WHY IT MATTERS AND HOW IT'S DONE

Testing for rbST *in milk*



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What is rbST?

Recombinant bovine somatotropin (rbST), also known as recombinant bovine growth hormone (rbGH), is a synthetic version of a protein hormone naturally produced in cattle. Since its commercial introduction in the 1990s, rbST has been used in parts of the dairy industry to increase milk yield by improving lactation persistency and reducing the natural decline in milk production after peak lactation. Although its use is permitted in a small number of countries, including the United States, it is prohibited in the European Union, Canada and several other regions. These restrictions are largely based on concerns about animal welfare and the uncertainty surrounding the long-term implications of its use. As a result, differences in international regulations have made rbST an important issue for dairy producers, processors, exporters and retailers, particularly those required to verify and support "rbST-free" claims on their products.

Why testing matters

Consumer interest in how food is produced has grown steadily over the past decade. As a result, production-related claims such as "rbST-free", "grass-fed" and "free-range" have become commercially valuable within the food industry. Today, these labels represent more than simple marketing claims. They influence what consumers buy, allow producers to command premium prices, and must be supported by scientific evidence. For dairy producers and exporters, the ability to substantiate these claims is therefore essential. Without reliable analytical methods to verify them, producers risk reputational damage, regulatory action and losing access to markets where production standards are strictly enforced.

Demonstrating that milk is free from rbST is, however, particularly challenging. Unlike many chemical residues or contaminants that can be detected directly, rbST closely resembles the naturally occurring bovine growth hormone produced by cattle. In addition, hormone concentrations in milk vary with factors such as stage of lactation, animal physiology and management practices. Consequently, analytical methods must not only be highly sensitive but also selective to distinguish between the recombinant and endogenous bovine somatotropin.

Detection of rbST: From ELISA to LC-MS/MS

Enzyme-linked immunosorbent assay (ELISA) has long been the established method for rbST screening. It is fast, inexpensive and well suited to high-throughput testing, but because it relies on antibody recognition, cross-reactivity with endogenous bovine somatotropin (bST) can compromise specificity, particularly when the objective is to distinguish the recombinant hormone from its naturally occurring counterpart. Liquid chromatography–tandem mass spectrometry (LC-MS/MS), although generally more time-consuming and costly, has increasingly become the preferred confirmatory

AT A GLANCE

Screening and confirmation

ELISA

SCREENING

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LC-MS/MS

CONFIRMATION

- More time-consuming and costly
- Targets characteristic peptides or biomarkers such as IGF-1
- Can distinguish rbST from endogenous bST with a high degree of specificity

technique. Because bST is a relatively large protein hormone, direct analysis is challenging, and most LC-MS/MS methods instead target characteristic peptides generated by enzymatic digestion or indirect biomarkers such as insulin-like growth factor 1 (IGF-1). By measuring analytes according to their mass-to-charge ratios and characteristic fragmentation patterns, LC-MS/MS offers a high degree of analytical specificity. When recombinant-specific peptides are monitored, the technique can distinguish rbST from endogenous bST with a level of confidence that is difficult to achieve using immunoassays alone. In practice, many laboratories combine the strengths of both approaches. ELISA provides a rapid and cost-effective means of screening large numbers of samples, while LC-MS/MS provides the analytical specificity required to confirm positive or suspicious findings.

Supporting "rbST-free" claims

Reliable rbST testing is about more than verifying individual batches of milk. As production claims such as "rbST-free" come under greater regulatory oversight, businesses are increasingly expected to support these claims with robust analytical evidence rather than relying solely on supplier declarations or internal quality assurance records. As a result, analytical testing is no longer just part of routine quality control; it has become an important tool for demonstrating compliance, protecting brands and maintaining consumer confidence.

South Africa provides a useful example of this changing landscape. Marketed locally as Lactatropin, rbST has been approved for veterinary use in South Africa since the late 1980s – well before many of today's export markets introduced restrictions on its use. Although rbST remains registered for use in South Africa, many dairy products are marketed as "rbST-free", reflecting consumer preferences as well as the expectations of retailers and export markets. As demand for transparent and verifiable production claims continues to grow, the ability to support these claims with reliable analytical evidence is becoming increasingly important.

For laboratories and dairy processors, this means that testing methods must be accurate, reliable and well documented. Method validation, sample traceability and consistent analytical performance all help to ensure that production claims can be confidently supported if they are questioned by retailers, regulators, or consumers.

Looking ahead

Although the use of rbST is restricted or prohibited in many parts of the world, the need to verify "rbST-free" claims is likely to increase as consumers, retailers and regulators place greater emphasis on transparency in food production. This creates a growing demand for analytical methods that can reliably distinguish between milk from treated and untreated animals.

Continued advances in LC-MS/MS, including improvements in sensitivity, throughput and data analysis, are making rbST testing more robust and accessible. As analytical capabilities continue to improve, laboratories will be better equipped to generate the reliable evidence needed to substantiate production claims and meet regulatory requirements.

The future of rbST testing will depend not only on advances in analytical technology, but also on the growing demand for transparent and verifiable food production practices. While ELISA will continue to play an important role in routine screening, LC-MS/MS is expected to remain the benchmark for confirmatory analysis. Together, these complementary approaches provide the dairy industry with a practical way to verify "rbST-free" claims, supporting regulatory compliance, facilitating trade and reinforcing consumer confidence. ■

References are available.



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