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Opinion

Antibiotic Residuals in Meat Kinetics, Detection and Impacts

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Humans are basically Omnivores and they have been prying on animals since the start of this world. Almost 346.14-million-ton meat is consumed every year in the world. People prefer animals to eat according to their culture and religion. Whatever the meat is containing, will be metabolized by our body and eventually becomes part of it. This whole process involves different body organs which have their specific function in meat digestion at different stages.

Bacteria and antibiotics

Most of the disease we usually see in hospital are of bacterial origin. Either we are a veterinarian or a human physician, our first choice for any bacterial disease will be antibiotics. There are different classes which have different mode of actions. All bacteria have their own method of attack on any cell to transfer disease and the antibiotics are chosen to keep the attack of bacteria and mode of action of drug in consideration.

Use of antibiotics in veterinary medicine

All animals are prone to diseases and almost 75% of diseases are bacterial in nature. The worldwide treatment option to combat bacterial diseases is the use of antibiotics of different generations. In veterinary medicine when we use any antibacterial drug, it is injected in muscles and then absorbed in the blood through capillaries towards the targeted site.

Pharmacokinetics of antibiotics

The study of time courses of drug Absorption, Distribution, Metabolism and Excretion is defined as pharmacokinetics. Its main goal is to reduce the toxicity and enhancing its efficiency.

Pharmacokinetics gives us knowledge to understand the physical and chemical properties of a specific drug and how its responses correlate with the body.

The pharmacokinetics of Antibiotics depends upon their chemical structure which effects their bioavailability, tissues penetration, distribution, degradation and elimination.

When we take antibiotics it absorbed in our digestive system and then goes into our blood stream like the nutrients from the food and goes to all the parts of the body including the targeted area.

After absorption and distribution of antibiotics in the body tissue and body fluid metabolising enzymes in the body degrade it.

The liver is the main organ for metabolism of drugs Although every tissue of the body has ability to metabolise them. Drug metabolising enzymes are called mixed function oxidase or mono oxygenase. Cytochrome P450 enzymes are essential for the metabolism of many medications.

The antibiotics are metabolised by liver and then inactivated and converted into a more readily excreted substance eg. Penicillin can be metabolised to penicilloic acids in the man.

Kidneys are the main route of drug elimination through urine. Both the antibiotics and antibiotic metabolites are removed from the body through these excretion pathways as well as excretion into bile and feces.

Each antibiotic may stay in the body for different length of time but common antibiotic such as Amoxicillin and ciprofloxacin in our

system for 24 hours after taking the last dose.

People having kidney problems may have different or longer time to eliminate it from the body. About 60% of the antibiotics are excreted by the urine via glomerular filtration and remaining 40% are excreted through feces.

Antibiotic residuals

When the antibiotics are metabolized, they leave the residuals in meat and body organs such as liver and kidney which is then consumed by the eater as an indirect an unnecessary dose. These residuals are detectable in meat and these organs via different methods. Two of the major tests are described in detail and can be followed.

Detection of antibiotic residuals from meat

Swab test on premises (STOP)

Principle

Stop is the biological test for the presence of inhibitors (antibiotics) in animal tissue. It is based on the principle that if the tissue contains antibiotic residues, fluid from the tissue will inhibit the growth of a sensitive organism on a bacterial culture plate.

Materials

- Kidney tissue
- Cotton swab
- Agar gel culture plate
- Stain of Bacillus subtillus bacteria.

Procedure

- Cotton swabs saturated with kidney tissue fluid from the suspected carcass are placed on an agar gel culture plate.
- The agar gel culture plate has been preceded with a special stain of Bacillus subtillus bacteria that is highly sensitive to all the common antibiotics.
- The swabs and plates are incubated for 16-18 hours to allow the growth of the organism.
- Then the plates are examined for the zones of inhibited growth around the swab.

Advantages

- It is a very simple test
- It is a highly accurate test for the detection of the antibiotic residues in the animal tissue
- With this test, the tissue may be tested in the slaughtering plant.
- This test reduces the holding time of many retained carcasses.
- This test reduces the time spent in packing and mailing specimens and results in decreased mailing and laboratory costs.

Limitations

Experience has shown that the kidney is the most likely organ to contain antibiotic residues, so kidney tissue is used for this test.

Fast antimicrobial screen test (FAST)

Materials

- Cotton swab
- Meat sample
- Agar plates
- Bacillus megaterium spore suspension
- Incubator

Procedure

- A sterile cotton tipped applicator is inserted into the kidney sample of an animal and left for 30 min to absorb tissue fluids.
- The agar plates are surface streaked with bacillus megaterium spore suspension on a sterile cotton swab.
- The swab from kidney is removed, broken as close to cotton tip as possible and place on the agar plate and incubated at 44C.
- The plate is examined for a zone of inhibition around the swab at 6-18 hours.
- In case of inhibition at 6 h, the plate is further examined at 18 h for conformation, if there is clear inhibition, muscle, liver and kidney tissue from the suspected carcasses are collected and further analyzed for conformation.
- When no inhibition is seen at 6h, the carcass is free of antimicrobial residues at detectable levels.

Conclusion

The transfer of antibiotic residuals in human body through meat consumption is a real concern for us. We are having low doses of antibiotics indirectly and making the bacteria normally residing

in us, resistant to these drugs. We should make these testes mandatory for meat department such as slaughterhouses to conduct before selling the meat. This the only way to halt the process of antimicrobial resistance in disease causing bacteria.