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## **FROM TOTAL PROTEIN TO TRUE PROTEIN: OVERVIEW AND IMPACT**

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As of September 1, 2018, the Canadian dairy industry will be measuring protein in terms of true protein instead of total (crude) protein. The true protein test will be used to determine processor billing and producer payments.

This change will result in a protein test decrease of approximately 5.5%. However, the difference will be recaptured in the lactose and other solids (LOS) test. On average, this change will therefore be revenue-neutral on a national basis.

### **Background**

The current protein test used for billing and payment measures the total (or crude) protein content in milk. The difference between total protein and true protein is that the former includes non-protein nitrogen (NPN). On average, NPN accounts for 0.19 kilograms per hectolitre of milk, or roughly 5.5% of the protein test.

True protein is made up of casein and whey protein, which have high nutritional and economic value and contribute to cheese yields. On the other hand, NPN is made up of urea, ammonia, and other small non-protein nitrogen molecules that do not play a similarly practical role in dairy processing. These NPN would be more appropriately measured as Other Solids. It therefore more accurately reflects the amount of protein in milk.

When the producer payment system based on milk components was implemented in 1992, the "total protein" test method was the world standard for dairy; thus, it was adopted in Canada, as well. However, several countries have changed to true protein testing over the years (e.g., true protein has been used as the official test for payment in the United States since 2000).

### **Why are the tests changing?**

With improvements in processing technology and the introduction of the ingredient class in Canada, it became essential for both producers and processors to determine the exact quantities of protein in milk. Exact measurement will ensure accurate monitoring of liquid ingredients, and thus, fair auditing and invoicing procedures.

When milk protein concentrates (MPC) are manufactured, NPN is filtered out. Given that true protein does not count NPN, the filtration losses no longer affect the measure of protein. True protein from milk is retained in MPC. This resolves the issue over how protein losses are accounted for and paid for between producers and processors.

**For more information** please contact Deb (306-721-9486) or Doug (306-721-9485) at the SaskMilk office. If you are interested in more technical information, an additional paper is attached as Schedule 'A'.

# ***Appendix 'A'***

## **Changing from Total Protein to True Protein**

*Thank you to Les Producteurs de lait du Québec (PLQ) for allowing us to reprint their article. Authors: Jean Vigneault, Director, Communications and Union Life, PLQ, with the collaboration of Rachid Kouaouci, Assistant Director, Reference Laboratory, and Mario Séguin, Dairy Production Expert – Milk Recording and Data Management, Valacta*

**As of September 1st, dairy farmers across Canada will observe a decrease in milk's protein composition levels. This is due to the introduction of a testing method that will measure the exact casein and whey protein content of milk and exclude non-protein nitrogen (NPN) from the results. This change will be revenue neutral on a national basis and will be implemented across Canada.**

### **True protein versus total protein: what's the difference?**

Caseins and whey protein make up what is generally termed true protein. These proteins have high nutritional value, contribute to cheese yield, and provide real biological and economic value to the industry.

Electronic analyzers based on infrared spectrometry are used world-wide to measure protein content on a large scale. This technique allows for the rapid processing of large numbers of protein reference samples accurately, efficiently and at low cost. So far, the spectrometers have been calibrated using samples composed of protein based on the total nitrogen<sup>1</sup> content of milk. Historically, the term "milk protein" meant total nitrogen. However, "total nitrogen" contains a small amount of nitrogen from non-protein sources, or about 5% of the total. These other sources are called non-protein nitrogen because they are not part of the protein structure. Basically, they are urea, ammonia and other small nitrogen molecules that do not play a functional role in milk processing. The "true protein" in milk is the total nitrogen minus the non-protein nitrogen. The scientific community uses the term "protein nitrogen" to designate true protein. The total nitrogen measurement therefore slightly over-estimates by 0.19% the measurement of the actual quantity of true protein in milk.

### **Why make this change now?**

Technically, measurement of the true protein in milk has been possible for many years. Indeed, the infrared spectrometers use a wave length that is only sensitive to the peptide bonds in protein. These instruments could have been calibrated on a protein nitrogen basis. However, in 1992, when the producer payment system based on milk components was implemented, the "total protein" test method was the world standard for milk, so it was adopted here as well.

Several countries, including France, Australia and the United States implemented the true protein testing method a long time ago. In Canada, industry has only recently recognized the benefit of using the true protein content. With the introduction of the ingredient class in Canada, it became essential for both

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<sup>1</sup> The chemical method determines the total nitrogen content of the samples. The reading obtained is converted into protein by multiplying the total nitrogen content by a factor of 6.38.

producers and processors to determine the exact quantities of protein in milk to ensure monitoring of liquid ingredients and thus fair auditing and invoicing procedures.

**Will the lower protein content affect producer revenues?**

The change will not have any economic impact for producers. The protein level will decrease, since the casein and whey-protein quantities will be measured, but the components associated with non-protein nitrogen will be taken into account with the lactose and other solids content. The quantity of total solids will remain the same. The value of protein will be increased slightly but that of lactose and other solids will be reduced so that the overall effect will be revenue-neutral on a national basis.

**Will the change affect producers differently?**

The quantity of protein in cows' milk depends on feeding practices and, to a lesser extent, on breeding programs and genetics. The new testing method will determine the protein concentration very precisely. Up to now, this component accounted for most of the test result, i.e.  $\pm 95\%$  of what was called "total protein." The calibration technique using the total nitrogen measure resulted in an average non-protein nitrogen value of 0.19%. By calibrating the instruments to determine the true value of protein, each sample will continue to reflect the specifics of each producer and the milk from their herd.

**How will this change impact production statistics and the formulation of rations?**

Composition results will continue to be expressed on a total protein basis. You may compare your payment composition results with your cows' historical composition results by adding 0.19 kg to the protein composition results for your milk payment. This amount reflects the non-protein nitrogen content. It can also be used to formulate rations, if need be, and for production statements by the Milk Recording Section. More specific test results will contribute to more equitable payment of protein content in milk for both producers and processors.

**Summary**

- ✓ **As of September 1, 2018, composition results will be expressed in terms of true protein (casein + whey protein).**
- ✓ **Test results based on true protein are slightly lower because they do not consider non-protein nitrogen components (urea, ammoniac and other nitrogen molecules).**
- ✓ **Test results of lactose and other solids will be slightly higher to account for non-protein nitrogen components.**
- ✓ **The impact will be revenue-neutral. The price of protein will be increased to compensate for the decrease in quantity. The value of lactose and solids-non-fat will be reduced to offset the addition of non-protein nitrogen components.**
- ✓ **To compare results with previous compositions or for formulating rations, add 0.19 to the new protein concentration result.**