

G/aser
1st page only

" Food sterilization by microwave radiation " [destruction of mold spores and bacteria]

J. BILBROUGH (1969)

Microwave Instruments Ltd, Shiremoor, Northumberland

Normal methods of sterilization are briefly compared with the effect of microwave processing whose main objective is to kill mould spores on the inside of wrapping materials. A number of design features of suitable equipment are described with particular reference to prevention of stray radiation.

USUAL METHODS of sterilization involve heating to temperatures of 100°C or above for sufficient time to destroy mould spores and bacteria. In general, such temperatures are reached in the preparation of foodstuffs which are then sufficiently sterile to allow considerable periods of storage under suitable conditions. Problems arise when, after cooking or baking, foodstuff is allowed to cool before being placed in non-sterile containers.

An urgent requirement in the prepared-food industry is ensuring sterile wrapping conditions, normally difficult or impossible to attain because adequate control of manufacture and storage of wrapping materials is virtually impossible.

The problem is prominent for sliced bread, where mould spores can be introduced by the slicing blades and for wrapped cakes they can be enclosed on the inner surface of the wrapping paper.

Some common moulds are aspergillus niger, penicillium s.p. and rhizopus nigricans which can be killed by exposure at 70°C for about 20min. We have attempted to attain higher temperatures for a much shorter time, a period of 10-20s being compatible with conveyor belt treatment. Treated items retain heat for some minutes adding to the effectiveness. Effects were not measured statistically, only the treatment intensity and time to kill mould spores in a number of products were determined.

Microwave heating produces a rapid increase in temperature in materials containing a reasonable percentage of

water as its high dielectric loss gives preferential heating. Although the generation of internal heat is more rapid than in conventional heating processes (conduction is not greatly involved) the quicker surface heating of moist materials treats the part of the product most likely to be contaminated. The water vapour evolved condenses to droplets on the inside of the wrapper and effectively scalds the surface. For deep penetration in sliced materials longer treatment is necessary, but not difficult. This does not present any great electrical or practical difficulties.

The majority of mould spores can be killed by short-term exposure to temperatures in the region of 85°C. There is evidence that the spores are heated more rapidly than their environment, possibly due to molecular resonance or because of saline solutions in the cytoplasm. This differential heating has been placed between 5 and 7degC above the surrounding material and ensures their destruction without unnecessary or prolonged treatment of the food.

Whilst assisting in the sterilization process, condensation taking place on the inside surface of the wrapping during the heating process often causes a wrinkled and unwholesome appearance. Foods having a caramel or glazed outer surface tend to stick to the wrapping and these difficulties seem to be the major objections to the adoption of this sterilization process by the food industry. It is desirable that special wrappers be evolved to present an acceptable appearance to the consumer. A suitable material could be polythene-coated paper.