

## RESIDUES OF VETERINARY DRUGS AND PESTICIDES IN MEAT

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Residue is defined as a residue of substance having a pharmacological action, of their metabolites and of other substances transmitted to animal products and which are likely to be harmful to human health. Animals intended for human consumption may get exposed to pesticides through their feed, fodder or water or in course of their pest control measures. Despite obvious benefits, occasional misuse of such chemicals has resulted in overt intoxication of animals and accumulation of residues in feeds and fodder. A large number of drugs used to control or prevent infection or to promote growth are considered essential in modern animal production. The widespread and injudicious prophylactic or therapeutic use of antimicrobials in treatment of animals leads to the persistence of these residues in animal tissues. Given the current long life expectancy of humans, increased suppression of human immune system through long term exposure to low levels of these residues is also a growing concern.

### Antimicrobials

Many of the drugs used in modern production systems are rapidly absorbed and therefore do not produce lesions that can be observed at post mortem. Clearance rates for drugs will vary and conditions that prolong the process can lead to tissue residues at slaughter. Consumption of these antibiotics builds up resistant strains of bacteria in animals. When these resistant bacteria are passed on to consumers who consume meat, they are exposed to diseases which would now become impossible to treat. Even if the resistant bacteria do not cause illness, they transfer their antibiotic resistant factor to other unrelated bacteria.

Penicillin is approved for use in food producing animals in most countries. Diffusion of Penicillin in tissue and formation of residues in slaughter animals are considered a public health hazard because of the potential for hypersensitivity reactions in people. The accumulation of this drug to toxic levels leads to accumulation in kidney resulting into death.

The long term formulation of oxytetracycline available for intramuscular administration in food animals exhibit their long acting effect because of the high dosage used and the prolonged drug persistence at the site of intra muscular injection. These drugs account to relatively high frequency of drugs in tissues which result in blood dyscrasia and rarely, allergic reactions.

Sulphonamides are distributed though out all tissues of the body of the animal when administered. There is a major concern about thyroid toxicity as a major human safety concern associated with this drug which is usually related to the ingestion

of high doses of sulphamethazine. Aplastic anaemia, thrombocytopenia and allergy are also associated with the use of the compound Sulphamethazine and nitrofurazone can produce cancer in laboratory animals and as such are potential human carcinogens.

Fluroquinolones when administered to food producing animals, promote the emergence of resistance in bacteria that may not be pathogenic to animals but may cause illness in humans. The compound is also associated with renal toxicity and photosensitivity in humans. Chloramphenicol leads to aplastic anaemia and gentamycin and neomycin are found to be nephrotoxic.

Observation of withdrawal period of antibiotics before slaughter of animals will help in reducing the risk of antibiotic residues in meat to a great extent. The withdrawal period of some of the common antibiotics used in veterinary practice is shown in table 1.

**Table 1. WITHDRAWAL TIME OF COMMONLY USED ANTIBIOTICS**

DRUGS	Pre-Slaughter Withdrawal Time (days)
AMPLICILLIN	6
PROCAINE PENICILLIN G	5
DIHYDROSTREPTOMYCIN SULPHATE	30
ERYTHROMYCIN	14
OXYTETRACYCLINE HYDROCHLORIDE	3
SULPHADIMETHOXIME	7
SULPHAMETHOXY PYRIDAZINE	16
SULPHAMETHAZINE	10
TYLOSIN	8

The common methods used for detecting antibiotic residues are Microbiological inhibition test (MIT), ELISA, HPLC, radioimmunoassay and infrared or mass spectrometry. The maximum residual level of some antibacterials in meat is shown in Table 2.

If residues of antibiotics are present in food animal tissues above accepted limits, total condemnation of the carcass and its offal is fully warranted.

### Hormones

Hormones have been used for a variety of therapeutic and growth modifying purposes in animals. Anabolic steroids are being widely utilized by livestock owners world over to improve the lean fat ratio as well as to increase growth. The most serious

potential hazard arising from the use of anabolic steroids is that of tissue residues of the substance or its metabolites in tissues or organs. Organs such as kidney and liver remove the residual drugs and greatly reduce the content present in meat. Since anabolic steroids are often potent sex steroids and in some cases potential carcinogens, it is vital that they be used with great care to ensure that there are no undesirable effects in animals or consumers of meat. As a precaution, the stock must not be implanted less than 60 days before slaughter. Scientists argue that, because these substances have no effect if swallowed then these should not pose any health risk to humans. But the fact remains that you cannot eliminate the risk 100% and therefore you cannot say it is 100% safe.

**TABLE 2. MRL OF CERTAIN ANTIBACTERIALS FOR MEAT**

Compounds	MRL (ng/g)
Neomycin	500
Streptomycin	1000
Penicillin	60
Ampicillin	50
Amoxicillin	50
Benzyl Penicillin	50
Cloxacillin	300
Chloramphenicol	10
Nitrofurantoin	5
Sulphonamides	100
Trimethoprim	50
Tetracycline	500
Chlortetracycline	50
Oxytetracycline	250

Because of extremely short half life of endogenous hormones oestradiol, progesterone, testosterone and oxytocin, no pre-slaughter withdrawal time is necessary to protect public health. However indiscriminate use of these natural hormones may lead to residues in meat which may be carcinogenic. Synthetic hormones e.g. trenbolone acetate, zeranol, diethyl stilbesterol and MGA are not metabolized quickly. Hence it is necessary to demonstrate the amount of hormone in meat after treatment is below the safe limit. The important tests used for the detection of these residues include HPLC, ELISA and radioimmunoassay. The MRL value of hormones in meat is shown in Table 3. The hazardous effects of synthetic hormones include reduction in growth rate, muscle atrophy, excessive retention of water and sodium, depletion of potassium and suppression of the immune mechanism.

**(-Adrenergic Agonists**

The (-adrenergic agonists utilized for improving the carcass composition include clenbuterol, salbutamol, isoproterenol, cimeterol etc. Meat from clenbuterol treated animals has been

found to cause illness and even death in humans. Many harmful effects on humans have been demonstrated for these drugs due to their bronchodilator effects, muscle tremors, nausea, vomiting and tachycardia.

**Insecticides**

The chlorinated hydrocarbons (e.g. DDT, endosulfan) are extremely durable, persistent and bioaccumulating compounds which find their way in to the food chain usually through use in controlling environmental and animal pests. Endosulfan is registered for use in livestock feed (e.g. cereals and pastures), potentially leading to meat residue. Unacceptably high tissue concentration of these groups of insecticides has been observed in broilers fed with treated grains. Detoxification of these insecticides is less in birds as compared to mammals as the former are deficient in hepatic microsomal mono-oxygenase activity. OC compounds mainly accumulate in adipose tissue and the site of toxic action of this group of insecticide is brain. The symptoms mainly and the symptoms include paresthesia of tongue, lips and face, hyperexcitability, dizziness, clonic and tonic convulsions.

The organophosphates (e.g. Melathion, Coumaphos etc.) are less persistent in the environment than organochlorides because they can be hydrolyzed chemically and enzymatically. The organophosphate compounds therefore produce few tissue residues. They are however, frequently more toxic in small amounts as their biological activity is greater.

**TABLE 3. MAXIMUM RESIDUAL LIMITS OF HORMONES**

HORMONE	MRL/ SAFE LEVEL (ng/g)	MATRIX
Testosterone	600	Muscle
Progesterone	3	Muscle
Dexamethasone (WHO 1998)	0.5	Muscle and kidney
	2.5	Liver
	0.3	Milk

Several agrochemicals based on the phenols are used as preservatives or herbicides (e.g. 2,4- D, MCPA, 2,4,5-T) Although these are not used on food crops or livestock, they pose residue problems when treated products are used for bedding. When absorbed, they cause disagreeable flavours in meat and egg. Although they are not individually toxic, they have derivatives which are regarded with suspicion. They lead to wasting syndrome, gastric ulcer, immunotoxicity, hepatotoxicity, hepatoporphyrria, vascular lesions, teratogenicity, fetotoxicity and endometriosis.

**Anthelmintics**

The salicylanide flukeicides, oxcyclosanide, closantal etc are

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