Raw milk without bacteria: ultra-clean technology from udder to packaging

How is hygiene in the food industry applied in practice and what do the regulations say about it? Where are the weak points, for example when obtaining and treating raw milk? What can make a new patent even better?

by Bernd Genath, Fischer Planning, Netanya, Israel. www.fischerplanning.com

In the 'Global Estimates of Foodborne Diseases' report, the World Health Organisation refer to the fact that, on average, one in 10 people falls ill from germs that are transmitted through food. For 10 years, experts have been looking into the hygiene of industrial food production to be more than sure of the following estimates: 600 million people – about 10% of the population – are infected by contaminated foods each year.

- For 420,000 people, the illness is fatal, including disproportionate number of children aged five and under (30%).
- In Europe, the WHO report states that there are 23 million illnesses per year, with 5,000 fatalities.
- People suffer most from infected food in Africa and Asia.
- Raw meat, dairy products and eggs are most frequently contaminated.

Three sources of germs

The WHO states very conservative figures, derived from determined or reported illnesses. This does not include an estimate of unknown cases. Particularly in the poorest and low-income regions, there is a lack of medical provision, meaning the statistics there are unable to take contamination into consideration.

There are 31 triggers responsible for infection: bacteria, viruses, parasites, germs, spores, toxins and chemicals. In addition, there are particles from feed, faeces (E. coli) and urine, pet litter and insect parts.

The entirety of all these typical contaminations, which are encountered in stall air in the dairy, are described as 'bioaerosols'.

In principle, aerosols come from three sources of pathogens: animal (cow, sheep, goat), stall and processing chain. The hygiene problem of processing, for example the production facilities in the food processing industry as the third source, is hidden in the often poor filter technology.

When the level drops in the receiving container, the consequent vacuum draws contaminated air from the surrounding space through leaks in the connections and screw fittings of the storage container and holding vessel at the filter connection to the product. This undoes the success of the upstream sterilisation of both the semi-finished product and the air.

Problems with stall air

The weakness in the processing is in the farmer's milking parlour, with two contamination sources.

The milking process simulates the suckling of a young animal at its mother's udder. The vacuum pump and pulsator replace the calf, but with the difference that technology switches on the vacuum shortly before encircling the teat to ensure a good fixing position of the teat cups.

As a result, this free vacuum prior to the teat connection draws considerable amounts of contaminated air into the raw milk container. The area directly below the cow can contain the highest concentration of infectious germs that can be transmitted from animal to human. These air-borne emissions

from agricultural livestock farming now even concern the Federal government.

The government is demanding preventative measures for dairy products (pasteurisation) as well as being concerned about contamination of residents near to agricultural enterprises. As a result, for the first time, the latest version of the Technical Instructions on Air Quality (TA-Luft) stipulates that potential reductions in germs and endotoxins must be investigated for facilities that require authorisation.

Relevant measures can, for example, be biowashers and biofilters in order to absorb a majority of the organic contamination, which would escape into the atmosphere with the outgoing stall air.

Such approaches to reduce pathogens in the outside air naturally do not benefit food hygiene. The aerosols can affect people through infectious, allergic, toxic, pharmacological and other processes. The path of infection can be through breathing and via the digestive tract. Sometimes severe diseases can be caused by children drinking unboiled raw milk (not certified raw milk) on, for example, a farmyard holiday. For this reason, the Lower Saxonian State Office for Consumer Protection and Food Safety (LAVES) warns against drinking natural, fresh milk.

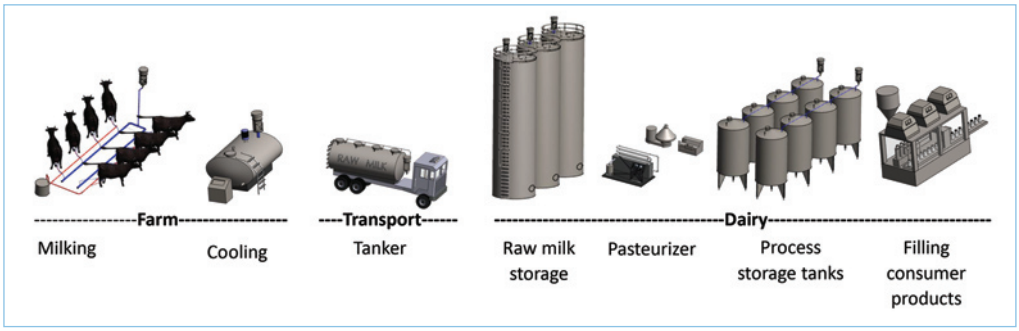
Prevention better than cure

The question mark behind 'risk' does not intend to invite discussion on the subject. It stands for yes-and-no: yes to a risk from unboiled raw milk, no to a risk after sterilisation.

A possibility of prevention is addressed as a result, namely the

Continued on page 9

The use of ultra-clean filter technology from the udder to the packaging.



Continued from page 7
thermal and/or chemical sterilisation of the foodstuff as prevention.

Consequently, the method allows a certain contamination of milk and yoghurts and cheese, but kills the aggressors by means of preservatives. This is where the description of 'cure' comes from. According to a stipulation by the European Union, the additives in foodstuffs must be listed and stated on the packaging with their e-number or precise description.

They are suspected of triggering symptoms such as headaches, nausea and allergies in susceptible people and causing cancer, in extreme cases. Due to the low immunity of infants, the shelf life of baby food must not be extended using preservatives.

Food chemists and biochemists know about the reactions and side effects of their inhibitors. Due to the side effects, they mix a cocktail of chemical additives, some of which only have the task of alleviating these side effects. It goes without saying that there are limits to the relevant dose.

As is known, this also applies for thermal treatment. Pasteurisation at about 70°C is aimed specifically at pathogens, vegetative cells and germs such as tuberculosis bacillus. But even higher temperatures do not provide any greater relief, as virtually every bacteria contains heat-resistant endospores, which can survive even hours of boiling.

This means manufacturers generally adopt a two-pronged approach for milk products, in the form of thermal disinfection with the addition of calcium sorbate (E203), a derivative of sorbic acid. For susceptible people, the health risks of calcium sorbate include irritations of the mucous membranes and pseudo-allergic reactions.

However, the German Additives Admission Ordinance (ZZuIV), which regulates the addition of preservatives, focuses less on these secondary side effects in its threshold limits and primarily on the target function of killing germs.

The Food Law must simply make compromises and assess the various levels of protection and set priorities.

Physics instead of chemistry

In the main, this is successful. There are no major hygienic issues in dairy and cheese products in Germany and Europe. Above all, voluntary and official checks keep an eye on quality and treatment of foodstuffs of animal origin.

The former Regulation (EC) No 882/2004, which is currently being revised, might soon be replaced by an even stricter EU control regulation.

The EU agricultural ministers agreed on this in July 2016. Various authorities are currently working on the implementation and national adaptation of the new hygiene package: on a Regulation on the Hygiene of Foodstuffs, on the Regulation on the Hygiene of Foodstuffs of Animal Origin and on an Ordinance regulating the Inspection of Foodstuffs of Animal Origin, to name but a few of the future official documents.

But, as already said, all these papers deal with protection against contamination and pathogens, and less with the side effects of the protective measures.

The collateral health risk could be most effectively reduced if infectious microbiology did not contaminate foodstuffs in the first place, if it were possible to physically shield dairy products from stall and hall air contamination.

The industry is working on relevant procedures. A few years ago, German-Israeli company Fischer Planning from Netanya, Israel presented filter technology for drinks and foodstuff production (Sterivent), which keeps semi-finished and ready-made products free from germs – ultra clean – in the storage containers by means of gauge pressure. A blower in the sterile filter combined with regulatory electronics provides a constant gauge pressure, even when the filling level drops.

The result: filtered air can only move from inside to out through any potential leaks. The gauge pressure blocks the path of the air from outside to in. A modified principle also places a cover of sterilised air ('laminar flow') over the filling and packaging machinery.

From Coca Cola to Müller to Nestle, manufacturers are using this preventative technique all over the world – from Australia to Europe, from the USA to Canada.

As a result, at least this third door blocks contamination from accessing the foodstuff via the air in the production plant or dairy.

Gauge pressure on vacuum

Checks by veterinarians must close the first door, milk that is already contaminated within the animal. The second door of germ migration from animal to human, through the stall and milking parlour air as a carrier of infectious materials, could not previously be blocked preventatively using physical procedures.

Instead of precautions, the described after-treatment with chemical products to sterilise and stabilise the shelf life had to be used. But now dairy plant equipment specialist Fischer Planning has obtained a German patent for milking machine technology, which does not allow any stall air to gain entry into the teat cups. This method also works with gauge pressure.

In simple terms, it floods the teat cup with sterile air from the ultra-clean filter technology until the valve is positioned firmly on the udder.

The gauge pressure of the air dome is above the milking vacuum of about 40 kPa. It communicates until it reaches the milk cooling tank, blocking the harmful substances in the air from accessing the raw milk.

As a result, its quality improves in the first instance and, secondly, this method extends the permitted time period until treatment.

In addition, farmers with milk filling stations could also benefit from this. Since the abolition of the milk quota two years ago, more and more farms rely on direct marketing of their products. Farmers offer their customers the option of bottling their own dairy-fresh raw milk from the farm using milk bottling stations. As the natural milk is not homogenised or pasteurised, valuable ingredients and the special aroma are preserved.

However, the regulations demand strict hygiene from such bottling stations. The raw milk must be bottled the day after its production. With Fischer technology, the use-by date could be extended if the authorities accept the suggestion.

Ideal for everyone

This saves spending the profits on storage, transportation, processing and marketing of low-germ raw milk in Germany. Furthermore, these advantages could penetrate into the second and third world.

Fischer Planning talk about an immense advantage for dairy producers and, of course, for providing the population with a hygienic supply, for example in India and other south and south-east Asian countries.

The German-Israeli planners and developers have looked around there and spoken with production plants. The majority of farmers there milk their one, two or maximum three cows by hand, as was the case in Germany 50 years ago. The farmers then carry the pitchers to the collection point. From here, the milk must be collected by refrigerated vehicles within half an hour to an hour as otherwise the milk would go off and no longer be usable.

For this reason, the large businesses must maintain fleets and personnel of up to 50 tankers, which constantly travel through the villages.

Fischer Planning is considering local small-scale milking facilities for the cows in the surrounding area, among other things. With the new patent, the company is focusing less on farmers – who would not invest in Germany anyway for want of profitable milk prices, as their quality already conforms to the regulations – and more on the process plant manufacturers and dairies.

In India, for example, the suggestion is for decentralised containers with milking parlour and refrigerated tank, which hygienically remove the milk from the cows and stores it for at least a day.

Spokespeople for the companies there anticipate that the vehicle fleet alone could be reduced in this way to 15-20 vehicles. The higher quality level would mean that the raw product can be used for other things and not, as is the norm in many Asian countries, only turned into cheap drinking milk or some kind of cheap cooking cheese.

The low-germ delivery also allows a higher degree of finishing with better results. There are also many advantages for the dairy industry in Germany. With the gauge pressure technology, it would be possible to construct an ultra-clean chain to produce dairy products without preservatives from the farm to packaging. ■

The patent for Germany has been granted and protection for the whole of Europe has been applied for.