

## Mechanically Deboned Poultry Meat and its Packaging

\*Pranav Chauhan<sup>1</sup>, Vishal K.<sup>1</sup>, Jay Prakash Yadav<sup>2</sup>, Rahul Singh<sup>3</sup>, Amit<sup>4</sup>, Sushobhit Kumar Singh<sup>4</sup>, Shyam Sundar Choudhary<sup>5</sup> and Shiv Varan Singh<sup>6</sup>

<sup>1</sup>Division of Livestock Products Technology, <sup>2</sup>Division of Veterinary Public Health, <sup>3</sup>Division of Pathology, <sup>4</sup>Division of Animal Reproduction, <sup>5</sup>Division of Medicine, <sup>6</sup>Division of Bacteriology & Mycology, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly (U.P.)-243122.

### \*Corresponding Author

**Name:** Pranav Chauhan

**Email:** [dr.pranav.chauhan@gmail.com](mailto:dr.pranav.chauhan@gmail.com)

---

**Abstract:** Poultry is a growing industry of modern age. Poultry meat does not having any religious taboo regarding rearing and consumption. Poultry meat is very healthy and nutritious food with rich in protein and of high biological value with low cholesterol content. Mechanically deboned chicken meat (MDCM) is a paste-like meat product produced by forcing ground turkey or chicken under high pressure with sieve to separate the bone from meat. It is low- cost raw material and widely used as a protein source in the formulation of industrial products. Its packaging is very important to extend the shelf life of MDCM.

**Keywords:** Poultry, Mechanically deboned meat, Packaging, Chicken

---

### INTRODUCTION

Mechanically separated meat (MSM), mechanically recovered/ reclaimed meat (MRM), or mechanically deboned chicken meat (MDCM) is a paste-like meat product produced by forcing pureed or ground beef, pork, turkey or chicken, under high pressure through a sieve or similar device to separate the bone from the edible meat tissue. The process entails pureeing or grinding the poultry carcass left after the manual removal of meat from the bones and then forcing the slurry through a sieve under pressure. This includes bone, bone marrow, skin, nerves and blood vessels in addition to the scraps of meat remaining on the bones. The resulting product is a blend of muscle (meat) and other tissues not generally considered meat. Mechanically separated meat has been used in certain meat and meat products, such as hot dogs and sausage, since the late 1960s. On account of technological modernization, MDCM has branched out mainly due to its simplicity to obtain and process industrialized products. For the production of chicken and turkey MSM, most of the time, breast carcasses are used as they still contain parts of breast meat. Mechanically deboned chicken meat (MDCM) is a widely used raw material for the production of meat patties. MDCM emerged in order to satisfy consumer preferences for chicken cuts and fillets instead of whole chickens, thus giving rise to finding ways to take advantage of chicken backs, necks and bones from deboning techniques. Mechanically separated poultry meat is a widely used industrial process that enables using non-prime raw materials or with no commercial value. Because it is a low- cost raw material, MDCM is

widely used as a protein source in the formulation of industrial products. Due to the high lipid content in its composition, it is very susceptible to oxidative reactions. These reactions occur from the metabolic transformations of fatty acids in the meat. Under the current law, the maximum fat allowed in MDCM is of 30%. Products made of deboned and formed minced poultry meat can be analysed. These are commercially known as chicken nuggets, chicken burgers, breast fillets and chicken frankfurters. Previous studies imply that product quality, the quality of source raw material and the technology of deboning and processing are interconnected [4, 6, 8, 9, 10].

### Quality of Mechanically deboned meat

MDCM is a by-product of the poultry industry increasingly used in processed meat products. It is also a source of high biological quality proteins that could be used to produce protein preparations with specific characteristics. MDCM is mostly obtained from necks and back parts of chicken and turkey carcasses [3]. Mechanically deboned meat is a relatively non-standardized raw material which, despite its higher calcium (bone) content, has the structural characteristics of minced meat, and because of this it is easily incorporated into meat processing technologies [11]. The use of mechanically deboned poultry meat (MDPM) has increased recently in the food industry because of the strong tendency to replace red meat for healthier white meat in industrialized countries, and the lower price of the latter compared with other kinds of meat. Poultry production in Turkey has made great progress in the last decade with the increased

production of cut-up parts for sale. In the formulation of comminuted meat products, MDPM is widely used owing to its fine consistency and lower cost. The incorporation of MDPM into emulsified meat products as well as into non-emulsified meat products in relatively low proportions has provided extra markets for meat from chicken frames and necks [7]. This correlation has been implied in earlier research [7, 5] which points out the importance of tissue component ratio in the meat mass. The same authors found that the yield of mechanical deboning ranges between 55-80% depending on the carcass and the parts used for deboning. The rest comprises "offal products", which are used as raw materials in pet food production.

#### Proximate of MDCM

The content of water, lipids, proteins, ash and calcium was studied in deboned meat and "offal product" samples of chicken carcasses, back, neck and wings [1]. Average water content was highest in deboned carcass meat samples (69.14%), slightly lower in samples of deboned wings (61.54%) and back (60.31%), and lowest in deboned neck meat samples (51.01%). The average proportion of total lipids was highest in deboned meat of chicken backs (20.85%), slightly lower in deboned meat chicken wings (19.47%), and the lowest in meat samples of deboned necks (6.29%), while in meat samples of deboned chicken carcasses it was 12.40%. The lowest total ash content was detected in deboned meat samples of chicken carcasses (0.40%), while these contents in deboned meat samples of back, wings and neck were 1.18%, 1.65% and 1.37%, respectively.

#### Raw Materials and Packaging Materials

Packaging materials used for meat products are usually plastics, in which polymers with good Oxygen-barrier properties (e.g., polyamide (PA)) are incorporated with polymers with good humidity barrier and sealing properties (e.g., polyethylene (PE) and polypropylene (PP)). Polymers are very sensitive to degradation reactions occurring during manufacture and use, and reactions with oxygen are the dominant cause of degradation of any polymers. To improve the properties of the polymer, in addition to aiding processing, additives are often added in small quantities (usually less than 5%) after polymerization. Additives such as antioxidants increase the stability and slow the degradation of many polymers. During the processing of polymers.

1) Mechanically deboning involves grinding meat and bone together and forcing the meat through the fine sieve of a mechanical deboner. Bone particles are left behind in the waste residue, which increases the calcium content of MDPM. The meat is obtained as a finely ground paste in which myofibrils are in highly fragmented form it contains considerable quantities of lipids (15-22%) and heme component. Heme pigments

acts as catalyst in the auto-oxidation of lipids and may cause flavor problems.

2) The process of mechanically deboning causes maceration of tissue. So microbial contamination may be easily blended throughout the deboned tissue, further heat evolved during the deboning process may also enhance bacterial growth like *Pseudomonas*, *Achromobacter* etc.

3) MDPM susceptible to soft texture, unstable color and rapid microbial deterioration during storage. Freezing of meat at  $-20^{\circ}\text{C}$  reduce the microbial counts.

#### Packaging Objectives and Requirements –

- i) It is prime objective is to stabilize the colour of MDPM
- ii) Packaging play important role in retarding the lipid oxidation
- iii) To inhibits further microbial deterioration
- iv) The texture of mechanically debone poultry meat should be maintained

The self-life of MDPM can be maintained during storage only if proper packaging technology is adopted. The packaging material should have good moisture and have gas barrier properties.

#### Packaging Techniques

##### Vacuum packaging:

Application of this technique in suitable laminates is a low cost proposition to achieve the desire objectives. It eliminates the volume of air around the meat and restricts further entry of oxygen during storage. The residual air is quickly consumed by meats respiration and partial pressure of oxygen drops below 10 mm Hg within two days of packaging [2]. Further, meat respiration allows the accumulation of carbon dioxide in the packaging which limits the growth of *Pseudomonas* and favour lactic acid bacteria which do not produce putrid odour. Vacuum packaging extends shelf life of meat while retaining the desired flavour. It saves the refrigeration space during transports and storage which indirectly reduces the labour cost. Besides, there is no weight loss during storage. However, since meat and package, both are subjected to mechanical stress, there may be problem of purge and increased drip loss.

##### Modified atmosphere packaging (MAP):

In this technique atmospheric composition the meat is changed by manipulation of  $\text{CO}_2$ ,  $\text{O}_2$  and  $\text{N}_2$  levels. In MAP, only initial change is made whereas in controlled atmosphere packaging (CAP) selective atmospheric composition of gases is maintained by constant monitoring the same throughout the storage period. Nitrogen flushing in meat package effectively inhibits lipid oxidation. Besides there is also slight increase in redness of meat during 10 minutes exposure to atmosphere.  $\text{CO}_2$  packaging selectively inhibits gram

negative bacteria such as *Pseudomonas* and related psychrotrophs, although lactic acid bacteria are not much affected. An effective atmospheric composition for mechanically deboned poultry meat may be 20-30% CO<sub>2</sub>, 0-10% O<sub>2</sub>, and 70-80% N<sub>2</sub> [2]. A combination of carbon dioxide packaging and sorbate treatment provides the most effective packaging and sorbate treatment provides most effective inhibitory system against poultry spoilage organism. It reduce oxidation rate and stabilizes the meat colour. Modified atmosphere packaging extends the shelf life of MDPM to a considerable extent. It maintains the colour, texture and flavour of meat during storage. However, it adds to the cost of the packaging.

### CONCLUSION

Poultry after dressing the muscle which is attached with it is further utilised by mechanical deboning. It is very cheap raw material of further used in meat product processing. The packaging requirements are very important of contains, preserve, display it and extend self-life of poultry meat.

### ACKNOWLEDGEMENTS

The authors would like to thank director of IVRI and ICAR. We certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

### REFERENCES

1. Botka-Petrak K, Hraste A, Lucić H, Gottstein Ž, Gomerčić MĐ, Jakšić S, Petrak T. Histological and chemical characteristics of mechanically deboned meat of broiler chickens. *Vet. Arhiv.* 2011 Apr 26;81:273-83.
2. Sharma BD. *Packaging Of Meat, Dairy And Poultry Products.*
3. Froning GW. Mechanical deboning of poultry and fish. *Advances in food research.* 1981 Dec 31;27:109-47.
4. Hraste A, Nejedli S, Jelić A, Botka-Petrak K. Primjena histološke tehnike u pregledu mesnih proizvoda sisavaca i ptica. *Zbornik radova II. hrvatskog veterinarskog kongresa.* 2000 Oct:10-3.
5. Janječić Z. Mekoća mesa peradi. *MESO: prvi hrvatski časopis o mesu.* 2006 Jul 15;8(4):196-7.
6. Jelić A, Nejedli S, Hraste A, Petrak KB, Jukić-Brestovec V. Stereologic analysis of products made from minced poultry meat. In *Proceedings of XIV European Symposium on the Quality of Poultry Meat 1999 Sep* (pp. 19-23).
7. Mielnik MB, Aaby K, Rolfsen K, Ellekjær MR, Nilsson A. Quality of comminuted sausages formulated from mechanically deboned poultry meat. *Meat Science.* 2002 May 31;61(1):73-84.
8. Nejedli S, Jelić A, Botka-Petrak K, Jukić-Brestovec V, Slunjski B. Stereological analysis of the tissue content of formed chicken meat products. *Veterinarska stanica: znanstveno-stručni veterinarski časopis.* 1998 Jan 1;29(6):323-8.
9. Nejedli S, Hraste A, Jelić A, Peševski R, Petrak KB. Application of histological techniques in examination of mammal and poultry meat products. *Veterinarski Arhiv.* 2000;70(Supplement).
10. Nejedli s, hraste a, botka-petrak k, kantura vg, nejedli d. Histomorphologic and stereologic analysis of tissue components within the chicken meat products. In *proceedings of xvi symposium on the quality of poultry meat 2003 sep* (pp. 23-26).
11. Tremlová B, Sarha P, Pospiech M, Buchtová H, Randulová Z. Histological analysis of different kinds of mechanically recovered meat. *Archiv fur Lebensmittelhygiene.* 2006 May 1;57(3):85.