

Popular Article

Iron deficiency Anemia and Diarrhoea in piglets

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Introduction

In pigs, iron deficiency anemia (IDA) is the most prevalent deficiency disorder during the early postnatal period that may turn into life threatening illness later life. Shortage of stored iron level in piglets may be due to selective breeding over years with high litter size. During foetal development all the foetus do not get sufficient iron from mother from liver depot. The type of anemia is microcytic hypochromic one although the young piglets are usually borne with normal level of hemoglobin in blood 11-13g/dl (Steinhardt et al, 1982). Several causes accumulate for the production of anemia in piglets particularly in intensive management system. Usually, piglets are not allowed to graze in the soil and field from where they may uptake iron along with feed, their growth is rapid during early life in comparison to hemopoiesis, high demand of iron for body growth is hampered. The source of iron of mother pig milk is very scarce that cannot meet out the need of rapid production of body growth. As a result, the hemoglobin level reduces gradually from normal to 6-5 g/dl. Increased demand of hemoglobin is not produced during the high development period and showing the anemia in piglet particularly during second week usually up to day 28 postpartum onwards.

Factors responsible for iron deficiency anemia

Poor iron source in sow milk

Iron along with other minerals and vitamins such as copper, cobalt, vitamin B₆, B₉ and B₁₂ are necessary for production of hemoglobin. Iron is the main mineral for hemoglobin formation. Piglets need 7-16 mg Iron every day depending upon the breeds but suckling piglets get on 1-2 mg iron from milk and other sources of feed. Therefore, a huge different between demand and supply remains in low age group of animals (Szudzik *et al*, 2019). The deficiency cannot be meeting out from sole milk and normal feed has to be supplemented either through feed, milk or injectable iron sources.

High growth rate in piglets

The growth rate amongst the domestic animals is highest in pigs; the feed conversion ratio in pig is 3:1 that means taking 3 kg feed it produces 1kg body weight. This rapid growth in growing piglets as well as in finishers with the resulting increase in plasma volume demands, a high intake of iron is needed to maintain adequate hemoglobin production (Losinger,1998).

Heritability

It is one of the causes for piglet anemia, high heritability is exists in the sow who usually give more litter size in comparison to low litter size, particularly in large white and landrace (Hollema *et al*, 2020). Like human baby piglet anemia causes low birthweight (LBW) that may determine the solvability and health status during weaning period. During gestation period supplementation of iron to sow may cause oxidative stress and negative affect foetal development and immune system.

Intensive Farming system:

In the modern intensive system of swine management piglets are kept under confined areas where no contact with natural vegetation or soils occurs. In household pig management, all pigs remain contact with soil, forage and vegetation, the necessary iron and other minerals and vitamins are taken from the natural sources. Therefore, intensive system invites piglet anemia than in the organic farming system (Prunier *et al*, 2022).

Storage of Iron in organs

Iron in animals may be stored as ferritin in store houses in liver, kidney, spleen, **muscle tissue** and large bone marrow like humerus, femur etc. piglets are borne with 40-60mg of iron including hemoglobin content. As there is scarce of iron in colostrum of pig, therefore increased

demand cannot be meeting out from the store houses of iron. Therefore, need to supplement just after birth either through oral route or injection.

General causes of anemia of piglets and pigs may be due to many more etiological factors such as

- Eperythrozoonosis (Eperythrozoonosis suis- a reckettial agent)
- Gastric ulcers –due to feed stress
- Hematoma-frequent shaking of head and injury
- Internal bleeding- injury at GIT or any other organ
- Hemorrhage- chronic and acute hemorrhage
- Porcine enteropathy (PE)-inflammatory reaction in intestines.
- Prolapse of the rectum- due to different stretches and Stress
- Torsion of the stomach and intestines- common in animals
- Faulty nutrition- mainly due to deficiency of mineral and proteins
- Lack of iron or copper- main guilty of piglet anemia.
- Warfarin poisoning- rodenticides may accidental exposure to piglets

Clinical manifestations

The condition is more prone in piglets but it may occur in grower, weaner and if deficiency persists it may be in adults. The clinical signs start as per the concentration hemoglobin of blood. Hemoglobin level and different pathological conditions are as follow

- (a) Piglets/Pigs with Hb levels 10 or more are normal.
- (b) Hb level of 9 is the minimum level for growth performance.
- (c) Hb level at 8 indicates a borderline anemia and alarming.
- (d) Hb level less than 7 is the level in which anemia retards growth
- (e) Hb level 4-6 is indication severe anemia with retardation and high morbidity

In piglets

If not supplemented the piglets start showing anemic signs in the second week. Clinically, it shows slower growth, changes in skin color if it is not black color. The color may change to yellowish or icteric. There may be exercise intolerance and rapid breathing with slight exercise. The animal may be less active and sometime initial scour starts. There is always a retarded growth and progressive weakness. In severe condition they may be breathing problem due reduced O₂ carrying capacity



Fig-1: Piglets suffering from anemia

There may be accumulation of fluid around the throat, brisket and internal body if the condition persists longer. The blood parameters also deviate from the normal value (table-1)

Other age groups

Once the anemia starts, if not treated it may lead to progressive anemia in other age group of the same flock. The clinical signs including

- Pallor of skin.
- Increased breathing rate due to deficient in Oxygen carrying capacity.
- Icteric wrinkle skin due to reduction of hemoglobin in muscle and blood
- Pale of visible mucous membranes such eyes
- Scurry diarrhea-due to low blood supply through intestine (chilling) and overload of unabsorbed ingesta
- Weakness.
- Chance of increased stillbirths.
- Hemorrhage may be found exterior or it can occur into the tissues or gut

Table-1: Blood parameters and indication of anemia

| Parameter | Normal | Anaemic |
|------------------------------|--------|--------------|
| Haemoglobin g/Dl | 11-13 | Below 8 |
| Packed Cell volume | 33-35 | Less than 17 |
| RBC $10^6/\text{mm}^3$ | 5 to 8 | 2-3 |
| Volume of RBC μ^3 (MCV) | 70 | <55 |
| RBC haemoglobin Con%(MCH) | 35 | <35 |

Post mortem finding

Usually, anemic piglets show poor weight gain, ill-thrift, pallor of visible mucosae, if it affted for long it may show thin-walled heart, and edema of the lungs, abdominal muscles and connective tissues. Gastroenteropathic condition may be seen in lower parts of intestines. Thin watery blood, pallor of ear and snout particularly in white breeds.

Diagnosis

The diagnosis of piglet anemia particularly due to iron deficiency by observing the clinical symptoms. Estimation of blood cell parameters such as PCV, RBC, Hb% may indicate the anemic status of piglet. A stained blood smear with Giemsa staining will also confirm the shape, size and density of the red cells. Any bacterial, blood parasitic infection may also reflect with the slide staining. The hematological parameters cited the above table may indicate the status of anemia. Death due to piglet anemia may be determined with post-mortem lesions of edema in the lungs, muscles, connective tissues and a thin-walled heart in week old piglets. Software based cytometric study may significantly contribute to develop highly specific diagnostic method using hematology analyzers. combining cytometry, cytochemical, physic-chemical and biochemical diagnosis of anemia (Burchardt *et al.* 2014).

Therapeutics and Preventives

Iron is slightly absorbed through the intestine, which is less than daily requirement for revival of health quickly. Regular iron and copper level may be checked for normal health. It is also helpful to give one time injection of iron dextran 300-500mg depending on the age of the pig and body weight.

Piglets may be given injectable iron (Fe dextran) 150-200mg. The same may be repeated after 15 days. The injections may be given intramuscularly at the thigh muscle or at thoracic area. Oral dosing of Iron may be fed from 3-5day post-natal piglets. The same may e repeated oner 10th day. Iron dextran or ferrous fumarate can be used for oral dosing. Iron deficiency cannot be prevented with precaution during gestation period as placental barrier hardly allow the iron to cross the foetus tissue. Therefore, experimental amino acid chelated Iron can be fed during pregnancy which can cross the placental marrier. An amount 120 mg amino acid chelated per kg feed may be given through concentrate. This therapeutic intervention can check the piglet anemia after birth. Iron methionine 200mg can be fed through though oral route at 3- 5 days of age. This may be repeated after 7 days.

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