

Series N° 1

Exercise 1: Case Study – Contamination by *Listeria monocytogenes*

A smoked salmon factory detects *Listeria monocytogenes* on sliced fillets. Analysis shows that the contamination is localized on slicer N°02 and the associated packaging table. The bacterium is not detected upstream.

1. What are the main categories of contamination sources in the food industry? In this specific case, to which category does *Listeria* belong?
2. Using the 5M method (Environment, Equipment, Manpower, Methods, Materials), propose at least five hypotheses explaining how the equipment could have been contaminated.
3. What immediate corrective actions must the quality manager implement? Rank them in order of priority.
4. Propose an enhanced cleaning and disinfection (C&D) protocol for the slicer, detailing the 6 steps (pre-rinse, cleaning, rinse, disinfection, final rinse, drying) and associated control methods (visual, ATP, microbiological).

Exercise 2: Multiple Choice Questionnaire (MCO)

For each question, select the correct answer(s).

- 1) Among the following contaminants, which is a physical contaminant?
 - a) Antibiotic residue
 - b) Aflatoxin
 - c) A glass fragment
 - d) *Salmonella*
- 2) Sinner's Circle (TACT) describes the effectiveness factors of cleaning. What does the "A" stand for?
 - a) Acidity
 - b) Mechanical Action
 - c) Surfactant Agent
 - d) Alkalinity
- 3) Which type of detergent is most effective at removing limescale (milk stone)?
 - a) A chlorinated alkaline detergent
 - b) A neutral detergent
 - c) An acid detergent
 - d) An organic solvent
- 4) ATP-metry is a control method that measures:
 - a) The number of living and dead bacteria
 - b) The presence of detergent residues
 - c) The amount of ATP, an indicator of the presence of organic matter
 - d) Only pathogenic bacteria

Exercise 3 : Dilution Problem

You need to prepare 50 L of a 0.5% (v/v) disinfectant solution from a concentrated product. The contact time is 15 minutes.

1. Calculate the volume of concentrated product needed.
2. What volume of water must be added?
3. An operator uses only half the required dose. What are the potential consequences?
4. How would you verify the actual concentration of the prepared solution in the field?

Exercise 4: Development of a Cleaning Procedure

You are responsible for hygiene in a ready-to-eat vegetable preparation workshop.

1. Write the complete Cleaning and Disinfection (C&D) procedure for a stainless-steel cutting table. Include: frequency, Personal Protective Equipment (PPE), materials and equipment needed, cleaning products and concentrations, steps-by-step sequence, and control points.
2. Propose a verification plan including:
 - Who validates the cleaning?
 - At what frequency?
 - Which documents must be completed?

Exercise 5: Choosing the Right Product

You are the hygiene manager. For each situation below, choose the most suitable detergent type (**alkaline, acid, neutral, or enzymatic**) and justify your choice.

1. Daily cleaning of a stainless steel tank showing "milk stone" deposits.
2. Degreasing at the end of the day of a heavily soiled industrial fryer.
3. Manual washing of fragile, lightly soiled plastic utensils.
4. Cleaning a conveyor belt with dried protein residues.

Exercise 6: Root Cause Analysis (Troubleshooting)

In a yogurt packaging workshop, ATP-meter checks on the filling head of machine N°04 are consistently non-compliant (high RLU) after cleaning, even though visual inspection is satisfactory. The cleaning protocol is being followed exactly as written.

1. List at least four hypotheses that could explain this problem.
2. Propose an **action plan** to investigate the root cause.
3. What long-term preventive measures could be implemented to avoid recurrence ?

