



# PerFerrous Gly

— Porphyrin Iron Type





PerFerrous Gly (porphyrin iron type) is a high efficient feed additive that has the function of iron-supply, growth promotion and hematosiis, produced by Hunan Perfly Biotech Co., Ltd.

## Composition

Organic iron, amino acid chelated iron, porphyrin iron, hemopoietic factors, etc.

The product includes two types:

PerFerrous Gly(Porphyrin Iron)--Enhanced Type

PerFerrous Gly(Porphyrin Iron)--Universal Type

## Action Mechanism

Iron is an essential trace element in animal body. It plays the important roles of oxygen transportation, protein synthesis, energy metabolism, vitamin metabolism and so on.

### 1 Iron Supplement

Inorganic iron such as ferrous sulfate (commonly use in feed) is easy to be absorbed and utilized by animals only after it must combine with appropriate organic ligands in the animal's gastrointestinal tract. Due to the insufficient number of organic ligands and some effect of unfavorable components (such as oxalic acid, phytate, phosphate, carbonate, etc.), inorganic iron bioavailability is relatively low. A large number of studies have demonstrated that the organic trace elements can improve the bioavailability.

The ferrous iron in this product consists of organic chelated iron, porphyrin iron and other organic iron, so their biological utilization rate is very high. For example, Tian Kexiong reported a variety of mineral elements utilization rate of 3-month-old pigs (weight 40kg) in 2003 (trial results are shown on Table 1. below): the absolute utilization rate of inorganic iron is only 31.27% in pig's intestinal tract, and absolute utilization rate of organic chelated iron can reach 44.54%; if the utilization rate of inorganic iron were 100%, the relative utilization rate of organic chelated iron could reach 142.44%.



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● Table 1. The Bioavailability of Trace Elements (n=4)

Table 1-1	Intake/mg			
	A <sub>1</sub>	A <sub>2</sub>	B <sub>1</sub>	B <sub>2</sub>
Cu	118.80	159.36	115.76±2.42	156.25±8.78
Fe	1865.40	2296.32	1815.31±38.00	2226.06±125.20
Zn	931.20	1232.00	793.68±16.60	1191.47±67.00
Mn	192.00	245.12	192.93±4.04	244.64±13.80

Table 1-2	Excretion/mg			
	A <sub>1</sub>	A <sub>2</sub>	B <sub>1</sub>	B <sub>2</sub>
Cu	48.29±4.75	56.52±2.02	50.15±12.03	65.88±2.72
Fe	314.27±65.99	449.04±36.60	477.27±173.10	660.22±126.50
Zn	792.44±15.24	861.65±17.22	507.67±15.98	683.18±41.13
Mn	61.34±16.56	71.78±11.15	88.19±10.46	103.17±8.96

Table 1-3	Bioavailability/%		Relative Biological Value/%	
	Inorganic	Chelated	Inorganic	Chelated
Cu	20.29±3.91	38.85±5.63	100	191.47
Fe	31.27±4.38	44.54±8.21	100	142.44
Zn	23.01±4.80	44.12±7.53	100	191.74
Mn	19.66±3.81	28.96±5.31	100	147.30

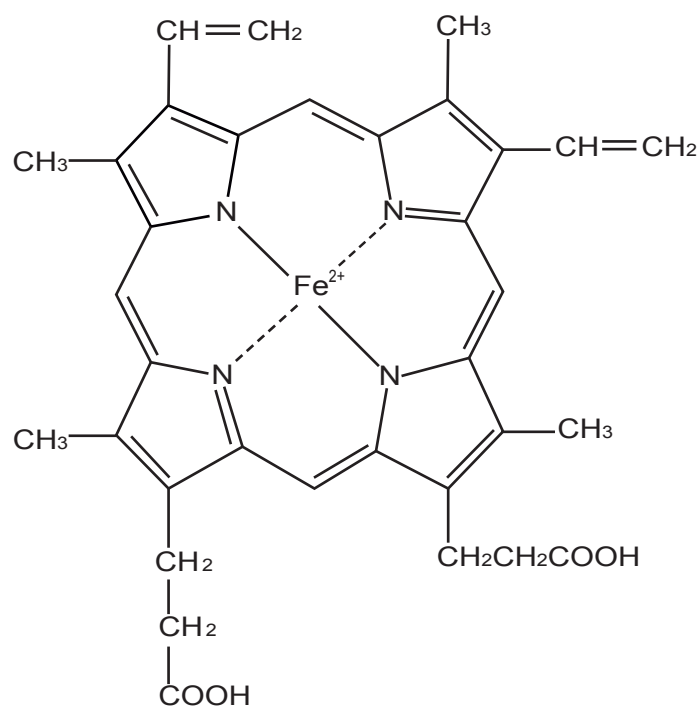
This product contains porphyrin iron. It comes from erythrocyte of fresh animals' blood directly. As homologous iron source of animal, it can be directly absorbed and utilized, and without transformation and resynthesis process, porphyrin iron has the highest biological utilization rate among all iron sources.



## 2 Growth Promotion

Compared with the ferrous sulfate and other inorganic iron commonly used in the feed, organic chelated iron, porphyrin iron and other organic iron not only provide organic ferrous that has the higher utilization rate, but also provide iron ligands, such as amino acids and porphyrin; among them, amino acids can provide nutrients, while porphyrin has unique role of “growth promotion”. The Figure 1. on the right shows the molecular structure of porphyrin iron (heme iron); the porphyrin formed by connecting four pyrrole rings with four methylene bridges is linked with the side chains to form the porphyrin. Nitrogen atoms in four pyrrole rings of porphyrin can coordinative combine with a ferrous ion to form porphyrin iron.

In animal body, not only oxygen-carrying molecules such as hemoglobin and myoglobin contain the porphyrin, but also cytochrome system (such as Cyt a, a3, b, c, c1, b5, P450 etc.), a variety of oxidoreductase system (such as cytochrome oxidase, peroxidase etc.) and catalase contain the porphyrin ring. So adding “absorbable porphyrin ring” will strengthen the biosynthesis and function of these active molecules in animals. For example, most members of the cytochrome system exist in inner membrane belonging to cellular energy factory “mitochondria” and tightly combine with inner membrane to play a role of “transfer electrons”. Once the biosynthesis is promoted, the oxidative energy supply speed of mitochondria will be effectively strengthened, eventually the supply of ATP is increased, then all kinds of life activities become vigorous, furthermore the growth rate of animal will also be improved.



■ Figure 1. The Molecular Structure of Porphyrin Iron



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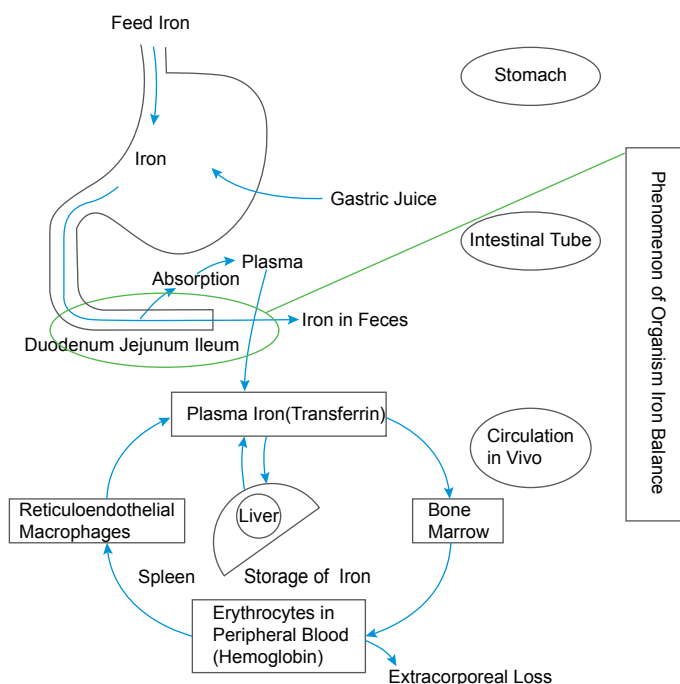
So many authors found that porphyrin iron could significantly promote the growth. For example, Cai Kezhou reported that the comparison effects of inorganic iron, amino acids and heme iron on production performance of piglets in 2009. The results are shown as Table 2., below, compared with inorganic iron group, the daily gain of heme iron group increases by about 13.83%.

● Table 2. The Effect of Different Iron Supplement Agents on Growth and Disease-resistant of Piglets

Items	Control	Inorganic Iron	Fe-amino Acid	Heme Iron
Daily Gain/g	280.4±23.8	296.5±28.4	321.5±31.4	337.5±26.9 <sup>a</sup>
Feed Intake/g	1040.5±87.6	1062.3±88.2	1056.9±90.4	1046.5±80.6
F/G	3.73	3.60	3.29	3.10 <sup>a</sup>
Diarrhea Times	10	5	2	0
Appearance	pale, messy	glimmering luster, messy	luster, soft	apparent luster, soft

### 3 Hematopoietic Function

Although organic Fe preparation has high bioavailability, there is the adjustment effect of “Fe balance” on iron absorption of animal: Fe can be absorbed and transported until they have combined with transferrin absolutely in animal body. However, the number of transferrin is limited, Dissociative transferrin can combine with new Fe in intestinal chime and transport it only when Fe is released from transferrin. If Fe is not utilized by bone marrow in the body, dissociative transferrin is saturated by the absorptive iron in intestine tract, and iron reabsorption will cease working automatically until iron is utilized by bone marrow in the body and new dissociative transferrin emerge, which is the body’s iron balance phenomenon. (See the Figure 2.)



■ Figure 2. Phenomenon of “Iron Balance” in Animal Body



Many authors have described the regulatory effect of animal intestinal tract on iron balance, for example, Cheng Ling (1998) pointed out that intestinal tract only absorbs the amount of iron needed for the body in its natural form; most of residual iron are excreted from the body along with the feces. Iron storage and hematopoietic function have an effect on iron absorption rate leading to the big change. Generally iron absorption rate is between 5-40%. When Piglets are in iron-deficient anemia, iron stores become depleted and hematopoiesis hyperfunction appears, eventually iron absorption rate can reach 30-40% in intestine.

So if there is no increase in body requirements of iron essentially, even animals has been fed with high bioavailability organic iron preparation, the increase in the absolute utilization rate of total iron is still limited. Is it possible to regulate the animal's iron demand? Traditional Chinese medicine, such as salvia miltiorrhiza, angelica, radix puerariae, radix astragali, etc., and feed additives, such as PerFerrous Gly, all significantly have the ability to stimulate the hematopoietic system - bone marrow.

Hematopoietic function is improved, the body's demand for iron is exuberant and "turnover velocity" of transferrin is accelerated in "iron balance" regulation, absolute utilization rate of feed iron is increased, therefore blood is energetic and appearance is red skin and bright hair.

Compared with inorganic iron, organic iron preparation is an iron source with higher utilization rate. Through the strengthening use of iron in bone marrow, this product accelerates the turnover velocity of transferrin (carriers for absorption and transportation) to improve the utilization rate of all kinds of iron source products. The above two points coordinate with each other. Therefore, the best solution is a combination of organic iron and hematopoietic agent for iron nutrition enhancement.

## Efficacy

- 1** Supplement of organic iron with high bioavailability improves piglets' blood physiological status and maintains normal level of blood cells and hemachrome to prevent many types of anemia.
- 2** This product promotes the biosynthesis of cell pigment system, various oxidoreductase system and catalase. It improves the speed of ATP energy supply in body's cells and other life activities, further to promote the growth of animals.

**3** This product improves the body's demand for iron and promotes the absorption of feed iron. It increases the contents of erythrocyte and hemoglobin, so that it improves capacity in blood supply and accelerates the circulation of blood leading to the healthy and ruddy skin.

**4** This product improves iron nutrition and reproductive performance of sows; it improves the litter size and piglets birth weight; it improves iron storage for newborn piglets and iron content in breast milk; it reduces piglets' mortality and promotes their growth; it improves the weaning weight.

## Usage & Dosage

Per T fodder allowed to add 200 ~ 500 g of this product:

Concentrated feeds, premixes are in proportion to add this product after conversion.

In order to ensure uniformity in the feed, the use of this product need to be premixed firstly, and then gradually added to the follow-up feed.

This product is used as soon as possible after unpacking, the remaining parts need to tie up and keep in dark place.

## Packaging & Storage

This product is packaged in a bag or barrel, the net weight of product is 25kg, and details see the package label.

Keep away from heat, moisture and direct sunlight, not with toxic and harmful substances mixed.

Under the condition of original package, the shelf life is 24 months.





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