N/Protein Determination in Meat
according to the Kjeldahl method

Reference: **AOAC 981.10** Crude Protein in Meat

Tested with **VELP Scientifica DKL Digestion units** and **VELP Scientifica UDK Distillation units**

Introduction

Würstel are typical sausages from Germany, Austria and South Tyrol.

They are mainly made from pork, but also meat such as beef, turkey and chicken.

During the process, the meat is finely grinded to a paste consistency and mixed with salt, spices, flavorings, additives and a high percentage of water, bagged and then cooked in steam ovens.

Meat proteins have an high nutritional value and also a technological importance: they affect the quality of the finished product, influencing some properties as well as water retention, emulsifying capability and the softness of the dough.

Protein Determination in meat according to the Kjeldahl method

Kjeldahl is nowadays the most used method for determining nitrogen and protein contents in foods and feeds thanks to the high level of precision and reproducibility and to its simple application.

The modern Kjeldahl method consists in a procedure of catalytically supported mineralization of organic material in a boiling mixture of sulfuric acid and sulfate salt at digestion temperatures higher than 400 °C. During the process the organically bonded nitrogen is converted into ammonium sulfate. Alkalizing the digested solution liberates ammonia which is quantitatively steam distilled and determined by titration.

Sample

Würstel - pork boiled sausages   Protein labeled content: 12 %

Sample Digestion

Start from some würstel, homogenize with a grinder for 40 sec. at 4000 rpm (1 mm particles size).

Weigh 1,000 g of sample into a nitrogen-free weighing boat (code CM0486000) and place it into a 250 ml test tube.

For each sample, add in the test tube:

- 2 catalyst tablet VST (code A00000277; 3.5 g K_2SO_4, 0.0035 g Se)
- 20 ml concentrated sulphuric acid (96-98%)
- 5 ml of hydrogen peroxide (30%)

Prepare some blanks with all chemicals and without sample.

Connect the Digestion Unit to the KS 100 Scrubber (code F307A0660) to neutralize the acid fumes created during digestion phase.

Digest the samples for 30 minutes at 250 °C, plus 30 minutes at 350 °C and 60 minutes at 420 °C according to the method "bacon, ham, hot dog, salami, sausage" (n° 13 on DKL 20).

Distillation and Titration

Let the test tubes to cool down to 50-60 °C.

Condition the UDK 159 unit by performing the Automatic Check up in Menu-System and a Wash down.

Distill the samples according to the following parameters (pre-defined method n° 13):

- H_2O (dilution water): 50 ml
- HCl (0.1N) as titrant solution
- NaOH (32 %): 70 ml
- Protein factor: 6.25
- H_3BO_3 (4 % with indicators): 30 ml

Distillation&Titration analysis time: from 4 minutes for one test.

Typical Results on Meat

The results are calculated as a percentage of nitrogen and percentage of protein.

Sample quantity (g)	Nitrogen %	Protein %
1.002	1.956	12.228
1.051	1.968	12.300
1.032	1.971	12.320
1.055	1.948	12.176
1.030	1.941	12.131
1.008	1.972	12.327
1.032	1.963	12.268
1.060	1.957	12.231
1.059	1.963	12.266
1.005	1.972	12.323
Average ± SD%	**1.961 ± 0.011**	**12.257 ± 0.066**
RSD% *	**0.540**	**0.539**

Protein Labeled Value: 12%

Protein Factor: 6.25

* RSD% = (Standard Deviation * 100) / Average

The complete procedure was verified by using 5 ml of glycine standard solution containing 28 mg of nitrogen, as reference substance.
The obtained recovery falls into the expected range: between 98% and 102%.

Conclusion

The obtained results are reliable and reproducible in accordance with the expected values, with a low relative standard deviation (RSD < 1%), that means high repeatability of the results.

Benefits of Kjeldahl method by using DKL Digestion units and UDK Distillation units are:
- High level of precision and reproducibility
- High productivity
- Worldwide official method
- Reliable and easy method
- Time saving
- Affordable equipment cost
- Moderate running costs

VELP solutions

Tested with	Other VELP solutions				
DKL 20	DKL 8	DKL 12	DK 6	DK 8	DK 20
UDK 159	UDK 129	UDK 139	UDK 149	UDK169	