



# Allergen Test Kit Sensitivity and Scale

Throughout the past decade, the food industry has dramatically increased the analysis of products, ingredients, and surfaces for the presence of undeclared food allergens. To meet this demand, diagnostic test kit manufacturers have developed multiple types of test kits to provide allergen control tools for the food industry.

However, along with the proliferation of technology comes potential confusion as not all test manufacturers take the same approach to characterize their methods. One of the most complex aspects of allergen residue analysis is a lack of globally recognized standards for test kit manufacturers to calibrate their method against, unlike pathogenic bacteria, chemical contaminants, and drug residues, which have well recognized standards. Unfortunately, the material one uses to differentiate between allergens such as egg, peanut, or milk is a point of debate. Some people choose to use the specific protein considered to be the allergen (this is sometimes contested) such as peanut Ara h 1, while others choose to use a purified protein extract from a food and report on a scale of parts per million (ppm) protein. Lastly, many choose to use extracts of the food itself — reporting in a scale of total allergenic food.

## Which One is the Correct Approach?

There is no correct answer; however, it is critically important the kit user understand the scale with which they are reporting results. When developing the first test kits for food allergen detection in 1997, we, in collaboration with the Food Allergy Research and Resource Program (FARRP) at the University of Nebraska-Lincoln made the decision to report allergens in terms of ppm total allergenic food. NEOGEN and FARRP have remained consistent with this methodology. We believe ppm total allergenic food gives the test kit user the most practical information about the status of product or surface.

## Which Approach is More Sensitive?

Various scales of allergenic content have equivalent sensitivities when properly related to one another. Those who prefer to convert their results from ppm total allergenic food to ppm allergenic protein can do so based on average protein content of these foods, which is included in table 1. Remember, all tests are not created equal. This description of relative sensitivities assumes tests meet their manufacturers' performance claims. Scale is every bit as important as results in the determination of allergen residues.

**Table 1: Converting Veratox® Allergen Results to ppm Protein**

| USDA National Nutrient Database Release 28 |         |                                       |                         |   |   |
|--|---------|---------------------------------------|-------------------------|---|---|
| Food Type                                  | NDB No. | USDA Description                      | Average Protein Content | Limit of Quantification (LOQ) of Veratox Kit on a ppm Total Allergenic Food Scale | LOQ of Veratox Kit on a ppm Protein Scale |
| Almond                                     | 12061   | Nuts, almonds                         | 21.15%                  | 2.5 ppm almond  | 0.53 ppm protein                          |
| Casein                                     | 01091   | Milk, dry, nonfat, regular            | 36.16%                  | 2.5 ppm NFDM  | 0.90 ppm protein                          |
| Crustacean                                 | 15270   | Crustaceans, shrimp, raw (not frozen) | 20.10%                  | 2.5 ppm shrimp  | 0.50 ppm protein                          |
| Egg  | 01133   | Egg, whole, dried                     | 48.05%                  | 2.5 ppm egg   | 1.20 ppm protein                          |
| Hazelnut                                   | 12120   | Nuts, hazelnut or filberts            | 14.95%                  | 2.5 ppm hazelnut  | 0.37 ppm protein                          |
| Milk                                       | 01091   | Milk, dry, nonfat, regular            | 36.16%                  | 2.5 ppm NFDM  | 0.90 ppm protein                          |
| Mustard                                    | 02024   | Spices, mustard seed, ground          | 26.08%                  | 2.5 ppm mustard   | 0.65 ppm protein                          |
| Peanut                                     | 16087   | Peanuts, all types, raw               | 25.80%                  | 2.5 ppm peanut  | 0.65 ppm protein                          |
| Sesame                                     | 12024   | Sesame seed, whole, roasted, toasted  | 16.69%                  | 2.5 ppm sesame seed   | 0.42 ppm protein                          |
| Soy  | 16117   | Soy flour, defatted                   | 51.46%                  | 2.5 ppm soy flour   | 1.29 ppm protein                          |

Source: United States Department of Agriculture National Nutrient Database Release 28. (Varieties and cultivars can vary in protein content.)





Note: Higher sensitivity protocols are available upon request, and with a simple alteration to the sample extract preparation, sensitivities of Veratox kits can be increased significantly.

### How Do I Interpret Total Milk as Casein or Whey?

If conversion of total milk to casein is desired, one must take into account that non-fat dried milk (NFDM) contains 36.16% protein, 80% of which protein is casein. This means a 2.5 ppm Veratox for Total Milk is 0.724 ppm casein. With whey or  $\beta$ -lactoglobulin (BLG), 20% of the NFDM protein is whey. This means a 2.5 ppm total milk is 0.181 ppm whey.

| Target | NFDM Level | % Protein | % Target | Result           |
|--------|------------|-----------|----------|------------------|
| NFDM   | 2.5 ppm    | NA        | NA       | 2.5 ppm NFDM     |
| Casein | 2.5 ppm    | 36.16%    | 80%      | 0.724 ppm casein |
| Whey   | 2.5 ppm    | 36.16%    | 20%      | 0.181 ppm whey   |

### Why is Soy Unique?

Soy can be processed in various ways each affecting functionality and protein concentration. The adulterating material must be known in order to convert to protein accurately. As a general rule the following protein levels apply:

- Soy flour > 50% protein
- Soy protein concentrate > 65% protein
- Soy protein isolate > 90% protein

### Summary

The sensitivity of allergen detection tests is not just a function of the LOQ listed on the test's label, but also is based on the scale the system is calibrated against. It is vital users understand what the results from allergen tests truly represent to ensure the desired sensitivity is achieved.