

DAIRY PIPELINE

Moisture migration in cheese—gauging the effects of moisture loss and moisture gain

By Mark Johnson, senior scientist, Wisconsin Center for Dairy Research

This information won't be completely new if you have ever taken the Wisconsin Cheese Manufacturing Short Course. In addition, chemical changes in casein as a result of pH, temperature, proteolysis and loss of calcium were addressed in previous Pipeline articles. See Vol. 11, No. 2, Vol. 12, No. 1, and Vol. 14, No. 4

The water molecule is a quirky one. It is simple but complex, abundant but not always available. So many substances dissolve in water that some people call it the universal solvent. Perhaps that is why most of the moisture, or water, in cheese is mobile; it can move if compelled to do so. The most obvious example is the way cheese dries when exposed to air. It is usually done intentionally, with positive results; other times it is not welcome. For example, moisture migration in retail packages of shredded cheese is a common problem. Here's how it happens. Moisture can create a humid environment when it moves from cheese to the surrounding air. This is accelerated when the cheese and the air in the package warms, for example when bright lights illuminate the cheese or when the air in the store meets the package face. Inside the package, moisture is lost to the air. Most of the moisture comes from warm cheese in the front of the package; meanwhile the cheese and



packaging material in the back may remain cold. When the humid air inside of the package meets the cold cheese it condenses. The cold cheese then absorbs the water and may become soft and pasty, allowing the shreds to fuse.

Another example is seen when cheese is packaged with other foods. Moisture will migrate from products with high moisture or water activity, to low moisture products (or even air) and products with lower water activity. So, in some cases, cheese gets soft while other times the cheese dries out. This is why separating foods with different moisture and water activities is a good idea.

Packaged brined cheeses

You can also see moisture migration in packaged brined cheeses, like mozzarella or brick. The outside of the cheese is, of course, higher in salt. The high salt attracts moisture from the lower salt areas in the interior of the cheese. Depending upon the moisture content (and fat) the outer portion of the cheese may become pasty and mushy, conditions that make shredding or slicing difficult.

The migration of cheese serum—the water and anything dissolved in it—can result in moisture and pH gradients within a block of cheese. These gradients lead to variation in the physical characteristics of the cheese, influencing color, shred and melt characteristics and even eye development in Swiss. Some parts of a block of cheese may become too soft and pasty—which presents challenges when taking samples that are represent the entire block of cheese. Also,

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Popular feta faces identity crisis

If you are like most Americans you probably first encountered feta cheese adorning the Kalamata olives, fresh tomatoes, red onion and lettuce of a Greek salad. In recent years the popularity of feta cheese has grown tremendously, here in Wisconsin the production of feta cheese jumped 20% from 2001 to 2002. In many regions of the country you can start your day with a spinach and feta omelet and move on to feta stuffed savory pastries, portabella mushroom and feta sandwiches or tuna and feta tacos. And, of course, any salad can be topped with crumbled feta cheese.



In fact, in western Europe what we call a Greek salad might be called a Macedonian salad, and to get the same meal in Bulgaria you would ask for a Russian salad. We all know what it is, does it really matter what we call it? As it turns out, in the case of feta cheese, it might matter—a lot.

The latest round of the feta food fight started in October 2002 when the European Commission granted feta cheese the special status of a Protected Designation of Origin or PDO. This means that Greek feta is the equivalent of French Roquefort; feta can only be made from sheep or goat's milk in Greece. It is interesting that most PDO's are awarded for a specific region of a country, linking a product to local influences. However, under this ruling, the whole of Greece can produce feta even though soil, rainfall, and climate vary greatly.

Denmark, Germany, Italy and France currently make feta cheese, but Greece claimed the PDO status for feta based on history and tradition. Although the majority of the world's feta cheese is produced outside of Greece, the Greeks have been producing feta from ewe's milk, or a mix of ewe and goat milk, for thousands of years. They claim feta as their own and insist that the historical record supports Greek origins for feta. However, according to cook and author Clifford Wright, the word feta doesn't exist in classical Greek. He claims it originates from a New Greek word, tyripheta, which means cheese slice. The origin of this word is the Italian fette, or slice of food. Others suggest that feta cheese originated on the Balkan peninsula, which is now southern Bulgaria. Macedonia has also been tabbed as the birthplace of feta.

It is unlikely that anyone can conclusively track down the origin of feta, and that isn't really the question here anyway. Another way to frame the issue is to ask: Is feta a generic term for tangy, square, brined white cheese or is it a word that specifically applies to cheese made from ewe or goat milk in Greece, according to the Greek rules of production that date back to 1936? For most Americans, who only know feta as a salty cheese made from cow's milk, the answer

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History of International developments

*From Joerg W. Rieke (J.D.), German Dairy Association (MIV), Bonn/Germany
Presented at the Wisconsin Cheese Industry Conference, April 15-16, 2003 LaCrosse, WI*

Paris Convention for the Protection of Industrial Property, 1883

Art. 1 includes indications of source and appellations of origin among industrial property, protected by the Convention;

- ◆ protection of geographical indications against false indications of source;
- ◆ protection of geographic indications depends on the law of the country providing protection.

Madrid Agreement for the Repression of False or Deceptive Indications of Source of Goods, 1891

- ◆ Extension of the protection of geographic indications against false or misleading indications of source;
- ◆ Protection depends, as in the case of the Paris Convention, on the law of the country providing protection i. e. this country decides whether a geographical indication constitutes an indication of source or whether it is a generic name. (exception for geographical wine designations: country of origin).

Lisbon Agreement for the Protection of Appellations of Origin and their International Registration, 1958

- ◆ Adoption of the French definition of appellation of origin, i. e. protection merely for indications, where the quality and characteristics of a product are due exclusively or essentially to the geographical environment, including natural and human factors;
- ◆ Protection merely for appellations of origin that are recognized and protected as such in the country of origin (Agreement presupposes a national system of protection and registration);
- ◆ Establishment of an international system of registration and protection.

Stresa Convention for the Use of Appellations of Origin and Denominations of Cheeses, 1951

- ◆ Protection of “appellations of origin” and “denominations of cheeses,”
- ◆ Appellations of origin which are the object of internal legislation reserving their use, within the territorial confines of one of the Contracting Parties, to cheese manufactured or matured in traditional regions, by virtue of local, loyal and uninterrupted usages, are listed in Annex A (protection of the origin);
- ◆ Denominations of cheeses that are the object of internal legislation within the territorial confines of the Contracting Party, which first has used these denominations and which uses them only for cheeses having definite characteristics, are specified in Annex B (protection of characteristics);
- ◆ Inclusions in Annex A require a majority of three quarters of

all members, those in Annex B require a simple majority

- ◆ Denominations of cheeses enlisted in Annex B shall not be transferred to Annex A; they may be used by the other Contracting Parties for cheeses having the characteristics defined in Annex B, provided that the denomination is accompanied by the indication of the manufacturing country.

Annex A

- Pecorino Romano (Italy)
- Parmigiano Reggiano (Italy)
- Gorgonzola (Italy)
- Roquefort (France)

Annex B

- Havarti (Denmark)
- Samsøe (Denmark)
- Gruyere (Switzerland/France)
- Emmental (Switzerland)
- Edam (Netherlands)
- Gouda (Netherlands)
- Caciocavallo (Italy)
- Provolone (Italy)
- Asiago (Italy)
- Fontina (Italy)
- Saint-Paulin (France)
- Brie (France)
- Camembert (France)

WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), 1994

Competing positions in the Uruguay Round of the GATT: EU proposed a “French-style” protection system; USA favored the protection of geographic indications through a certification mark system
The result: Section 3 of the TRIPS Agreement covers six topics:

- ◆ Definition and scope of a geographical indication
- ◆ Minimum standards and common protection provided for geographical indications corresponding to all kinds of products
- ◆ The interrelationship between trademarks and indications of origin
- ◆ Additional protection for geographical indications for wines and spirits
- ◆ Negotiations and review
- ◆ Exceptions to the protection of geographical indications


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seems obvious—it's a generic word. For Europeans, who have eaten sheep's milk feta as well as feta made from cow's milk for decades, the issue might be murkier.

Joerg Rieke, German Dairy Association, traveled to the Wisconsin Cheese Industry Conference in April, 2003 to participate in a panel discussion of global trade issues. He focused on the European perspective regarding PDO issues— of which feta is only one component. (See sidebar for his summation of international developments.) Rieke notes that although the European Commission's ruling on feta doesn't affect Wisconsin cheesemakers, we need to pay attention to ongoing discussions of the World Trade Organization. Currently, the WTO Trade-Related Aspects of Intellectual Property Rights, or TRIPS, agreement protects geographic indicators that identify wine and spirits. Some WTO members want to extend protection of geographical indicators to many other goods, and that list contains cheeses we are very familiar with—Emmental (or "Swiss"), Asiago, Parmesan, Muenster, etc.

Under the TRIPS agreement, geographical indicators (GI's) fall under the rubric of intellectual property. The official definition of a GI, from Article 22.1, includes the concept that "... indications which identify a good as originating in the territory of a Member, or a region or locality in that territory, where a given quality, reputation or other characteristics of the good is essentially attributable to its geographic origin." Thus, the link (it doesn't have to be a geographical name) between the good and the region producing it is protected.

As Rusty Bishop, Director of Wisconsin CDR and chair of the U.S. National Committee of the International Dairy Federation, noted in a recent publication, U.S. dairy representatives view the feta issue, and others like it, "as an attempt to create new trade barriers." However, any legal disputes among WTO members regarding the geographical indicators behind PDO's would fall under intellectual property rights disputes heard by the WTO, not trade barrier cases.

Regarding the feta issue in the EU, Denmark filed a lawsuit against the European Union's executive commission December 2002 in an attempt to overturn the ruling. To track this issue, or other PDO issues involving Parmesan, Emmental, etc., and to gauge how it will affect U.S. cheesemakers, you should pay attention to upcoming WTO formal talks in September, 2003 at a ministerial meeting in Cancun, Mexico. Better yet, you can get involved through the U.S. National Committee (USNAC) of the International Dairy Federation (IDF). Contact Deb Wendorf-Boyke at 608-663-1250 ext 112 or usnacsec@usnac.org 

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News from CDR

Attention Wisconsin cheese makers interested in Italian cheese!

Jim Path is organizing an artisan cheese making course that will feature “Cheese Masterpieces from Italy.” If you are in the Master Cheesemaker program the full two day course is required. The first day, which is mainly lectures, is recommended for cheese makers returning for additional cheese certification since it will fulfill a Master’s requirement.

Discussion topics on the first day will include an overview of the Italian dairy industry, including different styles of fresh mozzarella, manufacture of Gorgonzola, Asiago, and Grana, as well as tasting and evaluation of select Italian cheeses. Participants will be busy making cheese on the second day of this seminar. Enrollment is limited, sign up early. Any questions? Contact Jim Path at (608) 262-2253 about the curriculum, and CALS Outreach Services about registration, (608) 263-1672.

CDR welcomes another talented cheesemaker

Brian Leitzke, formerly of White Clover Dairy, has joined CDR’s cheese program. Brian has been a licensed Wisconsin cheesemaker since 1996. Though he has experience making Edam, Gouda, Havarti, and reduced fat cheese, Brian says he enjoys making just about any kind of cheese .

WMMB brings Gordon Food Service and customers to Wisconsin

CDR spent an entire day talking about cheese with several dozen pizzeria and Italian restaurant owners from the upper Midwest. This visit—one of the Wisconsin Milk Marketing Board efforts to increase the use of Wisconsin cheese—involved teaching and talking with the restaurateurs, all customers of Gordon Food Service of



Big Dave twirls a pizza crust

Michigan. They learned about the melt, stretch, and spread of cheese, alternative cheese blends, and applications for cheese use that got them thinking beyond pizza. And, if that wasn’t enough, Big Dave and Pizza Paul came by and put together a stunning array of pizza varieties.

WMMB kept these customers of Gordon Food Service busy during their Wisconsin trip. They saw the whole cycle of the dairy industry, starting with a few Wisconsin dairy farms, visited some cheese plants and spending the day with CDR.



Restaurant owners assess stretch and melt



Mark Johnson compares pizza cheeses.

Migration *continued from page 1*

smaller retail packages will vary in composition which in turn will affect the accuracy of nutritional information.

Serum can move in response to temperature; it moves from warm to cooler areas during the cooling of freshly manufactured cheese. Pressure influences migration, and, in the case of air drying, serum moves from areas of high moisture to areas of low moisture.

Whether moisture moves in response to these factors—and how fast it moves—depends on the ability of the casein or casein network in cheese to hold or restrict the flow of moisture. Also, the physical condition of the curds, particularly how fast they fuse or knit, can slow moisture movement. Other factors that must be considered, especially in the initial stages of cooling the pressed cheese, are cheese composition, pH and salt content. These factors influence moisture migration by affecting the ability of the casein network to hold serum. In addition, changes in the casein network as the result of proteolysis, and pH changes during the ripening of the cheese, will greatly affect the ability of the casein to hold moisture and slow moisture migration. Proteolysis in low salt cheeses will increase the ability to hold moisture while proteolysis in high salt cheeses produces free moisture. However, if the pH increases in a cheese with an initial low pH, such as Camembert, free moisture will be absorbed by the casein.

Syneresis and the creation of free moisture

Casein micelles are bundles of hundreds of casein molecules and they are full of “free” moisture. During cheesemaking, while milk is clotting, the casein micelles aggregate into clusters. These clusters aggregate into larger clusters, eventually resulting in clotted milk, which you can think of as a casein network. In the process, pools of moisture and fat are trapped between and within the clusters. As soon as the clotted milk is cut, the caseins begin to tighten and, in a process called syneresis, moisture is forced from the casein network of each curd particle. When serum is outside the curd it is called whey, but it is often called free serum if it is still trapped within the curd particle.

Both heating the curd and a continued drop in pH will accelerate syneresis. Typically, the cheese maker helps force out the free serum from the curd by physically pressing the curds. However, not all the free moisture within a curd particle or between curd particles is pressed out, some is trapped. Nor is the process of syneresis finished. As long as the cheese is warm, free moisture will be forced out of the casein network and then it can move. Consequently, there will be pools of free moisture remaining in the cheese after pressing. Whether or not this moisture is absorbed by the casein network, or moves in response to temperature, depends on the chemistry of the casein network and the curd temperature since casein loses water when it is warm and pools of serum form between curd particles. Casein that is low in calcium will absorb serum when the cheese is cooled, greatly slowing its migration. Also, curd low in calcium will fuse better which then helps to restrict moisture movement in response to temperature.

Two events to slow moisture migration

Two events must simultaneously occur to slow moisture migration in cheese. The first event is to stop, or greatly slow, syneresis to prevent more free moisture from being created. You can do this by decreasing the temperature. Acid development enhances syneresis. It is more difficult to slow acid development when mesophiles are used since these cultures still produce acid at 70° F. Thermophiles can be greatly restricted by salt (less than 3% S/M) and temperature (less than 90° F).

The second event you need to orchestrate in order to slow moisture migration is to create conditions that will allow the casein network to hold the moisture. The most common method is to cool the curd. Although cold cheese absorbs serum, it does not necessarily hold it very tightly. For example, a high pH, and high salt cheese such as Queso Fresco will hold water when cold (40° F) (although you can see some free moisture if you break the cheese open even at that temperature). However, if you warm the cheese to 50° F, a lot of moisture will come out of the cheese. You can see this when you carry around a bag of cheese curds on a warm day, as the temperature increases so does the moisture in the bag.

A similar observation will occur with a cheese with very low pH (4.9 or below). In both cases the casein network can absorb, but not hold the moisture, after a slight increase in temperature. A



temperature, by the way, that is lower than the temperature of most cheese when pressed. In other words, even though the cheese is cold, the casein network does not have a strong hold on the moisture. Cold cheese absorbs moisture because hydrophobic interactions between casein molecules weaken. As a result, the casein network “swells” with serum. This is easily reversed if the cheese warms slightly, especially if the cheese is high in salt and there is a lot of calcium bound to the casein. If calcium is lost from the casein the casein molecules will hold the moisture more tightly, restricting the loss of moisture when the cheese is warmed slightly.

Calcium removed by acid development

Calcium is removed from the casein by acid development and by curd rinsing. Rinsing creates an environment where the moisture surrounding the curd is low in calcium; therefore calcium leaches from the casein. A particularly effective method to remove calcium from the casein is to lower the pH prior to coagulant addition since a high pH at coagulant addition leaves casein with more bound calcium.

More calcium is removed from the casein when the milk is still liquid vs. from the curd after whey separation. The lower the pH at which most of the whey or serum is pushed out of the curd i.e. cutting pH is also effective. A lower pH at drain but a high pH at coagulant addition or cutting is not as effective at removing calcium from the casein. However a lower pH at rennet addition and at drain also removes the main buffer, inorganic phosphate, from the casein (see rise and fall of pH article). This could result in an excessively low pH in the finished cheese. Consequently, when milk is clotted, or when the whey is separated at a low pH, most cheese makers will rinse the curd to remove some of the lactose—thus preventing too much acid development. Keep in mind that the higher the casein content of the milk or cheese, the lower the pH needed to remove the amount of calcium necessary to allow the casein network to hold the moisture.

Moisture migration in large blocks

Moisture migration doesn't always occur in large blocks of cheese, but when it does it can be a problem. One effective solution involves cooling the curd prior to pressing. In Cheddar, you can do this by rapidly moving air during vacuum transport of curd from the cheese vat to the pressing form or hoop. In washed cheeses, such as Colby or reduced-fat cheeses, the cold water lowers the curd temperature. However, even if the curd is cool, moisture will still migrate if the casein network can

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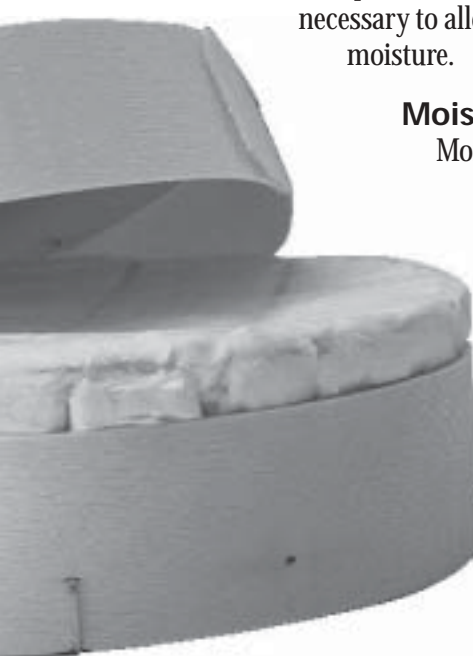
not hold the moisture and if the temperature of the cheese on the outside of the block is cooler than the inside. The cheese maker must coordinate cooling the pressed blocks with the loss of calcium from the casein network, curd fusion, and the inhibition of syneresis.

Cooling the curd prior to pressing can effectively restrict moisture movement, but, just like cooling blocks of cheese, it must be done in unison with other events. Syneresis—curd contraction and release of moisture—must be slowed or stopped. Syneresis is enhanced as calcium is lost from the curd during pressing. However, if sufficient calcium is lost from the curd prior to pressing, syneresis will lessen during pressing. In addition, loss of calcium promotes curd fusion during pressing. Allowing curds to fuse will help slow moisture migration, although this may require a longer press time depending on the curd firmness and calcium content of the casein. Longer press times allow for acid development by the starter to be completed, calcium to be lost from the casein and fusion to occur.

Certain conditions must be met

In summary, certain conditions must be met for moisture to migrate in cheese in response to temperature gradients. First, free moisture must be created. Second, a driving force must be present to move it, like a temperature difference between the outside and inside of the cheese. Third, the casein network must be unable to hold the moisture. If you want to restrict moisture migration in response to temperature then the casein network must be able to both absorb and hold the moisture. Both cooling, and the loss of calcium from casein, can help you do this. 🍷

The Journal of the AOAC International, Vol. 84, No. 2 published a collection of papers edited by Bob Bradley and entitled “Cheese Moisture: Its Variations and measurement. CDR has a limited number of these reprints available, call Marge Schobert at (608) 262-5970 and request a copy of the Bradley papers.



Curd Clinic

Curd Clinic doctor is Virginia Deibel, Ph.D. and CEO of BrainWave Technologies, Inc., Madison, WI

Q. There seems to be some controversy regarding the use of metal detectors in dairy plants. Are they necessary? How do they fit in a HACCP plan?

A. Not all dairy plants incorporate metal detection into their food safety plans. However, for those that do, metal detection should be part of the prerequisite program rather than the HACCP plan. Components necessary for a metal detection program include the following:

Standard operating procedures (SOP)

The metal detection SOP should include its care, use and operation. Further, SOP's should include the frequency of calibration (many perform this task hourly), the types of metal wands used in calibration (ferrous, non-ferrous and stainless), and their sizes. Also, activities performed when there is metal found in the product, when the metal detector or its calibration fail should be noted. These activities are called corrective actions. Outlining corrective actions to perform when systems fail is an essential part of all food safety programs. Events that provoke corrective actions include calibration or equipment failure and metal found in the product. Since many plants only have one metal detector, steps outlining what to do with products when the metal detector fails are necessary. Often, placing the product on hold until the problem is solved, then passing the product through the metal detector is the corrective action outlined.

Instances where metal detection is not possible should be noted on the SOP. For example, if products that are too large to fit through the opening or when metallic foil is used on packaging.

Employee education

All employees who work with the metal detector should learn how use it, maintain it and perform corrective actions. Documentation of training is necessary and should include the date, material covered, instructor's and employees signature. Employee education may start with reading the SOP, hands-on instruction followed by consistent management oversight.

Documentation of activities

Documentation is critical because it proves company policies were performed as stated in the SOP. Documentation includes metal detection calibration and/or corrective actions. Also, the employee performing each activity should initial the documentation sheet. For calibration, record the types of metal used, sizes, date, time and any problems encountered. When handling corrective actions, record the date of the problem, employee who discovered/solved the problem and action taken (i.e. manufacture called, quality control and management notified, product placed on hold until problem fixed and product rerun through detector). Make sure you include a place for a manager's signature and date to signify that the management has reviewed the document on a daily, weekly or monthly basis on the documentation form.

It is up to each plant to choose the options that work the best for them. The important actions are documentation of events and employee education relating to company policies. Management oversight should be constant to assure compliance—just as it is with any activity.

Metal detector facts

The sensitivity is determined by the size of the opening that product passes through, the type of metal present and the inherent properties of the product.

In general, the smaller the opening that product passes through, the more sensitive the detection. Therefore, select one with the smallest opening that your products will fit through. Because the sensitivity is reduced with larger products, metal detection is as effective. Prior to purchasing any metal detector, testing to determine if its efficacy justifies the cost is important. Also, any metal contaminant located closest to the opening sides will generate a stronger signal than metal located in the middle of a large block. Taken together, metal detection for larger products is less effective.

Types of metal and their sensitivities

Ferrous: any metal that can easily be attracted to a magnet (steel, iron). This is typically the easiest metal to detect.

Non-ferrous: highly conductive, non-magnetic metals (copper, aluminum, brass). In dairy products, the sphere size needed for detection is 50% greater than with other products due to the conductivity of these products.

Non-magnetic stainless steel (300 series): metals with poor electrical conductive qualities and low magnetic permeability

make these the most difficult to detect. When passing a dairy product through a metal detector, the stainless steel contaminant has to be 200 to 300% larger than a piece of ferrous metal to produce the same metal detector signal strength.

Shape and orientation

The metal contained within calibration wands is usually spherical because the shape is equal from any dimension. This will produce an even signal from anywhere within the opening. Non-spherical metals do not produce uniform detection signals; which decreases the detection capabilities of the machine. Metals detected in dairy settings rarely are spherical in nature. For example, a wire from a cutting harp may produce a signal no bigger than the diameter of the wire, which is under the detection limit.

Package positioning

When detecting 300 series stainless steel contamination, the positioning of the product through the metal detector becomes important. The signal is strongest if a package enters the opening at an angle or on its end. When the package enters the opening lying down and not angled, a weaker signal is generated. Positioning for the detection of ferrous metals is opposite that of stainless steel; ferrous metals produce strong signals if the package enters the opening straight and lying down and a weak signal if the product enters the opening on an angle in a standing position. In dairy settings, 300 series stainless will be the source of most metal contamination. Therefore, products placed flat on a conveyer belt will create a weaker signal.

Inherent properties of the product

Metal detectors work by reading magnetic characteristics or electrical conductivity. Dairy products have high moisture, fat, acidity and contain salt; these properties are electrically conductive. Since metal detectors must be programmed to read above the natural product electrical conductivity, the baseline of these products needs to be higher thus smaller metal pieces may not be detected.

Should metal detectors be a CCP?

During a hazard analysis, if plants have raw ingredients or a step in the production process that produces a reasonably likely risk for metal contamination, then metal detection should be considered as a CCP. However, it is generally accepted that most raw ingredients or processing steps in dairies do not create a metal hazard. While there may be occasional instances of metal contamination, it is not a consistent occurrence. CCP's are put in place to mitigate *significant* hazards that are *reasonably likely to occur on a consistent basis*. (For example, pathogens are often found in raw milk. Pasteurization is a CCP). Additionally, if metal detection is a CCP, all products produced *must* pass through a metal detector. When metal detectors malfunction and there is no spare, all products must be placed on hold until the problem is resolved. Once resolved, products can be released from hold as

they are passed through the metal detector. Metal detection in dairy products is often inconsistent due to the inherent properties of both the product and the metal detector capabilities. Therefore, in most dairy settings, it is commonly accepted that metal detection is not a CCP.

Is metal detection required?

Are metal detectors necessary if metal detection is not a CCP? Bolts, wires, tools or other metal hazards occasionally find their way into dairy products during production. It is up to the dairy plant to determine whether a metal detector is needed. Customers of most cheese producers either currently or in the near future will require metal detection as a condition of product sale. Metal going through grinders, slicers or augers can cause significant damage. If a cheese product is not processed further but only rewrapped, at some stage of the manufacturing process, metal detection should occur as a means to reduce physical hazard contamination risk. The responsibility then falls to the dairy producer. Ice cream and cream cheese producers currently are not subjected to the same strict customer demands. The products are not often reprocessed and as a result, the requirement is less stringent. If the plant has a history of metal contamination then the purchase of a metal detector be considered.

The potential for metal contamination increases when cheese is sliced or shredded. For this reason metal detectors are usually part of the prerequisite program for a cut and wrap operation.

The decision to incorporate metal detection is up to each plant and should be based on historical data and customer preferences. Metal detection in dairy products is not yet a fail-safe technology.



Skimming the Shelf—



What's New in Print?

"The Roqueforts and Gorgonzolas lewdly flaunted their mould, and a squadron of Camemberts let their pus ooze out freely."

Cheese

By Willem Elsschot

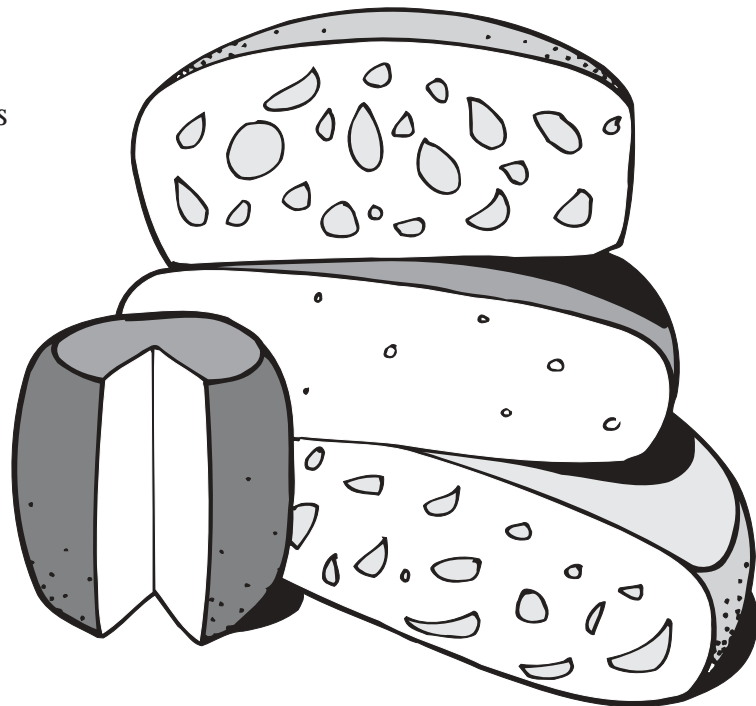
It isn't easy to find a novel about cheese—but here's one for your summer reading pleasure. This book has been described as a comic classic in the *Seattle Times*, a slightly dated tragicomedy by Julie Hatfield in the *Boston Globe*, and lauded as a "surprisingly humane farce of ambition gone haywire and Edam gone bad" by Mary Elizabeth Williams in the *New York Times*. Originally published as "Kaas" in the Netherlands in 1933, *Cheese* is the story of a lowly shipping clerk Frans Laarmans, who yearns for status and respect. The road to success involves 20 tons of Edam, which Laarmans plans to sell by hiring salesmen. Laarmans himself, who is so self-conscious he can barely talk to strangers, is far too busy outfitting his new office and designing his business letterhead.

As Laarmans prepares for his new career he stops outside a cheese shop, admiring the window display. The author describes it this way:

"Huge Gruyeres as big as millstones served as a base, and on top of them were Cheshires, Goudas, Edams, and numerous varieties of cheese that were entirely unknown to me, some of the largest with bellies slit open and innards exposed. The Roqueforts and Gorgonzolas lewdly flaunted their mould, and a squadron of Camemberts let their pus ooze out freely. An odor of decay wafted from the shop, but this decreased after I had stood there for a while. I didn't want to give way to the stink, and would only leave when I thought the time had come. A businessman must be as tough as a polar explorer."

From the beginning of this story you can guess how it will end, but that is no reason to stop reading. Author Elsschot manages to evoke a range of emotions in his readers, you'll laugh and blush and squirm in your chair as Laarmans's cheese fantasy spirals into a cheese nightmare

Elsschot's real name was Alfons de Ridder. He worked in advertising by day and wrote his novels at night. "Cheese" is a classic in the Netherlands and now it is available in English. (I ordered it through the internet.) 🍷




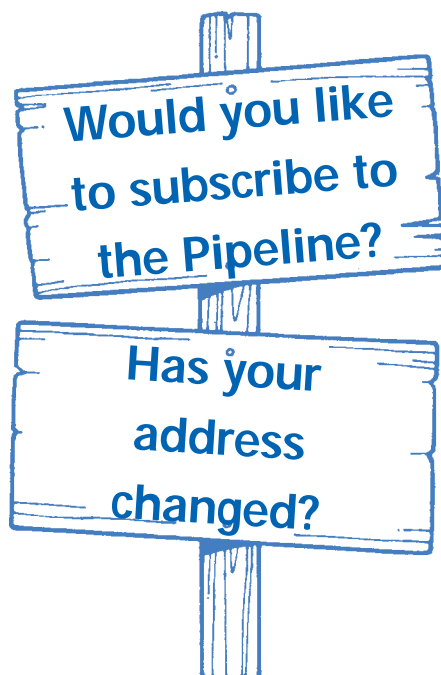
Research update

Supplements are the whey to go

It's no secret that exercise increases the need for protein. Many people in the dairy industry realize that the nutritional quality of whey protein concentrate makes it an ideal protein supplement for athletes. Many athletes apparently realize this too; their appetite for sports beverages, sports bars, and supplements containing whey protein seems unquenchable. Supplements are particularly popular with body builders who are aiming for strength and bulk. But do they work?

Researchers from Victoria University in Australia reported to the scientists attending the 2003 Experimental Biology Meeting that a combination of whey protein and creatine does indeed increase strength and produce greater muscle fiber growth. A team of scientists lead by Mick Carey and Alan Hayes used a double blind protocol on thirty-three subjects to compare supplements. The experimental subjects, who had already been using resistance training, were given creatine/carbohydrate (CrCHO), whey isolate (W), creatine/whey isolate Cr/W), or a carbohydrate (CHO). All of them were matched for strength, consumed 1.5 gms of supplement per kg of body weight, and took part in the same supervised resistance program. Muscle biopsies were used to assess changes in muscle fiber.

The Cr/W group, given the combination supplement of creatine and whey isolate, showed the greatest gain in strength, which also correlated with an increase in muscle fiber. In fact, this group had 12 times the muscle fiber increase compared to the carbohydrate group. Whey isolate alone, and the CrCHO group, also showed increases, but not as striking as the creatine/whey group. 



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You can also find the Dairy Pipeline on our website: www.cdr.wisc.edu

Calendar

July 12-16 IFT Annual Meeting, Chicago, IL. For information see www.am-fe.ift.org.

July 31-Aug. 3 American Cheese Society Annual Meeting. San Francisco, CA. For info, call (502) 583-3783.

Aug. 19-20 Milk Pasteurization and Process Control School. Madison, WI. Call Scott Rankin at (608) 263-2008 for information, or the CALS Outreach Services (608) 263-1672 to register.

Sept. 17-18 Dairy, Food and Environmental Health Symposium. cosponsored by Wisconsin Association of Food Protection, WI Association of Dairy Plant Field Reps, and WI Environmental Health Assn., Fond du Lac, WI. For more information, check the WAFP website at www.wafp-wi.org.

Sept. 23-24 Italian Cheeses Artisan Course, Madison, WI. Program Coordinator: Jim Path, (608) 262-2253.

Oct. 7-8 North Central Cheese Industries Assn. Annual Convention. Minnesota. For information, call Dr. David Henning at (605) 688-5477.

Oct. 13-17 Wisconsin Cheese Technology Short Course. Madison, WI. Call Bill Wendorff at (608) 263-2015.

Oct. 21-22 Whey & Whey Utilization Course. Madison, WI. Program Coordinators: Bill Wendorff (608) 263-2015 and K.J. Burrington (608) 265-9297.



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