PIGLET ANAEMIA AND GLEPTOSIL

-the problem and the answer

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Iron

Man has known of the versatility and usefulness of iron as an industrial material since Ancient times but awareness of the biochemical importance of iron is much more recent. Scientific studies of this century have shown that iron is of great physiological significance and essential for normal body function.

Iron comprises 0.005% of the body's weight and is thus regarded as a trace element. It's most widely known role is as a vital constituent of haemoglobin, the red pigment contained in red blood cells and responsible for the transport of oxygen around the body. 65% of the iron in the body is found in haemoglobin. Iron is also a constituent of storage compounds in the liver, myoglobin in the muscles, various enzyme systems and a small amount is found in the blood plasma bound to protein.

The actual amount of iron required varies with the species of animal, its size and iron status. Whenever the intake of iron is insufficient to meet the body's requirements iron deficiency anaemia develops. This is particularly prevalent in young rapidly growing animals, such as the piglet, reared under intensive conditions.

Piglet Anaemia

Iron deficiency anaemia in the piglet can be manifested in one of two ways - clinical or sub-clinical anaemia.

Clinical anaemia is the more severe form and is characterised by a reduced growth rate, severe breathlessness, with the muscles of the diaphragm contracting jerkily (hence the common name "thumps"), lethargy, the skin is pale and diarrhea is common. Death may occur in rapidly growing pigs, or thin unthrifty pigs may result.

Whilst the signs of clinical anaemia are easily recognised, the onset of sub-clinical anaemia may not be recognised at all. With no healthy pigs to act as a comparison, the producer may not realise his/her pigs are growing at below optimum rates, or see the damaging effects that sub-clinical anaemia is having on feed conversion rates. In addition he/she may not realise that all his pigs have a greatly lowered resistance to disease until too late.

Why are piglets prone to anaemia?

The piglet, more than any other animal is prone to develop iron deficiency anaemia, and under modern commercial rearing conditions will inevitably develop anaemia unless some form of supplement iron is given.

There are four basic reasons why this is so:

1. Lower body iron at birth

In comparison with other animals the piglet has a far lower body tissue concentration of iron at birth whilst the adult pig has a far higher concentration than other species, showing that the piglet piglet has a much greater requirement for iron right from birth.

2. Inadequate supply of iron from milk

Analysis of the mineral content of sows colostrum and milk have shown that both are iron-deficient, and contain only 5-10% of the piglets actual iron requirement. Indeed it has been estimated that sows milk provides only about 1mg of iron per day to each piglet during suckling.

3. No natural source of iron

Under modern methods of intensive husbandry, sows and piglets are kept in confinement in concrete floored farrowing pens, with no access to a source of iron. While it is possible to introduce soil into the pen to help prevent anaemia it is firstly impossible for the piglets to obtain sufficient iron to satisfy its requirement in this way; secondly it is prohibitive in terms of labour; and thirdly, it is possible to introduce parasites and disease.

4. Rapid growth rate

During the first 8 weeks of life, the piglet has a far higher growth rate than other infant domestic animals and weight may increase eleven-fold or more. As an increase in body size is associated with an increased iron requirement to satisfy expanding blood volume it is apparent that high levels of iron must be obtained to satisfy these needs if anaemia is to be avoided.

It should now be clear that piglets do require iron supplementation to attain their full growth potential, but how do you supply this necessary trace element.

Iron - How is it obtained?

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1. Oral iron

The original means of iron supplementation, regular oral dosing of piglets, is still being practiced in some parts of the world despite its limitations. The absorption of iron from the gut is limited, whether in the form of pastes, licks, solutions, or soils, uptake being restricted by a safety mechanism called the "mucosal block". In order to beat this block, piglets must be treated within 12 hours of birth, that is, before the block occurs. Additionally comprehensive studies have shown that on average only 5% to 20% of orally dosed iron is actually absorbed, and this in turn depends on the quality of the iron source since bioavailability of iron can vary widely. Indeed many iron salts are unpalatable and this further aggravates the main problem with many iron rich feeds, that is one of sufficient feed intake.

Iron rich licks and iron enriched solutions were introduced as "self-help" alternatives in the fight against iron deficiency. Unfortunately, they do not guarantee that every piglet will obtain sufficient iron to meet its needs. There are always those who do not get enough.

2. Outdoor rearing

A more "hit or miss" approach to oral iron dosing of piglets is by allowing sows to farrow outdoors so that in theory piglets have the chance to get iron from the soil. In fact this technique has an important drawback; again the piglets simply cannot ingest enough iron to totally prevent anaemia or to meet the increased iron demand of such high performance modern hybrids.

3. Iron via the sow

An indirect method of raising the iron status of piglets, is to give extra iron to the sow during pregnancy. While the sows milk iron level is certainly improved and placental iron transfer to the piglets may be increased, the extra contribution is still not sufficient to achieve the required iron level. Indeed increases in the piglets own iron level in studies of this technique are attributed to eating the sows iron rich feces.

A particular study which compared supplementation of the sows diet with an iron compound and direct iron injection focused its attention on the iron rich feces and its effect on piglets. In a high proportion of these piglets, anaemia was still prevalent and when compared to piglets in the iron injection control group, their growth rate was found to be much lower.

As an overall view of oral iron, the variable amount of iron ingested by the piglet and limitations of intestinal absorption make oral iron an unsatisfactory alternative to iron injection.

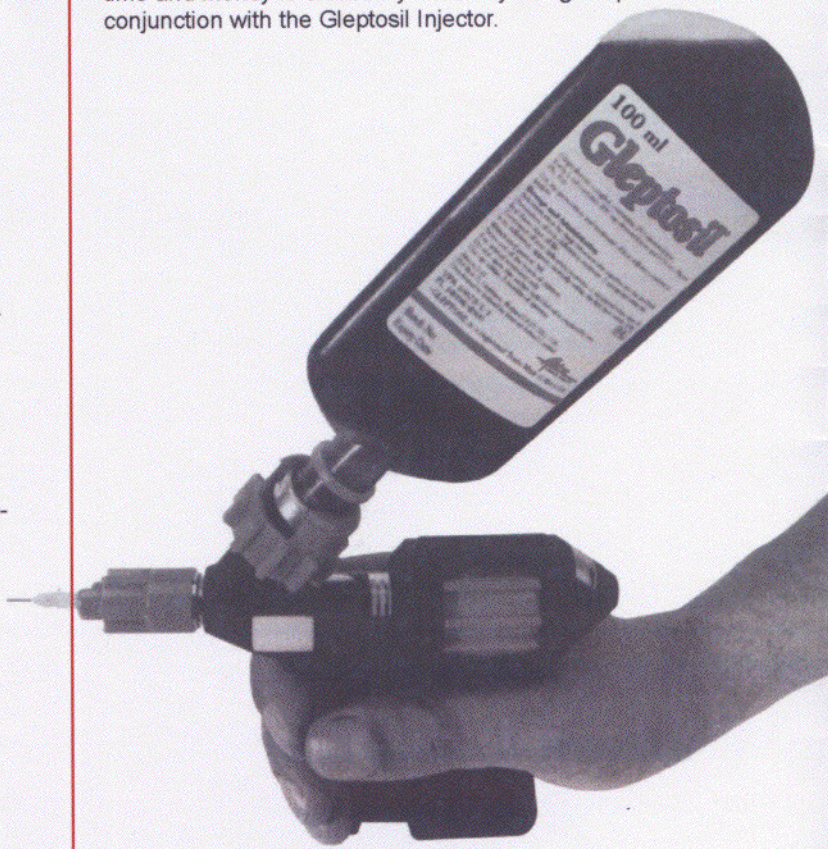
4. Iron injection

High quality injectable iron treatments are widely accepted as the most effective method of preventing piglet anaemia, ensuring enough iron for optimum growth and disease resistance.

A number of iron injection preparations have been developed over the past 30-40 years all based on the same principle. All iron salts are potentially toxic until bound to a carbohydrate carrier molecule and in common with other complexes of larger molecular size, removed from the intramuscular injection site via the lymphatic system. Rapid absorption and utilization are critical factors in the effectiveness of an iron injection as any complex still around the injection site after 72 hours tends to be taken up by tissue macrophages, inhibiting further absorption, promoting "rusty" hams and lowering the commercial value of the carcasses.

Today there is still a great variation in the absorption properties of many products. Gleptosil whose iron/carbohydrate complex, gleptoferron, one of the largest available, is at the top of the absorption league. While intramuscular injection is the most popular method of administration some authorities demand that all injectable substances must be given subcutaneously. Studies with Gleptosil have shown it to be equally effective either way retaining all of its benefits and advantages.

Not only does Gleptosil adequately meet the needs of the modern high performance pig, but also the producers, whose time and money is drastically saved by using Gleptosil in conjunction with the Gleptosil Injector.



Iron - How much is required?

How much iron is required?

We have considered the reasons why piglets require iron supplementation to attain their full growth potential and the different methods utilised to supply the iron needed. But how much iron is necessary to meet the needs of the modern high performance pig?

A piglet's body contains approximately 50mg of iron when it is born and will gain 23mg from its mother's milk and 25 to 50mg from its environment during the first three weeks. In 1947 Venn found that a piglet must retain approximately 7mg of iron per day for the first 3 weeks of life to prevent the development of anaemia. He also concluded, however, that 250 - 350mg of iron needed to be retained during the same period in order for the piglet to grow at an acceptable rate while simultaneously maintaining haemoglobin levels above those necessary for optimum performance. Consequently it follows that the calculated deficit of a three week old piglet raised indoors is between 125 and 250mg. The average requirement for supplemental iron is therefore 200mg which is why it is a common practice in most countries to supply this amount via a single injection shortly after birth.

During the third to fifth weeks of life body-weight may increase by a further 3kg to 9kg- 6 times birth weight. Between 60 and 100mg of additional iron is needed to maintain normal haemoglobin levels during this period. Research in Germany has suggested that creep feed intake may provide a small percentage of this iron but that the amount is inadequate to satisfy all of the extra requirement.

The case for more than 200mg of iron

In 1976 Pfau and Rudolphi suggested that 800mg of iron was necessary to maintain normal iron status over the first 3 to 5 weeks - if no creep feed was available. Where creep feed was available, 400mg injections produced weight gains of approx. 50mg per day more than 200mg injections. Pfau and Rudolphi considered that haemoglobin levels should be at least 12mg/100ml to ensure normal iron status. They also believed that haemoglobin levels of 8-9gm/100ml (previously considered normal) could conceal reduced tissue iron levels. If genetic selection facilitates the production of even faster growing strains it is possible that the amount of routinely injected iron may well have to be increased beyond the present 200mg.

The case for less than 200mg of iron

The introduction of early weaning systems in recent years has led to a re-evaluation of the piglet's iron requirements. It has been suggested that 100mg would be adequate to obtain satisfactory performance from piglets weaned at 3 weeks of age. A study investigating this claim was published in The Veterinary Record.

The split litter trial involved 15 litters. 82 piglets received 200mg iron and 83 piglets received 100mg. Both, as Gleptosil, were administered intramuscularly into the hind leg at 3 +/- days of age. The piglets were weaned at 3 weeks. Throughout the suckling period and up to 6 weeks after injection, piglets in the 200mg group had significantly higher haemoglobin levels. Body weights for the 200mg iron group were also significantly greater from 1 to 4 weeks after injection.

The effect of iron dose on the incidence of anaemia was investigated by determining the percentage of piglets with haemoglobin concentrations below 9mg/100ml. Approximately 80% of all piglets were classified as anaemic before treatment, but, in response to 200mg iron, the incidence of anaemia was zero 21 days after injection, i.e., at weaning, By contrast, over 40% of those which had received 100mg were anaemic at weaning despite their haemoglobin concentrations being raised above their initial level.

The trial also suggested that there was increased disease resistance to an Escherichia coli scour in the 200mg group. In one litter affected with the pathogenic Abbotstown strain, 5 of the 6 piglets injected with 100mg died while only 1 of the 6 injected with 200mg died.

In conclusion the trial confirmed that piglets do require iron supplementation and that 200mg is necessary for them to attain their full potential when weaned at 3 weeks of age. As genetic selection is producing even faster growing strains, however, the amount of routinely injected iron may well have to be increased. If this is the case, Gleptosil and the Gleptosil Injector, with their proven practical features, would continue to be the products of choice.

The properties of a good iron injection

So what makes a good injectable iron product?

1. It must be effective
2. It must be safe
3. It must easy to inject

Let us look at these features in greater detail.

1. Effectiveness

Iron injections are normally given into the muscle of the hind limb. They can also be administered into the neck muscle and subcutaneously. To be effective the iron must be absorbed before it can be used for haemoglobin and enzyme synthesis. Generally any iron not absorbed within 3-4 days tends to become fixed there. Not only is this iron not readily available for utilization but more importantly it can permanently stain the muscle and can cause the meat to be rejected at slaughter, with consequent economic loss. With high molecular weight compounds such as gleptoferron active absorption occurs from the muscle into the lymphatic system which then drains into the bloodstream.

Practical Benefits of Gleptosil

Specialised cells in the liver absorb the gleptoferron from the blood and split the iron from the carbohydrate complex. The iron is then converted into naturally occurring forms which are stored or transported to the site of haemoglobin synthesis, such as the bone marrow. The haemoglobin is then incorporated into the red blood cells and released into the circulation. Detailed clinical studies have confirmed that gleptoferron is rapidly absorbed and utilised, in fact over 95% of the injected iron is absorbed within 24 hours of injection.

2. Safety

Iron salts are very toxic and if 200mg iron as, for example, ferric sulphate, was injected, the pig would very probably die. That is why it is necessary to complex the iron with a carbohydrate molecule to improve absorption and safety. The carbohydrate complex in gleptoferron has a unique chemical structure and very low toxicity which enables gleptoferron to be injected into piglets on the first day of life, unlike some iron dextrans which are recommended for use on day three or beyond.

3. Ease of Administration

The injection of piglets with iron can be a time consuming exercise for the operator and a stressful occasion for the piglet. The Gleptosil injector ensures that a 1ml dose of Gleptosil is delivered accurately and rapidly to each piglet from a 100ml flexible plastic vial. Many commercial users have found this saves up to 50% of their time when compared with other methods, thus reducing their costs. Each 1ml of Gleptosil contains 200mg of iron - the normal piglet dose. The small dose and excellent safety of Gleptosil mean that it can be injected into all piglets, including the very smallest, within 12 hours of birth, thus allowing iron injections to be carried out at the same time as other management procedures such as teeth clipping or tail docking, once again effecting an important time saving.

Practical benefits of Gleptosil

Since the launch of Gleptosil in the late 1970s independent comparative studies have been conducted world-wide. Field trials in 6 countries and using over 20,000 piglets have shown that the mortality to weaning in groups of piglets injected with Gleptosil was reduced by 2.9% compared with piglets treated with a variety of iron dextran products. In other words, Gleptosil produces nearly 3 extra pigs for every 100 treated and raised to weaning.

The launch of Gleptosil was followed by over 10 years worldwide success during which time it was claimed to be the world market leader. Unfortunately it was not available during the early 1990s which forced pig farmers to find alternative iron products to prevent iron deficiency anaemia in their piglets.

The reintroduction of Gleptosil prompted a large UK breeding company to undertake its own clinical evaluation of the properties of Gleptosil in comparison with a 20% iron dextran. The trial, using over 1800 piglets on two farms, confirmed the practical benefit of Gleptosil in reduced mortality and demonstrated that Gleptosil significantly improved daily liveweight gains over the pre-weaning period compared to 10 & 20% dextrans.

Conclusions

It should now be clear that:

1. Piglets do require iron not only to prevent iron deficiency anaemia but to attain their full growth potential.
2. A high quality iron injection is the most effective, safe and sure method of supplying the piglet's essential iron requirement.
3. 200mg of iron/piglet is the currently accepted level of supplementation but this may have to be increased to satisfy the needs of the faster growing modern hybrids.
4. To be effective an iron injection has to meet strict quality and performance criteria all of which are to be found in Gleptosil and the Gleptosil Injector.

Presented by

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