

Is Your Salad Safe? Antibiotic Resistance of Foodborne Pathogens Detected on Commercial Ready-To-Eat Leafy Greens

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Abstract

Leafy greens are known to have a large microbial load due to farming, environmental, and processing conditions. Subsequently, leafy greens are progressively linked to outbreaks of foodborne pathogens in developed countries. This microbial risk may be exasperated in developing countries such as South Africa where it is common practice to use natural waterbodies, which have been found to be contaminated by pathogens such as *Listeria monocytogenes* and *Salmonella* spp., for irrigation. Additionally antibiotic resistant (ABR) isolates have been linked to fresh produce as well as agricultural practices and environments in South Africa. The isolation of ABR foodborne pathogens from Ready-to-Eat (RTE) foods poses a risk for public health as it limits viable treatment options. This study screened 60 leafy green samples, 30 bagged RTE samples and 30 unbagged and semi bagged whole samples, from three commercial retailers in the Western Cape for foodborne pathogens *Listeria* spp. (ISO 11290-1:2017) and *Salmonella* spp. (ISO 6579-1:2017). In South Africa, a zero-detection limit applies for these pathogens in RTE leafy greens. Presumptive colonies from chromogenic agar were confirmed using the VITEK®2 compact automated system. The antibiotic susceptibility of confirmed isolates was determined according to CLSI and EUCAST guidelines using disc diffusion. No *Salmonella* spp. were detected while three samples (0,05%) tested positive for *L. monocytogenes*, and three (0,05%) for *Listeria* spp. including novel *L. rocourtaie*. Colonies were also confirmed to be *Klebsiella oxytoca*, *Enterobacter cloacae* complex, *Raoultella planticola*, *Citrobacter* spp. and emerging foodborne bacteria *Globicatella sanguinis*, and *Kocuria kristinae*. These bacteria have been linked to invasive infections in humans. Antibiotic resistance to relevant clinical and veterinary antibiotics was found; namely erythromycin and vancomycin resistant *L. monocytogenes*, and a multidrug resistant (MDR) *L. seeligeri*. The emerging pathogens exhibited resistance to clindamycin and erythromycin. These results highlight the need for better surveillance of leafy green microbial contamination. To date this is the first study to isolate *K. kristinae* from fresh produce as well as to isolate *R. planticola* from fresh produce in Africa. Detection of ABR and MDR bacteria to clinically relevant therapeutic options from RTE products is concerning for the future of public health.