True Metabolizable Energy Values of Some Poultry Feedstuffs Available in the Pacific Northwest

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TRUE METABOLIZABLE ENERGY VALUES OF SOME POULTRY FEEDSTUFFS AVAILABLE IN THE PACIFIC NORTHWEST

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ABSTRACT

True metabolizable energy (TME) values of selected poultry feedstuffs were determined during the course of several studies and reported here.

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INTRODUCTION

Since energy is one of the most expensive segments of a poultry ration, accurate knowledge of the available energy content of feedstuffs is necessary to formulate the most economical least-cost rations and to achieve profitable production.

Apparent metabolizable energy (AME) is the most widely used method for evaluating poultry feedstuffs for available energy. However, since Sibbald (1976) developed a bioassay for true metabolizable energy (TME), a considerable amount of research has been conducted to investigate the assay's applicability.

Sibbald's method has several advantages over the previous AME assays. It is simple, rapid, and inexpensive. Besides its reported flexibility, reproducibility, and data quality (Sibbald, 1976, 1977a, 1979a, 1980a), the TME assay can be extended to measure bioavailable amino acids (Likuski and Dorrel, 1978; Sibbald, 1979b, 1979c) and lipids (Sibbald and Kramer, 1980) in feedstuffs.

However, there are problems associated in adopting a new energy system. Since energy requirements for poultry now are expressed in terms of AME, it is necessary to generate new TME requirement data. Sibbald (1977b) proposed a theoretical solution, using a conversion factor of 1.097 to change the AME requirement data to TME. This theoretical conversion factor, on the other hand, is not recommended to generate TME values for feedstuffs (Sibbald, 1980b).

In several studies to evalute the TME bioassay (Boldaji *et al.*, 1981; Bilgili, 1981) we have determined the TME values of several feedstuffs available in the Pacific Northwest.

MATERIALS AND METHODS

A series of experiments was conducted involving the "T.M.E. Bioassay" described by Sibbald (1976) using dubbed, adult Single Comb White Leghorn (SCWL) roosters and 10-week-old Medium White (Wrolstad) poults.

The birds, of similar body weight, were kept in individual wire cages (30 x 45 cm), equipped with water and feed troughs. Alternate cages were left vacant to prevent any cross-contamination of excreta. During and between assays the roosters were kept on a rooster maintenance ration (1241D) that has been described elsewhere (Bilgili, 1981). Before each experiment, the birds were not fed for 24 hours to empty their digestive tracts. At the start of the assay, the birds were weighed and force-fed a known amount (25 to 30 grams) of the test ingredient under study, using a transparent polyvinyl tube and a rod, described in detail by Boldaji *et al.* (1981). A plastic funnel was fused in one end of the tube to facilitate the flow of feed. After force-feeding, the time of day was recorded and the birds were returned to their cages. A metal tray was placed under each cage to collect the excreta. In each trial, a sufficient number of birds of similar body weight were fasted over the same period and were used as controls for endogenous energy ($FE_m + UE_e$) losses. Only water was provided during the 24-hour fast and after the force-feeding. Exactly 24 and/or 48 hours after the force-feeding, the excreta collection trays were removed, cleaned of feathers and scales, and the excreta collected with a water sprayer. The excreta were dried in a forced-air oven at 102°C for 24 hours, allowed to come to equilibrium with atmospheric moisture, weighed, and ground. Subsamples of ground feed and excreta were analyzed for gross energy using a Parr-adiabatic bomb calorimeter. The moisture content of the feed, together with gross energy values of feed and excreta, was used to calculate TME values (Sibbald, 1976), using the formula:

$$\text{TME (kcal/g)} = \frac{(GE_f \times F_i) - (Y_f - Y_e)}{F_i}$$

where: GE_f is the gross energy of the feedstuff (kcal/g);

F_i is the feed input (g);

Y_f is the energy excreted by the fed bird; and

Y_e is the energy excreted by the unfed bird (Sibbald, 1979a).

RESULTS

The TME values and proximate analysis of several selected feedstuffs determined in our laboratory are presented in Table 1. Some of the data have been subdivided to provide more information on particular feedstuffs. Samples of spray- and freeze-dried Whiting meal were assayed with the aid of gelatin capsules rather than as loose ingredients. Triticale varieties were assayed by using both SCWL roosters and Wrolstad poults. There were no differences between the type of assay bird in terms of utilizing the available energy of triticale varieties. Fish meals, meat and bone meal, soybean meals, and sunflower seed products were assayed, using a 48-hour excreta collection period because of their slower rate of passage through the digestive system.

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Table 1. Summary of analysis of some selected feedstuffs available in the Pacific Northwest

FEEDSTUFF	No. of samples	Dry matter %	Gross energy kcal/g dry matter	Crude protein %*	TME kcal/g dry matter			TME	
					---Range---		Mean	kcal/lb	kcal/kg
Alfalfa, dehyd. 17%	2	90.7	4.48	18.0	1.54	1.61	1.58	651	1433
Barley:									
Hannchen	7	86.5	4.36	10.7	3.26	3.74	3.49	1372	3019
No. 2 Western	7	87.4	4.34	8.5	3.25	3.62	3.48	1383	3042
Lady Godiva	7	86.6	4.34	8.8	3.24	3.75	3.51	1382	3040
Hiproly	5	87.4	4.52	17.3	3.41	4.06	3.69	1466	3225
Klages	16	88.3	4.36	9.0	3.32	3.69	3.48	1397	3073
Corn, yellow	60	87.7	4.44	8.7	3.76	4.31	4.06	1618	3561
Fish meal:									
Herring	5	89.2	5.47	65.9	3.73	4.03	4.01	1626	3577
Pacific Whiting									
Spray-dried	6	91.2	6.19	55.2	4.85	5.68	5.26	2181	4797
Freeze-dried	12	89.2	5.54	58.1	3.61	4.49	4.00	1622	3568
Meat & bone meal, 50% solv.	5	91.6	4.04	48.1	2.60	2.84	2.66	1108	2437
Soybean meal:									
44%	5	89.6	4.57	42.0	2.89	3.03	2.95	1201	2643
47.5%	5	88.3	4.80	46.6	2.53	3.08	2.81	1128	2481
Sunflower seeds:									
Dehulled	5	94.9	7.35	24.4	5.89	6.39	6.08	2623	5770
Ground	11	93.3	7.02	19.4	5.52	5.93	5.71	2422	5327
Hulls	12	91.0	5.47	8.6	2.19	3.35	2.75	1138	2503
Triticale**:									
Palouse	10	88.3	4.38	12.1	3.14	3.90	3.62	1453	3196
VT-75-229	10	88.2	4.42	13.8	3.04	3.73	3.47	1391	3061
1776865102	10	88.1	4.30	12.6	3.27	3.92	3.57	1430	3145
Wheat:									
Yamhill	13	87.9	4.33	9.3	3.55	4.06	3.81	1522	3349
Purple	8	88.5	4.30	14.7	3.39	4.08	3.72	1496	3292
Maxigene	8	86.7	4.40	18.2	3.55	3.86	3.68	1450	3191
Red	8	87.6	4.35	12.4	3.40	3.81	3.67	1461	3215

*Expressed on an "as-is" basis.
**Pooled for chickens and turkeys.