

## Rapid detection and enumeration of pathogenic *Vibrio parahaemolyticus* in raw vegetables from retail outlets

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**Abstract:** This study aims to determine the frequency and density of potentially pathogenic *Vibrio parahaemolyticus*, defined as those possessing thermostable-direct hemolysin (*tdh*) and/or *tdh*-related hemolysin (*trh*) genes, in raw salad vegetables at retail level in Selangor, Malaysia. A combination of Most Probable Number - Polymerase Chain Reaction (MPN-PCR) method was applied to detect the presence of *tdh* and/or *trh* gene-possessing *V. parahaemolyticus* and to enumerate their density in the samples. A total of 276 samples of vegetables commonly eaten raw in Malaysia (Cabbage = 30; Carrot = 31; Cucumber = 28; Four winged bean = 26; Indian pennywort = 17; Japanese parsley = 21; Lettuce = 16; Long bean = 32; Sweet potato = 29; Tomato = 38; Wild cosmos = 8) were analyzed. The samples were purchased from two supermarkets (A and B) and two wet markets (C and D). With the MPN-PCR technique, about 12.0% of the samples were positive for the presence of *V. parahaemolyticus* *tdh*-positive, with maximum densities of up to 39 MPN/g. The total frequency of *V. parahaemolyticus* *trh*-positive in the samples was 10.1%, with maximum concentration 15 MPN/g. *V. parahaemolyticus* *tdh*-positive was most prevalent in samples from Wet Market C (20.78%) and also in vegetable type *Oenanthe stolonifera* (Japanese parsley) with 19.0%, while *V. parahaemolyticus* *trh*-positive was predominant in samples from Wet Market D (16.7%) and was most frequent in both *Oenanthe stolonifera* (Japanese parsley) and *Cucumis sativus* (Cucumber) with 14.3% prevalence for each type. The results highlighted the fact that raw vegetables could be contaminated with virulent *V. parahaemolyticus* and could act as a transmission route, thus poses risk to consumers from the consumption of raw vegetables. To the author's knowledge, this is the first assessment of *V. parahaemolyticus* carrying *tdh* and *trh* genes in raw vegetables from retail outlets in Malaysia.

**Keywords:** *Vibrio parahaemolyticus*, most probable number (MPN), polymerase chain reaction (PCR), vegetables, thermostable direct hemolysin (TDH), TDH-related hemolysin (TRH)

### Introduction

*Vibrio parahaemolyticus* is recognized as a common cause of foodborne illnesses in many Asian countries, including Japan, Taiwan and China (Su and Liu, 2007). For a long time, *V. parahaemolyticus* has been known to be ubiquitously present in brackish and marine waters, and infection to human is frequently associated with the consumption of contaminated seafood or raw or undercooked shellfish (Guoxiang et al., 2009). However, recent foodborne outbreaks throughout the world have been intensively linked

to consumption of fresh fruits, vegetables and unpasteurized juices (Gorny, 2006).

Fruits and vegetables, particularly those eaten raw and without peeling, have been demonstrated to be the vehicle for transmission of a range of microorganisms (Erdogru and Sener, 2005). Okafo et al. (2003) reported the presence of *Escherichia coli*, *Vibrio* spp. and *Salmonella* spp. in raw vegetables harvested from soils irrigated with contaminated streams in Nigeria. Studies of other microorganisms found in vegetables were also reported recently (Chai et al., 2008; Learn-Han et al., 2009; Ponniah et al.,

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