37. *Sign*: Swollen head and back of neck (exudative diathesis - increased capillary permeability).

***Causes*:**

a. Nutritional deficiencies — vitamin E or selenium.

38. Nutritional deficiencies and toxicities; almost always a breeder flock problem.

Vitamin A:
Circulatory system development abnormal; skeletal abnormalities, especially in the skull and spinal column; degenerative changes in the brain, spinal cord, and nerves; embryonic mortality is early (during days 2 to 3). Chicks hatching may have watery discharge from eyes or have eyelids stuck together. A great excess of vitamin A also will cause skeletal abnormalities.

Vitamin D_3:
Late embryonic mortality (>17 days); stunting; poor skeletal growth; rickets.

Vitamin E:
Circulatory system problems, exudative diathesis, hemorrhages, stunting, encephalomalacia, eye abnormalities (e.g., cloudy lens or hemorrhages), edema of neck and feet; embryonic mortality peaks during days 2 to 5. Muscular weakness after hatching.

Vitamin K:
Hemorrhages in embryo and membranes, especially at or near time of hatching.

Thiamin:
Polyneuritis; early mortality peak and late peak ≥19 days; many dead chicks in hatching trays.

Riboflavin:
Stunting, short legs, disorganization of the circulatory system, edema, clubbed down, curled toes, micromelia, anemia, brown or dark green liver; mortality peaks during days 3 to 5, 10 to 15, and 21 to 22. Mortality peaks change from late to early as breeder depletion of riboflavin proceeds.

Niacin:
Hypoplasia (decreased growth and development) of skeletal muscles, edema, short upper beak, nervous and vascular system abnormalities. Mortality peaks during days 8 to 14.

Vitamin B_6 (pyridoxine):
Inhibition of early embryonic growth; mortality peaks during days 8 to 14.

Pantothenic acid:
Subcutaneous hemorrhages, edema, hydrocephalus, poor feathering, twisted legs, fatty livers, opacities of the eye, pale, dilated hearts; embryonic mortality peaks during days 2 to 4 and 11 to 15.

Biotin:
Chondrodystrophy and micromelia (deformed skeleton, shortened long bones, parrot beak), syndactylism (webbing between toes); hemorrhages in the embryo and chorioallantois; peak embryonic mortality during days 3 to 4 and ≥17. The early mortality peak is greatest with severe deficiency, while the late peak is greatest with mild deficiency.

Folic acid:
Bent tibia, syndactylism (toe webbing), flattened head, small eyes, exposed viscera, parrot beak, other beak defects, stunting; peak embryonic mortality days >17.

Vitamin B_{12}:
Edema (especially around eyes), hemorrhages, curled toes, short beak, poor leg muscle development, dwarfing, fatty liver, enlarged thyroid, dilated, irregularly shaped heart, head-between-thighs malposition; peak embryonic mortality during days 8 to 14 (small peak) and 16 to 18.

Manganese:
Chondrodystrophy, deformed skeleton, shortened long bones, parrot beak, micromelia, edema, abnormal down feathers; peak embryonic mortality days >18. Chicks uncoordinated.

Zinc:
Skeletal defects, especially in posterior vertebral column (most common defect is rumplessness), small eyes, exposed viscera, beak and head abnormalities, edema. Chicks are weak; will not stand, eat, or drink. Embryonic mortality can be very high.

Calcium:
Effects more indirect through poor shell quality, increased egg weight loss, and increased contamination. Stunted growth, decreased bone development, and increased mortality tend to occur in later stages. A great excess of calcium also will cause embryonic abnormalities.