Vulnerabilities in the Animal By-Products Food System

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The increasing degree of industrial symbiosis in the meat processing food system adds to the technical, regulatory, and procedural complexity of tracing and managing animal by-products. The food system has a number of key vulnerabilities for exploration, while recognizing the gains in the sustainability and circular economy sphere.

Key Findings

1. Interest and demand in animal by-products as raw material has increased in recent years because of disruption to sectors such as pet food, and reduction in food loss and waste.
2. Institutional overlap and the involvement of multiple stakeholders presents the need for cross-institutional reporting capabilities.
3. The complexity in the system presents areas of vulnerability for food safety and hygiene and crime.

The ABP Landscape

- co-location of pet and human food production makes it logistically easier to divert ABP into the human food chain and potentially more difficult to detect when divergence takes place
- the change in the UK's status after the EU exit means that exporting some types of ABP to the EU is no longer financially viable, and presents an intelligence gap
- the potential industrial, export, and supply disruption as related to the increased demand for raw pet food has increased ABP demand
- lack of alternative after the termination of the APHA Service Level Agreement (SLA) between the APHA and the FSA.

Introduction

The divergence of Animal By-Products (ABPs) unfit for human consumption back into the food chain became a control strategy priority for NFCU in 2021/22. This briefing identifies key areas of vulnerability in the ABP food system given recent changes to the landscape.

Interest in the animal by-product system has increased in recent years because of the greater importance of resource efficiency, sustainability, and reducing livestock numbers. However, the complexity of the system, interaction (or the lack thereof) of multiple institutions and stakeholders in the system present concerns for food safety and potential opportunities for crime.

The aim of this rapid topic brief was to allow the Food Standards Agency (FSA) and the National Food Crime Unit (NFCU) to identify key areas of vulnerability (if any) in the animal by-products system and to enable future programmes, policies, and research products to address them. The emphasis is on identifying areas of systemic vulnerability instead of solely process and technological oriented risks.

The ABP System

An ABP system map with colour coding for areas and types of vulnerability (figure 1).

Areas of Vulnerability

The food system is vulnerable to crime in a variety of ways, particularly where waste material intended for disposal is instead diverted to other sectors. This involves misrepresentation, unauthorised alteration, and tampering with or providing misleading information on labels. Due to the nature of crime and fraud, evidence of wrong-doing is not always apparent in the literature or tracked in food and waste statistics.

Divergence/Bulking/Recategorization

There is potential of ABPs being diverted to the human food chain, or ABPs of Categories 1 and 2 being diverted to Category 3 renderers. Given that there are economic costs to disposal, and some ABP material may be considered raw materials for the generation of useful biomolecules and ingredients (for example, protein hydrolysates, functional extracts, and biopeptides) that may end up in the human food chain or pharmaceuticals, this is a critical area for management.

- ABPs being processed and stored on the same site as non-ABP material may potentially provide opportunity for divergence and bulking. Given increasing levels of industrial symbiosis, this is risky, although guidelines are present to guide design, traceability, and hygiene elements
- potential for divergence at instances where ABP material (for example, Category 3 hides and skins) are returned to production sites after slaughterhouse trips. This route requires

approval and/or registration with the APHA, but presents an opportunity for divergence of other material
- Cat 1 material may be incorrectly disposed as a lower category in order to save on disposal costs. However, this creates potential of misdirection to animal feed, raising the likelihood of disease transmission
- a potential area of divergence and / blind spot may be provided by the fact that ABPs under 20kg (per week), produced by retail businesses can be sent to landfill with no need for registration with the APHA or record keeping. As a weekly limit, this can amount to a significant amount of ABP that can be redirected or used in other systems (for example, resold under false pretence or sent to animal feed).

Traceability (Labelling and Registration)

- documentation for hauliers match correct trailers (for example, trailers registered and labelled for Category 1, must only carry Category 1 material and these labels must match the descriptions in commercial documents)
- approval and registration certificates for sites and processes reflect actual products processed and handled. Evidence from Ireland indicates that audit teams note discrepancies between certificates and the sites observed. This may involve differences in processing lines, products manufactured, or inaccurate categories and details of materials (for example, blood products as compared to bloodmeal)
- consignment traceability particularly in terms of correct descriptions and information on seals (e.g. through TRACES). There might be difficulty in misrepresentation of information on durability, packaging, and storage dates.

Testing

Laboratory testing limitations for the UK food system have already been identified by the Elliot Review (2013), but in terms of ABP, the following are further noted by this analysis:

- only two laboratories in the UK can carry out testing for GTH (Laboratory of Government Chemists and Agri-Food Biosciences Institute) . Samples may also be sent accredited laboratories in the EU.
- only one laboratory in the UK can carry out test validation samples (for continuous processing of ABPs). The test must be agreed on with the laboratory in advance and also be observed by an APHA veterinary officer.
- no laboratories in the UK are currently accredited to test for Enterococcaceae. However, compost and biogas facilities can either test for E.coli or send samples to accredited laboratories in the EU. It is important to note that for any other ABP processing facility, such as rendering plants, pet food and fertiliser factories, blood processors, biodiesel plants, milk processors, only Salmonella and Enterobacteriaceae testing are needed. However, APHA may ask for further testing given operational conditions of the sites.
- there are no official / validated methods for detecting adulteration in Cat 3 materials.
- all bacterial testing (except for Salmonella) must take place immediately after ABP processing. These sample collections are not observed by APHA veterinary officers, and processors may need to send samples to multiple laboratories as laboratory accreditation is on a test-by-test basis.

Markers and stains

Identifying categories of ABP that are most non-compliant with GTH application. Evidence from the EU has indicated that category 2 Meat and Bone Meal (MBM) intended for fertiliser has been the most common type with non-compliance. The trend may be because of inadequate amounts

or non-uniform distribution during the marking process.

Authorisation and Regulation

- ensuring that ABP processing plants that process ABP of ruminant origin and produce PAP for aquaculture are authorised by all relevant authorities
- FSA is not the responsible enforcement authority for blood disposal outside premises
- regulation and controls keep abreast of process improvements and technological developments (particularly in rendering, transesterification, biodiesel production , and bio-based polymers), to make sure opportunities for divergence and recategorization are curtailed.

Vulnerable links in the food system

- food brokers have been identified as a highly vulnerable link in the food system
- trade and smuggling of ABPs that may be contaminated or sourced from infected animals. This can be of particular concern in terms of material sourced from contaminated ABPs imported into the country
- for International Catering Waste, the responsibility of identifying and disposing lies with the owners (individual, company, or armed forces operating) the vessel, and the waste must be sent to a waste reception facility before it leaves the terminal
- intentional adulteration of food products supplied to needy people through sources such as charities. Such food items will not be subject to rigorous testing and may miss vital tracking information.

Intelligence collection

- identify potential points in food system pathways for illicit / illegal diversion of ABPs back into the food and feed chain
- examine fully the role of food brokers, consolidators, and storage sites that keep ABPs of multiple categories with foodstuffs in facilitating / enabling food crime
- tracing ABP from exports from the UK back into the country in pet food. Given the boom in the pet food market over the pandemic and the emergence of new pet food manufacturers and unapproved producers, there is a blind spot within the pet food sector
- identifying products of concern with ABP ingredients, and how much are being imported illicitly and carried in by passengers
- ensuring the incidents of non-compliance of GTH (possibly due to inadequate amounts) are reported and managed across all reporting bodies, including the FSA.

Recommendations

1. Improving reporting and surveillance
a. Enhancing intelligence flows from partners and industries
b. Improving intelligence sharing with international partners and FBOs
c. Closer links with raw pet food producers and consumer groups
d. Improving tracking and reporting of small quantities of ABP disposal (for example, <20kg of disposal from retailers and identifying small quantities of fallen stock)

2. Tracking and monitoring programs for glyceroltriheptanoate (GTH) and dyes e.g. E131 and E151.

3. Assess the flows and stocks of materials in the animal by-product system (for example, through Mass Flow Analysis) to map the flows to be quantified and managed.

Annex

Table 1 Stakeholders in the ABP food system (illustrative)

Producing activities and sites (for example, at abatoirs and farms)

Company name	Activity
FSA	Approval and presence at abattoirs
Sarval	-
SecAnim	Collection of fallen stock (with Sarval)
FABRA (Food chain and Biomass Renewables Association)	At abattoirs
APHA (Animal and Plant Health Agency)	Approval
Water Authorities	Compliance failure for drain traps and gratings for waste water
North East Fallen Stock Ltd (Dundas Chemical)	Fallen stock collection for example, ostriches, goats, zoo animals, whales and butchers waste.
Advanced Proteins	Collection from butchers, slaughterhouses, supermarkets, food processors, Port Authorities, customs, and Local Authorities (bulk removal of seized, contaminated, and damaged materials)
Leo Group Ltd	Collection of fallen stock
Licensed Animal Slaughterers ad Salvage Association (LASSA)	-
JGP Pears	-
Association of Independent Meat Suppliers	-

Intermediate handling and storage activities and sites

- Animal Health and Veterinary Laboratories Agency (AHVLA): testing
- APHA (Animal and Plant Health Authority)
- Elemental: fertilizer

Distributing

Company name	Activity
Local authorities	materials in transit
OakBank (Dundas Chemical)	All the transport for raw material and finished products
Advanced proteins	full load and just in time operators
BJK Ingredients (acquired by Leo Group)	-
Haulage Holdings (Leo Group)	-
JGP Pears	-

Trading

Company name	Activity
Defra (Imports and EU Policy Team)	Trade in Cat 1 or 2 and PAP
Competent authorities of member state of destination/authorisation	Operators to notify and apply
Meatex	B2B - see for pet food (is it only premium)
Leo Group	Ship oils globally - oil produced at Omega Proteins facility is certified under ISCC scheme

Company name	Activity
JGP Pears	-

ABP Processing

Company name	Activity
APHA (Animal and Plant Health Authority)	-
SARIA UK	-
Dundas Chemical Co Ltd	Salmon oil and hydrolysate
Caledonian Pet Foods (Dundas Chemical)	Handling all types of pet food material
Foyle	Primary processing and rendering, all waste handled in house
Advanced Proteins	Fats and oils, PAPs and biomass fuels
Leo Group Ltd	PAP and purified fats - GMP certified, and pet foods
BJK Ingredients (acquired by Leo Group)	Pharmaceutical inputs (enzymes and omega 3 fish oils), pet food, proteins, fertilizer raw materials, animal fats, oils, and minerals for livestock and aqua feed, blood plasmas, haemoglobin powders, hydrolysate (porcine muco, porcine gelatin)
JGP Pears	Also have CHP on site
European Fat Processors and Renderers Association (EFPRA)	-
Association of Independent Meat Suppliers	-

Incinerating

- Local Authorities
- Environment Agency
- Leo group - Osten biofuel power station

Composting

- APHA (Animal and Plant Health Authority)

Combusting/Producing Renewable Energy

- APHA (Animal and Plant Health Authority)
- SecAnim
- ReFood : anaerobic digestion

Product Manufacturing

- APHA (Animal and Plant Health Authority)
- Pet Food Manufacturers Association
- Pet Health Council

Burial Excavations

Company name	Activity
Advanced Proteins	Excavating sites of on-farm burials for diseased animals and providing disposal solution.

Table 2 ABP Categorization

Category 1 (high risk)	Category 2 (high risk)	Category 3 (low risk)

Carcasses and animal parts suspected of transmissible spongiform encephalopathy (TSE) infection	Abattoir rejected animals (because of infectious disease)	Carcasses and animal parts fit for human consumption, at a slaughterhouse
Wild animal carcasses suspected of disease infection with potential transition to humans and animals	Carcasses with residues from authorised treatments	Animal origin food and products originally intended for human consumption but withdrawn for commercial reasons
Carcasses of animals used in experimentation	Unhatched poultry (dead in shell)	Domestic catering waste
Animal parts contaminated because of illegal treatments	Carcasses of animals killed for disease control	Shells from soft tissue shellfish
International catering waste	Carcasses of dead livestock	Eggs, egg-products, eggshells, and hatchery by-products
Carcasses and animal parts from zoos, circus animals, and pets	Manure	Aquatic animals and aquatic and terrestrial invertebrates
Specified risk material, for example, animal parts posing particular disease risk	Digestive tract content	Hides and skins from slaughterhouses
-	-	Animal hides, skins, hooves, feathers, wool, horns and hair with no signs of infectious disease at time of death
-	-	Processed animal proteins (PAP) that include animal proteins from any category 3 ABP with the exception of milk, colostrum, and their derived products, eggs, egg products and eggshells, gelatine, collagen, hydrolysed proteins, animal origin dicalcium phosphate and tricalcium phosphate, and blood products

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1. Food system activities (in yellow) result in ABPs through various processes (for example, slaughtering, foodstuffs determined to no longer be fit for human consumption). These are distributed, handled, and stored through a variety of stakeholders, before they reach ABP processing, where by activities like rendering, are converted into material that can then be used in the pet food sector, as biodiesel, fertilizers, cosmetics, etc. Certain proportions of these can be burnt in co-generation to produce energy, and others are landfilled in controlled conditions. The system is vulnerable at various points to cross-contamination, divergence through design (for example, co-location and multi-site operations), document fraud, improper handling and transport, informal transactions, and institutional oversight or overlap.
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