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INFLUENCE OF ULTRA-VIOLET AND ELECTRON BEAM IRRADIATION ON THE ACRIDINE ORANGE STAINING CHARACTERISTICS OF MICRO-ORGANISMS

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1.0 ABSTRACT

A method was assessed which has the potential to detect foods that have been irradiated. It is based on the comparison of the Aerobic Plate Count (APC) and the count obtained using the Direct Epifluorescent Filter Technique (DEFT). It is postulated that the Acridine Orange (AO) differentially stains the cells so that all viable cells fluoresce orange and non-viable cells fluoresce green. In this investigation all orange fluorescing cells prior to irradiation were considered viable. The APC prior to irradiation, correlated well with the orange fluorescent cells. The post-irradiated APC, however, was markedly lower than a count obtained by DEFT on the same sample. The difference between the post-irradiated APC and DEFT counts gave the number of cells made non-viable by the process.

Further to this, the investigation attempted to elucidate a possible explanation for the continued orange fluorescence of cells that were made non-viable by the irradiation process. This was based on a comparison between APC and DEFT counts of thermally treated and irradiated samples. The APC of the heat treated sample was substantially higher than a DEFT count on a similar sample, as compared with APC of an irradiated sample which was considerably lower than the DEFT count on the same sample. This supported the findings of previous research that RNA synthesis therefore was not the rate-limiting step for recovery.

In addition, the leakage of intracellular components, especially RNA, from sublethally injured cells as result of damage to the cytoplasmic membrane and loss of selective permeability was examined. There was some indication of a possible relationship between leakage of RNA from the heat-treated cells and a subsequent lowering in the number of orange fluorescing cells. Evidence obtained indicated that for DEFT the presence of RNA was implicated as the site for the continued orange fluorescence.