

Chapter 3. Factors that Influence Microbial Growth

December 31, 2001

Evaluation and Definition of Potentially Hazardous Foods

1. Introduction

The factors discussed in this section constitute an inclusive, rather than exclusive, list of intrinsic, extrinsic, and other factors that may be considered when determining whether a food or category of foods requires time/temperature control during storage, distribution, sale and handling at retail and in food service to assure consumer protection.

Many factors must be evaluated for each specific food when making decisions on whether it needs time/temperature control for safety. These can be divided into intrinsic and extrinsic factors. Intrinsic factors are those that are characteristic of the food itself; extrinsic factors are those that refer to the environment surrounding the food. The need for time/temperature control is primarily determined by 1) the potential for contamination with pathogenic microorganisms of concern (including processing influences), and 2) the potential for subsequent growth and/or toxin production.

Most authorities are likely to divide foods among three categories based on an evaluation of the factors described below: those that do not need time/temperature control for protection of consumer safety; those that need time/temperature control; and those where the exact status is questionable. In the case of questionable products, further scientific evidence--such as modeling of microbial growth or death, or actual microbiological challenge studies--may help to inform the decision.

2. Intrinsic factors

2.1. Moisture content

Microorganisms need water in an available form to grow in food products. The control of the moisture content in foods is one of the oldest exploited preservation strategies. Food microbiologists generally describe the water requirements of microorganisms in terms of the water activity (a_w) of the food or environment. Water activity is defined as the ratio of water vapor pressure of the food substrate to the vapor pressure of pure water at the same temperature (Jay 2000b, p 41):

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