

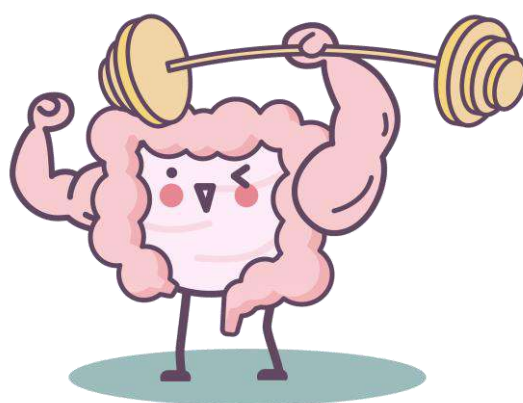
# Research on the application of sodium butyrate in sows



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Sodium butyrate, with the molecular formula of  $C_4H_7O_2Na$ , is white or white-like powder, and has a special rancid fat odor like cheese.

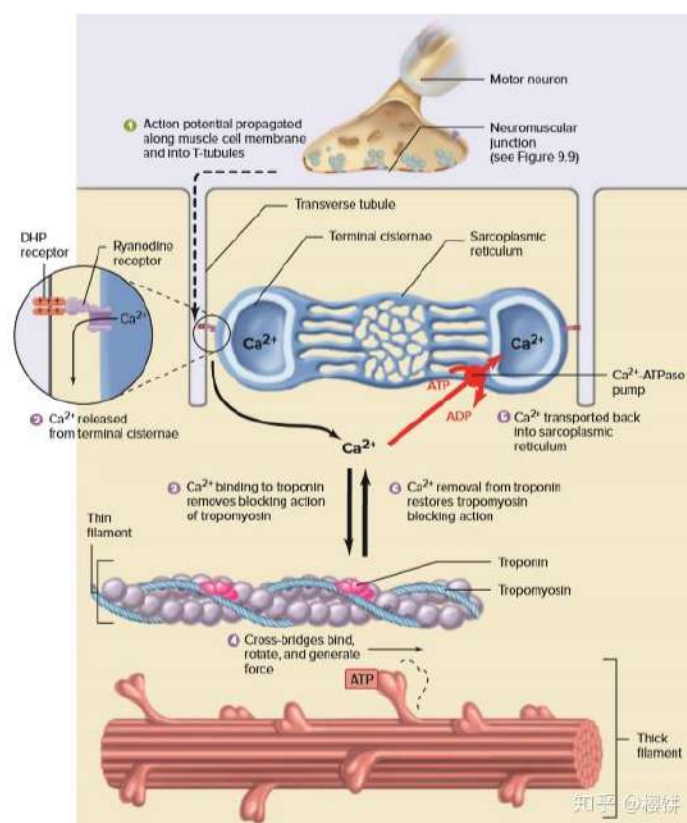
Butyric acid inhibits the growth of harmful bacteria through cell membrane, promotes the growth of beneficial bacteria in gastrointestinal tract, and makes gastrointestinal microecology in positive balance. Butyric acid is the preferred energy of intestinal cells, which is absorbed in intestinal cavity and can quickly provide energy for intestinal epithelial cells through oxidation. It has been proved that sodium butyrate is an activator to increase the proliferation of intestinal villi and deepen the crypt. It can enlarge intestinal absorption area, increase feed intake and daily gain, reduce diarrhea and mortality, and promote nonspecific immune system and specific immune system function.



### 1 Enhance the absorption rate of calcium by the body

Some data show that sodium butyrate can increase the absorption rate of calcium in the intestinal tract of breeding sows by 53%. The reasons may include: ① Sodium butyrate can increase the proliferation of stem cells and enlarge the absorption surface area by increasing the proliferation of crypts and the length of small intestinal villi, thus enhancing the absorption of nutrients including calcium. ② Studies have shown that adding sodium butyrate to the diet of early weaned piglets did not change the total number of microorganisms in gastrointestinal tract, but increased the proportion of lactobacillus in intestinal bacteria. Lactobacillus can produce more lactic acid and butyric acid products after proliferation. Both of them can reduce the pH value of

hindgut. They play the role of acidification, dissolving calcium salts and improving the absorption of calcium. In addition, lactic acid can also form a complex with calcium, which further improves the absorption and utilization of calcium. ③Sodium butyrate may regulate the expression of calcium transporter gene by affecting the effective translation of mRNA on cell membrane, thus affecting calcium absorption. The full absorption of calcium can improve the contractility of uterine smooth muscle, promote the delivery of sows, reduce the incidence of dystocia, and reduce the incidence of reproductive diseases such as metritis and vaginitis caused by artificial intervention in midwifery. At the same time, it can effectively prevent the excessive loss of calcium in the bones of sows, reduce the occurrence of leg diseases of sows, and prolong the planting period.



## 2 Improve milk yield and milk fat rate

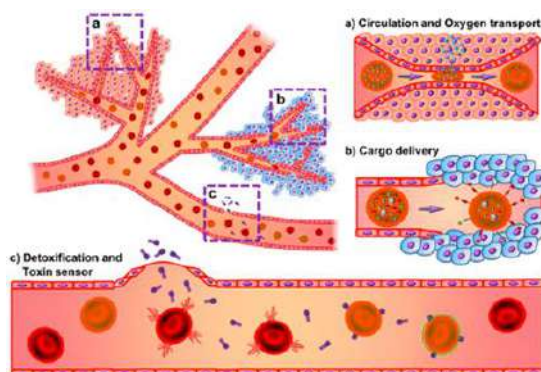
Sodium butyrate stimulates the secretion of cholecystokinin (CCK hormone) and activates the activities of digestive enzymes such as pancreatic amylase and pancreatic lipase. The concentration of lactose, maltose and sucrose in intestinal cavity was greatly increased, and the digestibility of feed was improved. Sodium butyrate is a rapid energy source for intestinal

epithelial cells. It can also increase the digestion and absorption area of small intestine by increasing the height of intestinal villi and the depth of crypt, thus improving the absorption of nutrients. Among them, the absorption of short-chain fatty acids will increase the milk fat rate in milk. At the same time, short-chain fatty acids can stimulate the proliferation and development of breast cells, promote the formation and secretion of milk, and increase the milk yield.



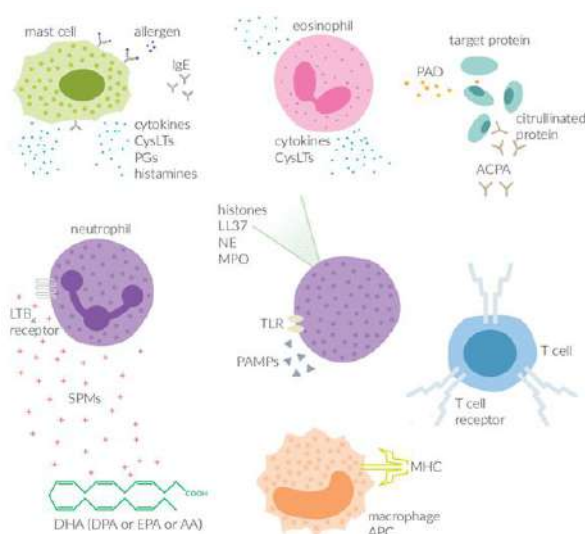
### 3 Promote hemoglobin synthesis

Sodium butyrate can promote the synthesis of hemoglobin in sow blood and increase the number of red blood cells. Butyrate can induce the remote promoter of globin gene and promote the synthesis of hemoglobin, especially can selectively stimulate the increase of fetal hemoglobin synthesis. When the number of red blood cells increases, the oxygen carrying capacity of blood will be enhanced, which will make the skin of sows red and bright, and reduce the difficulty of embryo breathing in late pregnancy. At the same time, the oxygen carrying capacity of umbilical cord blood is enhanced, and the embryo implantation capacity is improved, so that the newborn piglets have strong vitality.



### 4 Improve the health level of sows

Studies have shown that sodium butyrate can significantly increase the number of mast cells in duodenum, jejunum and ileum by 19.7%, 27.2% and 30.7% respectively compared with the control group. The proliferation of these cells can enhance the immune response sensitivity of gastrointestinal system, improve immunity, and build a solid gastrointestinal immune barrier in cooperation with healthy and complete intestinal epithelium and wall structure.



#### 5 Enhance the ability to resist heat stress

The final metabolites of butyrate are ketone body and carbon dioxide. The generated carbon dioxide is converted into bicarbonate anion, which leads to the increase of hydrogen ion concentration in the body and strengthens the exchange with sodium ion. The absorption of sodium ions increased, the stable internal environment was maintained, the ability of sows to resist heat stress was enhanced, and the occurrence of postpartum diseases was reduced.

#### 6 Reduce the occurrence of gastrointestinal diseases in piglets

Sodium butyrate can reach milk through sow breast tissue and be used by piglets. Milk dry matter contains butyric acid derivatives about 3.8%. Sodium butyrate can promote the development and maturity of gastrointestinal tract of piglets, maintain the health of intestinal tract, and reduce the occurrence of diarrhea in piglets.