Veterinary Residues in Food of Animal Origin

Residue Surveillance

European law requires all Member States to monitor residues of veterinary drugs and prohibited substances in food products of animal origin. This is implemented in the UK by the National Residues Control Plan (NRCP). The number and type of samples taken is determined on a UK wide basis according to output, with NI taking a proportionate share of the samples.
The Meat Inspection Scheme also operates in Northern Ireland on a statutory basis. This scheme focuses on testing suspect animals in abattoirs, mainly cattle, for a range of antibiotics and hormones. DAERA inspectors select animals for sampling on the basis of treatment history, information received, and ante and post mortem inspection.
In addition to statutory testing, a risk based programme (Risk) which covers sheep, cattle, pigs, poultry, eggs and milk is undertaken in NI. EU law provides Member States with the flexibility to undertake additional discretionary testing in situations where further investigation is necessary or a survey is considered appropriate.
A non-compliant result from any of the testing schemes will trigger follow-up action which may include on-farm investigations and sampling, and possible targeted sampling of animals from the farm in question when presented for slaughter.
Compliance with EU residues surveillance legislation is an essential requirement for the export of Northern Ireland produce. Both domestic and export markets increasingly demand high quality products, with safety as a key element. An efficient and effective residues surveillance programme is vital in meeting this requirement. The additional testing makes an important contribution to product safety and provides added assurance to existing and potential customers.

Commentary on Non-Compliant Results for 2016

1. National Residues Control Plan
2. Meat Inspection Scheme
3. Risk Scheme

1. NATIONAL RESIDUES CONTROL PLAN

Samples collected under the UK National Residues Control Plan may be taken at abattoirs or on-farm, and provide retrospective surveillance data. As a consequence, carcases are not detained pending the laboratory result.

a) Prohibited and Unauthorised Substances

1. A number of samples tested non-compliant for a range of compounds, α-boldenone, α-nortestosterone, α-estradiol, taleranol/zeranol, testosterone, thiouracil and one sample contained the corticosteroids, cortisol, cortisone and prednisone. However, research studies for most of these compounds provide information regarding how they can occur naturally because of dietary, pregnancy, stress and other injury related factors. In all cases any follow up samples taken were compliant and no evidence of misuse was uncovered and no penalties applied.

b) Veterinary Medicines

1. **Dihydrostreptomycin**. This is an aminoglycoside antibiotic licensed for use in cattle, sheep and pigs. Residues of dihydrostreptomycin above the maximum residue limit were found in the kidney of a sheep. On farm investigation revealed that the animal had been treated with Pen & Strep and that the recommended withdrawal period had been adhered to. The investigation highlighted that the correct dose had been given however it had been administered to one site whereas the manufacturer's recommendation is that the dose should be given across multiple sites. The herd was flagged for follow up sampling at slaughter and all follow up samples taken were compliant.

2. **Amoxicillin.** This is a β-Lactam antibiotic that is licensed for use in a wide range of animal species. Residues, ten times the concentration of the maximum residue limit, were detected in a bovine milk sample. No investigation was undertaken as no milk entered the food chain however five animals from the same producer were sampled at slaughter house for follow up analysis and were compliant.

3. **Sulphadiazine**. This is an antimicrobial that is licensed for use in a wide range of animal species. Residues of sulphadiazine, nine times the concentration of the maximum residue limit, were detected in the kidney of one pig. On farm investigations found that the animal had been treated with sulphadiazine and that the withdrawal period had been completed a significant period prior to slaughter and therefore the cause of residue was unknown. Follow up samples were taken which were compliant however 6 months later a further 16 of 20 samples were found to contain levels of sulphadiazine.

4. **Sulphadimethoxine**. This is an antimicrobial that is licensed for use in pigeons. Residues of sulphadimethoxine above the maximum residue limit was detected in the kidney of one pig. On farm investigations found that the animal had not been treated with any medication and medicated feed had not been used on the farm within the last 3 years. As such the cause of the residue was unknown and all follow up samples taken were compliant.

5. **Closantel.** This is an antiparasitic drug, active against liver fluke, that is licensed for use in cattle and sheep. Residues were detected in two ovine liver samples in excess of the maximum residue limit. On farm investigations revealed that withdrawal times had been adhered to in both cases. However in one instance the animal may have been overdosed as estimated average weight was used to determine dose. In the remaining case a potential reason could not be determined. All follow up samples taken from both farms were compliant.

6. **Triclabendazole.** This is a narrow-spectrum antiparasitic agent, active against liver fluke, that is licensed for use in cattle, sheep and goats. Residues, ten times the concentration of the maximum residue limit, were detected in a bovine milk sample. As part of the investigation it was determined that the farmer may have treated the animal with the wrong product; he had intended to treat the animal with Zanil (oxyclosanide) but suggests he may have treated with Fasinex (triclabendazole) by mistake.

7. **Monensin.** This is an antiprotozoal agent used as an aid in the prevention of coccidiosis. It is licensed for use in broilers but not for chickens or turkeys producing eggs. Residues above the regulatory concentration were detected in an egg sample. As part of the investigation it was determined that there were 5 sites on the farm and that the cause of the residue may have been that birds from one of the treated sites (pullets) could have got amongst the laying birds. A further suggestion was that medicated feed may have been given to the laying birds however a follow up sample was compliant.

b) Contaminants

1. **Cadmium.** Cadmium is a metallic environmental contaminant that accumulates in kidney with increasing age of the animal. In the EU, a maximum permitted limit of 1.0 mg kg^{-1} has been established for this metal contaminant. Cadmium was found in a bovine kidney. The on farm investigation identified no obvious cadmium sources, the animal was 9 years and 8 months old and had been born on the farm.

2. MEAT INSPECTION SCHEME

Under this scheme, the carcase is detained at sampling and excluded from the food chain if a non-compliant result is obtained.

a) Prohibited and Unauthorised Substances

1. **Flubendazole.** This is a broad spectrum antiparasitic agent, active against mature and immature stages of certain nematodes. It is unauthorised for use in sheep. Residues of flubendazole and metabolites were confirmed in the liver tissue of five sheep from one producer. The on farm investigation did not determine the cause of these residues.

2. **Phenylbutazone.** This is a non-steroidal anti-inflammatory which is only licensed for horses that are not intended to be slaughtered for human consumption. It is not licensed for use in cattle. Residues of phenylbutazone were detected in the blood of a bovine animal. An on farm investigation determined that the animal may have shared bedding from a horse on the same farm which had been treated with a high dose of phenylbutazone almost 6 months previously. This specific sample was a follow up sample to a non-compliant sample in a different testing scheme. All additional follow up samples were compliant. It is believed that cross contamination from the horse being treated with phenylbutazone will have caused the residues in the cattle on this farm. Work at AFBI has shown that cross contamination can easily occur.

b) Veterinary Medicines

1. **Oxytetracycline.** This is an antibiotic that is licensed for use in a wide range of animal species. Residues of oxytetracycline above the maximum residue limit were found in the kidney of four bovine animals from four different producers. Subsequent investigations showed that one animal had been slaughter after the recommended withdrawal time and one had been slaughtered before the full withdrawal time. In another instance the withdrawal time had been correct however the animal had been overdosed in error and multi injection sites had been used rather than a single injection site. For the fourth animal there was confusion at the farm and the wrong animal had been sent for slaughter.
Furthermore, residues of oxytetracycline above the maximum residue limit were detected in the muscle of two sheep from two different producers and in the kidney of one sheep from a further producer.
Subsequent investigations showed that the animal of one of the muscle non-compliant results had been slaughtered one day before the recommended withdrawal time. In the other two occurrences the flock owner had bought the animals a short time before slaughter and both claimed they had not treated their animals.

2. Meloxicam. This is a non-steroidal anti-inflammatory drug (NSAID) with analgesic and fever reducing effects. Residues above the maximum residue limit were found in the liver of one bovine animal. Follow up investigation

showed that the full withdrawal period had not been adhered to as the animal had been slaughtered 7 days after treatment whereas the withdrawal period is 15 days.

3. Dihydrostreptomycin. This is an aminoglycoside antibiotic licensed for use in cattle, sheep and pigs. Residues of dihydrostreptomycin above the maximum residue limit were found in the kidney of two bovine animals from two different producers. On farm investigations showed that for one animal the drug (pen & strep) had been wrongly administered i.e. subcutaneous rather than intramuscular and for the other animal no cause for the residue was determined as the recommended withdrawal time had been adhered to.

4. Penicillin G. This is a narrow spectrum β-lactam antibiotic that is licensed for use in a wide range of animal species. Residues of penicillin G almost three times above the maximum residue limit were found in the kidney of one bovine animal which had been treated with depocillin and the withdrawal time had been adhered to. All follow up samples were compliant.

5. Marbofloxacin. This is a fluoroquinolone antibiotic. Residues of marbofloxacin over 30 times the maximum residue limit were found in the kidney of one bovine animal On farm investigations revealed that the animal had been purchased the day prior to slaughter and had not been treated by the herd keeper.

6. Closantel. This is an antiparasitic drug, active against liver fluke, that is licensed for use in cattle and sheep. Residues were detected in eleven ovine liver samples in excess of the maximum residue limit, five were from one producer and six were from another producer. All samples had been taken as follow up samples to previous non-compliant samples for closantel. On farm investigations failed to reveal the cause of the residue in the five animals as they could not be traced to the original owner and they had been purchased two days prior to slaughter. In the case of the other six animals on farm investigations found that all lambs had been administered a dosage regardless of weight so there is a likelihood that the residues were due to the animals being overdosed.

7. Sulphadiazine. This is an antimicrobial that is licensed for use in a wide range of animal species. Residues of sulphadiazine were detected in twenty different pig kidney samples. Four of these were from one producer and the on farm investigation determined that sulphadizaine had not been used on that site and no explanation for the non-compliant samples could be found. The other sixteen samples were all taken at the same time from the one producer in response to a non-compliant sample for the same substance which had been taken under a different testing scheme.

8. Nitroxynil. This is an antiparasitic drug licensed for use in cattle and sheep which is active against immature and adult liver fluke and some gastro-intestinal roundworms. Residues were detected in four cattle liver samples in excess of the maximum residue limit; three of the animals were from the same

producer. For these three animals an investigation determined that the animals had not completed the full withdrawal period due to an error by the farmer regarding when the animals had been treated. For the other animal it had been bought just 7 days before slaughter and the current owner had not treated the animal.

9. Ivermectin. This is a broad-spectrum antiparasitic agent. Residues were detected in a cattle liver sample in excess of the maximum residue limit. The animal had been bought the day prior to slaughter and current owner had not treated the animal.

10. Tylosin. This a broad spectrum macrolide-class antibiotic that is used in veterinary medicine to treat felines, canines and livestock. Residues of tylosin were detected in the kidney of one bovine animal. Investigation determined that the animal had been administered Tylan 200 and the withdrawal period was adhered to. However the manufacturer's recommended for administration is a maximum 15 ml per site whereas this animal was given a total of 40 ml so the cause of the residue may have been due to this.

c) Contaminants

1. **Cadmium.** Cadmium is a metallic environmental contaminant that accumulates in kidney, with increasing age of the animal. In the EU, a maximum permitted limit of 1.0 mg kg^{-1} has been established for this metal contaminant. Cadmium was found in the kidney of two different bovine animals from two different farms. One sample had been taken as a follow up to a non-compliant sample for cadmium in a different testing scheme. The other animal was 12 years old and born on the farm and no obvious cadmium sources were identified.

3. RISK SCHEME

The Risk scheme samples are taken at abattoirs (sheep, cattle, pig and poultry samples) while milk samples are taken from bulk tanks on farm and egg samples mostly from packing stations. Carcases are not detained pending laboratory results as risk samples are designed to provide risk-based surveillance data.

a) Prohibited and Unauthorised Substances

1. Phenylbutazone. This is a non-steroidal anti-inflammatory which is only licensed for horses that are not intended to be slaughtered for human consumption. It is not licensed for use in cattle. Residues of phenylbutazone were detected in the blood of a bovine animal. An on farm investigation determined that the animal may have shared grazing area and bedding with a horse on the same farm which had been treated with a high dose of phenylbutazone almost 6 months previously.

b) Veterinary Medicines

1. Closantel. This is an antiparasitic drug, active against liver fluke, that is licensed for use in cattle and sheep. Residues were detected in two bovine and thirteen ovine liver samples in excess of the maximum residue limit. On farm investigations revealed that both of the bovine animals had been treated over a year prior to slaughter. For the ovine samples the investigations failed to reveal the cause of the residues in most cases as animals had not been administered any closantel formulations or they had been bought a short time prior to slaughter and traceability to original owners was not possible. In one case medicine records were not completed and in another the lambs had all been given the same dosage so lighter lambs may have been overdosed.

2. Fenbendazole. This is an antiparasitic drug licensed for use in cattle and sheep for the treatment of mature and immature forms of gastro-intestinal roundworms, lungworms, tapeworms and nematode eggs. One ovine liver sample was found to contain a concentration twice the maximum residue limit. The flock keeper had not administered this animal with febendazole and all follow up samples were compliant.

3. Marbofloxacin. This is a fluoroquinolone antibiotic. Residues of marbofloxacin just over the maximum residue limit was found in the kidney of one bovine animal. On farm investigations revealed that the animal had been treated and withdrawn as per the manufacturer's instructions and the follow up sample was compliant.

4. Nitroxynil. This is an antiparasitic drug licensed for use in cattle and sheep, which is active against immature and adult liver fluke and some gastro-intestinal roundworms. Residues were detected in two cattle liver samples, one ovine liver sample and one bovine bulk milk sample in excess of their specific maximum residue limits; all animals were from different producers. For the three tissue samples, the investigations did not determine the cause of the residues. In one case the animal had been treated but withdrawal time had been adhered to, in the other two, no treatment had been given. The investigation for the bulk milk sample revealed that two animals had been treated in recent months and were contributing to the bulk tanker; the farmer had assumed that due to the test completed by his dairy being compliant it was ok to include the milk from these animals into his bulk tank. Follow up milk samples taken 6 months later were all compliant.

5. Rafoxanide. This is a narrow-spectrum anthelmintic effective against a few roundworms and flukes; it is not effective against tapeworms or external parasites. It is used scarcely in ruminants either as an injectable or a drench**.** It is not used in swine, poultry, horses or pets. Residues were detected in one ovine liver sample. Investigation did not determine the cause of the residue. Animal had been purchased several days prior to slaughter and current owner had not treated the animal.

6. Monensin. This is an antiprotozoal agent used as an aid in the prevention of coccidiosis. It is licensed for use in broilers but not for chickens or turkeys producing eggs. Residues above the regulatory concentration was detected in an avian liver sample. The cause of the residue was not determined during the investigation and medicine records were not fully completed.