IDF Newsbrief

Global Dairy Expertise

Issue 113 - March 2017

MESSAGE FROM THE DIRECTOR GENERAL

Few areas of science have advanced as quick and as far as DNA sequencing technology. When cloning cancer-related genes in the 1990s, my team needed several days, sometimes weeks, to sequence a single gene. Nowadays DNA sequencing is largely automated and entire genomes can be sequenced in a matter of days or even hours depending on their size.

Whole Genome Sequencing (WGS), i.e. determining the complete DNA sequence of an organism's genome at a single time, is revolutionizing several aspects of dairy science and technology.

In breeding, WGS can be used to determine true relationships between individuals, help conserve genetic diversity and influence breeding decisions.

In food safety, WGS of samples taken from feed, farms, milk, processing plants and other parts of the supply chain can be used to track pathogens to the source of contamination with great precision. WGS also can be used in monitoring the microbial environment, allowing for early detection of changes that might cause problems later, and in microbial risk assessment.

WGS is also a great tool for understanding the interactions between organisms and the bacteria they host. Complex microbiological communities, including microbes that cannot be cultured and are hard to detect by classical methods, can be analyzed with sufficient detail to detect diet-induced changes in gut microbiota and characteristics of milk that are influenced by the gut microbiome.

While WGS is powerful in generating data, the real challenge lies in interpreting them. Incorrect sequence alignments can lead to spectacular mistakes, like reporting the presence of bubonic plague and anthrax pathogens in the New York subway. Likewise, it could be that incorrect interpretation of samples from dairy farms and factories could lead to erroneous conclusions. The upcoming IDF World Dairy Summit in Belfast will be an opportunity to discuss WGS. If the need would arise, IDF will provide guidance for the dairy sector in interpreting the results of this powerful technology.

Dr. Nico van Belzen,

IDF Director General

EXECUTIVE SUMMARY

This issue features IDF technical support on the development of the **ISO Standard on "natural ingredients"**, as well as the **IDF-USP collaboration** on the development of screening tools for detecting adulteration of milk. IDF National Committees have approved **twelve new work items.** IDF has released the **Guide to Water Footprint Methodology for the Dairy Sector**, and new factsheets on the **importance of salt in the manufacturing and ripening of cheese** and on **why galactose is good for you**.

Last but not least, the website of the **IDF WDS in Belfast** is now live and registration for the **IDF/ISO Analytical Week 2017**, in Madison, US, is now open!

ISO STANDARD ON "DEFINITION AND TECHNICAL CRITERIA FOR FOOD INGREDIENTS TO BE CONSIDERED AS NATURAL" ON THE ROAD TO ADOPTION

ISO has been developing a standard on "Definition and technical criteria for food ingredients to be considered as natural". Its purpose is two-fold:

- providing the technical criteria for food ingredients to be considered as "natural" for use by the food and beverage industry worldwide;
- being used in business-to-business communications and relationships in the global food supply chain.

IDF, as a member of the Technical Committee (TC34) under which this works falls, followed the development of the standard and provided several comments in order to clarify some of the provisions. One major concern was that the use of acids and bases for pH adjustment might disqualify an ingredient to be "natural". If this would be the case, it would mean that for example acid casein and caseinates would not be considered natural ingredients, which would be disadvantageous to the dairy sector.

The ISO working group (WG) drafting this standard met early January 2017 to reach consensus on the comments received from the different TC members. IDF attended the meeting and succeeded in convincing the WG members that the use of pH adjustment processes should not prevent a food ingredient to be classified as "natural".

The standard will be circulated to the members of the TC34 for adoption as Technical Specification. This would ensure the testing of the standard in the marketplace before its review in 3 years to convert it into an International Standard.

IDF will continue to monitor the progress of this document.

IDF was represented by David Isherwood (NZ) and Laurence Rycken (IDF) at the working group in Vevey, CH. Christian Bruun Kastrup (DK) attended as member of the Danish delegation and Michael Hickey (IE) as a member of the Irish delegation.

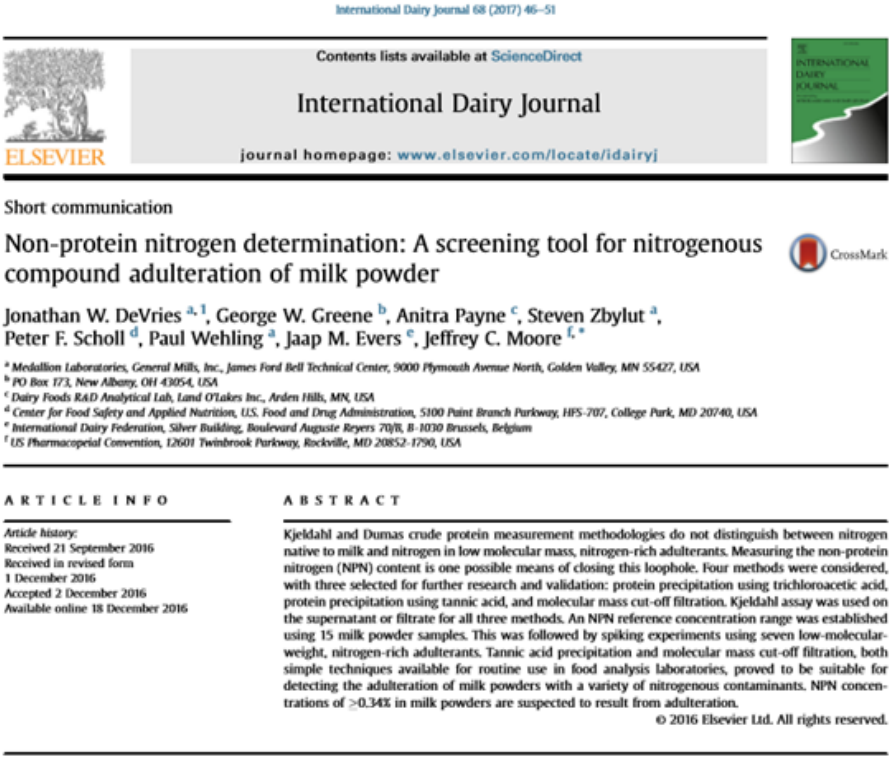
IDF-USP COLLABORATION: DEVELOPING A SCREENING TOOL FOR DETECTING ADULTERATION OF MILK

IDF promotes the global harmonization of food standards and analytical methods affecting the dairy sector. IDF is collaborating with other standards-setting organizations to create synergy. IDF and the US Pharmacopeial Convention (USP) are currently working on a project to develop a screening method, using non-protein nitrogen (NPN) analysis, for detecting economically motivated adulteration (EMA) in milk and milk products by nitrogenous compounds.

The initial work was carried out under the aegis of USP and focused specifically on milk powder. With the co-authorship of Dr. Jaap Evers (IDF Leader – Global Standards), this work has now been published by the International Dairy Journal (IDJ 2017, volume 68, pp. 46-51) and is accessible to subscribers, or for purchase, through Elsevier's website. The key findings of this study include that NPN analysis using tannic acid to precipitate protein, or using a molecular mass cut-off filtration technique (both simple techniques available in food analysis laboratories) are suitable for detecting adulteration of milk powders with a variety of nitrogenous compounds.

"It is pleasing to see that the recently established collaboration between IDF and USP is so quickly delivering outcomes benefitting the dairy sector", says Dr Evers. "To further investigate the potential of this method, the IDF Standing Committee on Analytical Methods for Composition is currently conducting studies to determine whether the method can also be applied to liquid milk."

Dr. Harrie van den Bijgaart (Chair, IDF Methods Standards Steering Group) anticipates that ultimately the existing IDF/ISO joint standard for NPN determination may be amended enabling simultaneous measurement of the NPN content and screening for EMA of raw milk and processed milk products, *"The partnership with USP is delivering important benefits to the global dairy sector by developing and harmonizing analytical methods to safeguard the integrity of milk and milk products."*



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Short communication

Non-protein nitrogen determination: A screening tool for nitrogenous compound adulteration of milk powder

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ABSTRACT

Kjeldahl and Dumas crude protein measurement methodologies do not distinguish between nitrogen native to milk and nitrogen in low molecular mass, nitrogen-rich adulterants. Measuring the non-protein nitrogen (NPN) content is one possible means of closing this loophole. Four methods were considered, with three selected for further research and validation: protein precipitation using trichloroacetic acid, protein precipitation using tannic acid, and molecular mass cut-off filtration. Kjeldahl assay was used on the supernatant or filtrate for all three methods. An NPN reference concentration range was established using 15 milk powder samples. This was followed by spiking experiments using seven low-molecular-weight, nitrogen-rich adulterants. Tannic acid precipitation and molecular mass cut-off filtration, both simple techniques available for routine use in food analysis laboratories, proved to be suitable for detecting the adulteration of milk powders with a variety of nitrogenous contaminants. NPN concentrations of >0.34% in milk powders are suspected to result from adulteration.

TWELVE NEW WORK ITEMS APPROVED FOR THE IDF STANDING COMMITTEES

The IDF National Committees have approved twelve new work items (NWI) for the IDF Standing Committees.

Two priority NWIs have been identified. In the first one, the SCAHW will produce an *IDF Guide to good animal welfare practices in dairy production*. The aim is to collect all the strategies used in national and local levels, and to review and update the previous IDF Guide with the latest scientific, technological and managerial development in a version 2.0 to be published in 2018. This new IDF Guide will be used to promote common interpretation of OIE/ISO standards in the dairy industry. The SCNH and SCENV will be creating an *IDF Nutrition and Sustainability Information Hub.* It is acknowledged that it is challenging to define healthy and sustainable diets, and there have been mixed information and misconceptions about this topic. In the new work, the AT Members will compile initiatives done in this area, relevant communication material, and communication proof points on available documents for IDF Members and IDF National Bodies.

Ten NWIs are proposed on the analytical area (SCAMC, SCHMM, SCAMPAI, SCSA, SCAMAC). Of these, five aim at revising ISO/IDF standards, one aims at IDF leading the revision of the dairy component of an ISO standard for microbiology, two aim at providing guidance on the use of currently existing standards, and the two last ones are methods entering the standardization process. A new standard will be developed for a non-proprietary fluorometric method for alkaline phosphatase determination. The aim is to standardize an open method for alkaline phosphatase in milk and milk products to provide alternative fluorimetric detection entirely independent on the supplier and easily applicable in practical processes with standard laboratory equipment. The second new standard will deal with quantification of individual proteins in milk and milk products. The knowledge of individual protein composition is becoming increasingly important for the assessment of the compositional and nutritional value of milk, human health and cheese technology purposes. Using two different liquid chromatographic methods coupled to tandem-mass spectrometry, this standard will provide guidelines for the quantification of individual proteins in milk and milk products.

DR PETER PARODI IS AWARDED POSTHUMOUS ORDER OF AUSTRALIA

Dr Parodi, the dairy nutrition research scientist and biochemist, was awarded last month an Order of Australia for his over 63-year contribution to the dairy industry and to science. Dr. Parodi was the man who helped change the way the world thought about milk. His pioneering research into the milk fat led to the first identification of rumenic acid, a conjugated linoleic acid (CLA). Based on his extensive knowledge of fatty acid biochemistry and metabolism, Parodi predicted that in humans, vaccenic acid, which is also a component present in milk fat, could act as a precursor to make rumenic acid. His scientific publications lead to today's recognition of the benefits of dairy foods for human health. He wrote many reviews looking beyond saturated fat, to the numerous other nutrients present in dairy foods, considering the overall effect of dairy foods rather than just the effect of the saturated fat they contain.

He was a recipient of the dairy industry's most prestigious awards, both nationally and internationally, including the IDF award for his lifetime contribution to dairy science in 2007.

IDF EVENTS

We're excited to announce the launch of the IDFWDS2017 website!

Our aim with this website is to provide our visitors with clear, easily accessible information on the IDF World Dairy Summit 2017. We will regularly be expanding our online content, to bring you updated information on the programme, social events, and much more

Start exploring

- Learn more about the conference theme: *Making a difference with Dairy*
- Review the latest program at a glance
- Get to know more about Belfast, the host city

Check the website regularly for the latest conference news including the launch of conference registration in late March!

Online registration for the IDF/ISO Analytical Week 2017 is now available!

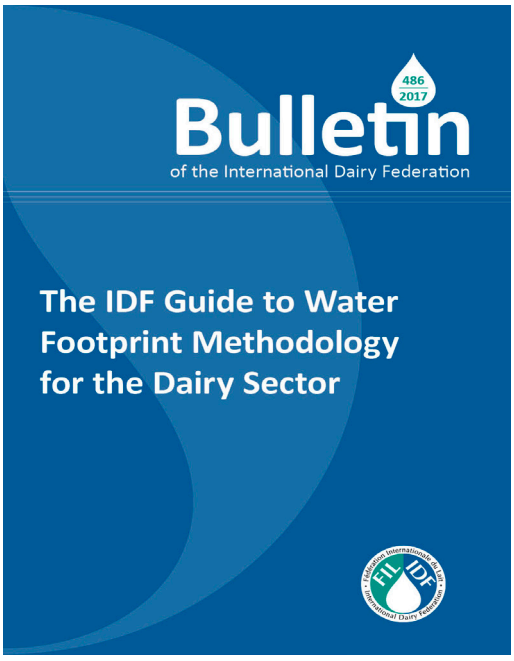
Are you planning to join the IDF/ISO Analytical Week 2017, 8 – 12 May in Madison, Wisconsin, US? Then you should not miss the early bird registration!

The IDF/ISO Symposium on the New Approaches to the Safety, Quality and Performance Triangle will highlight the analytical week. Renowned experts from outside the dairy industry will stimulate new ideas, address food safety challenges and opportunities and highlight technologies in cutting edge endeavors to balance the triangle of Safety, Quality and Performance.

Participants can also enjoy the exhibition of analytical providers (8-10 May) as well as the Technical Tour to Covance on 10 May. Members and announced observers from ISO and IDF are welcome to join the business meetings with a full registration package.

Participants should make their own hotel reservation through the website to receive the special conference rate. We recommended you to hurry as May is a busy time for visitors in Madison.

IDF PUBLICATIONS



IDF Guide to Water Footprint Methodology for the Dairy Sector

IDF has released a new guide to measure water footprint for the dairy sector. The guide, which provides a methodology for the calculation, is part of IDF's commitment on efficient management of water resources to ensure food security and sustainability of the dairy and livestock sectors, and a better future for the next generations.


Scientific excellence • Industry applicability • Strategic networking • Global influence

The importance of salt in the manufacturing and ripening of cheese

IDF Factsheet 001 – March 2017

Walter Bisig* (CH)

Introduction

Salt contains the two elements sodium (Na) and chlorine (Cl), which both fulfil important functions in the human body. Sodium plays a role in the regulation of our water balance and the osmotic pressure in the cells, in the acid-base balance and in the control of muscles and nerves. The daily needs of sodium and chlorine for adults are 550 mg Na and 830 mg Cl, which is 1.5 g salt. The actual consumption of salt varies between countries in the rage of 6 – 12 g/day. As high salt consumption is a risk factor for high blood pressure and therefore coronary heart diseases, the WHO recommends a reduction in salt consumption to 5 g/day. Many countries have programs in place to reduce the salt content in people's diets, with stepwise reduction targets. Cheeses have a salt content between 0.4 and about 4 g/100 g, specific to the variety.

The contribution of cheese to the salt content in people's diets depends largely on the composition of the diet, and the salt content of the cheese. In Switzerland with a high cheese consumption of about 21.5 kg/capita per year, cheese contributes 7.5% to salt intake, in Germany with a consumption of 24.6 kg/capita per year it is 10%. Many countries have lower annual consumptions of cheese, e.g. 12 and 15.5 kg/capita in the UK and the USA respectively or 3.7 kg/capita in Brazil. This translates to lower contributions to people's salt intake.

Primary functions of salt in cheese

Salt has several functions in cheese. Rind formation for brine-salted cheeses, inhibition of growth of microorganisms, ripening, texture, water binding, aroma and taste are modulated by salt. It is an important contributing factor for food safety and for the suppression of spoilage bacteria or variety-specific undesired bacteria in cheese. Salt is an important tool for the cheesemaker to influence the ripening process towards the desired variety and quality. Therefore, different cheese varieties need different salt contents, from 0.4% for Emmentaler up to 4 or even 5% for blue cheeses. To obtain the optimal salt content, well defined salting conditions are necessary. For brine-salted, smear-ripened cheeses, the loaf size, water and fat content, brining time, brine concentration, temperature, pH, flow of the brine and salt addition in the smear water are important factors. For curd-salted cheeses, salt loss through whey has to be known and stable to get a defined salt content.

Salt promotes the dewatering and rind formation in brine-salted cheeses. Through its influence on the growth of microorganisms and the activity of enzymes such as rennet and microbial enzymes, it modulates cheese ripening. Starter bacteria are more sensitive to salt than non-starter lactic acid bacteria (NSLAB). Most Lactococci are inhibited from 4% salt-in-moisture while *Streptococcus thermophilus* is inhibited at 2.3%. Pediococci as NSLAB are only inhibited at 10 – 12% salt, so they still grow during ripening in salted cheese. Salt sensitivity is strain-specific. Overall, salt slows down proteolysis, as shown in a Gruyère model cheese. Salt-in-moisture concentrations of 2 – 6% increase the swelling and the solubility of casein. This promotes the fusion of the cheese curd, especially for cheeses with a low pH. It also prevents the separation of serum e.g. in Mozzarella, and reduces free-oil formation during the ripening of Mozzarella. Through the reduction of protein-protein interactions, salt increases the meltability of cheese, e.g. for Raclette cheese and Mozzarella.

Factsheet - The importance of salt in the manufacturing and ripening of cheese

Salt has been used for thousands of years to preserve foods by inhibiting the growth of undesirable microorganisms or for technological properties and last but not least to enhance flavour. Therefore, understanding the role of salt in the cheese making process is crucial when sodium reduction strategies are sought. This fact sheet will provide you with an introduction of the importance of salt cheese. More detailed information can be found in the 2014 IDF Special Issue on this topic.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Reasons why galactose is good for you

IDF Factsheet 003 – March 2017

Key facts

- Galactose is a vital structural element and serves as a key source of energy, especially in neonates [2,3,4].
- In normal conditions, galactose is quickly and almost completely metabolized to glucose in the liver.
- Galactose serves as a substrate for cerebrosides, gangliosides and mucoproteins in the brain and nervous system, which supports its neural and immunological role [2,3,6,7].
- Sources of galactose are not limited only to lactose-containing foods. Galactose is also present in legumes and some fruits and vegetables [3,4,5,8].
- The human body has the ability to produce galactose endogenously [2,3].
- Evidence shows that galactose in its oligosaccharide bound form has prebiotic properties [3,9].
- Galactose has been shown to have therapeutic potential, especially in disorders affecting brain function such as Alzheimer's [10,11] as well as nephrotic syndrome [12].
- Free galactose is detrimental only in the case of Galactosemia, a genetic disorder that prevents the processing of galactose, thereby leading to toxic levels [10, 21].

What is galactose?

Galactose is a simple sugar that is normally transformed in the liver before being used up as energy. This sugar is quite abundant in human diets and helps in a number of functions.

Galactose sources

- The main dietary source of galactose is lactose from milk and yogurt, which is digested to galactose and glucose
- Foods containing small amounts of free galactose include low-lactose or lactose-free milk, certain yogurts, cheeses, creams, ice creams and other foods artificially sweetened with galactose. Plain natural foods (fruits, vegetables, nuts, grains, fresh meats, eggs, milk) usually contain less than 0.3 g galactose per serving

Essential source of energy

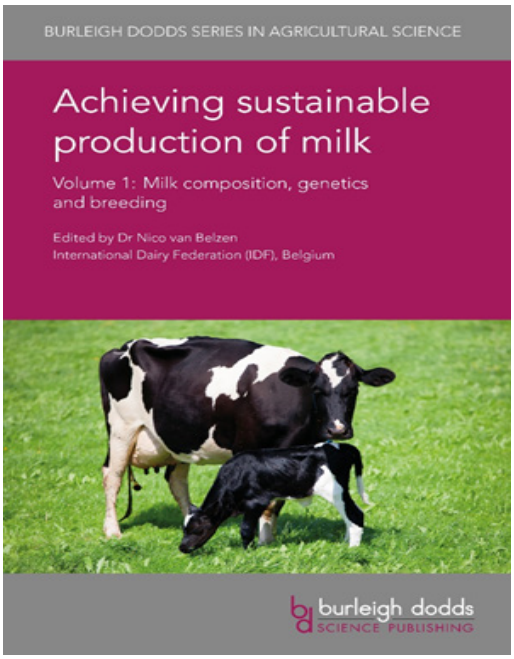
Because galactose is a precursor to glucose production, it is an important energy-providing nutrient. This is essential during the early developmental stages of mammalian infants, when they are exclusively dependent on milk [9].

Therapeutic role of galactose

Galactose has recently been reported to be beneficial in the management of a number of diseases, particularly those affecting brain function [2]. The conversion of galactose to amino acids in the brain requires ammonia equivalents as a substrate. Galactose plays a potentially useful role in removing these neurotoxic compounds from the brain in patients suffering from hepatic encephalopathy or Alzheimer's disease [13]. Dementia is associated with dysfunction of the insulin-receptor system, followed by decreased glucose transport to and subsequent metabolism in brain cells. As galactose is transported to the brain, it can act as an alternative source of energy owing to its metabolism to glucose [14]. Daily oral galactose administration has also been shown to be a promising new, non-toxic therapy for the treatment of resistant nephrotic syndrome [15].

Factsheet - Why galactose is good for you

Galactose is a simple sugar present in the human diet, with dairy products being the most common source. It is crucial in human metabolism, with an established role in energy delivery. This fact sheet provides some key evidence why galactose is good for you. For IDF members a more technically detailed document was drafted, this can be found on the IDF intranet.



Achieving sustainable production of milk

Burleigh Dodds Science Publishing has produced a three-volume book series on dairy that contains contributions from IDF-affiliated authors and others:

- Achieving sustainable production of milk Volume 1 edited by Dr Nico van Belzen, International Dairy Federation, Belgium
- Achieving sustainable production of milk Volume 2 edited by Dr Nico van Belzen, International Dairy Federation, Belgium (available shortly)
- Achieving sustainable production of milk Volume 3 edited by Emeritus Prof John Webster, University of Bristol, UK (available shortly)

Two freely available chapter excerpts can be found at:

- Pathogens affecting raw milk from cows - Claire Verraes, Sabine Cardoen and Wendie Claeys, Federal Agency for the Safety of the Food Chain, and Lieve Herman, Institute for Agricultural and Fisheries Research, Belgium
- Improving smallholder dairy farming in tropical Asia - John Moran, Profitable Dairy Systems, Australia

BDS Publishing also offers one whole chapter freely available to you when you sign up to their emailing list at the Burleigh Dodds website.

"As demand for dairy products continues to grow, and with sustainable nutrition and food security at the top of the global agenda, it is imperative that we develop and share the latest knowledge, practices and issues relating to sustainability of dairy chains. With a veritable Who's Who of dairy expertise and an expert editor in IDF Director General Nico van Belzen, achieving sustainable production of milk will go a long way to achieving this." *Dr Jeremy Hill, past-President IDF and Chief Technology Officer at Fonterra Co-operative Group Ltd.*

Order your own copy(s) with a special 20% discount online in the BDS Publishing Bookshop (quote promotion code: IDF20) or you can use the Librarian Recommendation form.

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