

Rapid Protein Determination in Meat using Automated Dye Binding Technique: Collaborative Study

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Abstract

Ten laboratories participated in a collaborative study to determine the total crude protein in both raw and processed meat samples using an automated protein tagging and colorimetric technique. Meat products were prepared following the AOAC International Official Method 983.18 and analyzed using CEM Corporation's Sprint Rapid Protein Analyzer. Each sample was weighed and iTAG™, a dye that binds with the lysine, histidine, arginine, and the N-terminus of proteins commonly found in food products, was added. Upon completion of the test, the result was displayed as a percentage (g/100g) of protein present.

Ten blind duplicate samples were sent to each of the ten collaborating laboratories. Each of the samples was analyzed and the final results compared to the AOAC Standard Method of analysis for protein determination (981.10).

Sample Preparation

- ★ **Load Method** - Select the appropriate pre-programmed item for analysis (i.e. hotdog).
- ★ **Tare sample cup** - Place a sample cup on the attached balance and tare the balance. The balance communicates directly with the Sprint System, eliminating the need to write down additional weight information.
- ★ **Place the sample in the cup** - Using the balance, weigh out the appropriate amount of sample (included in the method information) into the sample cup. This information will be automatically sent to the Sprint.
- ★ **Place the sample cup and filter into the Sprint**
- ★ **Start** - Press the Start key to begin to add iTag, homogenize the sample, and perform the analysis. Upon completion, the test will stop automatically and the result will be displayed on the onboard screen.



Table 1. Results Crude Protein Determination by AOAC Official Method 981.10

Sample	Mean Protein, %	Standard Dev. Repeatability
Beef Raw	18.08	0.23
Pork, Raw	16.87	0.31
Chicken, Raw	21.76	0.10
Turkey, Raw	18.16	0.07
Beef Hot Dog	9.41	0.12
Dry Hard Salami	21.12	0.08
Semi-Dry Summer Sausage	18.41	0.23
Ham, Natural Juices	17.89	0.13
Pork Sausage, raw	15.78	0.34
Beef Jerky	38.65	0.08

Apparatus

- ★ **SPRINT Protein Analyzer**, with optional meat homogenizer: 0.2 mg protein sensitivity; range of 0.01 to 99.99% in liquids, solids, and slurries; 0.01% resolution; microprocessor computer control.

- ★ **Electronic balance**: 0.1 mg readability, serial cable for communication with Sprint Protein Analyzer.

- ★ **Sprint Pak**: Includes 54 sample cups with lids, 54 filters, optics cleaning solution, homogenizer cleaning solution, and dye-binding agent.

SPRINT System and SPRINT Paks are available from CEM Corp.



Interlaboratory study results for the determination of protein in meat and meat products

Sample	No. of Labs	Mean %	Standard Dev. Repeatability	Relative Standard Dev. Repeatability	Standard Dev. Reproducibility	Relative Standard Dev. Reproducibility	% Recovery
Beef Raw	10	18.06	0.23	1.26	0.30	1.65	97.67
Pork, Raw	10	17.26	0.24	1.38	0.35	2.04	102.01
Chicken, Raw	10	22.25	0.34	1.51	0.34	1.51	102.58
Turkey, Raw	10	18.03	0.16	0.91	0.29	1.60	99.17
Beef Hot Dog	10	9.80	0.17	1.71	0.25	2.55	104.03
Dry Hard Salami	10	21.84	0.38	1.77	0.38	1.77	101.03
Semi-Dry Summer Sausage	10	18.29	0.23	1.23	0.27	1.50	99.78
Ham, Natural Juices	10	17.21	0.25	1.48	0.49	2.86	99.36
Pork Sausage, raw	10	16.05	0.49	3.04	0.55	3.41	101.65
Beef Jerky	8	38.98	0.11	0.28	0.44	1.14	101.43

Conclusions

The data indicates that the protein content, as measured by the Sprint Rapid Protein Analyzer, compares favorably with the AOAC reference method. The use of iTAG as a dye binding agent, combined with the Sprint's automated process will deliver a reliable and reproducible protein determination for meat samples.

