

Popular Science Summary

Milk contains different proteins that are important for making dairy products. The amounts of different types of proteins present in milk can affect how well milk coagulates and therefore affect how efficiently cheese can be produced. Dairy industries are in search of more rapid and reliable methods to analyze milk proteins. However, many current laboratory techniques are expensive, require highly specialized equipment and can take a long time to analyse.

This project investigated whether microfluidic chip electrophoresis could be used to analyze milk proteins as a new protein analysis method. The method was performed using an Agilent 2100 Bioanalyzer, an instrument that separates proteins according to their weight and produces a protein profile within a short time. Milk samples were collected from Swedish dairy farms and silos were analysed and compared with results from LC-HRMS, a common advanced protein analysis method. The results showed that the Bioanalyzer could successfully detect the major milk proteins and generate repeatable protein profiles while requiring only small sample volumes and limited preparation. The method was much faster than advanced mass spectrometry techniques and therefore has potential for screening large numbers of milk samples. However, it was less precise when distinguishing proteins that have very similar structures or molecular weights.

The study also explored whether differences in protein composition were related to milk coagulation properties that are important for cheese production. Some relationships were observed, particularly for κ -casein, a protein known to play an important role in curd formation. Nevertheless, protein composition alone could not fully explain differences in coagulation behaviour between milk samples.

In conclusion, the Agilent 2100 Bioanalyzer is not yet a replacement for advanced analytical methods such as LC-HRMS. However, it shows strong potential as a rapid and practical tool for routine milk protein screening in the dairy industry where fast results and high sample throughput are important.