Emergence of *Campylobacter* spp. in grasscutter (*Thryonomys swinderianus*, Temminck, 1827)

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**ABSTRACT**

**Objective:** To investigate the presence of *Campylobacter* spp. in feces of grasscutter farming in Côte d'Ivoire and then to see the possibility for grasscutter meat consumption to constitute a risk for people.

**Methods:** Standard methods of microbiology were used for the isolation of *Campylobacter* spp. The identification of the bacteria was performed by biochemical and molecular tests.

**Results:** A total of 138 feces samples were collected from 52 paddocks on an experimental farm and a family farm in Abidjan. Of the 138 samples analyzed, three from the experimental farm were positive for *Campylobacter* with a prevalence of 2.18%. All the strains isolated was identified as *Campylobacter coli*. 

**Conclusions:** The presence of *Campylobacter coli*, a pathogenic bacterium, in cane rats whose meat is highly valued by Ivorians could pose a risk to consumer’s health.

**KEYWORDS**

Campylobacteria, Emergence, Risk, Public health

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**1. Introduction**

In Côte d’Ivoire (Ivory Coast) as in most countries of West Africa, the grasscutter (*Thryonomys swinderianus*) game is one of the most consumed bushmeat\(^1\). Demand before the year 2000 was estimated at 80 million heads of grasscutter, 300 000 tonnes of meat consumed annually\(^1,2\). Various activities are undertaken in Côte d’Ivoire and in many countries in Africa to promote the breeding of grasscutter\(^3–5\). However, very few studies, taking account both the health risk associated with consumption of meat from grasscutter and diseases as the cause of death rodents bred in captivity, were performed\(^5,6\). Among the etiologic agents can be incriminated, *Campylobacter* spp. are one of the leading causes of foodborne illness caused by bacteria in the world\(^7,8\). Campylobacteriosis is a zoonosis, the pathogen of which is *Campylobacter* spp., primarily *Campylobacter jejuni* (*C. jejuni*) and *Campylobacter coli* (*C. coli*). It is mainly isolated from poultry. Moreover, various animal species like small rodents have been identified as sources of human contamination\(^9–12\). However, data on large rodents like grasscutter are almost nonexistent in the literature. This fact has motivated this work whose goal was to achieve a surveillance of *Campylobacter* spp. on...
grasscutter farms. Specifically, it came to seek the presence of Campylobacter spp. in the droppings of grasscutter.

2. Materials and methods

2.1. Sample collection

The study was carried out on two farms. The first one was an experimental farm (Mbadon) with 16 enclosures and 22 breeding grasscutter. The second farm (Faya family farm) had 36 enclosures and 145 grasscutters. At the end of the study, 138 fresh feces samples of breeding grasscutter were analyzed, 77 of which were taken from the experimental farm and 61 from the family one. All fresh feces samples of grasscutter were collected in 52 paddocks on these farms.

The fresh droppings were collected in paddocks using sterile plastic spoon. A spoon was used for each paddock and five samples were collected per paddock. These droppings were collected in sterile vials and identified. Each test sample was directly added to 9 mL of Preston broth supplemented with 7% sheep blood lacquered and Campylobacter growth supplement (SR 0232E, Oxoid, Basingstoke, Hampshire). The samples were then packaged in an anaerobic jar under microaerophilic atmosphere generated by a packet type CAMPYGen (CN0025A Oxoid, Basingstoke, Hampshire) and then transported to the laboratory.

2.2. Isolation and identification of Campylobacter strains

To enrich the sample, jar was put directly at 37 °C for 24 h. The isolation of Campylobacter was performed on Columbia agar (CM0331B, Oxoid, Basingstoke, Hampshire) supplemented with 5% fresh sheep blood and selective supplement CCDA (Campylobacter–Charcoal Deoxycholate agar) (SR0155E, Oxoid, Basingstoke, Hampshire) and then inoculated media were incubated for 2–5 d at 37 °C in microaerophilic conditions. A presumptive colony per culture was inoculated on Columbia agar supplemented with 5% fresh sheep blood and controlled by a Gram stain and no growth aerobically. The species identification was performed using biochemical tests including the demonstration of cytochrome oxydase, catalase, indoxyl acetate esterase and hippuricase.

A confirmation of the biochemical identification was performed using a monoplex PCR with primers asp[13].

3. Results

Of the 138 samples, three samples from the experimental farm were positive for Campylobacter spp. with a prevalence of 2.17% (3/138) (Table 1). These three positive samples were taken in the same paddock.

Table 1

| Identity of the farm | Mbadon | Faya | Total |
|---------------------|--------|------|-------|
| Campylobacter spp. isolated | 3      | 0    | 3     |
| C. coli             | 3      | 0    | 3     |
| C. jejuni           | 0      | 0    | 0     |
| C. lari             | 0      | 0    | 0     |

All Campylobacter spp. strains were identified as C. coli by biochemical test. This identification was confirmed by molecular test (Figure 1). Figure 1 shows photograph of agarose gel carried after amplification of the gene asp of Campylobacter aspartokinase. Neither C. jejuni nor C. lari (Campylobacter lari) has been detected (Table 1).

4. Discussion

Previous studies found Campylobacter species (C. coli and C. jejuni) in some rodents such as rats and mice[11]. This study is the first report of Campylobacter sp. in grasscutter, a significant protein source for some African populations[2].

In rodents, the prevalence of Campylobacter sp. varies by countries (3.4% in Trinidad and Tobago, 18% in France and 57.4% in Portugal[11,14,15]). In the present study, the prevalence of Campylobacter sp. was low (2.17%). All strains were identified as C. coli. This low prevalence could be explained by captivity. Indeed, the grasscutters of the study were bred in captivity. In wild animals, many contamination sources are available including soil and droppings of bird or other animals. In breeding grasscutter, enclosures were cemented and cleaned daily. These hygiene conditions could reduce contamination sources. Likely, contamination sources could be water or food. There is no data available to compare this condition. This low prevalence could also be explained by the isolation technique used. We have not added to the medium the Preston selective supplement for its inhibitory action on some strains of C. coli. This could promote the growth of saprophytic bacteria and mask Campylobacter sp. strains which are weak competitors. In this study, none strain of C. jejuni has been detected contrary to the results of other studies on rodents[11,12].

In conclusion, this study was the first report of C. coli circulation in breeding grasscutter. Although the prevalence was low, the detection of C. coli could be a topic of concern in foodborne diseases. Further studies are needed to understand the real prevalence of this bacterium in wild and breeding grasscutter in Côte d’Ivoire. In addition, studying the sanitary risks related to grasscutters contaminated by Campylobacter sp. strains are also needed.
Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgements

This research is part of a project carried out within the consortium Afrique One “Ecosystem and Population Health: Expanding Frontiers in Health” and the Pasteur Institute of Côte d’Ivoire for offering his framework for this study and grasscutter farmers for their open collaboration. Afrique One is funded by the Wellcome Trust (WT087355MA).

References

[1] Mbete RA. Consumption of bushmeat in households in Brazzaville, Congo[D]. Liège: University of Liège, 2012.
[2] Tovignon GZ. Influence of vegetative parts of cassava (Manihot esculenta) on growth performance of grasscutter in breeding (Thryonomys swinderianus Temminck, 1827)[D]. Brussels: Free University of Brussels, 2005.
[3] Fantodji À, Soro D. The grasscutter farming: experience in Côte d’Ivoire. Gret ed. Paris: Ministry of Foreign Affairs; 2004, p. 136. [In French].
[4] Goué D, Fantodji A, Aoussi S. [Community grasscutters: the case of village groups to cooperative nature (GVC) Koublilaïgnan Garango (Boufalé, Ivory Coast): structural organization and management of livestock]. Revue Sciences et Nature 2008; 2(2): 143–154.
[5] Blé–Yatanan C, Kakou–Ngazoa S, Kouassi KS, Dosso M, Fantodji A. [First approaches to the application of molecular detection by RT–PCR for identification of Hantavirus in the grasscutter (Thryonomys swinderianus)]. Revue Française D’histotechnologie 2011; 24(1): 99–105.
[6] Sacramento IT, Ategbo JM, Mensah GA, Adote-Hounzangbe Ð. Li et al [First attempts to the application of molecular detection by RT–PCR for identification of Hantavirus in the grasscutter (Thryonomys swinderianus)]. Revue Française D’histotechnologie 2011; 24(1): 99–105.
[7] Dabboussi F, Alam S, Mallat H, Hlais S, Hamze M. [Preliminary study on the prevalence of Campylobacter in childhood diarrhea in northern Lebanon]. East Mediterr Health J 2012; 18(12): 1225–1228, French.
[8] Garénaux A, Ritz–Bricaud M, Federighi M. [Campylobacter and food safety: analysis, assessment and management of risk]. Bull Vet Acad Fr 2005; 158: 377–383, French.
[9] Wilson DJ, Gabriel E, Leatherbarrow AJ, Cheesbrough J, Gee S, Bolton E, et al. Tracing the source of campylobacteriosis. PLoS Genet 2008; 4(9): e1000203.
[10] Wysock B, Uradziriski J. Campylobacter spp.—a significant microbiological hazard in food. I. Characteristics of Campylobacter species, infection source, epidemiology. Pol J Vet Sci 2009; 12:1: 141–148.
[11] Nkogwe C, Raletobana J, Stewart–Johnson A, Suepaul S, Adesiyun Á. Frequency of detection of Escherichia coli, Salmonella spp., and Campylobacter spp. in the faeces of wild rats (Rattus spp.) in Trinidad and Tobago. Vet Med Int 2011; doi: 10.4061/2011/686923.
[12] Meerburg BG, Jacobs–Reitsma WF, Wagenaar JA, Kijlstra A. Presence of Salmonella and Campylobacter spp. in wild small mammals on organic farms. Appl Environ Microbiol 2006; 72(1): 960–962.
[13] Lázaro CA, Conte–Junior CA, Vilca MA, Lucas JR, Ramos DD, Mancheo A, et al. Molecular identification of Campylobacter jejuni and Campylobacter coli isolated from small–scale poultry slaughterhouse in Lima, Peru. Int J Poult Sci 2012; 11(11): 677–682.
[14] Backhans A, Fellström C. Rodents on pig and chicken farms – a potential threat to human and animal health. Infect Ecol Epidemiol 2012; 2: doi: 10.3402/iee.v2i0.17093.
[15] Colles FM, Dingle KE, Cody AJ, Maiden MCJ. Comparison of Campylobacter populations in wild geese with those in starlings and free–range poultry on the same farm. Appl Environ Microbiol 2008; 74(1): 3583–3590.

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Background

Campylobacter spp., a pathogen bacterium isolated from poultry and feces, can cause foodborne illness in animals. Grasscutter, a rodent largely consumed in West Africa, is nowadays bred in captivity. However, in breeding conditions, a high death level has been noticed. Thus, it will be interesting to establish a relationship between poultry, meat contamination and rodent death.

Related reports

C. coli has been isolated in 2.17% of fresh feces of grasscutter, but this is in contradiction to Nkogwe et al. (2011), who have not identified C. coli. However, this result is lower than that of small rodents (rats and mice) prevalence revealed by Nkogwe et al. (2011), Henzler and Opitz (1992) and Cabrita et al. (1992). This may be due to the captivity environment conditions (paddock cemented and cleaned) and the microbiological method which was not selective.

Innovations and breakthroughs

Grasscutter (Thryonomys swinderianus) meat is appreciated by Ivorian. To promote this activity, people initiated their livestock farming. In this known conditions of captivity, contamination in grasscutter feces bred in captivity using contaminated by this germ. This shows that contamination bred in captivity and in healthy conditions, this revealed authors revealed that only 2.17% of level is low in captivity.

Applications

C. coli has been isolated from rats and mice in variables frequencies (from 3.4% to 57.4%), but any study has been already done for grasscutter. In this study, the authors revealed that only 2.17% of poultry samples were contaminated by this germ. This shows that contamination level is low in captivity.

Peer review

This is an interesting research in which authors have isolated C. coli in grasscutter’s poultry. As the rodents are bred in captivity and in healthy conditions, this revealed that animal feed can also be implicated in Campylobacter spp. transmission. Thus, a health risk due to consumption of grasscutter meat could really exist.