# Studying Occupational Exposure and Practices in the Poultry Slaughter Industry in France

# Location: Les Fermiers de l’Ardèche, 07340 Felines, France

# Date of visit: 16/10/2024

The visit to the aforementioned slaughterhouse was conducted with assistance from colleagues at the French National Veterinary Services. The primary aim of the visit was to identify the steps in poultry production that result in direct exposure to contaminated elements. The poultry processing chain consists of several steps that can lead to occupational exposure for the workers involved. The following steps have been identified:

1. **Transportation to slaughterhouse**: The slaughterhouse receives around 6-7 lots of broilers from different farms located in the region of Auvergne Rhône-Alpes. Each lot can be classified as either small or large, consisting of approximately 2,300 or 4,600 broilers respectively, divided into crates of 10-12 broilers depending on their weight. The delivery of the lots is carried out by trucks between 4 a.m. and 8 a.m.
   1. **Task**: The trucks are unloaded by a single forklift that is entirely controlled by one person. Bundle of broiler crates are unloaded at the discharging section of the slaughterhouse. This person also collects the emptied and cleaned crates from the discharging section and moves them outside. At the end, the person cleans the forklift with a high-pressure water spray.
   2. **Exposure:** Possibility of airborne exposure exists throughout the task, especially during the cleaning of the forklift with water spray, which creates contaminated air particles.
   3. **Hygiene measures:** 
      1. Mask: No
      2. Gloves: Yes
      3. Handwashing: Unknown
2. **Crates unloading**: After unloading the crates full of broilers, each crate is placed on the conveyor belt at the start of the production line. This task is likely managed by a single person. The discharging area is cleaned by one person using wipers and high pressure water spray.
   1. **Task**: The person probably picks up each crate from the bundle and puts it on the conveyor belt.
   2. **Exposure**: Contact with contaminated surface of the crates and broilers’ exterior portion.
   3. **Hygiene measures:** 
      1. Mask: No
      2. Gloves: Yes
      3. Handwashing: unknown
3. **Hanging**: Broilers are transferred from the crates on the moving conveyor belt and hung by their legs onto the hooks of the production line. This process is carried out manually, typically involving 4 to 6 workers simultaneously. To ensure the broilers remain calm and stress-free, the hanging area is illuminated with blue light, which has a soothing effect on the broilers.
   1. **Task**: The worker picks up each broiler by its legs and suspends it on the moving hooks. This process results in full hand exposure to the exterior of the broilers.
   2. **Exposure**: Contact with contaminated broilers’ exterior portion.
   3. **Hygiene measures**:
      1. Mask: No (females), Yes (males)
      2. Gloves: Yes
      3. Handwashing: Yes
4. **Stunning**: Broilers hanged to the hooks of the production chain moves through a stunning stage where the broilers are anesthetized before bleeding. The primary goal of stunning is to render the broilers unconscious and insensible to pain before bleeding. This is essential for animal welfare and ensures that the slaughter process adheres to humane practices. Effective stunning methods include gas stunning, often used in larger slaughterhouses, and electric stunning. In this particular slaughterhouse, electric stunning was employed. Broilers pass through a stunning machine where electrodes are applied to their heads. This process involves dipping their heads into an electrode solution with the help of an inclined plate, ensuring a quick and effective induction of unconsciousness.
   1. **Task**: Fully automatic
   2. **Exposure**: NA
   3. **Hygiene measures**: NA
5. **Bleeding**: The broilers, suspended by their legs, allow easy access to their necks and are passed through a bleeding machine that makes a precise incision on each neck. One person is assigned to perform post-bleeding verification, inspecting the broilers and intervening if necessary.
   1. **Task**: The person manually incises the broiler's neck using a knife.
   2. **Exposure**: Contact with contaminated broilers’ exterior portion. Typically, one out of every 30 broiler is bled manually, depending on the machine's efficiency.
   3. **Hygiene measures**:
      1. Mask: No (females), Yes (males)
      2. Gloves: Yes
      3. Handwashing: Yes
6. **Scalding**: After stunning and bleeding, broilers are subjected to scalding, a crucial step where carcasses are immersed in hot water to facilitate efficient feather removal. In the slaughterhouse, the scalding temperature was maintained at around 57°C for 5 minutes. However, for our article, we used soft scalding at 52°C for 120 seconds. This scalding process is entirely automatic.

***Notes for article:*** *During this stage, the prevalence of contaminated carcasses can increase, although the bacterial load on carcasses is often reduced. Research by McCarthy et al. (2019) indicates that the prevalence of contamination after scalding is related to the initial bacterial load on the broilers. In the model, if the incoming load on the carcass exceeds 5.5 to 6.5 log CFU, the prevalence of contaminated carcasses was set to increase to 100%; otherwise, the prevalence remained unchanged. Despite the increase in prevalence, the scalding process reduces contamination levels by eliminating bacteria on the exterior of the broilers.*

* 1. **Task**: Fully automatic
  2. **Exposure**: NA
  3. **Hygiene measures**: NA

1. **Defeathering**:Following scalding, the carcasses are sent to the defeathering station, where an automatic machine removes the feathers. As the carcasses move along a conveyor belt, they pass through rotating rubber fingers or other mechanical plucking devices that efficiently strip the feathers from the carcasses. One person is assigned for post-defeathering inspection.
   1. **Task**: The person visually checks each defeathered carcass for remaining feathers, misplaced legs, illness symptoms, overheated carcasses and other abnormalities. In case of such events the broilers is either quickly adjusted with hands or removed from the production chain.
   2. **Exposure**: Contact with contaminated carcasses. Typically, one out of every three carcasses is managed manually, depending on the defeathering machine's efficiency.
   3. **Hygiene measures**:
      1. Mask: No (females), Yes (males)
      2. Gloves: Yes
      3. Handwashing: Yes
2. **Evisceration**: During evisceration, the internal organs of the carcasses are carefully extracted. This process involves making precise incisions and using specialized equipment to remove organs such as the heart, liver, intestines, and lungs. In positive flocks, contamination during evisceration occurs if viscera is lacerated given the broiler was colonized. Depending on the efficiency of the machine 3-4 persons are assigned to clean up/finish the process of removing internal organs form the carcasses.
   1. **Task**: Eviscerated carcasses are inspected visually and manually eviscerated in case of presence of remaining organs inside the carcass.
   2. **Exposure**: Almost each of the carcasses are treated/intervened manually which results into direct contact with contaminated carcasses.
   3. **Hygiene measures**:
      1. Mask: No (females), Yes (males)
      2. Gloves: Yes
      3. Handwashing: Yes
3. **Washing**: The slaughterhouse was equipped with both post-evisceration wash and inside-outside bird wash (IOBW). This step is completely automatic.

***Notes for article****: Following the discussion with Fédération des Industries Avicoles (FIA), two types of washing are implemented in the model, namely, Inside Outside Bird Wash (IOBW) and IOBW along with Post Evisceration (PE) wash. About 50%−75% of the farms practice two types of washing.*

* 1. **Task**: Fully automatic
  2. **Exposure**: NA
  3. **Hygiene measures**: NA

1. **Chilling**:
2. **Portioning**: