Feed contamination and food safety in China

Bai Xue

Animal Nutrition Institute, Sichuan Agricultural University, Sichuan, Yaan, 625014, China

The toxic and harmful substances in animal products mainly come from animal feeds. We should trace the food safety from the beginning, and therefore, animal feed safety is the precondition of food safety. The toxic and harmful substances in feed can be classified into biological contamination and non-biological contamination. The fomer includes bacterial contamination, spoilage and toxins from bacterial, and the later includes chemical contamination and radioactive contamination.

1. Current status of the biological contamination in feed in China

Mycotoxin, the secondary metabolites produced by fungal, is toxic to human and animal, including Aflatoxin (AFT), Deoxynivalenol (DON), Zearalenone (ZEN), Fumonisin (Fum), T-2 toxin and Ochratoxin A (OTA). The detection rate of mycotoxin in feedstuffs and complete feeds in China could be higher than 90%, with the exception of oil seed meals. The exceeding rate of mycotoxin in complete feeds was the highest, ranging from 60% ~ 70%. Although the detection rate of AF, OTA, T-2 was high, the exceeding rate was low, indicating the moderate pollution. Both the detection rate and the exceeding rate of ZEN, Fum, and DON was high, indicating the heavy pollution of these toxics. According to the survey of more than 800 feed ingredients and complete feeds in China and Southeast Asia, the detection rate of AFT, B1, T-2 toxin, OTA was higher than 94%, indicating the widely existing of the three toxins in China and in Southeast Asian countries.

2. Current status of the non-biological contamination in feed in China

2.1 Trace elements

Trace minerals could increase animal performance, and therefore has been frequently added in animal feeds in exceeding amount. Piglet supplemented with high copper (150 ~ 250 mg/kg, CuSO4) and high zinc (2000 ~ 3000 mg/kg, zinc oxide) has a higher growth rate, feed conversion rate, feed intake, and a lower diarrhea rate. But high Cu and Zn can significantly increase the excretion of copper and zinc, and the deposition of copper and zinc in liver, kidney and muscle. Nowadays organic As are widely used as animal growth promoters, which cause the risk of residue in livestock products. The LD_{50} of arsenic for people is 1 ~ 2.5mg.

2.2 Antibiotics

Antibiotics can promote animal performance and therefore are widely used as feed additives.

Antibiotic additives may deposit in animal carcass, eggs and milk, resulting in the chronic accumulation in human body which may lead to allergic reactions, bacteria resistance, teratogenic, mutagenic, carcinogenic. The use of antibiotics should be strictly regulated by the rules and standards. The major problem is that some items of the rules such as off-drug period are not obeyed occasionally. Some drugs banned in other countries are still used in China. There is no definite evidence that the drug resistance of human is directly related to the antibiotics used in animal feed, but the long-term sub-therapeutic use of antibiotics has brought widespread anxious in society.

2.3 Hormones

Clenbuterol, a neural stimulant of β-adrenal, can promote animal growth, improve feed conversion, increase protein deposition and reduce body fat. But clenbuterol may deposit in animal muscle and giblets with high concentration, causing bad effect on liver, kidney and nervous system of human via food chain. Clenbuterol and other β-agonists have been banned since 1997 in China, but the clenbuterol poisoning accidents happened many times in Guangdong and Liaoning province.

The use of sex hormones and thyroid hormones in beef cattle and aquaculture was approved in the past, but these hormones can be easily accumulated in animal products, imperiling human health. Estrogen was proved to be carcinogenic and therefore was banned in China. The safety issues of peptide hormones are still in discussing.

2.4 Animal feedstuff of cows

People thought that offals of animal products (such as bone meal, meat meal and blood meal) are safe when treated by high temperature and high pressure. But the prion in the offals of animal products can not be killed by high temperature, high pressure, UV, radiation and drugs, causing mad cow disease which is a zoonose. It was banned to use the offals in 1998 in UK. In 1996, there is a global banning on the use of offals for preventing the occurrence and spread of mad cow disease.

2.5 Pesticide Residues

Animal feeds are mainly from plants, and the modern production of plants is based on pesticides, which contain many chemical pollutants, such as dioxins, PAHs, nitro-PAHs, PCBs, chlorinated aromatics, nitro - aromatic compounds. They are hard to be degraded, easy accumulating, strong toxic, carcinogenic, teratogenic, and mutagenic. These pesticides may accumulate in animal body via food chain, and ultimately enter human body and imperil human health.