Vitamins and development

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The supply of adequate levels of vitamins in the maternal diet is critical in ensuring that sufficient are available for embryonic development and subsequent emergence of a healthy viable hatchling.

There are many factors that can affect the hatchability of fertile eggs from egg storage and hygiene to incubation and disease and not least flock age and nutrition.

The use of egg break-out can help establish the cause of embryonic mortality and although recognised vitamin deficiency symptoms are seldom seen, occasional field abnormalities appear, that do not respond to additional supplementation – 'clubbed-down' and riboflavin being a recent example.

Embryonic mortality

Embryonic mortality can occur at different times during incubation and hatching and this is shown in Table 1.

For embryos that are fully developed but show specific abnormalities, Table 2 summaries the vitamin deficiency involved.

Leeson et al, suggested that lower hatchability, related to vitamin metabolism may occur when high crude proteins diets are fed.

He suggested that the excretion of excess nitrogen could impose a very high metabolic demand for 'B' vitamins. Field experience has shown that a significant increase in vitamin supplementation to broiler breeders has improved hatchability and chick viability, this is especially important for young breeders.

The increase involves 'B' vitamins as well as the antioxidants vitamins A, E and C. These antioxidants play an essential role in the maternal diet but are critical for the developing embryo.

Carotenoids can also contribute to the antioxidant system, occurring naturally in maize based diets, however in 'white' diets addition of a carotenoid like Carophyll Red has been shown to be very cost effective.

Vitamin D_3 and particularly its metabolite 25-OH-D_3 (Rovimix HyD) can help improve many of the problems found with poor calcium metabolism and subsequent poor hatchability, namely shell quality and embryonic skeletal abnormalities in the chick.

Vitamins play a critical role in the production of a viable day old hatchling, economising on vitamin addition has been shown to be false economy. ■

	Vitamins											
	A	D_3	E	K	B_1	B_2	B_6	B_{12}	Niacin	Panto. acid	Folic acid	Biotin
Period of embryo mortality:												
Early (1-7 days)	✓	✗	✓	✗	✓	✓	✗	✗	✗	✓	✗	✓
Mid (8-16 days)	✗	✓	✗	✗	✗	✓	✓	✓	✓	✓	✗	✓
Late (17-21days)	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓

Table 1. Periods of embryonic mortality associated with vitamin deficiencies (Adapted from Wilson 1996 : Leeson 2000).

Table 2. Some abnormalities of the fully developed chick embryo associated with vitamin deficiency (Adapted from Wilson 1996 : Leeson 2000).

	Vitamins											
	A	D_3	E	K	B_1	B_2	B_6	B_{12}	Niacin	Panto. acid	Folic acid	Biotin
Abnormality												
Skeletal	✓	✓	✗	✗	✗	✗	✗	✗	✓	✓	✗	✓
Short legs	✗	✓	✗	✗	✗	✓	✗	✗	✗	✗	✓	✓
Stunted	✗	✓	✗	✗	✗	✓	✗	✓	✗	✗	✗	✗
Curled toe	✗	✗	✗	✗	✗	✓	✗	✓	✗	✗	✗	✗
Toe webb	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓
Beak	✗	✓	✗	✗	✗	✗	✗	✓	✓	✓	✓	✓
Oedema	✗	✗	✓	✗	✗	✓	✗	✓	✓	✓	✓	✗
Eye abnormalities	✓	✗	✓	✗	✗	✓	✗	✓	✓	✓	✓	✓
Haemorrhages	✗	✗	✓	✓	✗	✗	✗	✗	✗	✗	✗	✓
Muscular and nerves	✗	✗	✓	✗	✓	✗	✗	✓	✓	✗	✗	✗
Down	✗	✗	✗	✗	✗	✓	✗	✗	✓	✓	✗	✓
Poor liveability	✓	✗	✓	✗	✓	✓	✗	✗	✓	✗	✗	✓