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Mini Review

Role of Ruminants in Occurrence and Prevalence *Campylobacter Jejuni* in Humans

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Abstract

Campylobacter jejuni is a leading bacterial cause of foodborne illness in developed countries. Major environmental reservoirs of the pathogen include farm animals and wild birds. Through incidental contamination during livestock production, *Campylobacter jejuni* can enter and proliferate in slaughter, packing, and processing systems and contaminate food to cause human diseases. In addition to foodborne illness, zoonotic transmission of *C. jejuni* to humans has been frequently reported. This review simply describes the role and epidemiological investigations of ruminants in the transmission of *C. jejuni* from farms to humans.

Keywords: *Campylobacter jejuni*; Ruminant products; Epidemiological investigations; Human

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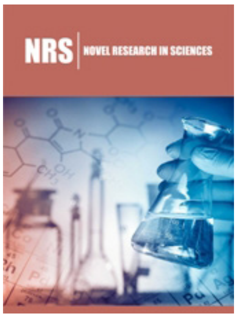

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Introduction

Campylobacteriosis is a foodborne disease in humans caused by thermophilic *Campylobacter spp*., mainly *Campylobacter jejuni* [1]. Campylobacter are slender, spirally curved, gram-negative rods with a characteristic corkscrew-like darting motility. In comparison with other food-borne bacterial pathogens, Campylobacter are more fragile and require microaerobic conditions for growth [2]. *Campylobacter jejuni* is widespread among livestock and poultry, usually colonizing the intestines without causing clinical diseases [3]. Animals harboring *C. jejuni* consistently shed the bacteria through feces, spreading within and among animal species on farms [4]. Wild mammals and wild birds have been identified as possible reservoirs for *C. jejuni* transmission to agricultural animals because they carry *C. jejuni* in their gut and also, these animals could be possible potential reservoirs for human [5,6]. Thus far, compylobacterosis has been reported in wild birds and mammals.

A wide range of diseases can be caused by *Campylobacter spp.* in ruminants. The disease includes infertility, abortion, and diarrhea in both sheep and cattle, and *C. jejuni* is the most prevalent species in these animals [7,8]. According to Burrough et al. [9], in the United States, a high prevalence of *C. jejuni* was detected among pigs with diarrhea. Also, since 2003, *Campylobacter jejuni* has become the main cause of sheep abortions in the United States [10]. In the United Kingdom, *Campylobacter jejuni* often occurs in cattle in clinically healthy animals [11]. The occurrence of *C. jejuni* in South Africa has been shown to be high among goats on farms and particularly among diarrheic feces compared to non-diarrheic feces [12-14]. Fundamentally, the major reservoirs of this pathogen for ruminants and pigs on the farms are wild birds and environmental sources, such as water and insects. Wild birds influence the prevalence of *C. jejuni* in different ruminant and pig farms through their behavioral patterns [6-15]. In other words, wild birds usually eat food of mixed animal and vegetable origin and seek farms on the ground close to animals where they are very likely to transmit *C. jejuni* through their fecal droppings; thus, wild birds may play a significant role in sustaining the epidemiology of *C. jejuni* on farms by contaminating the ground, soil, feed, and water [4]. According to Leblanc Maridor et al. [16], a high prevalence of *C. jejuni* infection was detected among the piglets on the pig farms in France; however, there was no molecular epidemiology evidence implicating any environmental sources on the farm; in addition, the authors describe the means of infection as being from the mothers to the piglets. Other studies isolated *C. jejuni* from the ruminant and pig houses in the floor, walls, water, and feed in the troughs [10-17]. According to Gwimi et al. [18], the prevalence of *C. jejuni* and C. coli in Nigeria was shown to be high among pigs (92.7%) and humans (62.7%).

According to epidemiological investigations, the incidence of high interrelatedness in the *C. jejuni* genotype detected in mutton, beef, and pork with that of campylobacteriosis in human, indicate that meat could serve as a vehicle for *C. jejuni* to human [19,20]. In developed countries, meats are one of the main causes of *C. jejuni*, and, recently, there has been an important correlation between handling meat and eating raw meat or undercooked meat and the cases of campylobacteriosis in humans [21]. However, the prevalence of *C. jejuni* is clearly dissimilar in different types of meat. In Poland, there is a prevalence of *C. jejuni* in beef (66.7%) and pork (68.6%) [22]. In Greece, a high incidence of *C. jejuni* was detected in retail lamb that was sampled in the areas closest to consumer purchase [23]. While in the United States, there is strong molecular characterization suggestion for the transmission of *C. jejuni* from the ruminant meats to humans, which suggests that *C. jejuni* is a significant threat to public health [24]. *Campylobacter jejuni* has the ability of proliferating in ruminant slaughterhouses and contaminating the equipment and products [25]. So far, numerous reports have recognized the epidemiological proofs for the zoonotic transmission of *C. jejuni* strains from beef to humans [26,27], and a few reports have implicated ruminant meats as sources of *C. jejuni*. Consequently, because of the increasing number of campylobacteriosis in humans, and the importance of meats as a source of *C. jejuni*, further comparable data related to the spread of *C. jejuni* in meats are needed.

From this study, caution should be taken in slaughterhouses handling the meat using mesh gloves [28]. It has been reported that using these gloves participate significantly to the spreading of pathogens over the carcass and equipment, such as tables, chutes, and plastic cutting boards [29]. Further, amended surveillance tools in the meat production chain are essential for the control of *C. jejuni* in humans, as *C. jejuni* can survive for hours on hands, gloves, and moist surfaces [28]. Unpasteurized milk is one of the leading agents of transmission of *C. jejuni* to humans in developed countries [30]. In the United Kingdom, the fractional fail of milk pasteurization is paving the way for the transmission of *C. jejuni* from cattle to humans [31]. Other reports suggested that dairy products might play a significant role in the transmission of *C. jejuni* from farms to humans [32,33]. In the Netherlands, 64.7% (22/34) children who visited a dairy farm showed diarrheal disease of *C. jejuni*, and drinking raw milk was correlated with the disease; in addition, 30% of cattle tested positive for *C. jejuni* [34]. In California, unpasteurized milk has been associated with about 80% of campylobacteriosis outbreaks [33]. However, campylobacteriosis in human has been associated with unpasteurized milk in multiple states. Before processing the milk it could be contaminated through the handling procedures as well as milk production. Yuen & Alam [34] tested the raw milk hygiene among dairy farmers in the Tawau area Sabah, Malaysia. They found that appropriate hygiene treatment was able to reduce the bacterial amount to an acceptable level in all stages of the study. Thus, to reach an acceptable bacterial level for raw milk, it is essential to decrease the period before processing the milk and freezing the milk should immediately after milking.

Conclusion

Campylobacter jejuni is one of the main agents of gastroenteritis in humans and animal products are play as carriers of this pathogen from farms to humans. In the present review, the occurrence of *C. jejuni* is frequent in ruminant meats. Further studies certainly need to be done on the survivability of *C. jejuni* in ruminant meats. It is also recommended to study *C. jejuni* from different food chain steps such as from ruminant farms (water, flies, and wild birds), slaughterhouses (tables, chutes, and plastic cutting boards), and markets, then characterize the isolates by molecular typing and compared with the human campylobacteriosis isolates to identify the source of the *C. jejuni*.

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