

SNAPSHOT

Total volatile basic nitrogen in meat products: occurrence, method of determination and use as a freshness indicator

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Project Description

This project aimed to review the scientific literature on the use and application of TVB-N and outline its applicability for red meat. In addition, it developed recommendations for a research plan to underpin Australian exports of beef meat with respect to robust indicators of freshness.

Project Content

Indicators of freshness are important for the marketing of red meat, in particular “fresh chilled” red meat destined for export markets where long storage periods are often applied. These indicators can be colorimetric, microbiological, chemical or sensorial and each provides important information, but they do not all explain the variation in each, other and they require different approaches for assessment, some of which are resource demanding. One such approach that has been adopted by Chinese authorities is to measure total volatile basic nitrogen (TVB-N).

Because Australian beef and sheep meat industries have an export focus, it was deemed pertinent to establish the basis of the application of TVB-N and its usefulness for indicating the “freshness” of such meat, on the basis that it is possible that this test could in the future be applied to determine the suitability of Australian red meat. The objective was to be prepared for such a development, but also to better understand the worth of the test but identifying paucities in the literature in relation to the application of the test.

Project Outcome

The review has highlighted that the literature has many reports of studies across species where the threshold of acceptability based on TVB-N differs. Guidelines that propose TVB-N limits do not reference the scientific basis – but, researchers have interpreted their results against these limits. Thus, often policy is driving the

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science and these facts will be important should policies be adopted to enforce the measurement of TVB-N on imported Australian beef and sheep meat.

It is clear that TVB-N increases with storage of meat in line with other markers of spoilage, but the increases are not always consistent and although many studies have used TVB-N as an indicator of spoilage, there has been reduced focus on determining the interrelatedness of different indicators of “freshness”. In many studies this reflects also a deficiency in experimental design and interpretation of the data. Since TVB-N does not reflect the generation of nitrogenous compounds determining the contribution of bacterial growth vs proteolytic degradation has remained unresolved. There is evidence however that if preservation methodologies are applied to meat and that both bacterial growth and proteolysis are inhibited that lower levels of TVB-N will be detected.

In terms of beef there is no specific threshold to interpret TVB-N results against, and when compared against existing recommendations there is little relationship with other spoilage thresholds based for lipid oxidation, microbiology, colour, or sensorial traits like odour. It is of relevance that the proliferation of some types of bacteria (Enterobacteriaceae and Pseudomonas) exhibits a stronger relationship to TVB-N increases than other types of bacteria specifically aerobic types and as a consequence TVC thresholds maybe breached, but with non-harmful bacteria. This area requires further elucidation and linking this with spectroscopy technologies that show potential for non-invasive measurement of chemical changes reflected by TVB-N would be a sound approach.

Benefit for Industry

The knowledge gaps identified in this review will provide industry the opportunity to premeditate, prepare and apply evidence-based responses to potential hurdles to market access based on TVB-N.

