Journal of Computational Science & Engineering 57(2022) 45-48
Available at http://www.asocse.org ISSN 1710-4068

Application of ELISA Eechnology in Quality and Safety Detection of Livestock Products

Cuiping Li [1], Haibo Chen[2],Changchun Dai [3], Na Lin[4]
[1]Binzhou Polytechnic, Binzhou, Shandong 256600, China
[2]Binzhou Polytechnic, Binzhou, Shandong 256600, China
[3]Binzhou Polytechnic, Binzhou, Shandong 256600, China
[4]Binzhou Polytechnic, Binzhou, Shandong 256600, China

Abstract: ELISA technology is to adsorb antigen antibody on solid-phase carrier, carry out immunoenzyme staining on the carrier, and finally use spectrophotometer to judge the color development result of substrate, so as to achieve the purpose of detection. ELISA technology can detect the quality and safety problems of products in time, so as to deal with them effectively. ELISA technology has high safety. It can detect livestock products reasonably with less organic solvents. This paper introduces the principle of ELISA and its application in the quality and safety detection of livestock products, in order to be helpful to the work of grass-roots inspectors.

Keywords: ELISA technology; Product quality and safety; Testing; application

***Corresponding author.** Email: Lqian27@163.com

Received 03 August 2022, Revised 15 August 2022, Accepted 22 August 2022

1.Introduction

ELISA technology is an experimental technology with high specificity and sensitivity based on immunological reaction, which combines the specific reaction of antigen and antibody with the efficient catalysis of enzyme to substrate [1]. The specific step is to bind the antigen and antibody in the matrix to the surface of the solid-phase carrier to retain its immune activity, and then add the antigen and antibody to combine with the enzyme to form a coupling compound. The coupling compound not only has the activity specificity of the enzyme, but also has the activity of specific binding with the antigen and antibody on the surface of the carrier, and finally add the substrate of the corresponding enzyme, Thus, the color reaction occurs, and the color development result of the substrate is determined by the spectrophotometer to judge the detection result. There are seven common types of ELISA, including double antibody sandwich assay for antigen, double antigen sandwich assay for antibody, indirect assay for antibody, competitive assay for antibody, competitive assay for antigen, capture coating assay for antibody and About the author: Gao Lina (1982.12 -), female, from Tianjin, master, engineer, mainly engaged in the quality and safety inspection and testing of aquatic products and livestock products Principle of ELISA technology.

2.Background

2.1 Detection of drug residues in livestock products

Drug residue is a very important part in the safety detection of livestock products. In the process of livestock and poultry breeding, in order to better reduce the occurrence of livestock and poultry diseases, some drugs are usually added to the feed, and some farms can't use drugs strictly according to the instructions after livestock and poultry diseases,

which leads to accumulation in livestock and poultry Drugs with incomplete metabolism. If the residual drugs exceed the safety standards or livestock and poultry use illegal drugs before slaughtering and processing, animal products will pose a great threat to the health and safety of consumers. The use of ELISA technology can comprehensively monitor the drug residues in livestock products and accurately determine the drug residues in livestock and poultry. In the process of using ELISA technology, multiple samples can be detected at the same time, and only a small amount of methanol, acetonitrile and other organic solvents are used in the detection process, The use of this part of organic solvent has almost no impact on livestock and poultry, which not only ensures the detection accuracy, but also improves the safety [2] Application of ELISA technology in quality and safety detection of livestock products.

At present, drug residues in livestock products mainly include hormone drugs, antibiotics, furans, sulfonamides, genetically modified drugs, quinolones, etc. in the detection of antibiotic residues in livestock products, ELISA method has the advantages of simple sample pretreatment, short analysis time and high sensitivity GC-MS and other

2022@ The American Computational Science Society. All rights reserved.

methods are more suitable for screening a large number of daily samples. For example, when ELISA technology is used to detect sulfonamides residues in pork and milk, the detection limit can reach 2.0 μ G / kg, the detection limit of chloramphenicol can reach 100ng / kg, and the detection limit of chlorpromazine is 12.07 μ g/L [3] 。 Hormone drugs such as diethylstilbestrol can improve the average daily weight gain and feed return of livestock and poultry. For people, diethylstilbestrol can not only cause human cancer, but also cause physiological dysfunction and affect the growth and development of children. Therefore, the World Health Organization prohibits the use of diethylstilbestrol, and the European Union limits diethylstilbestrol to 2 μ G / kg, the detection limit of ELISA in the detection of diethylstilbestrol is 187.5ng/kg, which is much higher than the limit value.Detection of animal biological toxins

Biological toxins are mainly the residues of bioactive substances in the body caused by livestock and poultry passing through the food chain. These bioactive substances not only do some damage to livestock and poultry itself, but also pose a great threat to mankind. Common biological toxins in livestock products include algal toxins and mycotoxins. Algal toxins mainly include diarrhoeal shellfish toxin, paralytic shellfish toxin, neurotoxic shellfish toxin, Sika fish toxin and amnesia shellfish toxin [4]. Aflatoxin is a kind of mycotoxin, which is a serious and widely distributed toxin in biological toxins. The long-term use of animal products containing aflatoxin will cause serious damage to human body and the incidence rate of cancer will increase greatly. The detection limit of ELISA for aflatoxin was 0.01 μ G / kg, the detection time is about 2h, and the detection limit is 20ng / kg. Compared with other detection methods, it has higher sensitivity and shorter detection time.

2.2 Microbiological detection of livestock products

The of microorganisms is an important factor leading to foodborne diseases and affecting the safety of livestock products,

Microbiological examination of livestock products mainly includes the total number of colonies, coliforms, Salmonella, Staphylococcus aureus and other pathogenic bacteria. The commonly used microbiological detection method is to isolate and cultivate microorganisms, and then use biochemical test and serological test for diagnosis. This method not only requires operators to have certain professional quality, The detection cycle is also relatively long, mostly 6 ~ 7d, while the detection time of ELISA in detecting microorganisms is usually 2 ~ 3D, which greatly saves the detection time. At present, in the process of fish breeding, due to the serious pollution of water source and environment, the content of

Salmonella in aquatic products is high, so it is necessary to detect microorganisms in aquatic products. In addition, some bacteria such as E. coli can not be cultured under certain conditions, which is difficult to detect by traditional detection methods [5], and ELISA technology can solve this problem well.

2.3 Detection of livestock products, pesticides and genetically modified products

Livestock and poultry need feed to provide nutrients for their growth and development in the process of breeding, and the raw materials of feed are mostly crops. Crops need to use certain fertilizers and pesticides in the process of middle finger to ensure the normal growth of crops. However, excessive use of fertilizers and pesticides will lead to excessive pesticide residues in crops, which will be eaten by livestock and poultry after being made into feed, These substances cannot be completely excreted through metabolism, so they enter the human body through the food chain. After eating livestock products containing pesticide residues, they will have symptoms of nausea, fever and even coma, which seriously endanger people's health. In recent years, researchers have introduced foreign genes with good properties into plants, animals or microorganisms to form genetically modified organisms. The genetic material of genetically modified organisms has changed, and this change is not clear at present, which may bring some unpredictable harm to human body. In order to control and avoid this kind of harm, pesticides in livestock products Genetically modified products are tested. ELISA can be well combined with high performance liquid chromatography and thin layer chromatography to narrow the positioning range, effectively detect the residue types and contents of pesticides and genetically modified products, and escort the quality and safety of livestock products.

3. Conclusion

At present, ELISA technology is widely used in the detection of veterinary drug residues, biotoxins, microorganisms, pesticide residues and genetically modified products of livestock products because of its simple operation, high sensitivity, high specificity, high safety, low cost and simple equipment. Summary It can quickly analyze a large number of samples and reduce the detection cost, Improving the detection efficiency has been called an indispensable method in the quality and safety detection of livestock products. In the next step, we should

2022@ The American Computational Science Society. All rights reserved.

continue to improve the purification steps of samples and improve the recovery and sensitivity, so as to make ELISA have a broader application prospect.

3.1 The work of county (city) centers and veterinary laboratories is limited

Due to the problems of funds and equipment, it is difficult for some centers and veterinary laboratories to carry out business work, the construction of laboratory instrument hardware facilities and equipment lags behind, and there is insufficient testing funds Suggestions on accelerating the construction and development of animal disease prevention and control system in grass-roots prefectures .

3.2 Paying attention to the veterinary team

Departments at all levels should raise awareness of the importance of animal disease prevention and control, and pay attention to the veterinary team. Animal husbandry is an important industry in the development of agriculture and rural economy, and the veterinary team is an important force for the healthy and sustainable development of local animal husbandry. Governments at all levels should clearly understand that the work of grass-roots veterinarians is dangerous, has poor reputation, heavy workload, low treatment and poor working environment. Without the important link of epidemic prevention and control, the development of animal husbandry industry will not develop rapidly and healthily. Therefore, caring for grass-roots veterinary workers means paying attention to the development of animal husbandry industry, agricultural and rural economic development, and increasing the income of farmers.

3.3 Increasing the working funds of grass-roots Township stations to ensure the comprehensive development of animal husbandry and veterinary work

Sufficient funds are needed to carry out the whole animal husbandry and veterinary work. For example, the preservation of vaccines requires corresponding freezers and refrigerators, while the operation of freezers and refrigerators consumes electricity, and the transportation of vaccines requires refrigerated vehicles; The inspection and Quarantine of livestock and poultry and their products need testing equipment and facilities; Spray disinfection requires mechanical equipment, diesel oil and disinfectant to work. The consumption of iodine and iodine needles is compulsory. To this end, governments at all levels

Departments should increase the budget, ensure the working funds of county, city and township stations, purchase and reserve emergency materials for the prevention and control of major animal diseases and equip vaccine freezers, which is the premise to ensure the smooth development of animal husbandry and veterinary work.

3.4 Improving the treatment of village epidemic prevention personnel and ensure the relative stability of the team

The village epidemic prevention officer is a supplement to the veterinary team in the whole Township and an integral part. It is an important guarantee for the epidemic prevention density of livestock and poultry to meet the national requirements. It is also an indispensable member in the inspection and Quarantine of livestock and poultry and their products such as origin. It is an important force to ensure the safety of livestock and poultry products, It is also an important guarantee for the popularization and implementation of a number of agricultural technologies at the grass-roots level. Therefore, it is suggested to improve the corresponding treatment of village epidemic prevention personnel.

3.5 Increasing professional technicians in Township stations to ensure the development of epidemic prevention and control

Some Township animal husbandry and veterinary stations are obviously short of professionals, and the phenomenon of aging is obvious

Obviously, and some township professionals are seriously transferred. In order to avoid affecting the smooth development of animal husbandry and veterinary work due to the shortage of veterinary professionals in villages and towns, villages and towns should increase the recruitment and training of professionals.

3.6 Increasing the investment and reconstruction of county (city) level Central Veterinary Laboratory

County (city) level finance should increase investment in laboratory hardware facilities, strengthen laboratory capacity-building, include monitoring funds into the financial budget, and ensure the normal development of animal

2022@ The American Computational Science Society. All rights reserved.

disease monitoring, so as to better provide technical support for county (city) level animal disease prevention and control. Further strengthen the training of veterinary laboratory personnel to improve their professional theoretical level, experimental operation skills and knowledge of relevant laws and regulations, so as to ensure the sound and rapid development of epidemic prevention and control.

Avidin biotin ELISA system, in which the indirect method is mainly used to detect antibodies in the detection of infectious diseases. Its advantage is that the corresponding antibodies can be established by using the same enzyme label antibody only by changing the coating antigen. When the interfering substance in the antigen material is not easy to be removed or the antigen with sufficient purity is not easy to be obtained, the antibody can be measured by competitive method. The antibody detected by capture coating method can be used for the early diagnosis of viral infection.

References

[1] Liu Weihong Application of enzyme linked immunosorbent assay in the detection of veterinary drug residues in livestock products [J] Shandong Animal Husbandry and veterinary, 2017,38 (4): 61-62
[2] Zhang Pei, Wu Feiyan, Shi Weiwei, Li Zhuan Application of ELISA technology in safety detection of livestock products [J] Contemporary animal husbandry, 2017 (32): 9-10
[3] Huang Shengguang, Zhao Hui, Wang Yufang, Xiao Jiamei, Wang Feng Research Progress on detection methods of veterinary drug residues in livestock products [J] Specialty research, 2020,42 (2): 65-75
[4] Xing yingshou, Qi kezong, Zhu Liangqiang Application of ELISA technology in safety detection of livestock products [J] Advances in animal medicine, 2004 (3): 19-22
[5] Chen Dongliang, Liu Sumei Application of ELISA technology in safety detection of livestock products [J] Chinese animal husbandry and veterinary abstracts, 2017,33 (8): 64,72

2022@ The American Computational Science Society. All rights reserved.