A Research Note

DETECTION OF ENTERIC BACTERIA WITHIN LOCULAR TISSUE OF HEALTHY CUCUMBERS

INTRODUCTION

THE POSSIBILITY that bacteria might be present in the internal tissues of healthy vegetables has largely been ignored in the past, although several researchers have shown that such tissues can contain a mixed bacterial flora (Samish et al., 1963; Thomas and Graham, 1952). The significance of this phenomenon, however, has not been fully elucidated. Recently we reported the occurrence of internally-borne, soft-rotting plant pathogenic bacteria in certain healthy appearing vegetables (Meneley and Stanghellini, 1972), and observed that several isolated bacterial species, belonging to the family Enterobacteriaceae, were not pectate liquefiers. This note concerns the identification of the latter bacteria and discusses the possible implications of their occurrence in the hospital environment.

EXPERIMENTAL

HEALTHY, intact, field-grown cucumbers from California and Mexico, purchased at a local produce house over a 3-month period, were rinsed in running tap water, washed in a hot detergent solution, then bathed in 10% chlorox for 0.5 hr and air dried under either ultraviolet or filter-sterilized air. Cucumbers so treated had sterile surfaces as shown by a standard, surface-swab technique. In order to prevent contamination arising from subcuticular regions, cucumbers were aseptically snapped open (rather than sliced) in a Microvoid transfer chamber. A 2–4g sample of locular tissue was removed from the center with a sterile dissecting needle, placed in nutrient broth (Difco) and incubated aerobically at 27°C.

RESULTS & DISCUSSION

4–100% OF CUCUMBERS in four samples, each comprising 25 fruits, contained bacteria. A mixed bacterial flora, primarily representing the Enterobacteriaceae, Pseudomonadaceae, Corynebacteriaceae, Bacillaceae and Micrococcaceae, was encountered. In addition, hemolytic Bacillus spp. and nonpectolytic, fluorescnet Pseudomonas spp. were present in the cucumber tissue.

In heavily infested lots, two or more bacterial types were often present in each tissue sample. Results of the isolations are presented in Table 1. Organisms that were gram-negative, oxidase negative, and fermented glucose within 3 days but did not hydrolyze sodium polypectate, were characterized as belonging to the Enterobacteriaceae. These isolates were further classified using Enterotubes (Roche) and certain procedures of Ewing and Davis (1970) as Proteus mirabilis, Citrobacter sp., Enterobacter cloacae and a yellow-pigmented Erwinia sp.

Although the total incidence of enteric infestation in our studies was relatively low, the number of infested fruits varied greatly between lots, corroborating the observations of Samish and Etinger-Tulczyjnsky (1962), who sampled over 4000 tomato and cucumber fruits. Further, these authors at times found less than 10 bacterial cells/cm³ of tissue from infested tomatoes. Since we only analyzed small samples of tissue (for the sake of absolute sterility), it seems probable, therefore, that larger samples would have increased the degree of detectability.

Samish et al. (1963) postulated that variability of infestation in different lots of tomatoes could be due to varietal characteristics, climatic influences, or agrotechnical practices. In a separate study using two lots of 25 cucumbers each and procedures as described above, we could not detect any bacteria within tissues of trellised, sand-cultured, glasshouse-grown cucumbers obtained from a commercial operation. This corroborates the studies of Geldreich et al. (1964), who did not detect coliforms on indoor cultivated foliage, and Leben (1972) who found markedly fewer bacteria on the surfaces of greenhouse plants as compared to those grown in the field. The apparent absence of bacteria in greenhouse cucumbers cannot be explained at this time, but almost certainly relates to cultural and environmental conditions during growth of the fruit.

The apparent rise of nosocomial infections during the last 10–15 yr parallels the increasing incidence of infections caused by gram-negative, enteric bacilli of low virulence or pathogenicity (Meyers et al., 1972; Selden et al., 1971; Williams, 1970). These opportunistic invaders, many of which are resistant to antibiotics, can and do appear on a variety of hospital equipment. While many avenues of introduction into the hospital exist, the possibility of their being internally carried in vegetables into at least the food processing areas of hospitals should not be disregarded. Ingestion of potential human pathogens may lead to colonization of the intestine (Shooter et al., 1971). Since endogenous infections often originate from the gastrointestinal tract (Armstrong, 1970), eventual infection could develop if host defense mechanisms were altered by immunosuppressive drugs or if the “normal flora”.was inhibited by antibiotics. This possibility would be increased if vegetable-borne pathogens had time to multiply by prolonged incubation in fresh salads (Tanner, 1946).

These results indicate that the internal flora of field-grown vegetables may provide a source of opportunistic bacterial pathogens as great as the flora reported to be epiphytic (Brown and Seidler, 1973; Geldreich and Borden, 1971; Kominos et al., 1972; Tervet and Hollis, 1948).

REFERENCES


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