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# Technology and Quality of Hurdle Treated Meat Products

**Anita Arya[1*], SK Mendiratta[2] and Sanjay Kumar Bharti[3]**

*[*1]Department of Livestock Products Technology, College of Veterinary and Animal Sciences GBPUAT, Pantnagar-263145, Uttarakhand, India*

*[2]Division of Livestock Products Technology, Indian Veterinary Research Institute, Izatnagar, Bareilly-243122, Uttar Pradesh, India*

*[3]Department of Livestock Product Technology, College of Veterinary Science and Animal Husbandry, DUVASU, Mathura, Uttar Pradesh 281001, India.*

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## INTRODUCTION

Hurdle technology known as combined methods, combined processes and combined conservation, etc., for improving the quality and shelf life of food [1]. The technology was better understood and its use was expanded by Listener and Gorris [2]. Globally, this technology is used and accepted to ensure a safe product for consumption. The most important Hurdle used are temperature (high or low), water activity (aw), acidity (pH), redox potential (Eh), preservatives (nitrite, sulphite, etc.) and competitive microorganisms (lactic bacteria). Combinations of hurdle factors is not universal for all meat products, for each and every product, specific hurdles are used. Several hurdles are used to obtain the optimum combination to give optimum sensory qualities, safety and stability [3]. The hurdles inherent in a shelf stable product, control microbial spoilage and food poisoning [2].

Hurdle technology involves simultaneous multiple preservation approaches, has generally helpful in controlling pathogens and maintaining food quality during storage [4]. The technology was applied to a bologna type sausage by lowering the pH, extending the heat treatment and reducing the amount of nitrite used. Positive hurdles, which keep the membrane lipids in apparently unchanged physiological condition and thus prolong the shelf-life of foods are: relatively low temperature, appropriate relative humidity, absence of light and slight anoxia. Another fundamental aspect of food preservation by hurdle technology is the synergistic effect of combined processes used which causes disturbance of the homeostasis within microorganisms [5].Water activity of these products generally adjusted at less than 0.85 as *Clostridium botulinum* cannot grow and Staphylococcus species do not elaborate enterotoxin [6,7]. *S. aureus* are considered to be hazardous to the consumer, moreover it can grow even at an $a_w$ as low as 0.83 and produce enterotoxin at aw values of 0.86 or higher [8].

## HUMECTANTS AND ACIDULANTS

Humectants and acidulants are fundamental ingredients of hurdle treated products. Honey is a well-known traditional food and natural humectants containing around 200 nutritive substances including vitamins, proteins, minerals, organic acids, flavonoids, phenolic acids, enzymes and other phytochemicals [9]. It is the only natural humectant in a concentrated sugar form used in food preservation [10]. Moreover, honey has been reported to provide antioxidant effects, and protect food from oxidative deterioration [11]. As a natural antioxidant, honey also provides health benefits, such as antimicrobial and antiviral activities, reduction of the risk of heart and gastrointestinal diseases and wound healing. Triyannato and Lee [12] evaluated the potential of natural humectants such as honey and rice syrup to replace sorbitol in the production of restructured duck jerky. Each humectant was mixed at 3%, 6% and 10% (w/w) concentrations with the marinating solution. Jerky samples treated with honey retained more moisture and samples treated with 10% honey showed the highest sensory scores.

Organic acids used to reduce pH in hurdle treated products are effective in inhibiting bacteria due to their ability to penetrate and disrupt the cell membrane and to acidify the cell contents [13]. Acetic acid (vinegar) is generally regarded as safe (GRAS) and is a potent antimicrobial and is being used to control Salmonella contamination in meat and poultry products [14].

Timm et al. [15] developed the method of extended shelf life sandwich applying humectants, acidulant and drying the meat up to water activity of no less than 0.85 and followed by wrapping the processed meat in a breading. By Moisture content of the meat is reduced to approximately 60% or less

**Corresponding author**: Anita Arya, Department of Livestock Products Technology, College of Veterinary and Animal Sciences GBPUAT, Pantnagar-263145, Uttarakhand, India, E-mail: dranitaarya@gmail.com

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and water activity of no less than 0.85.

Karthikeyan et al. [16] developed Chevon (capine) keema, using the principle of hurdle technology. The hurdles applied were water activity ($a_w$), pH, vacuum packaging, preservatives and heat treatment. $a_w$ of the product was adjusted to two levels viz., 0.90 and 0.88 by the addition of humectants. The pH of the keema was adjusted with lactic acid to 3 desired levels viz. 5.50, 5.65 and 5.80. Sensorically the product with pH 5.8 was the most acceptable and while pH 5.50 was the least acceptable. Standardised keema with aw 0.90 and pH 5.80 were stored at ambient temperature A gradual increase in moisture, $a_w$, TBARS number and tyrosine value were observed throughout the storage period. However, decrease in the growth rate of aerobic and anaerobic counts and complete inhibition of *Staphylococcus aureus* was observed. Product was well accepted up to the 3rd day and fairly accepted up to 5th day whereas the keema prepared by the traditional method was acceptable only on the first day.

Leistner [17] developed Lup Cheong (raw non-fermented sausage of China storable for several weeks without refrigeration) by the addition of 3.5% sodium lactate and 0.1% sodium acetate. The modified product remains tasty and is stable and safe even when stored for several weeks without refrigeration.

Lara et al. [18] prepared Charqui meats to observe the possibility of development of enterotoxigenic *Staphylococcus aureus* and *Clostridium botulinum* proteolytic type B spores and their toxins. Results demonstrated that the harsh processing conditions, high salt concentration, relative high temperature and water activity, inhibited the growth of both bacteria. *C. botulinum* spores germination also impaired might be because of the low aw conditions.

## USE OF IRRADIATION AND COMBINATION ANTIMICROBIALS

Antimicrobial agents, including food preservatives have been used to inhibit food-borne bacteria and extend the shelf life of processed food. Antimicrobials in combination with other hurdles were being used to extend the shelf life as well as safety of hurdle treated products. The use of antimicrobials in combination is also referred to as multiple-hurdle technology [2,19,20].

Chawla and Chander [21] developed shelf stable meat products by using a combination of hurdles (irradiation, reduced water activity and vacuum packing) and effectiveness of these hurdle against Clostridium sporogenes, *Staphylococcus aureus* and *Bacillus cereus* were tested. Radiation treatment (2.5 kGy) resulted in complete elimination of *S. aureus* (inoculated $10^6$ cfu) and *B. cereus* but not of *C. sporogenes*. The water activity ($a_w$) of 0.85 and vacuum packaging of products prevented the growth of these organisms inoculated into these samples during 3 months of storage at room temperature. Irradiation usefully inactivated yeast and molds and reduced the *B. cereus* during storage.

Charqui meat is a tropical intermediate meat product formulated using hurdle technology [17]. Salt, sodium nitrite, dehydration, and packaging are hurdles sequentially applied to inhibit deteriorating microorganisms with the possibility of selecting desirable microbiota.

A number of ready-to-use shelf-stable intermediate-moisture (IM) spiced and variety products can be developed using a combination of hurdles. Use of humectants, acidulants and preservatives as well as desired microbiota in combination contributes to its improved microbiological and sensory quality as well as stability of the product.

## REFERENCES

1. Pundhir A, Murtaza N (2015) Hurdle technology - An approach towards food preservation. Int J Curr Microbiol Appl Sci 4: 802-809.
2. Leistner L, Gorris LGM (1995) Food preservation by hurdle technology. Trends Food Sci Technol 6: 41-46.
3. Das H, Radhakrishna K (2001) Preservation of mutton as ready-to-eat curry by hurdle technology. J Food Sci Technol 38: 287-289.
4. Leistner L (2000) Basic aspects of food preservation by hurdle technology. Int J Food Microbiol 55: 181-186.
5. Whittenbury R, Gould GW, Banks JG, Board RG (1988) Homeostatic mechanisms in microorganisms. Bath University Press, Bath, pp: 220-228.
6. Karel M (1975) Freeze drying and advance food technology. NY: Academic Press, p: 643.
7. Leistner L (1992) Food preservation by combined method. Food Res Int 25: 151-158.
8. Tatini SR (1973) Influence of food environments on growth of *Staphylococcus aureus* and production of various enterotoxin A in milk. J. Milk Food Technol 36: 559-563.
9. Bertoncelj J, Doberšek U, Jamnik M, Golob T (2007) Evaluation of the phenolic content, anti-oxidant activity and colour of Slovenian honey. Food Chem 105: 822-828.
10. FAO (1996) Value-added products from beekeeping. FAO Agricultural Services Bulletin No. 124. Available at: http://www.fao.org/docrep/w0076e/w0076e00.htm
11. Gheldof N, Engeseth NJ (2002) Antioxidant capacity of honeys from various floral sources based on the determination of oxygen radical absorbance capacity and inhibition of *in vitro* lipoprotein oxidation in human serum samples. Agric Food Chem 50: 3050-3055.

12. Triyannato E, Lee KT (2016) Evaluation of honey and rice syrup as replacement for sorbitol in production of restructured duck jerkey. Asian Aust J Anim Sci 29: 271.

13. Keener KM, Bashor MP, Curtis PA, Sheldon BW, Kathariou S (2004) Comprehensive review of Campylobacter and poultry processing. Comp Rev Food Sci Food Saf 3: 105-116.

14. Mani-López E, García HS, López-Malo A (2012) Organic acids as antimicrobials to control Salmonella in meat and poultry products. Food Res Int 45: 713-721.

15. Timm RR, Tami M, Langstaff S, Corkill L (2014) Extended shelf life sandwich and method of making said sandwich Hormel Foods Corporation. US Patent CA 2,822,323 A1. Washington, DC: U.S.

16. Karthikeyan J, Kumar A, Anjaneyulu SASR, Rao KH (2000) Application of hurdle technology for the development of Caprine keema and its stability at ambient temperature. Meat Sci 54: 9-15.

17. Leistner L (1994) Further developments in the utilization of hurdle technology for food preservation. J Food Eng 22: 421-432.

18. Lara JAF, Senigaliaa SWB, Oliveiraa TCRM, Dutrab IS, Pintob MF (2003) Evaluation of survival of *Staphylococcus aureus* and *Clostridium botulinum* in charqui meats. Meat Sci 65: 609-613.

19. Friedly EC, Crandall PG, Ricke SC, Roman M, O'Bryan C, et al. (2009) *In vitro* anti-listerial effects of citrus oil fractions in combination with organic acids. J Food Sci 74: M67-M72.

20. Doern GV, Richter SS, Miller A, Miller N, Rice C, et al. (2005) Antimicrobial resistance among *Streptococcus pneumoniae* in the United States: have we begun to turn the corner on resistance to certain antimicrobial classes? Clin Infect Dis 41: 139-148.

21. Chawla SP, Chander R (2004) Microbiological safety of shelf-stable meat products prepared by employing hurdle technology. Food Contam 15: 559-563.