AOAC Official Method 981.10
Crude Protein in Meat

Block Digestion Method
First Action 1981
Final Action 1983

A. Reagents

(**a**) *Catalyst tablets.*—Containing 3.5 g K_2SO_4 and 0.175 g HgO (Kjeltabs "MT" available from Tecator, Inc., 2875C Towerview Rd, Herndon, VA 22071, USA, or equivalent).

(**b**) *Boric acid solution.*—4%. Dissolve 4 g H_3BO_3 in H_2O containing 0.7 mL 0.1% alcoholic solution of methyl red and 1.0 mL 0.1% alcoholic solution of bromocresol green, and dilute to 100 mL with H_2O.

(**c**) *Sodium hydroxide–sodium thiosulfate solution.*—Dissolve 2000 g NaOH and 125 g $Na_2S_2O_3$ in H_2O and dilute to 5 L (ca 50 mL is used per analysis).

(**d**) *Hydrochloric acid standard solution.*—0.2M (936.15 [*see* A.1.06]).

(**e**) *Hydrogen peroxide*.—30–35%.

(**f**) *Sulfuric acid*.—Concentrated.

B. Apparatus

(**a**) *Digestion block and associated glassware.*—Tecator DS-6 or DS-20 (Tecator), or equivalent.

(**b**) *Distillation unit and associated glassware.*—Kjeltec 1003 (Tecator), or equivalent.

C. Determination

Accurately weigh ca 2 g well-ground and mixed test sample on 7 cm N-free filter paper (e.g., Whatman 541), fold, and transfer to 250 mL digestion tube. Place tubes in fume hood and add 2 or 3 boiling chips, 2 catalyst tablets, 15 mL H_2SO_4, and *slowly* 3 mL 30–35% H_2O_2. Let reaction subside and place tubes in block digestor preheated at 410°C. (Digestor must be placed in perchloric acid fume hood or be equipped with exhaust system. Rapid addition of 30–35% H_2O_2 may cause the reaction to become violent.) Digest at 410°C until mixture is clear, ca 45 min. Remove tubes and let cool ca 10 min. Do not let precipitate form; if precipitate forms, reheat. Carefully add 50–75 mL H_2O.

Place NaOH–$Na_2S_2O_3$ solution in alkali tank of steam distillation unit. Make sure that 50–75 mL is dispensed from unit before conducting distillation. Attach digestion tube containing diluted digest to distillation unit. Place 250 mL receiving flask containing 25 mL H_3BO_3 solution with mixed indicator on receiving platform, with tube from condenser extending below surface of absorbing solution. Steam distil until 100–125 mL collects (absorbing solution turns green from liberated NH_3). Remove digestion tube and receiving flask from unit.

Titrate absorbing solution with 0.2M HCl to neutral gray end point and record volume acid required to 0.01 mL. Titrate reagent blank similarly.

$$\text{N, \%} = (V_A - V_B) \times 1.4007 \times \text{M/g test portion}$$

$$\text{Protein, \%} = (V_A - V_B) \times 1.4007 \times \text{M} \times 6.25/\text{g test portion}$$

where V_A and V_B = volume standard acid required for test portion and blank, respectively; 1.4007 = milliequivalent weight N × 100(%); M = molarity of standardized acid; and 6.25 = protein factor for meat products (16% N).

Reference: *JAOAC* **65,** 1339(1982).