SAFETY ASPECTS OF A PROPOSED BOVINE LUNG PROTEIN POWDER PROCESS

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Abstract – Exploring meat co-products for their high value components and potential applications thereof provides the meat industry with an opportunity to add value, reduce waste and improve sector sustainability. However, these products are highly perishable, offering an ideal media for colonization and growth of a number of spoilage and pathogenic microorganisms. To ensure the safety of downstream process and stability of generated products, a systematic assessment of associated hazards and risks must be undertaken.

Key Words – assessment, co-products, HACCP, hurdles, meat, risk

I. INTRODUCTION

Tissues from meat co-products are often rich in high quality proteins, which can be extracted for their functionality or to improve the nutritive value of food and beverages. However, due to their rich composition these products are also highly perishable. This brings challenges, from product collection and stabilisation, through to processing and final packaging. Still, under an effective system it is possible to generate high quality and safe products for downstream applications. Bovine lung, like many offal products, has a significantly lower commercial value. In this study, a proposed bovine lung protein extraction process is evaluated for potential food safety risks. The safety of the final extract relies on raw material quality and on a series of steps (hurdles) contributing to the final product stability. In the process here described, protein recovery from bovine lung tissue is achieved by isoelectric precipitation (IEP), which is a non-thermal process, already in use for protein recovery from meat muscle, seafood, poultry and pulses [1],[2], followed by separation, centrifugation and drying. The described Hazards Analysis and Critical Control Point (HACCP) is described in Figure 1, and can be used as a blueprint and further adapted to specific situations.

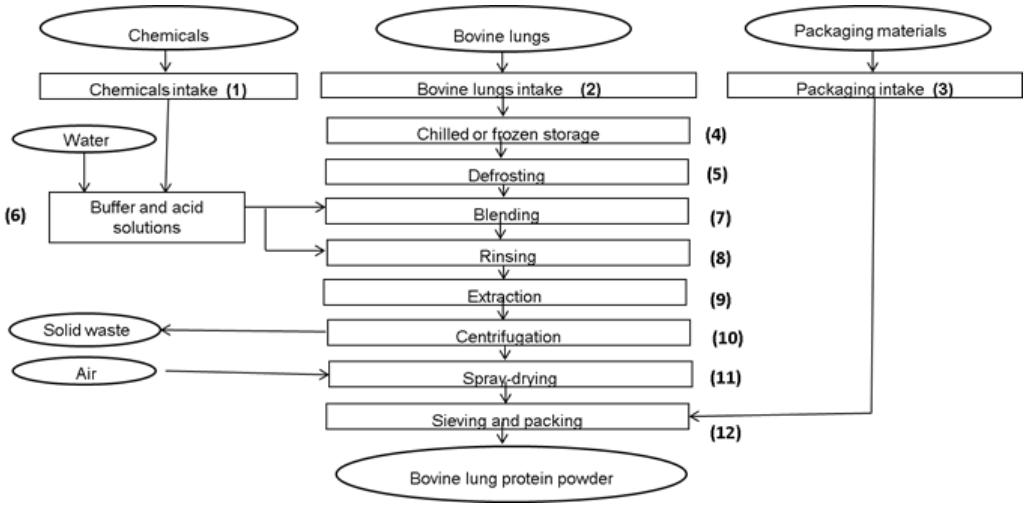

Figure 1. Process description (Flowchart) for the production of bovine lung protein powder

II. MATERIALS AND METHODS

A HACCP plan was drawn up for the process. Although not presented here, the work also covered detailed product description (specification) and process pre-requisite requirements based on Good Manufacturing Practices (GMP) and Good Hygiene Practices (GHP). Potential hazards associated with bovine offal were examined using the Rapid Alert System for Food & Feed (RASFF) database, Regulation (EC)2377/1990 provided information on maximum residue

limits for veterinary drugs associated with target tissues, Regulation (EC)853/2004 on microbial criteria for foods of animal origin and Regulation (EC)629/2008 on maximum levels for certain contaminants in foodstuffs.

III. RESULTS AND DISCUSSION

The flowchart diagram for the proposed process is presented in Figure 1. Basically, the described process consists of raw materials intake; storage; processing (blending; extraction; separation; drying); and packing. A summary of the hazard analysis conducted for each step of the flowchart diagram is presented on Table 1.

Table 1 HACCP summary sheet

Critical control point	Hazard	Controls	Limits	Monitoring	Corrective action	Verification
Raw material intake-lungs (Step 1)	High microbial load	Approved suppliers; GMP, GHP and training Temperature records	Strict microbial levels +/- 1^{o}C Temp variation for ≤ 2h (incoming raw material)	TVC; Salmonella; E-coli; S.aureus Temperature monitoring records checked	non-complying material moved to cat 3 (not human consumption)	Supplier pre-approval programme and regular audit Review monitoring records regularly
	Chemical contaminants		Legal limits (MRLs) Reg (EC) 470/2009	Vet. inspection and documentation	As above	Frequency of nonconformity
(Step 7) Blending	Microbial growth	pH and low temperature	pH ± 0.5 T ± 1^{o}C	Automatic sensors records checked	As above	Review monitoring records regularly
	Microbial contamination	Quality of processing water (food grade)	Legal requirements Council Directive 98/83/EC	Water analysis records checked	Introduce in-house water treatment	Results of water analysis checked regularly
(Step 11) Spray drying	Microbial contamination	Air quality test and filters regularly checked	Microbiological criteria for foods Final product moisture <6%	Air quality microbial checks	Substitute filters as needed	Review monitoring records regularly

IV. CONCLUSION

A systematic assessment of hazards and risks associated to this source material and its proposed processing was undertaken. This work presents a blueprint, which can be adapted for different processing units.

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