MEAT MICROBIOLOGY. A SHORT REVIEW

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Abstract: The microorganisms can be found everywhere, in air, water and soil, on animals and even on humans. They also occur in any food, such as: meat, seafood, eggs, dairy products and vegetables. Meat, due to its high water and rich nutritional composition, is a good medium for microorgansims'growth. At the same time the meat is susceptible to microbial spoilage and it can be a serious source of pathogenic bacteria.This paper aims to review some aspects of the fresh and vacuum-packaged meat microbiota. A good understanding of meat microbiota is the key to effective management of the meat and meat products safety and in the control strategies at processor, distributor, packer, retailer and consumer.

Key words: Fresh meat; Vacuum-packaged meat; Microbiota.

Introduction

Meat is the muscle tissue of slaughter animals composed of water, proteins, essential amino acids, fatty acids, vitamins, minerals and a small proportion of carbohydrates (Shah *and al.,* 2014; Stoica *and al.,* 2014). The rich nutritional composition of meat makes it an ideal environment for the growth of meat spoilage microorganisms and common foodborne pathogens (Zhou *and al.,* 2010; Shah *and al.,* 2014; Stoica *and al.,* 2014). The metabolic activity of spoilage microorganisms can lead to loss of meat quality and shortening of shelf-life with economic losses, while the growth of pathogens may cause safety problems (Brown, 2000; Filimon *and al.,* 2010; Zhou *and al.,* 2010; Adeyanju and Ishola, 2014; Sofos, 2014; Stoica *and al.,* 2014). Knowledge about the meat microbiota can lead to develop the storage conditions that prolong the shelf-life of meat and meat products. This paper is planned out to review some aspects of the fresh and vacuum-packaged meat microbiota.

The microbiota of fresh meat

There are numerous microorganisms which are potentially contributing to fresh meat spoilage (Stoica *and al.,* 2014). The most frequent bacteria to occur on fresh meat are bacteria of both Gram-negative and Gram-positive bacteria, such as: *Acinetobacter* spp., *Enterobacteriaceae* spp., *Flavobacterium* spp., *Micrococcus* spp., *Moraxella* spp., *Pseudomonas* spp., *Staphylococcus* spp., lactic acid bacteria (Brown, 2000; Dave and Ghaly, 2011; Sofos, 2014; Stoica *and al.,* 2014). Species of *Acinetobacter*, *Enterobacteriaceae*, *Moraxella* and *Pseudomonas* are particularly involved in the spoilage of refrigerated meat and meat product (Brown, 2000; Ercolini *and al.,* 2009; Dave and Ghaly, 2011; Doulgeraki and Nychas, 2013). *Pseudomonas* plays a significant role in the spoilage of minced beef, fresh pork and poultry meat; it exhausts the glucose and lactic acid and begins to metabolize the nitrogenous compounds, especially amino acids (Nychas *and al.,* 2008; Bruckner *and al.,* 2012; Doulgeraki and Nychas, 2013). The lactic

acid bacteria, *Enterococci* and *Micrococci* are predominately found in fresh meat, also (Stoica *and al.*, 2014). The bacteria presented here are generally harmless, but they spoil (change in colour in texture, an unpleasant odour, or an undesirable taste) the meat and it becomes sensory undesirable for the customer to purchase (Rieder *and al.*, 2012).

The microbiota of packaged meat

The vacuum packaging is an anaerobic / microaerobic microsystem that favors facultative anaerobic and anaerobic bacteria, including: *Aeromonas* spp., *Carnobacterium* spp., *Clostridium* spp., *Enterobacter, Hafnia* spp., lactic acid bacteria, *Leuconostoc* spp., *Rahnella, Serratia, Shewanella putrefaciens* and so on (Dainty *and al.*, 1992; Broda *and al.*, 2000, 2002; Ray, 2000; Spring *and al.*, 2003; Gill, 2004; Holley *and al.*, 2004; Brightwell *and al.*, 2007). The vacuum and long-term storage at refrigeration temperatures may promote the growth of some of these bacteria, allowing them to deteriorate the product or to produce diseases (Fleet, 1999; Ray and Bhunia, 2008). *Aeromonas* spp. produces a putrid odour and causes the deterioration of high *p*H vacuum-packaged pork (Holley *and al.*, 2004). *Clostridium* and *Enterobacteriaceae* can multiply in vacuum-packaged meat and have been identified as causative agents of blowing vacuum packages (Broda *and al.*, 1996; Brightwell *and al.*, 2007). The deterioration of vacuum-packaged meat caused by these bacteria is often characterized by unpleasant odours (putrid odours and tastes) of the meat (Brightwell *and al.*, 2007). The lactic acid bacteria can produce butyric acid and ethanol, during the prolonged storage in a modified atmosphere and reduce the shelf-life of the vacuum-packaged meat. *Enterobacter*, *Serratia* and *Hafnia* can cause the putrefaction of the meat, due to the production of amines and ammonia (Ray, 2000).

Concluding comments

Meat is a good medium for microorgansims'growth. Even at suitable refrigeration temperatures the meat may be subject to deterioration by bacteria that are able to grow under these conditions. Meat spoilage caused by bacteria is an important problem for processors, distributors, packers, retailers and consumers alike. A good understanding of meat microbiota can lead to develop the storage conditions that prolong the shelf-life of meat and meat products and it is should be useful to improve and guarantee consumer safety, an issue that is of increasing concern today.

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