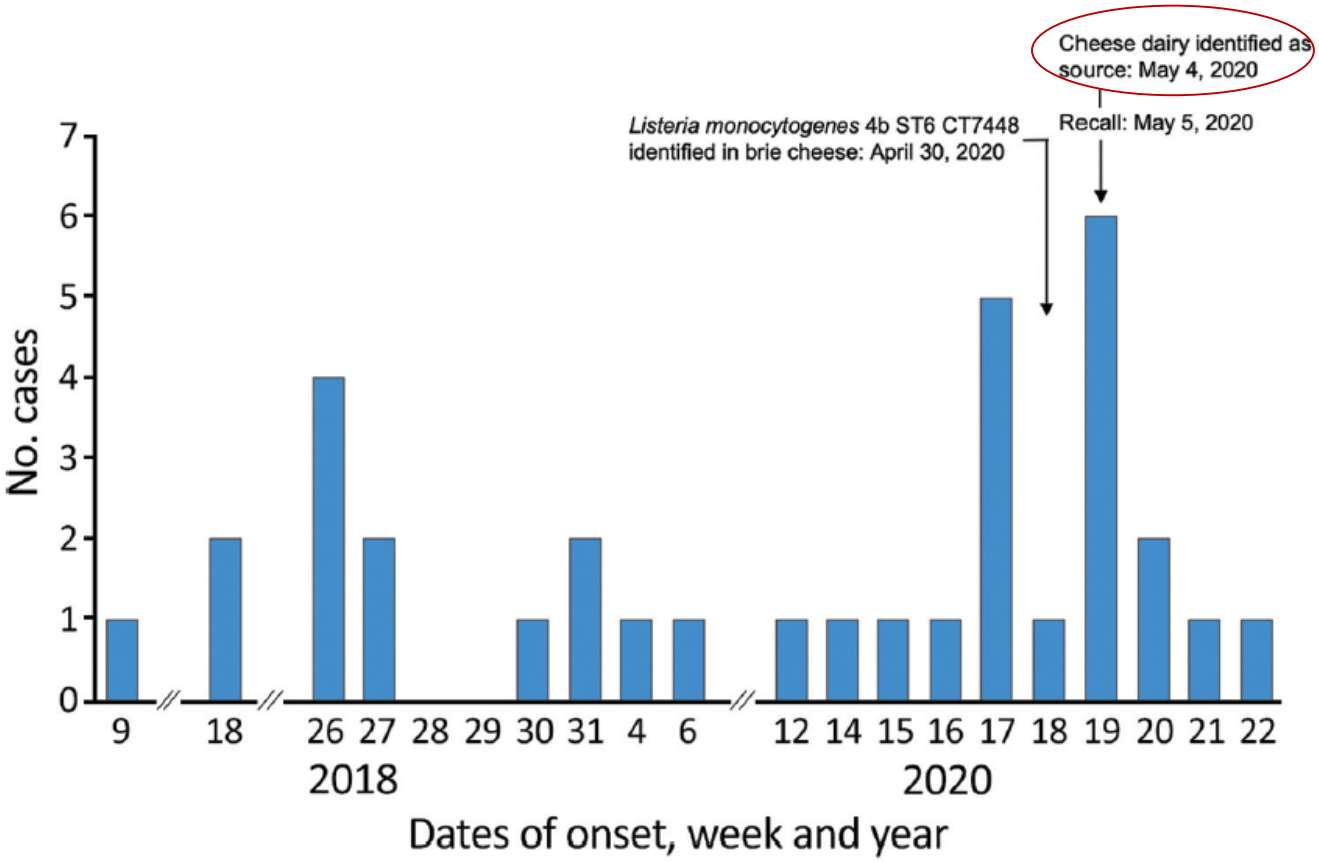

Figure 1. Cases of human listeriosis caused by *Listeria monocytogenes* ST6 CT7488, by week and year, Switzerland, 2018 and 2020. CT, cluster type; ST, sequence type.

Source: Institute for Food Safety and Hygiene, Zurich, Switzerland, M. Nüesch-Inderbinen and al.

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Autres cantons Modifié le 27 août 2020 à 14:27

Le brie d'un fromager schwytzois serait responsable de 10 décès

Le brie d'un fromager schwyzois serait responsable de 10 décès / Le 12h30 / 1 min. / le 27 août 2020

Food-induced listeriosis in Switzerland

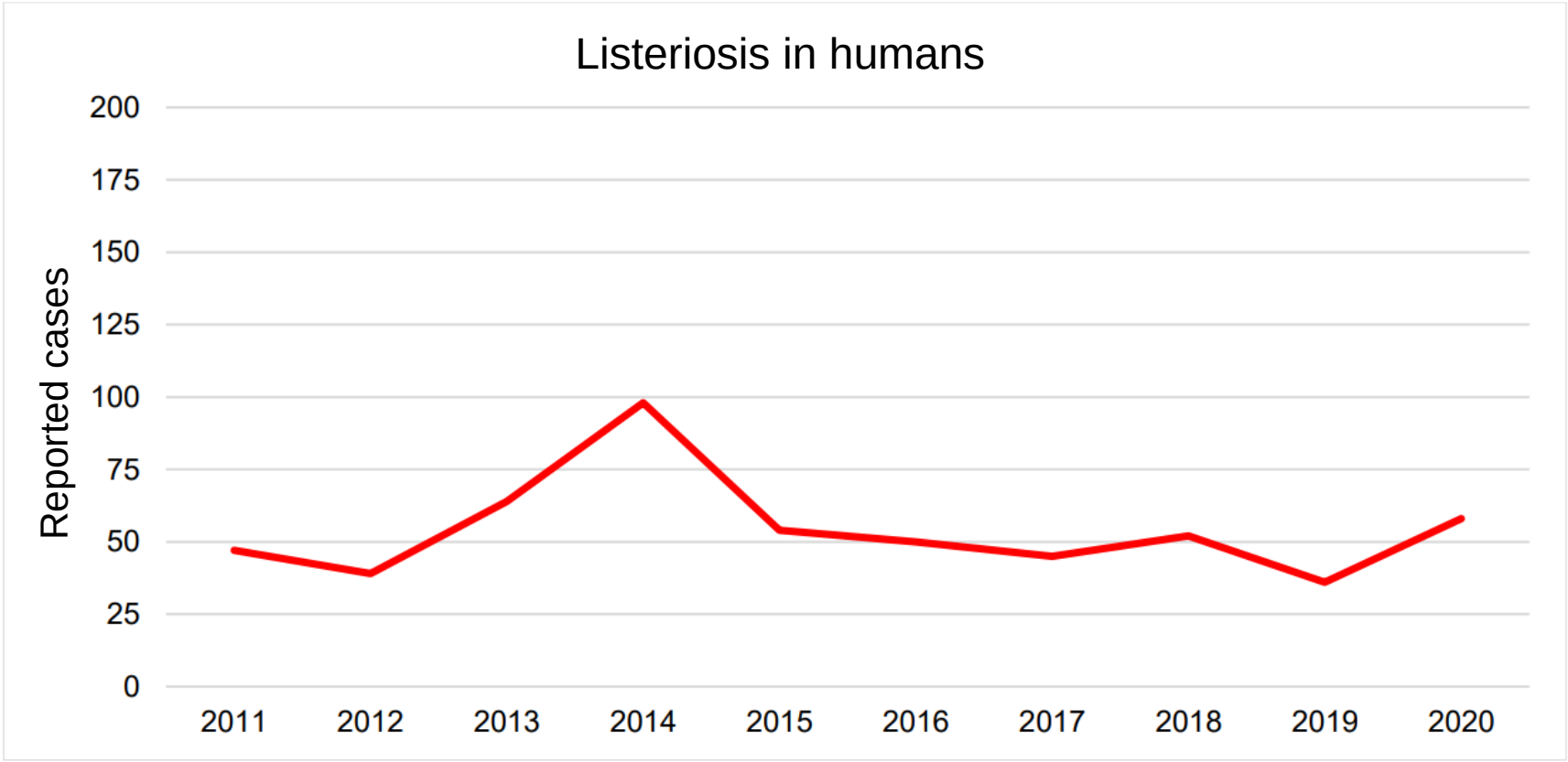


Abbildung LI—1: Anzahl gemeldeter Listeriose-Fälle beim Menschen 2011–2020 (Quelle: Bundesamt für Gesundheit, Stand Februar 2021).

Characteristics

→ *Listeria monocytogenes* can develop in cold conditions, survives salt and dryness and dies in hot conditions.

- telluric (found naturally in the soil)
- ubiquitous (found everywhere in the environment)

➢ Listeria can occur naturally in the digestive tract of ruminants = risk of contamination of udders and milk.

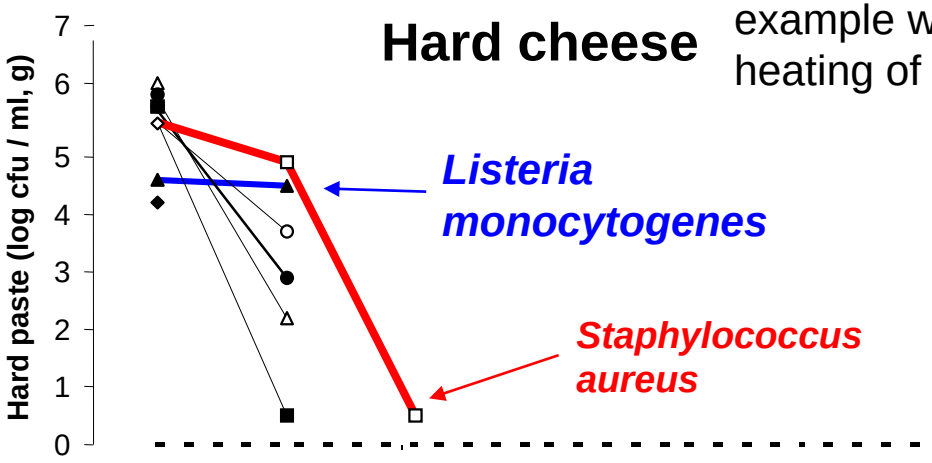
➢ *Listeria monocytogenes* can multiply even at a temperature of 0°C.

➢ Listeria can survive for a long time in water and can even multiply in it (damp places, condensation water).

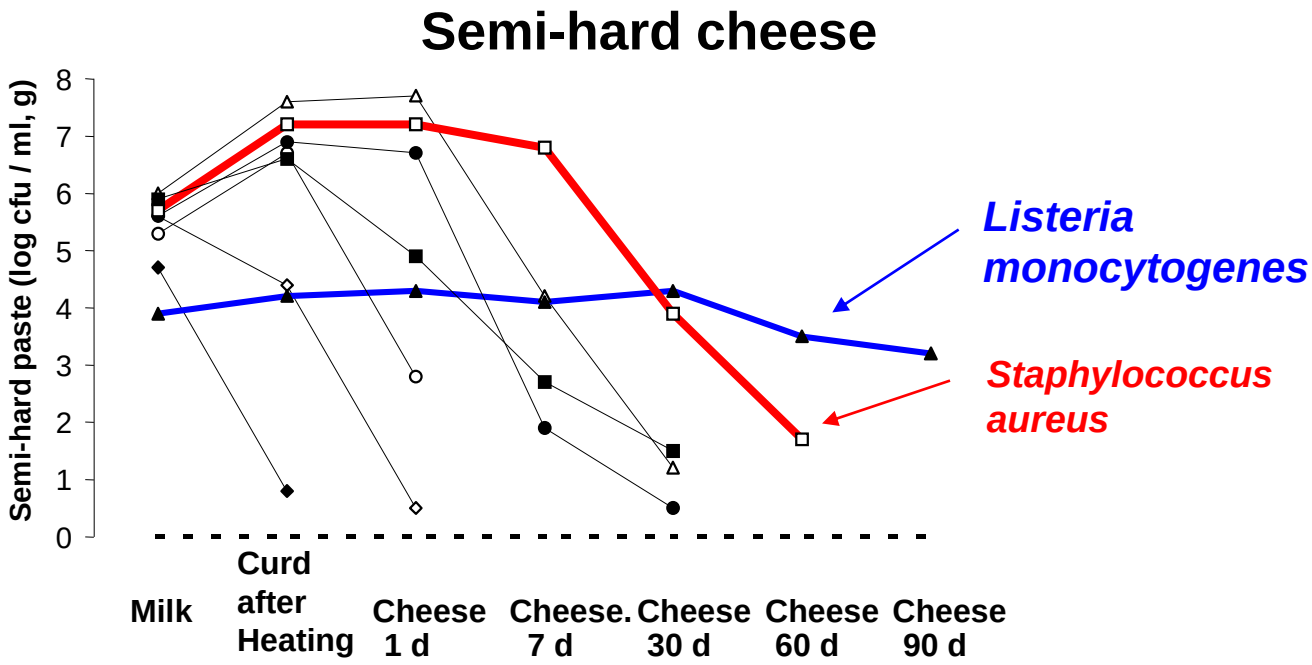
Characteristics of *L. monocytogenes*

Attribute	Value	Remark
Temperature (growth)	1 to 45°C (optimum 37°C)	Minimum in milk 0.4°C
Generation time (milk)	4°C: 29-40 h / 8°C: 9-14 h	
pH	pH 4.4 – 9.4	pH Optimum 7.0
Oxygen requirements	Facultative anaerobes (microaerophiles)	Withstands high CO2 concentrations (>30%)
Heat resistance milk / meat	*D-value at 65°C: 28-93s *D-value at 71.7°C: 4.1-12 s. (*conditions for 90% reduction)	As a result, when milk is thermized at 65°C/15sec, only 30-70% is eliminated.
Drought resistance	Long-term survival	
Disinfectant		Caution: up to 10% of strains are resistant to quaternary ammonium compounds (QACs).

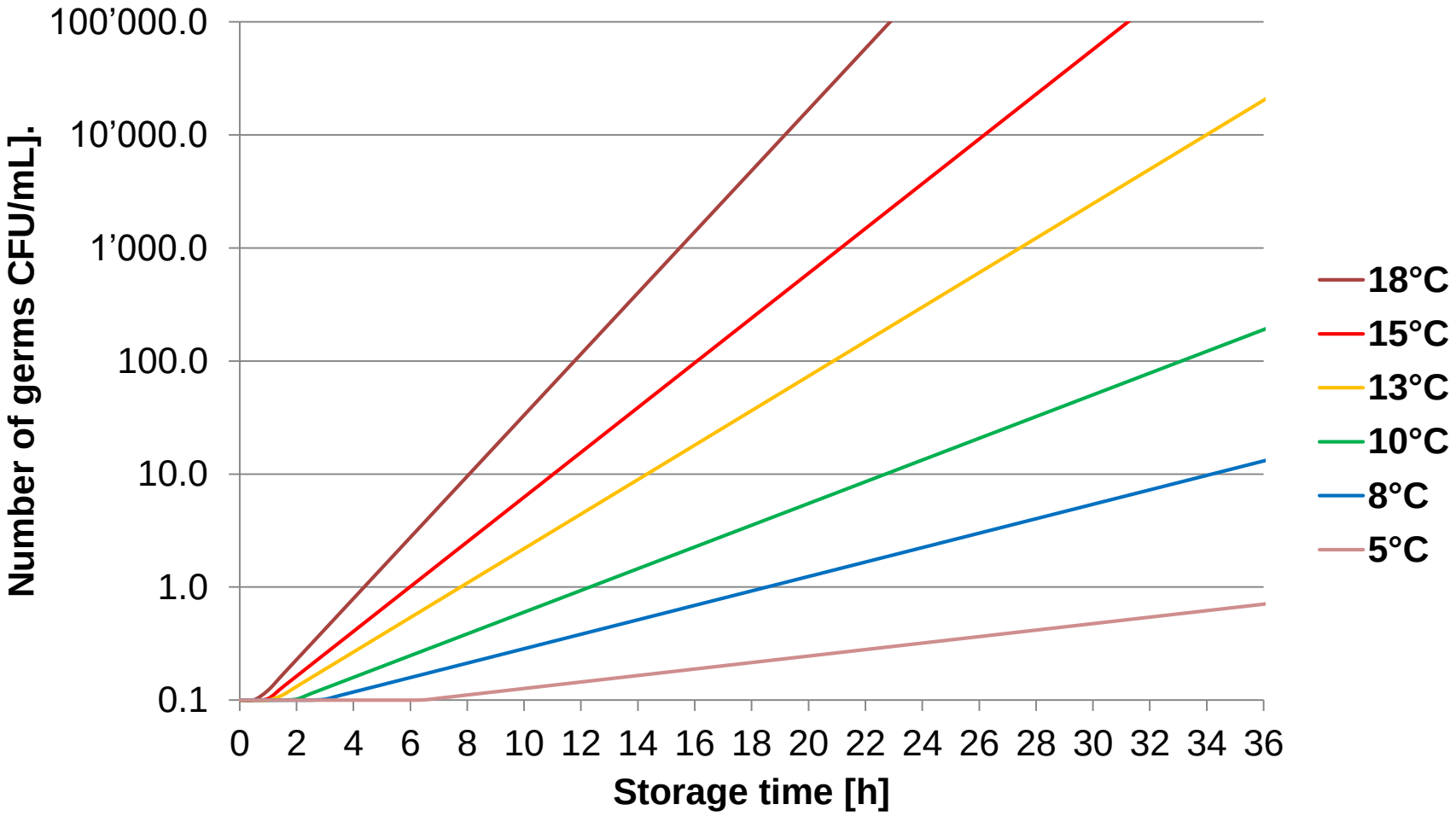
Example of *Listeria monocytogenes* survival in cheese paste



example was made by cooking the curd at 53°C, heating of curd to 50°C (note D value, slide 3)



Simulation of the multiplication potential of *L. monocytogenes* in milk



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Contamination risks

- **Failure of the company's hygiene policy :** (e.g. non-compliance with zones for staff and work equipment, insufficient cleaning, etc.).

- **Listeria-contaminated milk:** (e.g. listeria mastitis)
  direct contamination = e.g. raw-milk soft cheese
  indirect contamination = soil, work tools, salt bath, etc.

- **Spring water:** inadequate water treatment

- **Flooding:** listeria frequently found in wastewater

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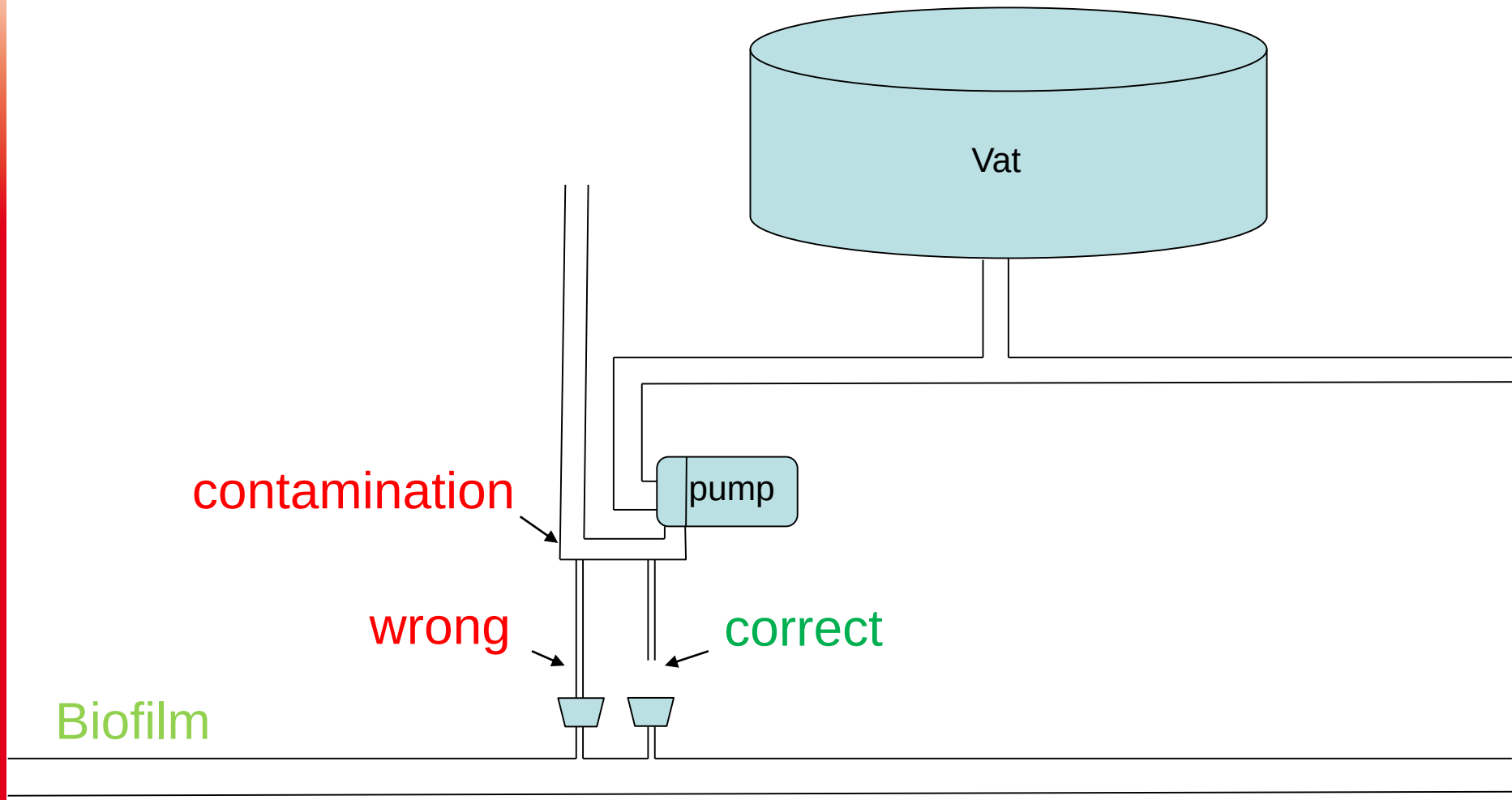
Pipe drainage



Listeria is very common in wastewater

Practical cases





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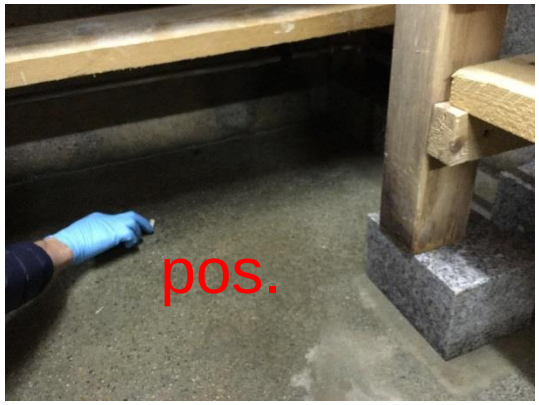
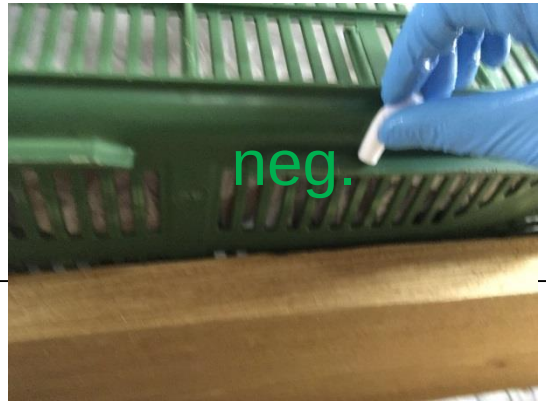
Practical cases





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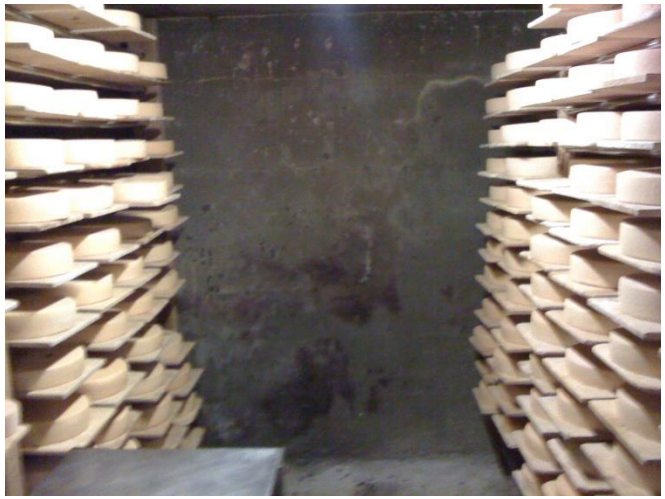
Practical cases, Alp dairy



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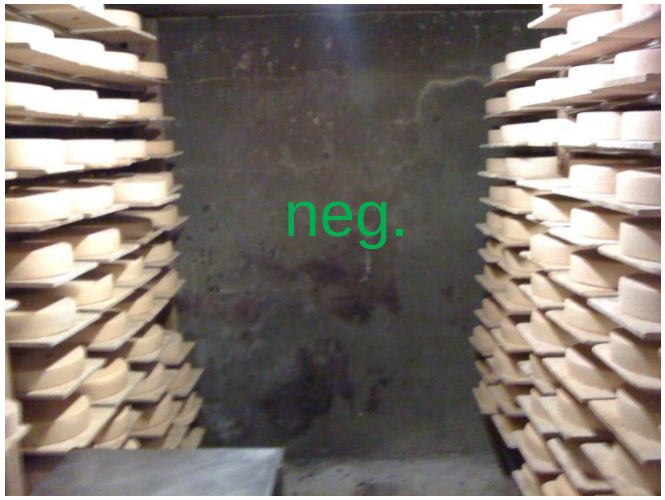
Practical cases, Alp dairy



The source is often not determined

Contamination probably due to water

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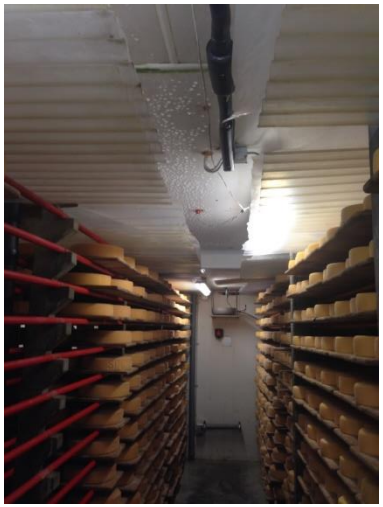
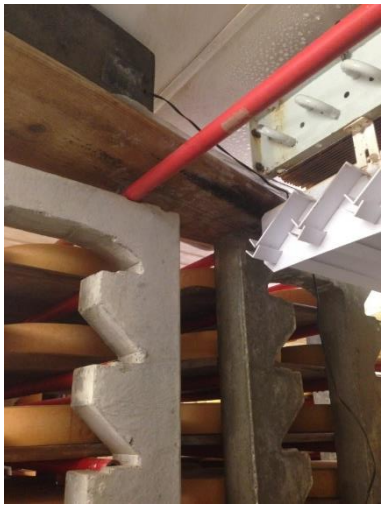
Practical cases




Practical cases

Saving cheeses...

Very difficult, there is always smear residues in the pores of the cheese.

1. **Removing cheese rind (smear ripened cheese)**
   - soak cheeses in lukewarm water
   - remove **all the smear** from each cheese
   - rinse the cheese (and the cheesemaker's hands) thoroughly with tap water
   - Let the cheeses dry on clean, disinfected shelves.
   - disinfect the surface of the cheeses by spraying with **70% vol. alcohol** or/and **immerse** the cheeses **in water at 85 - 95°C** after vacuum packing.
   - alcohol treatment guarantees 10 days without listeria, after which listeria may reappear

Listeria is microaerophilic

2. **Place vacuum-packed cheeses** in plastic bags
3. **Re-smear cheeses** with a good smear

Listeria is used to the old smear, unlike the new one. There's a risk that listeria will take over again

4. **Treatment with phages** (Listex)

Often with poor results

Take care not to contaminate the entire cheese dairy!

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High pressure pasteurisation trial

- Size of cheese wheels limited = max. ½ Raclette wheel
- Cheeses must be rindless

HPP system in Chavorney VD

Sanitation of a cheese dairy

Individual solutions, because infrastructure plays a key role in sanitation. Sanitation with the consultancy services and Agroscope is easier and helps prevent reoccurrence.

- When a product is already on the market → **inform the** competent **authority** (then take steps to recall the product).
- **Blocking** and clearing contaminated products (often a logistical problem due to lack of space).
- **Analysis plan** to find sources.
- **Decontamination** of the entire cheese dairy and work equipment
- A production shutdown lasting several days is often unavoidable.

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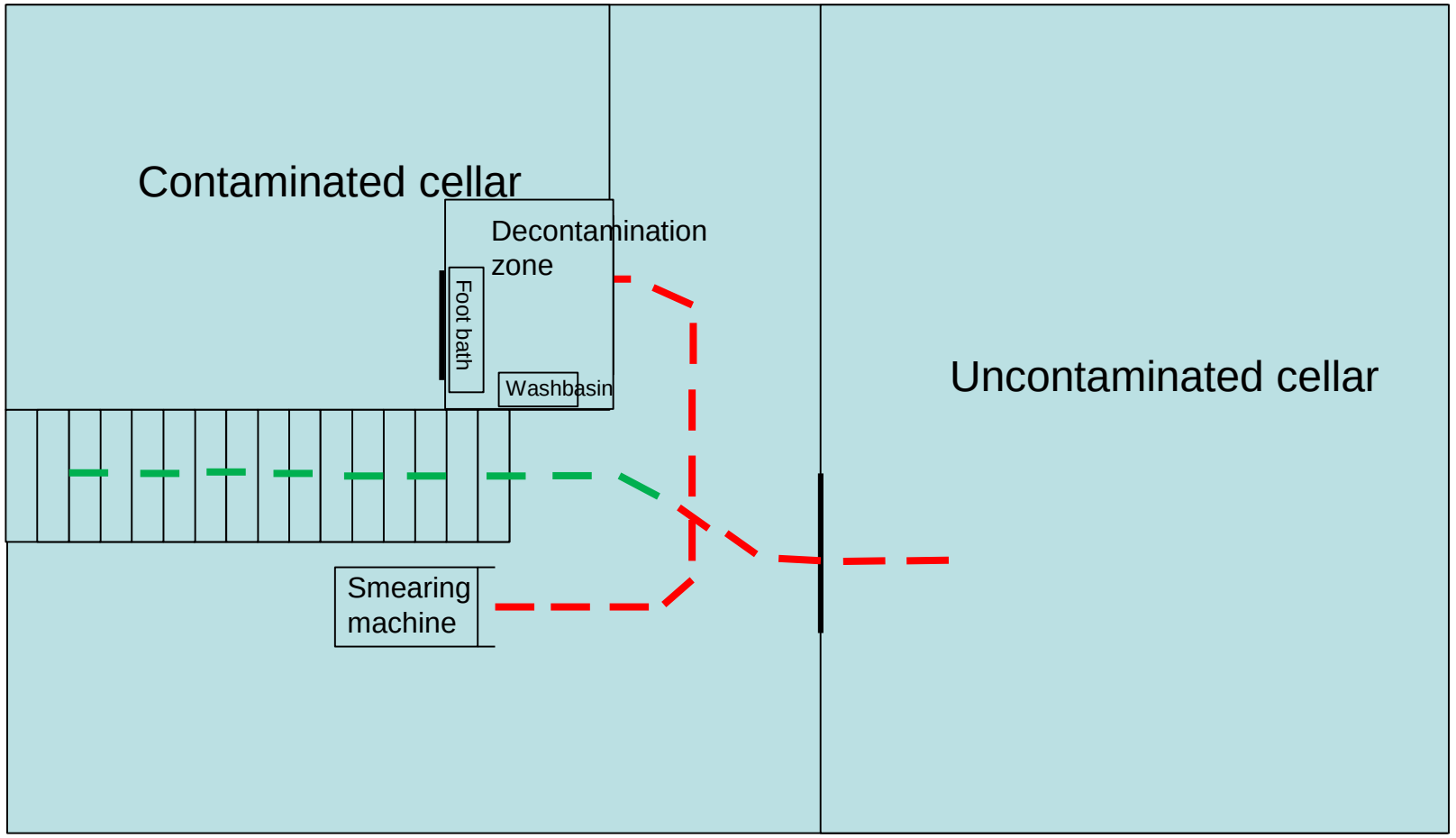
Risk of cross-contamination during sanitation



Decontamination of cheese boards

- The porosity of wood makes disinfectants ineffective
- The only way of decontamination is heat
  Example: steam chamber: 20 min at 70 - 85 °C

Pressure pump with steam generator

Listeria monitoring

It's not enough to test only ready-to-eat products. Listeria contamination at the cheese dairy is often not detected in good time. Contaminated products may already be on the market.

The aim of monitoring is to detect any contamination as early as possible, in order to prevent contaminated products from being placed on the market.

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Listeria monitoring

Samples :

- Recovered smear water
- Swap samples from drains
- Salt bath brine
- Swabs samples from surfaces such as work surfaces, pipes, hoses, cleaning utensils, floors etc.
- Water (at least 500ml Method of analysis with filter)

Salt bath analysis

- A single sample of salt bath brine for qualitative detection in 25g is insufficient!

- To obtain a representative sample, 1 liter must be analyzed. When salt bath water cannot be filtered for laboratory analysis, several samples must be analyzed.

Listeria-positive sample

Results	Measures within the company	Has the lot already been delivered?	Reminder	Inform the competent authority
Non-pathogenic Listeria detected	Corrective measures Increase sampling frequency	no	--	no
		yes	no	no
L. monocytogenes limit exceeded	Blocking the cellar respectively the lot General overhaul Corrective measures according to HACCP concept	no	--	no
		yes	yes	yes

Product recall

Limit values for *L. monocytogenes* = DHA Hygiene Ordinance

(Hygieneverordnung EDI, HyV)

Recall is always carried out with the competent authority (cantonal chemist).

Effects on the reputation and image of the company, the product and the industry

Conclusions

- **Prevention:** HACCP, Good Manufacturing Practices = rigorous hygiene, respect of work zones, clothing and tools, etc.

- **Monitoring:** to prevent listeria-contaminated products from reaching the market and damaging the image of the product, the dairy and the industry.

- **Insurance:** to avoid major costs or even bankruptcy.

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Thank you for your attention

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