

**Project number:** 6584  
**Funding source:** safefood (07/13)

**Date:** Nov, 2016  
**Project dates:** Sept 2013 – Sept 2016.

## Development of a Pilot Risk Register for the Pig and Poultry Meat Sectors on the island of Ireland



### Key external stakeholders:

Pig and Poultry slaughter plants, food manufacturers; retailers.

### Practical implications for stakeholders:

This research showed that residue surveillance programmes carried out by government agencies and industry are a necessary deterrent to ensure food safety. Food business operators should carry out continuous self-monitoring to satisfy regulatory compliance and demonstrate due diligence to their customers. The research on this project identified a list of priority substances that should be monitored in pork and poultry meat. In addition, sample compositing strategies were outlined to reduce sample analysis costs and/or allow more extensive sample analysis to be carried out.

### Main results:

Licensed antibacterials and the banned drugs (chloramphenicol, nitroimidazoles and nitrofurans) were identified as priority residues for both pork and poultry. Antibacterials are probably the number one priority substance because of the increased spotlight on antimicrobial resistance in recent years. Nandrolone, sedatives/tranquilizers and quinoxalines were also identified as relevant substances to monitor in pork. With respect to poultry, anticoccidials are one of the most important groups of substances and carry equal weighting to antibiotics. The monitoring of residues in Third Country imports is complicated due to differences in drug authorisations, which may require the monitoring of additional substances that are licensed or are illegally used in other jurisdictions. Thus it is important to review this list annually, with new information from RASFF and food safety research.

### Opportunity / Benefit:

The residue monitoring strategy proposed in this research should be of great benefit to the pork and poultry industry because:

- It will identify potential residue contamination problems at an early stage and thus prevent large product recalls.
- The sample compositing strategy developed from this work has the potential to reduce analytical costs and increase the volume of samples analysed.

### Collaborating Institutions:

Queen's University Belfast and University College Dublin.

**Teagasc project team:** Dr. Martin Danaher (PI)  
**External collaborators:** Prof. Chris Elliott (PI), (QUB)  
Prof. Francis Butler (UCD).

### 1. Project background:

The pork and poultry industry on the island of Ireland are major employers and export large quantities of products. The quality and safety of these products is of paramount importance and any issues in relation to either parameter can cause massive reputational damage, not only to the company involved but the entire industry. Due to complex supply chains there will always be potential risks arising from chemical contamination. While some of these risks are already known, there is always a possibility that an unanticipated contamination of a food supply might occur which may result in enormous economic loss due to the integrated nature of the industry.

### 2. Questions addressed by the project:

- Q What are the most important residue risks for the Pork and Poultry sectors?  
Q How can industry get better value for money from residue testing?

### 3. The experimental studies:

Official food inspection data on pork and poultry meat sample analysis was reviewed and interrogated from national residue surveillance schemes on the island of Ireland and across the EU. This included:

- Extensive datasets are available for Ireland covering the periods 1998 to 2014 through Irelands National Food Residue Database and through reports published on the website of the Irish Department of Agriculture Food and the Marine.
- Northern Ireland datasets (2004 to 2014) were accessed through the Agri-food and Bioscience's Institute website.
- EU wide residue testing results for the years 2008 to 2012.
- The results for residues in pork and poultry imported from outside of the EU have been obtained from RASFF reports for the years 2002 to 2015.

The scope of the review covered both Group A (banned drugs and illegal growth promoting agents) and Group B (licensed veterinary drugs).

### 4. Main results:

#### *Poultry monitoring results*

The analysis of data for group A substances in Irish poultry samples collected between 1998 and 2014 showed only one non-compliant result in 2011. In this isolated case, a non-compliant result was for the  $\beta$ -agonist, isoxsuprine. Northern Ireland data was interrogated for the years 2004 to 2014. In a 2004 incident, 21 out of 635 samples were found to be non-compliant for the banned veterinary drug furazolidone. On-farm investigations, found furazolidone-containing sediments at the bottom of these farms' older-style water tanks. It was thought that the sediment was inadvertently stirred up following the introduction of a new tank cleaning procedure. Only one other non-compliant result was found during this time period, which was a single sample found to contain low levels of metronidazole in 2005. The overall rate of non-compliance for group A substances has been very low in Irish poultry meat samples. However, the furazolidone incident in 2004 highlights the need for on-going monitoring of these substances. The occurrence of group A substances in food samples at any levels can have serious consequences for the food industry, including product recalls. EU wide monitoring of residues in poultry show that Group A substances were only found in a very low number of samples. Group A3 (steroids) and A5 (beta-agonists) were the only growth promoting substances found in poultry in the years 2008 and 2012. The group A6 prohibited veterinary drugs, which include chloramphenicol, nitrofurans and nitroimidazoles were the most frequently detected group A substances (rate of positives = 0.04%). Residues in imported meat were assessed through consultation of the RASFF portal. In 2002 and 2003, there were a large number of non-compliant results in poultry meat at the height of the nitrofurans incident, 88 and 55 non-compliant notifications, respectively. The rate of non-compliant results for Group A substances in imported poultry tested in the EU has dropped dramatically. No non-compliant samples have been found since 2009.

Group B substances comprise of (a) pharmaceutically active substances (namely, veterinary drugs and zootechnical feed additives) that are administered to food producing animal species, and (b) chemical contaminants. These compounds are more frequently detected in food compared to Group A substances because of their use in maintaining animal health. The anticoccidials (zootechnical feed additives) have been the most frequently reported non-compliant residues in Irish poultry samples since early 2000s. Since 2009, there has been a steady decrease in the rate of anticoccidial positives due to the setting of maximum residue limits. Some positives are still encountered for ionophores and toltrazuril but few positives have been reported for other drug residues in poultry. No non-compliant results have been found for antibacterial drug residues in Irish poultry meat since 2004. The 2008 EU testing programme identified non-compliant results for anticoccidial residues in 179 poultry meat samples; this number had reduced to 13 by 2012 (0.16% of samples). Since 2011, antibacterials were responsible for the greatest number of positives in poultry with 24 non-compliant results. These correspond to results from 18,412 test samples (overall positive rate of 0.12%). EU monitoring results for group B substance in imported poultry shows that there were a low number of non-compliant results between 2004 and 2011. In 2012, there was a large increase in the number of positives for anticoccidials due to the detection of clodolol, toltrazuril and cyromazine residues following the implementation of new mass spectrometry based detection methods. The rate of positives decreased in 2013 and only one non-compliant result was observed in 2014.

#### *Pork monitoring results*

The incidence of group A substances in Irish pork was very low during the period 1998 to 2014. In Ireland, a total of three and nine samples for the thyrostat, thiouracil, were found during 2008 and 2009, respectively. Thiouracil residues were most probably caused from feeding cruciferous plants. EU monitoring results show that steroids are the most frequently non-compliant residue followed by banned veterinary drugs (group A6), thyrostats and resorcyclic acid lactones (RALs). One positive result was also found for the beta-agonist, clenbuterol, in 2010. The most frequently reported hormone residue over the years is nandrolone followed by 17- $\beta$ -nortestosterone, boldenone and more recently androstene-5-3-beta. The non-compliant RAL residues are due to the detection of  $\alpha$ -zearalanol (zearanol) and  $\beta$ -zearalanol (taleranol). Both of these substances are metabolites of the mycotoxin zearalenone, which is produced by *Fusarium* species frequently detected in feed. In all cases it was reported that there was no evidence of use of illegal growth promoting agents and that feed contamination was suspected. This was verified in some cases by co-detection of mycotoxin residues (zearalenone and its metabolites). Chloramphenicol is the most widely detected of the group A6 banned drugs followed by the nitrofurans and nitroimidazoles. Monitoring for group A substances in imported pork, show that the majority of residues are due to chloramphenicol and nitrofurans residues in casings. The antibacterials are the most important group B residue in Irish pork. Since 1998, the only B2 substances that were detected in pork were the anticoccidials and the carbadox. The antibacterials also give rise to the most reports of non-compliant residues in EU work but they appear to be decreasing from 2008 to 2012. The incidence of group B2 positives in pork is generally very low between 2008 and 2012. Results are also presented for group B3 contaminants in Irish pork. In general, the incidence of these substances in pork is low. However, a number of non-compliant results were reported in Irish pork during the dioxins crisis in the period 2008 to 2009. Dioxins and PCB contamination is best prevented through the monitoring of feed and feed ingredients.

#### *Sample compositing*

Analysis of residues in food samples can be carried out using screening methods (costing <€10 per sample) to more expensive chemical tests, which cost hundreds of euros per sample. A sample compositing approach was proposed to reducing chemical analysis costs for the Pork and Poultry industry, along with advantages and disadvantages. In advance of deciding to composite samples, it is important to be aware of key information including (a) the likelihood of residue detections and (b) the sensitivity of the analytical method used. Examples were provided of how sample compositing could be applied for different groups of residues including anticoccidials and nitrofurans.

#### **5. Opportunity/Benefit:**

The food industry can engage with the researchers from team to support the implementation of a risk based monitoring system in their business.

#### **6. Dissemination:**

Research from this project was dissemination through conferences, workshops and peer reviewed publications. Dissemination will continue after then end of this project because the technology is now being

---

applied on other projects.

**Main publications:**

Elliott, C., Haughey, S.A., Meneely, J., Spence, M., Dean, M., Redmond, G., Butler, F., Danaher, M. (2016) 'Development of a Pilot Risk Register for the Pig and Poultry Meat Sectors on the island of Ireland: Food Hazard Alert. A Technology Viability Study Project Reference Number: 07/2013. June 2016.

Spence, M., Haughey, S.A., Dean, M., Danaher, M., Butler, F., Elliott, C.T. Food Fortress: The Development of a Risk Register for both the Pig and Poultry Meat Sectors on the Island of Ireland. In the Proceedings of: 2nd food integrity & traceability conference 2014, Queen's University Belfast, 8<sup>th</sup> – 10<sup>th</sup> April 2014.

Danaher, M. Veterinary Drug contaminant risk prioritization for poultry and pork. In the Workshop: Development of a Risk Register for the pork and poultry meat sectors on the Island of Ireland. Crowne Plaza Hotel, Blanchardstown, Dublin, 30th September, 2014

Danaher, M. Veterinary Drug contaminant risk prioritization for poultry and pork. In the Workshop: Development of a Risk Register for the pork and poultry meat sectors on the Island of Ireland. CAFRE, Loughry Campus, Dungannon Rd, Cookstown, Tyrone BT80 9AA, Northern Ireland, 18th September, 2015.

---

**7. Compiled by:** Dr Martin Danaher

---