APPLICATION OF THE HAZARD ANALYSIS CRITICAL CONTROL POINT (HACCP) SYSTEM IN THE MANUFACTURING LINE OF CURED SAUSAGES FROM GAME MEAT

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BACKGROUND

The hazard analysis critical control point (HACCP) is a system directed to identify microbiological hazards existing in an industrial operation or process in order to identify critical control points (CCP) in which such hazards can be controlled and tests systems established to be able to monitor or supervise control effectiveness. This system allows previous failure protection and correction, improving quality costs due to microbiological defects and almost avoiding final supercontrol, which despite offering relative guarantee of the product, may result in product destruction in case of late detection of failure, with the consequent added cost.

OBJECTIVES

This work covers in a practical way the implantation of the HACCP system to the manufacturing line of cured game sausages of the Losimon , S.L. meat industry, located at Almadén, Ciudad Real, Spain. Cured cooked game sausages (salami-type sausage, string sausage, etc.) are products prepared from edible parts of authorized game species (deer, wild boar, etc.), whether minced or not, seasoned with salt and other ingredients, whether introduced in natural or artificial casings and submitted to a drying-curing process which confers them characteristic organoleptic features.

METHODOLOGY

In order to be able to apply correctly the principles of the HACCP system, the following tasks were performed: (1) creation of a multidisciplinary team, (2) complete description of products, (3) study of consumer´s expected use, (4) description of the process or flow diagram, (5) several checkings of the process, (6) list of all biological, chemical or physical hazards which can be reasonably foreseen in each stage, (7) study of preventive measures, (8) determination of CCP, specifying the critical limit for each preventive measure, (9) supervision of measures or observations to demonstrate that a CCP is under control, (10) formulation of all corrective measures which are specific for each CCP of the system, (11) creation of procedures to verify that the HACCP system works properly and (12) development of the necessary actions to ensure that the HACCP system introduced is really efficient, allowing also system feedback in case of detection of deviations.

RESULTS AND DISCUSSION

This section presents the process or flow diagram, from raw material reception to issue of the final product, according to the field of study and basing always on the observations carried out in Losimon, S.L. meat industry. We also include a synoptic table showing the application process for each stage describing the main predictable hazards as well as the preventive measures to be considered to minimize or eliminate such hazard. The synoptic table reflects also the type of CCP, the critical limit for each preventive measure and the necessary supervision to demonstrate that a critical point is under control. Aiming at solving the possible deviations over or under the critical limits established, all corrective measures specific for each control point of the system have been clearly stated. Finally there is an enumeration of the necessary parameters (temperature control in chambers, water analysis, etc.), to provide data about what is happening in our industry at a specific moment.

FLOW DIAGRAM

1. Animals admission (deer and boar) ● CCP2 → 2. Storage in specific chambers ○ CCP2 → 3. Slaughtering process ● CCP2 →
4. Carcass splitting process ● CCP2 → 5. Preparation ○ CCP2 → 6. Mixture or preparation of the blend ○ CCP2 →
7. `Stuffing´ process ○ CCP2 → 8. Drying-curing process ○ CCP2 → 9. Final process ● CCP2 → 10. Storage ○ CCP2 →
11. Issue of the final product ○ CCP2

CCP1= Completely effective Critical Control Point; CCP2= Partially effective Critical Control Point.
● = Important contamination; ○ = Unimportant contamination

STAGE	HAZARDS	PREVENTIVE MEASURES	CCP	CRITICAL LIMIT	SUPERVISION	CORRECTIVE MEASURES	REGISTERS
1. Animal admission. Water supply.	* Microbiological contamination	* Adequate transport conditions(T°, hygiene. * Adequate water supply source.	2	* T° <7ºC in refrigerated meat. * T° <-12ºC frozen meat. * Satisfy drinkable water requirements (R.D. 1138/1990)	* Mean of transport control (T°, hygiene). * Batch control: T° and organoleptic features. * Water physical-chemical and microbiological analysis and chlorine control.	* Unsuitable material turndown. * Chlorine addition if necessary.	* Corrective measures. * Results from water analysis.
2. Storage in specific chamber.	* Microbiological contamination.	* Adequate time/ T°. * Chamber health conditions (cleanness, disinfection).	2	* T° <7ºC in refrigerated meat. * T° <-12ºC frozen meat. * Adequate storage time. * Satisfactory health conditions in store. * Appropriate storage conditions	* Raw material preservation state. * Temperature register. * Preservation time and stowage conditions. * Correct application of the cleaning and disinfection program. *Periodic visual inspection.	* Correction of storage conditions. * Unsuitable material turndown.	* Temperature register. * Corrective measures.
3. Slaughtering process	* Microbiological contamination	* Hygienic handling . * Appropriate T° during operations. * Cleaning and disinfection of tools and worktops.	2	* Satisfactory handling practice (SHP). * Satisfactory hygienic conditions. * Room T° under 12 ºC.	* Adequate handling. * Correct application of the cleaning and disinfection program. * Temperature register.	* Correction of storage conditions. * Correction of cleaning and disinfection program.	* Corrective measures. * Temperature register.
4. Carcass splitting	* Microbiological contamination	* Hygienic handling . * Appropriate T° during operations. * Cleaning and disinfection of tools and worktops. * Control of operations time. * Waste disposal.	2	* SHP. * Satisfactory hygienic conditions. * Store T° under 12 ºC in the splitting room.	* Hygienic handling conditions. * Correct application of the cleaning and disinfection program * Room temperature watching.	* Correction of working conditions. * Correction of cleaning and disinfection program. * Proper preparation of implements and equipment.	* Corrective measures. * Temperature register in the splitting room.
5. Preparation	* Microbiological contamination.	* Adequate time/ T°. * Satisfactory handling conditions. * Hygienic conditions of tools and equipment	2	* SHP. * Satisfactory hygienic conditions. * Room T° under 12 ºC .	* State of tools and equipment. * Correct application of the cleaning and disinfection program. * Handling practice. * Room T°.	* Correction of working conditions. * Correction of cleaning and disinfection program. * Unsuitable product turndown.	* Corrective measures. * Temperature register.
6. Mixture or blend preparation	* Microbiological contamination * Incorrect or excessive additive addition.	* Adequate time/ T°. * Satisfactory handling conditions. * Hygienic conditions of tools and equipment * Specific formulation. * Dosage by trained staff.	2	* SHP. * Authorized additives limit. * Satisfactory hygienic conditions. * Room T° under 12 ºC.	* Hygienic conditions. * Tools and equipment performance * Correct application of the cleaning and disinfection program. * Handling conditions. * Room T°.	* Correction of working conditions. * Correction of cleaning and disinfection program. * Unsuitable material turndown if necessary.	* Corrective measures. * Room temperature.
7. 'Stuffing' process	* Microbiological contamination.	* Equipment keep-up. * Satisfactory handling conditions. * Hygienic conditions of tools and equipment. * Adequate room T°.	2	* Satisfactory hygienic conditions. * Adequate equipment maintenance. * SHP. * Room T° under 12 ºC.	* State of facilities, equipment and tools. * Handling conditions. * Correct application of the cleaning and disinfection program. * Room T°	* Correction of working conditions. * Correction of cleaning and disinfection program. * Unsuitable material turndown. * Equipment repair.	* Corrective measures. * Room T°.
8. Drying- curing process	* Anomalous fermentation.	* Correct definition of production process. * Satisfy established specifications. * Adequate environmental conditions.	2	* Satisfactory hygienic conditions. * Satisfy technical specifications of the elaboration process	* Periodic organoleptic inspection of the product. * Periodic control of environmental parameters.	* Unsuitable products turndown. * Correction of environmental conditions.	* Corrective measures. * Environmental conditions.
9. Final process.	* Microbiological contamination.	* Satisfactory handling conditions. * Hygienic conditions of tools and equipment * Correct equipment performance. * Adequate room T°	2	* SHP. * Satisfactory hygienic conditions. * Room T° under 12 ºC .	* Correct handling. * Correct application of the cleaning and disinfection program. * Periodic equipment revision. * Room T°.	* Unsuitable product turndown. * Correction of the cleaning and disinfection program. * Correction of working conditions. * Equipment preparation.	* Corrective measures. * Room T°. * Worktops analysis. * Equipment maintenance.
10. Storage.	* Products alteration.	* Store hygienic conditions. * Adequate T° according to different types. * Correct storage.	2	* Avoid extreme temperatures. * Satisfactory hygienic conditions. * Adequate stowage conditions.	* Visual inspection of the product. * Correct application of cleaning and disinfection program. * Storage time and T°. * Correct filling.	* Unsuitable products turndown. * Correction of storage hygienic or stowage conditions.	* Corrective measures. * Storage conditions.
11. Issue of final product.	* Microbiological contamination. * Inadequate transport.	* Process hygiene. * T° during transport. * Adequate stowage conditions.	2	* Transport T° * Hygienic and stowage conditions. * Load incompatibility.	* Correct application of the cleaning and disinfection program. * Correct handling and stowage practice.	* Correction of hygienic and stowage conditions.	* Corrective measures. * Transport conditions.