Impact of surface texture and roughness on the cleanability and hygiene of food contact surfaces.

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Introduction

In the food industry, maintaining clean and hygienic surfaces is crucial to ensure food safety and prevent the spread of pathogens. Food contact surfaces, such as countertops, cutting boards, and equipment, play a vital role in food preparation and processing. However, the surface texture and roughness of these surfaces can significantly influence their cleanability and hygiene. Understanding the impact of surface characteristics on microbial adherence and removal is essential for designing effective cleaning and sanitation protocols. In this article, we will explore the relationship between surface texture, roughness, cleanability, and hygiene in food contact surfaces [1].

Surface texture refers to the physical characteristics of a surface, including its smoothness, roughness, and topography. Microorganisms have the ability to adhere to various surfaces, including those found in the food industry. The surface texture of food contact surfaces can influence microbial adherence through mechanisms such as mechanical entrapment, electrostatic interactions, and surface energy. Research has shown that rough surfaces provide more surface area for microbial attachment compared to smooth surfaces. Irregularities, cracks, and crevices in rough surfaces can harbor and protect microorganisms, making them more challenging to remove during cleaning and sanitation processes. Bacteria like *Listeria monocytogenes* and *Salmonella enterica* have been found to adhere more strongly to rough surfaces, increasing the risk of cross-contamination and foodborne illnesses [2].

The roughness of a surface affects its cleanability, as it can hinder the mechanical action of cleaning agents and reduce the effectiveness of sanitizers. The presence of surface irregularities and microscale roughness provides niches where microorganisms can reside, forming biofilms a complex matrix of microbial cells and extracellular polymeric substances. Biofilms are notoriously difficult to remove and can lead to persistent contamination. Cleaning protocols that rely on physical scrubbing or spraying may not effectively reach and dislodge microorganisms from rough surfaces. This can result in incomplete cleaning and the survival of pathogens, increasing the risk of cross-contamination. Additionally, the accumulation of organic matter, such as food debris and residues, in surface irregularities can provide nutrients for microbial growth and compromise the efficacy of sanitizers [3].

Recognizing the importance of surface roughness in food safety, the concept of hygienic design has emerged in the food industry. Hygienic design involves the construction and arrangement of food processing equipment and surfaces to facilitate effective cleaning and sanitation. Smooth and easily cleanable surfaces are a key aspect of hygienic design. Food contact surfaces with low roughness values (measured in micrometers) are generally considered more hygienic. Smooth surfaces minimize microbial attachment and make cleaning processes more efficient. They allow for better contact between cleaning agents and the surface, facilitating the removal of soil and microorganisms. Surfaces with low roughness also promote the flow of water, aiding rinsing and preventing the formation of biofilms. Surface roughness can be quantitatively measured using techniques such as profilometry and atomic force microscopy. These methods provide numerical values that characterize the surface texture, including average roughness (Ra), root mean square roughness (Rq), and maximum roughness (Rz). Understanding these measurements can help evaluate the cleanability and hygiene of food contact surfaces [4].

The surface texture and roughness of food contact surfaces play a significant role in cleanability and hygiene. Rough surfaces provide more opportunities for microbial attachment, making them challenging to clean and sanitize effectively. Smooth surfaces, on the other hand, promote cleanability by minimizing microbial adherence and facilitating the removal of contaminants. Adopting hygienic design principles and selecting surfaces with low roughness values are crucial steps in ensuring food safety. Regular monitoring of surface roughness, along with appropriate cleaning and sanitation protocols, can help mitigate the risk of microbial contamination and improve overall hygiene in the food industry [5].

References

1. Yoda I, Koseki H, Tomita M, et al. Effect of surface roughness of biomaterials on Staphylococcus epidermidis adhesion. BMC Microbiol. 2014;14(1):1-7.
2. Yu P, Wang C, Zhou J, et al. Influence of surface properties on adhesion forces and attachment of Streptococcus mutans to zirconia *in vitro*. Bio Med Res Int. 2016; 26(1).
3. Zhang K, Baras B, Lynch CD, et al. Developing a new generation of therapeutic dental polymers to inhibit oral biofilms and protect teeth. Mater. 2018;11(9):1747.

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4. Zhang X, Zhou X, Xi H, et al. Interpretation of adhesion behaviors between bacteria and modified basalt fiber by surface thermodynamics and extended DLVO theory. Bio Interfaces. 2019;177:454-61. 35

5. Zhu X, Jańczewski D, Guo S, et al. Polyion multilayers with precise surface charge control for antifouling. Appl Mat and Interf. 2015;7(1):852-61.

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