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To whom it may concern

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Liebefeld, March 18, 2014

Opinion on the use of wooden shelves for cheese ripening

In the following you get our point of view concerning the FDA opinion paper on the use of wooden shelves for cheese ripening.

For further informations I am at your disposal – find my coordinates in the footer.

Yours sincerely
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Annex: Opinion on the use of wooden shelves for cheese ripening

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Use of wooden shelves for cheese ripening

Cheese production in Switzerland is around 180'00 tons per year. A large part of the annual cheese production consists of semi-hard, hard and extra hard cheese varieties that are ripened on wooden shelves in small scaled cheese dairies as well as in industrial cheese factories. Wooden shelves have been used for many decades in traditional cheese production all over Europe. The advantages of wood as ripening shelves lie above all in its moisture retaining properties, which facilitate the control of the ripening process. On the other hand, regarding food safety, the porous structure of wood may represent a risk.

Between 1983 and 1987, Switzerland experienced a long-lasting outbreak of listeriosis due to the contamination of a locally produced soft cheese, causing at least 122 cases, of which 31 were fatal¹. As a consequence of this event, Agroscope's Institute for Food Sciences IFS (the former Federal Dairy Research Institute FAM) was assigned to maintain a laboratory for the detection of Listeria and to create appropriate measures to prevent new outbreaks of listeriosis due to dairy products. Two of these measures were the Listeria Monitoring Program and a special task force within the IFS advisory services: The Listeria Advisory Team. In case of problems with Listeria the team can be demanded to date from any enterprise for analysis and advice as well as direct participation in the process of complete redevelopments. One of the weak points in the production process at that time was the individual cleaning process of the wooden shelves in the concerned cheese factories.

Out of this analysis, IFS developed methods for the sanitation of wooden shelves that became the basics of a SSOP for the cleaning and sanitizing of the wooden shelves by heat treatment equivalent to pasteurization conditions, which is widespread used in cheese factories in Switzerland today. In short: The first step consists in a mechanical cleaning with alkaline detergents at 60°C followed by rinsing with water. In the second step, the shelves undergo a heat treatment by immersion in hot or boiling water or by exposure to steam in closed cells at normal pressure. The aim is to get a core temperature of the shelves of >70°C for 30 minutes followed by cooling and drying of the shelves in a closed compartment².

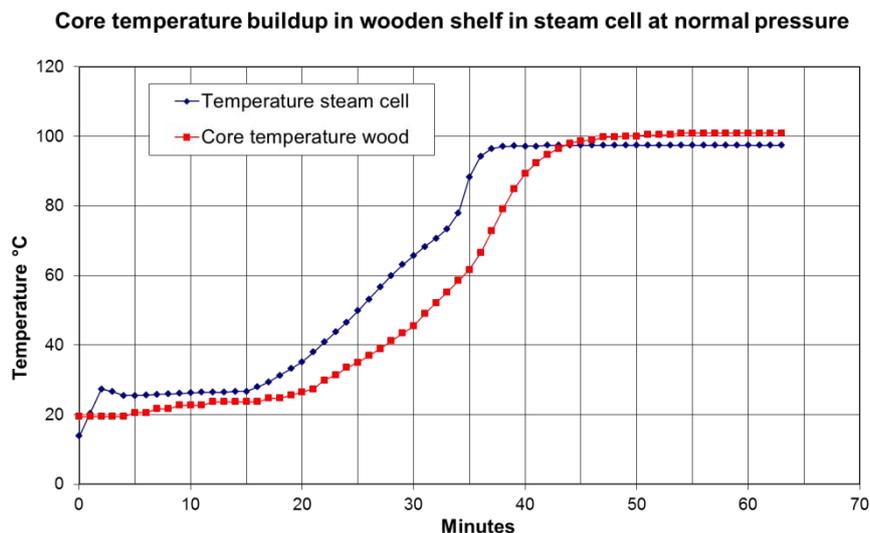


Fig 1 Buildup of core temperature in a wooden shelf in a steam cell at normal pressure

As an example, Figure 1 shows temperature data of one run in the process of creating data for the definitive set of parameters in the SSOP "Cleaning and disinfection of wooden shelves" of a cheese factory. The concept of strategies against *Listeria monocytogenes* in Switzerland including this kind of heat treatment has been repeatedly presented and discussed at international congresses (Cheese World 2006, Munich Germany; ISOPOL XVII 2010, Porto, Portugal; safefood Listeria Network Conference 2011, Moorepark, Fermoy, Co. Cork, Ireland; EFSA Focal Meeting 2012, Bern, Switzerland)³ and



there is no doubt among experts, that with the above mentioned SSOP a safe decontamination of wooden boards can be achieved.

This type of treatment enables the producer to dispose of hygienically irreproachable wooden shelves in full compliance with the cGMP requirements (21 CFR 110.40a). In addition Swiss cheese factories regularly monitor the smear water of the cheese care robots for the presence of *Listeria monocytogenes*.

This knowledge has been integrated in the official guideline of FROMARTE, the Association of Swiss cheese specialists, in 2007⁴. It fully corresponds with Swiss- and EU-legislation permitting wood as an appropriate material in traditional cheese production under the premise that “surfaces (including surfaces of equipment) in areas where foods are handled and in particular those in contact with food are to be maintained in a sound condition and be easy to clean and, where necessary, to disinfect. This will require the use of smooth, washable corrosion-resistant and non-toxic materials, unless food business operators can satisfy the competent authority that other materials used are appropriate”⁵.

Based on the Regulation (EC) No 852/2004 EU member states are allowed to declare lists of special materials to be used in food business operations producing traditional products. The French ordinance “Arrêté du 7 novembre 2012 relatif aux règles sanitaires applicables aux produits laitiers présentant des caractéristiques traditionnelles”⁶ for instance explicitly includes wooden shelves for the maturation of cheese – under the premise of Article 3 to 5 of Regulation (EC) No 852/2004⁵ committing the food business operators to define their processes on the principles of HACCP and GMP. Thus the use of wood in appropriate ways in production and ripening of cheese is legally approved. It should be noted that the EU recognizes Swiss food regulations as equivalent.

There are many ongoing discussions about safety of materials with food contact. One of the big issues is the formation of biofilms. Stainless steel, plastic coated steel, plastics or wood – biofilms can be found on every type of material used in food production. While stainless steel is considered as the most practical material in processing equipment, the continuous use of corrosive substances like acid, alkaline detergents and disinfectants affects the smoothness of the surface and therefore enhance the possibilities for biofilm formation. Although there are many different approaches the current state of the art is far away from an effective cleaning procedure to control biofilms⁷.

“Nowadays, the most efficient practical means for limiting microbial growth includes good production hygiene, a rational running of the process line, and effective use of cleaning and disinfectant products. Due to the increased resistance of biofilms to conventional disinfection processes, novel means for their control are constantly sought through the control of environmental factors on the process line and the use of new control strategies.”⁷

Steel boards coated with plastic (polyethylene or polypropylene) as well as plastic boards show medium to long term problems concerning notch-sensitivity and inherent brittleness. Mechanical damages, micro fissures and corrosion spots induce a kind of porous surface structure, creating the same problems for cleaning and disinfection as for wooden surfaces. The advantages and hazards in the use of plastics in the context of food production have been reviewed by Boersig and Cliver⁸. They surveyed information relevant to the possible influence of wood versus plastic pallets on food safety and came to the conclusion that “until 1994 comparisons between wood and plastic for bacterial retention and transmission were generally interpreted as favoring plastics. More recent scientific findings, however, suggest the opposite interpretation. Bacteria are able to grow on plastic surfaces and subsequently be transferred to other surfaces. The evidence shows that bacteria are less likely to grow on wood surfaces and that they are less easily transferred from wood. The apparent conclusion is that if a hazard exists, the hazard is from plastic pallets.”⁸

The fact that neither a perfect material nor a single cleaning procedure exists to cover all hygienic aspects, underlines the importance of applying conditions of GMP. The use of wood as shelves for cheese ripening is only possible if the requests of 21 CFR 110.40a are respected (“..all plant equipment and utensils shall be so designed and of such material and workmanship as to be adequately cleanable, and shall be properly maintained.”). The focus lies on the terms “to be adequately cleanable” and that the material shall be “properly maintained”. A food business operator has to prove, that his cleaning and sanitizing process for the wooden shelves is equivalent to a procedure for boards of



stainless steel or plastic and that the material after the heat treatment does not represent a source of contamination of pathogenic bacteria for the food coming in contact with it.

A recent publication by Zangerl et al.⁹ concerning the use of wood as shelves for cheese ripening demonstrates, that “the cleaning procedure alone was not sufficient to render *L. monocytogenes* from the upper 2 mm wood layer inactive.” The cleaning procedure consisted in soaking the pieces of wooden shelves for 15 min in a solution of hot alkaline detergent followed by brushing and rinsing with warm water.

But Zangerl et al. went further by introducing a second step heat treatment in a water bath at 80°C for 5 min and at 65°C for 15 min, respectively, with the contaminated surface downwards and proofed the destruction of *L. monocytogenes* in the upper 2 mm of the wood layer⁹. A result which perfectly coincides the results achieved with the IFS method mentioned above^{2,3} by disinfection due to a heat treatment aiming at a core temperature in the wooden shelves of >70°C for 30 minutes. In both treatments, the porous structure of the wood surface is of no concern for the extinction of remaining pathogenic organisms after the initial cleaning procedure.

A further advantage of heat treatment over chemical disinfection is that there is no accumulation of residues of chemical disinfectants such as quaternary ammonium compounds or organochlorine compounds that may contaminate the food surface.

Conclusion: Microbial pathogens can be controlled if food facilities engage in good manufacturing practice. Proper cleaning and sanitation of equipment and facilities are a prerequisite to ensure that pathogens do not find niches to reside and proliferate. Adequate cleaning and sanitation procedures are particularly important in facilities where persistent strains of pathogenic microorganisms like *Listeria monocytogenes* can be found. It has been demonstrated that even high counts of *L. monocytogenes* can be eliminated from wooden shelves if they are thoroughly cleaned and sanitized by a following heat treatment. “Thus, wood can be used in the foodstuff sector especially where clear advantages in comparison with other materials exist and possible disadvantages can be reduced by suitable measures.”⁹

1 Büla CJ, Bille J, Glauser MP. An epidemic of food-borne listeriosis in Western Switzerland: description of 57 cases involving adults. Clin Infect Dis. 1995;20(1):66-72.

2 Teaching material for further education of qualified dairy personnel, in German „So halten wir die Listerien unter Kontrolle“, ALP forum 2006, Nr. 37

3 Imhof R., Successful strategies against *Listeria monocytogenes* in Switzerland

4 FROMARTE QM concept, FROMARTE, the Association of Swiss cheese specialists; Bern, Switzerland, 2007

5 REGULATION (EC) No 852/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 29 April 2004 on the hygiene of foodstuffs, Annex II, Chapter 2 on SPECIFIC REQUIREMENTS IN ROOMS WHERE FOODSTUFFS ARE PREPARED, TREATED OR PROCESSED, Art. 1 f. (<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:139:0001:0054:en:PDF>)

6 République Française, « Arrêté du 7 novembre 2012 relatif aux règles sanitaires applicables aux produits laitiers présentant des caractéristiques traditionnelles » (<http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000026601296>)

7 Manuel Simões, Lúcia C. Simões, Maria J. Vieira (2010) A review of current and emergent biofilm control strategies, LWT - Food Science and Technology 43 (2010) 573–583

8 MICHAEL R. BOERSIG and DEAN O. CLIVER (2010) The Role of Pallets in Microbial Food Safety, Food Protection Trends, Vol. 30, No. 10, Pages 576–579

9 Zangerl, P., Matschweiger, C., Dillinger, K., & Eliskases-Lechner, F. (2010). Survival of *Listeria monocytogenes* after cleaning and sanitation of wooden shelves used for cheese ripening. European Journal of Wood and Wood Products, 68(4), 415-419