Use of wood in cheese ripening

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What use is wood in cheese ripening?

In some countries the use of wooden vats or the practice of ripening cheese blocks/loaves on wooden shelves is considered critical in moisture exchange and in defining the final texture and flavour of such cheeses. Additionally, the use of wooden shelves is required in the specifications of many PDO (Protected Designation of Origin) cheeses.

Cheeses which are rich in microflora will promote the development of a biofilm on the surface of the wood. These biofilms are dominated by microflora, the diversity of which is determined by the type of cheese and the cleaning practices used. The biofilms formed can have a major technological role in cheesemaking, such as acidification in the case of wooden vats, or colonisation with a surface flora in the case of wooden shelves.

What does the wood do?

In addition to these symbiotic properties, the wood material itself may possess interesting properties from a food safety point of view:

- Its hygroscopic properties allow drying which inhibits microbial growth.
- Some wood species have antimicrobial properties, probably linked to the presence of polyphenols. The wood species that show the most effective antimicrobial capabilities are oak and pine. Spruce shelving, which is widely used to support ripening of cheeses, is less effective but is superior to plastic for discouraging certain bacterial growth (Milling et al, 2005).
- Colonisation with a positive biofilm inhibits establishment and growth of *Listeria monocytogenes* (Mariani et al, 2011), probably via a process of nutritional competition (Guillier et al., 2008).

What is the dairy industry doing about use of wood?

There is no legislation or official guidelines in Europe regarding the cleaning of wooden tools in cheesemaking, and each cheesemaker has, on the same general basis, their own procedure. The only mandatory aspects are to ensure the efficiency of the cleaning regarding absence of potential contamination by pathogenic bacteria, and absence of any loose pieces of wood.

Research has shown that the method which seems most appropriate for decontamination is brushing with detergent, followed by a heat treatment. A minimum temperature of 70°C for 30 min in the centre of the board is recommended (Zangerl et al. 2010). After this heat treatment, the authors were not able to isolate *Listeria monocytogenes,* despite significant initial artificial contamination. Imhof et al. (2016) performed a similar experiment by using boards contaminated with *Listeria innocua* that were heat treated at 70 °C for 20 min. Again, these authors were not able to identify the *Listeria innocua* contamination following the heat treatment.

In practice, the procedure for cleaning wood after use involves a brushing step with water (cold or < 35°C) and then a cleaning step at high pressure at 85°C in a tunnel. The shelves are cleaned on the end of each cycle of ripening; the length of time between cleaning depends on the type of cheese.

What are the challenges in using wood?

There are challenges to using wood, with regard to food safety. Wood is a natural material and because of its porosity it is difficult to clean. Issues with respect to hygiene are suspected, but research showing this is limited. In order to take advantage of all the benefits of wood in cheesemaking, the challenge is to ensure the efficiency of the cleaning procedure regarding potential contamination by pathogenic bacteria. In addition, it is essential to avoid splinters from the wood coming into contact with the cheese.

Wooden vats and shelves act as a reservoir of microbial biodiversity contributing to the final quality, safety and character of cheeses. Wood, as a tool to regulate the cheese ripening micro flora and the humidity of the ripening area, has proved to be difficult to replace with a synthetic material. The role of wood is crucial in the balance of hydration and drying of cheese, which is subsequently important for the development of the expected microbial ecosystem on the rind.

What are the regulatory safeguards?

In Europe, the Law Food Hygiene regulation (CE 178/2002) concerning food and feed hygiene principles and one of its subsequent texts (CE 852/2004) recommends the use of smooth and easy to clean surfaces for food contact. As an example, the use of stainless steel is preferred over the use of wood as a shelving material due to the porous structure of the wood.

This regulation is complemented by European regulation CE 1935/2004 which deals with materials and articles intended to come into contact with food. It stipulates that this material should not transfer constituents to food in quantities which could endanger human health, bring about an unacceptable change in the composition of the food or induce deterioration in its organoleptic characteristics. In this particular context, the use of wood is strictly regulated. However, the European regulations do allow its member states to use some wood species for processing and packaging of some more traditional dairy products (CE 96/536 and CE 97/284, date: 97/04/25).

In several countries where the use of some wood species for food contact has been allowed for many years, the use of wood in the manufacturing of some dairy products has received an exemption permit. For example, since November 1992, the French Food Safety Authority permits the use of wooden shelving for ripening traditional cheeses, i.e. PDO cheeses or cheeses with an historical use of wooden shelving during their cheese maturation. The Authority also allows the wider use of wood in traditional cheese making processes.

Conclusion:

The three specific properties of wood that are exploited by the dairy industry are:

- Exchange of moisture between wood and its direct environment and therefore creation of a favourable microclimate promoting the development of an advantageous cheese surface flora.
- Transmission of antimicrobial molecules, probably polyphenols, between the wood and the products in contact with it.
- Technological flora present on the surface of wood for fermented products.
  As the presence of pathogenic bacteria cannot be excluded, a suitable cleaning method implemented by cheese makers allows the total sanitation of the wood materials.

As the presence of pathogenic bacteria cannot be excluded, cheese makers must apply a suitable cleaning method to achieve the total sanitation of the wood materials.

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