Prevalence and antibiotic resistance of *Citrobacter* spp. from pet turtles and their environments in Korea

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**Introduction:** Pet turtles are known as a source of bacterial infection to humans when handled in captivity. Pet turtle rearing has become increasingly popular worldwide. However, turtles carry many pathogenic enteric bacteria which have been classically associated with warm-blooded animals including humans. *Citrobacter* spp. can be responsible for *Citrobacter* infection in humans if the owner fails to handle a pet turtle with care. The bacteria can be transmitted by physical contact with the infected turtles or through contaminated environments such as water and soil in turtle cages.

**Methods:** 34 turtles purchased from nine pet shops and eight online markets in Korea were examined to determine whether the turtles and their environment such as soil and water were contaminated with *Citrobacter* spp. Biochemical tests and morphology revealed that *Citrobacter* spp. were isolated from samples. Presumptive isolates were identified through 16S rRNA gene sequencing. Each of the isolate’s antibiotic resistance was characterized with a disk diffusion test.

**Results:** *Citrobacter* spp. were isolated from 7 of 34 (20.6%) fecal samples. Five were identified as *C. freundii* and two as unknown *Citrobacter* spp. through 16S rRNA gene sequencing. Each of the isolate’s antibiotic resistance was characterized with a disk diffusion test.

**Conclusion:** This study concluded that some pet turtles sold in Korea are carriers of *Citrobacter* spp. Awareness of pathogenic bacteria when handling pet animals like turtles to prevent their transmission is an important public health concern. Therefore, further studies should be performed to genetically characterize these isolates as well as other harmful human pathogenic bacteria isolated from the pet turtles.

Virulence factors and antibiotic resistance of *Edwardsiella tarda* isolated from pet turtles in Korea

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**Introduction:** *Edwardsiella tarda*, a widely known aquatic zoonotic bacterium was isolated from pet turtles in Korea. Pet reptile business has gained worldwide popularity. However, turtles are carriers of pathogenic enteric bacteria which have been classically associated with various species including humans. *E. tarda* can be responsible for human *edwardsiellosis* if the owner is in close contact with a pet turtle. Our research aims to identify and characterize *pathogenic E. tarda* in pet turtles purchased from pet shops and online markets to determine the potential risk of exposure to a zoonotic pathogen from a public health standpoint and provide information concerning the prevention of transmission to humans.

**Methods:** 27 turtles purchased from nine pet shops and eight online markets in Korea were examined to determine whether the turtles carried with *E. tarda*. *E. tarda* were isolated from fecal samples through biochemical tests and morphology on selective media. Presumptive isolates were identified through 16S rRNA sequencing and further characterized by detection of virulence genes by PCR. Each of the isolate’s antibiotic resistance was studied with a disk diffusion test.

**Results:** *E. tarda* were isolated from 12 of 27 (44.0%) fecal samples. These isolates were identified as *E. tarda* through 16S rRNA gene sequencing. Most of isolates showed susceptibility against amikacin, amoxicillin, cefoxitin, ceftriaxone, ciprofloxacin, gentamicin, imipenem and streptomycin but resistant to colistin and sulfamethoxazole/trimethoprim.

**Conclusion:** This study concluded that some pet turtles sold in Korea are carriers of *E. tarda*. Awareness of pathogenic bacteria when handling pet animals like turtles to prevent their transmission is an important public health concern. Therefore, further studies should be performed to genetically characterize these isolates as well as other harmful human pathogenic bacteria isolated from the pet turtles.