An Aviagen Brand

ENERGY - The Fuel of Life

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Energy is often considered the "Fuel of Life". Primarily, it is needed for maintaining basic metabolism (maintenance energy). Any excess is then used for production of meat (growth) and/or eggs (production). Fed too much energy, hens become overweight (excess growth) leading to poor production. If fed too little energy, hens begin using protein to meet their basic maintenance needs and egg production may be compromised. As is the case with most things in life, balance is the key. This article is an attempt to provide a flock manager with some tools to use when making decisions on feeding energy to a breeder flock. Some of the research cited is not current and is in no way intended to be anything more than an example of the thought processes that may be helpful when making difficult decisions about feeding.

Table 1 and **Table 2** give a summary of research done by Pearson and Herron (1982) that predicts energy requirements of broiler breeders. Notice that at any given time, 70-85% of the calories consumed are required strictly for maintenance leaving only a small percentage leftover to use towards egg production. Internal data has shown that the figures given in **Tables 1** and **2** are still relevant for todays modern broiler breeders. To make things a little more interesting, variability exists in several areas that can change a flock's energy requirement and thus how they allocate feed towards egg production. Flock condition, body weights, house environment, and feather condition are just a few of these areas. Using data obtained from several researchers as well as internal findings, below some scenarios in which adjustments that can be made to meet the energy needs of a flock are given.

Table 1: Predicted energy requirements of broiler breeder pullets to 20 weeks with a pen temperature, except brooding, of approximately 22°C (72°F).

Age (weeks)										
	2	4	6	8	10	12	14	16	18	20
Body Weight kg (lb)										
	0.20 (.44)	0.36 (.79)	0.60 (1.32)	0.82 (1.81)	1.05 (2.31)	1.25 (2.76)	1.48 (3.26)	1.70 (3.75)	1.95 (4.30)	2.16 (4.76)
Predicted Energy Requirement (kcal/day)										
Total	70	120	140	165	190	218	235	250	265	290
Maintenance	40	80	100	125	146	165	185	200	220	245
% of Total	57	67	71	73	74	76	78	80	83	84

Selected and rearranged data from Pearson and Herron (1982)

Table 2: Predicted energy requirement of broiler breeder hens from 20-68 weeks at a pen temperature of approximately 22°C (72°F).

Age (weeks)								
	20	24	28	32	36	40	44	48
Body Weight kg (lb)								
	2.16 (4.76)	2.50 (5.51)	3.15 (6.94)	3.30 (7.28)	3.48 (7.67)	3.58 (7.89)	3.62 (7.98)	3.70 (8.16)
Egg Production (%)								
	5	60	85	82	77	73	68	63
Average Egg Weight (grams)								
	47.2	54.4	58.6	61.1	63.3	65.2	67.1	68.4
Average Daily Egg Mass (grams)								
	2.4	33.0	49.8	50.1	48.7	47.6	45.6	43.1
Predicted Energy Requirement (kcal/day)								
Total	300	350	400	450	450	450	450	445
Maintenance	250	285	300	335	343	350	350	352
% of Total	83	81	80	74	76	78	78	79

Selected and rearranged data from Pearson and Herron (1982)

As cooler weather approaches, house temperatures may fluctuate. Adjustments in feed allocation must be made in order to make up for the energy the birds use as they try to stay warm.

Estimating Energy Adjustment for Temperature Changes

A hen requires 30 kcal per day for each 5°C (9°F) change (reduction) in temperature (between about 15 and 25°C / 59 and 77°F).

A flock producing at a level of 60% with an egg weight of 64 g (27 oz/dozen) and a body weight of 3.49 kg (7.7 lb) requires 388 kcal per day at 24°C (75°F), hens at 19°C (66°F) require 418 kcal/day. For a diet with 2800 kcal/kg (1270 kcal/lb) this means an increase from 139 g/bird/day (30.6 lb/100 birds/day) to 149 g/bird/day (32.8 lb/100 birds/day).

A bird's feathers act as an insulation barrier that allows it to maintain body heat more efficiently during cooler temperatures. Feathering must be considered when trying to allocate feed amounts under cooler house conditions. The loss of feathers in broiler breeders, whether they are housed close to thermoneutral or at cooler temperatures results in increased energy needs (**Table 3**).

Table 3: Predicted energy requirement (kcal/day) of a broiler breeder with various feathering conditions.

Feather Score					
	1 well feathered	2 20% feather loss	3 40% feather loss	4 60% feather loss	5 almost no feathers
Pen Temperature °C (°F)	kcal/day				
21°C (69.8°F)	450	464	495	536	601
14°C (57.2°F)	485	506	534	580	655

Average body weight of the flock is another factor that must be taken into consideration when determining feed amounts.

The following is a general rule for adjusting energy needs for over or underweight hens, within the range of body weights generally encountered.

Estimating Energy Adjustment for Body Weight Changes

Caloric needs increase by 10 kcal/day for each 227 g (0.5 lb) change.

Example: A house of hens that average 3.63 kg (8 lb) requires an additional 3.6 g/bird/day (0.8 lb/100 birds/day) of feed containing 2800 kcal/kg (1270 kcal/lb) when compared to a house of hens averaging 3.40 kg (7.5 lb).

Post peak feed allocation is critical to maintaining good persistency of lay over the life of the flock and can prove to be a difficult task to manage, especially when some of these other factors mentioned above are involved. Below is a general rule for calculating post peak feed reduction based on egg mass output.

Estimating Energy Adjustment for Egg Production Changes

Every 1% difference in egg production (at same egg weight) alters the energy needs of the hen by approximately 1.85 kcal/bird/day.

Example: 80% egg production with a 65 g (27.5 oz/doz) egg weight equals 52 g/bird/day (1.83 oz) egg mass output (EMO), if production drops to 79% with same egg weight, EMO is 51.3 g/bird/day (1.81 oz). This is a 1.35% drop in EMO, 0.0135 x 140 kcal/egg = 1.89 kcal/bird/day less energy required.

On a 2800 kcal/kg (1270 kcal/lb) diet, a 0.67 g/bird/day (0.15 lb/100 birds/day) less feed would be necessary.

Energy management is critical for proper egg production to be attained and maintained. In the winter time this becomes more difficult due to the many factors which can affect the amount of energy the bird has available for egg production.
The examples given here provide estimates of how the energy requirements of the bird can change, highlighting the fact that energy requirements do not remain constant and can be affected by a number of factors. Take this into account when determining feed levels. Actual changes to feed amounts must be based on close monitoring of body-weight gains, feather cover and feed reductions if egg production is to be kept on track.