

# Food testing: Beyond the lab

Drawing on their scientific experience at Innovative Research Solutions, Scientists, Anishka le Roux and Dr. Timo Tait highlight that food analysis involves complex and rigorous processes—far more intricate than the simplified portrayals often seen on television.

When thinking about food testing, people often imagine a scene straight out of CSI. A scientist, appropriately clad in an immaculate white coat and safety goggles, inserts a sample into a sophisticated looking machine and presses a few buttons. Moments later a result is neatly printed out and the whodunnit is solved! Yet, whether in high stakes forensics or maintenance of critical food safety standards, the reality of sample analysis looks quite a bit different. The process can be complex. Careful consideration must be given to the nature of the sample type, test specific preparation methods, and relevant controls to ensure accurate and reliable results. Without the correct approach, even the most sophisticated test can produce misleading results.



## THE VITAMIN B12 CASE STUDY

Rising demand for alternative diets, food allergies, affordability, and industrial advancements, require critical control of food safety and quality. Yet, although many machines exist to aid in food component analysis, a lot of science happens behind the scenes, even in rapid methods of detection.

For instance, consider cobalamin, a.k.a. vitamin B12. With an adult RDA of 2.4 mcg per day, this essential nutrient plays a crucial role in red blood cell formation, brain function and DNA synthesis. It is found primarily in animal-based foods such as meat, poultry, eggs, and seafood. If you are vegan, you may obtain B12 from supplements.

Several processes are at play to avail B12 to the body and the biochemistry is complex. Yet in brief, protein bound B12 is released in the stomach through the action of hydrochloric acid and pepsin. It then binds to protein called haptocorrin. After further enzymatic processing in the small intestine it finally attaches to intrinsic factor which facilitates its absorption in the ileum to the bloodstream where it can interact with the rest of the body. Untreated, disruption of this process by dietary habits, medical conditions, or medications can lead to B12 deficiency, resulting in fatigue, anaemia, and irreversible neurological damage.

## THE ANALYTICAL CHALLENGE

Given its importance, foods are frequently fortified with B12. However, verification of B12 concentration in food products isn't a one-size-fits-all procedure. Numerous analytical techniques exist, each with its own advantages and limitations, and all influenced to varying degrees by budget, processing time, sample complexity and available infrastructure, to name a few.

The microbiological assay is a common technique based on the principle of measuring the growth of a vitamin B12 auxotrophic microorganism like *Lactobacillus leichmanni*. By comparison of its growth in relation to a calibrated reference curve, one can estimate the vitamin B12 content in test samples. While this method is highly sensitive and relatively cost effective, it is time-consuming and may not distinguish between active and inactive vitamin B12 analogues, leading to potential inaccuracies in complex food matrices.

Another widely used approach is high-performance liquid chromatography (HPLC), which separates and quantifies vitamin B12 molecules based on their physical and chemical properties. HPLC is fast and offers high specificity, making it an excellent choice for analysing complex food products and distinguishing between different forms of B12. However, this method requires sophisticated

equipment, specialised sample preparation, and may be less sensitive at very low concentrations than the biological assay.

Several other laboratory techniques can be used to determine vitamin B content, with variations in complexity, cost, and sensitivity. The critical point is that no single test works best. The correct method depends on the analyte in question, the accuracy required and a balance between expedience and expenditure.

Enter the importance of sample preparation. An improperly prepared sample can lead to weak or misleading results, just like inadequate evidence collection can compromise an investigation. Sample type, processing steps, and potential interference from other food components all influence the test outcome. Without thorough preparation, all methods will fail to provide an accurate answer to your question.

Portrayals of sample analysis to solve puzzles on popular television shows should probably not take centre stage, yet it is prudent not to forget its importance in the process. It requires time, planning, expertise, and a deep understanding of the biochemical nature of food components and their interactions. The quality of the answer is only ever as good as the effort put into obtaining it.

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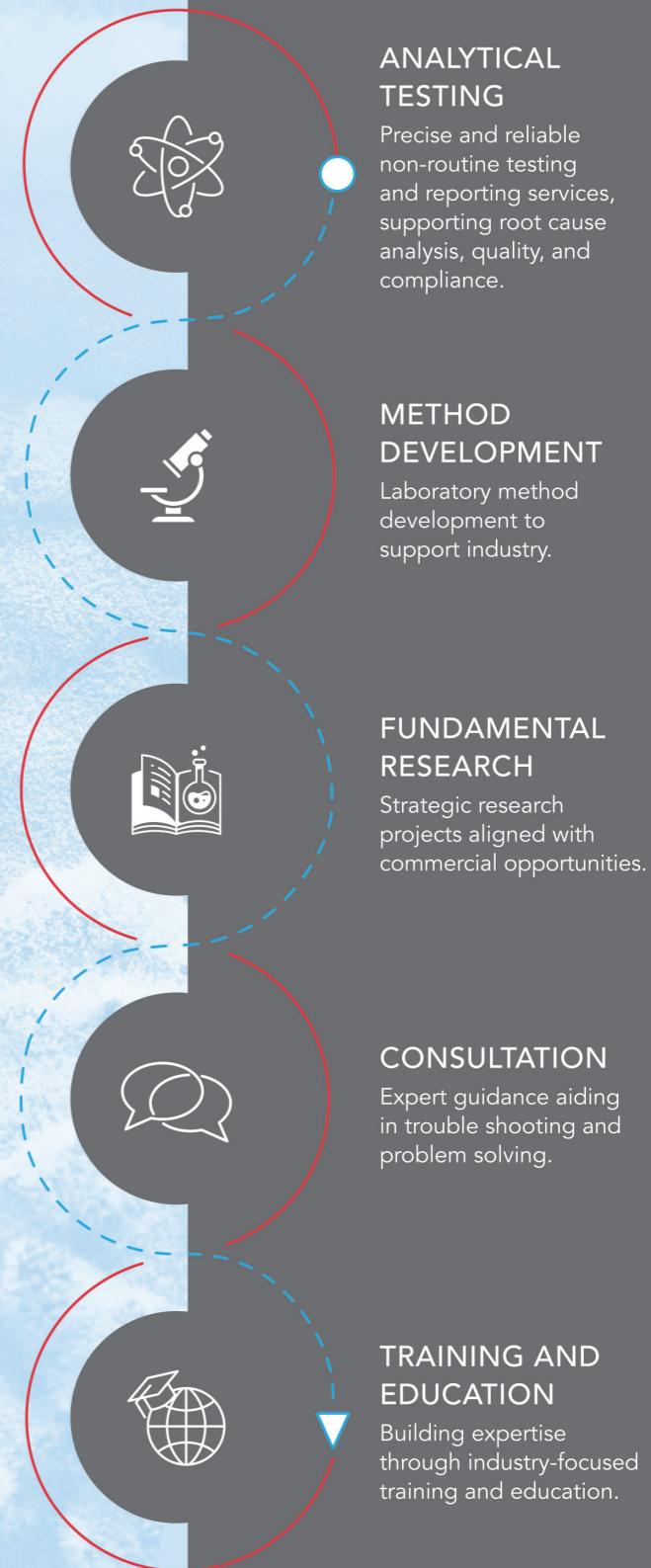
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