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# Food Spoilage by Microbial Growth

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## About the Study

Microbial growth is an autocatalytic process: no development will occur without the presence of at least one viable cell and the rate of growth increases with the amount of viable biomass present. A single bacterium with a multiplying time of 20 minutes growing in a food, or pockets of food trapped in equipment, can create a population of more prominent than $10^7$ cells over the span of an 8-hour working day. It is subsequently, a prime concern of the food microbiologist to understand what impacts microbial growth in food sources with the end goal of controlling it. The circumstance is complicated by the fact that the microflora is probably not going to comprise of a single pure culture. In the course of growth, harvesting/slaughter, processing and storage, food is subject to contamination from a range of sources.

Some of the micro-organisms introduced will not be able to grow under the conditions prevailing, while others will grow together in what is known as an association, the composition of which will change with time. The elements that influence microbial development in food varieties, and subsequently the associations that grow, determine the nature of spoilage and any health risks posed. Those include physico-chemical properties of the food itself (intrinsic factors); conditions of the storage environment (extrinsic factors); properties and interactions of the microorganisms present (implicit factors); and processing factors.

Microorganisms can utilize food varieties as a source of nutrition and energy. From them, they derive the chemical components that establish microbial biomass, those molecules fundamental for development that the organism cannot synthesize, and a substrate that can be utilized as an energy source. The widespread utilization of food items, for example, meat or casein digests (peptone and tryptone), meat infusions, tomato juice, malt extract, sugar and starch in microbiological media bears eloquent testimony to their suitability for this reason. The acidity or alkalinity of an environment profoundly affects the action and stability of macromolecules like enzymes, so it isn't surprising that the growth and metabolism of micro-organisms are influenced by pH. The storage of fresh leafy foods requires exceptionally careful control of relative humidity. On the off chance that it is too low, vegetables will lose water and become flaccid. If it is excessively high, then condensation might occur and microbial decay might be initiated. In food microbiology mesophilic and psychrotrophic organisms are generally of most prominent significance. Mesophiles, with optimum temperature around 37 °C, are often of human or animal origin and include common foodborne pathogens, for example, *Salmonella*, *Staphylococcus aureus* and *Clostridium perfringens*. Mesophiles grow more rapidly at their optimum temperature than psychrotrophs thus spoilage of perishable products stored in the mesophilic growth range is more quick than spoilage under chill conditions.

Among the organisms capable of growth at low temperatures, two groups can be distinguished: the true or strict psychrophiles have optima of 12 °C –15 °C and will not grow above about 20 °C. Psychrotrophs or facultative psychrophiles will grow down to the same low temperatures as strict psychrophiles but have higher optimum and maximum growth temperatures. Thermophiles are generally of far less importance in food microbiology, although thermophilic spore formers such as certain *Bacillus* and *Clostridium* species do pose problems in a restricted number of situations.

Microorganisms exhibit mutualism, where the growth of one organism stimulates the growth of another. Alternatively, one organism may increase the accessibility of nutrients to others by degrading a food component like starch or protein into all the more readily assimilable compounds. Some micro-organisms might eliminate an inhibitory part and subsequently permit the development of others. On the other hand, micro-organisms might be antagonistic towards each other producing inhibitory compounds or sequestering essential supplements like iron.

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