PRESENCE OF CAMPYLOBACTER SPP. IN NATURE

ABSTRACT: Presence of bacteria from Campylobacter spp. in nature and their importance encourages many researchers to study their biology.

The aim of this study was to understand the epizootiology of these bacteria by analyzing all available data and our own results. This would help to follow their movements and prognosticate the outbreak of the disease caused by Campylobacter.

In this experiment we used parts of the digestive tracts and reproductive organs of poultry and intestines of pigs and cattle. Isolation methodology was adjusted to the conditions favorable for Campylobacter spp. by providing selective mediums and microaerophilic conditions. Final determination of the isolates was done with Api Campy strips and appropriate software.

Of the 60 samples analyzed, 42 were positive for the presence of Campylobacter spp.: Campylobacter jejuni in 28 and Campylobacter coli in 14 cases. After examining samples from the reproductive tract, 4 birds were positive, with Campylobacter jejuni in 3 and Campylobacter coli in 1 sample. Of the 12 samples from pigs, 7 were positive (Campylobacter jejuni). Of the 6 samples from calves, Campylobacter jejuni was present in 4 cases.

For the sake of clarity, the overall epizootiological situation, established on the basis of literature data and the obtained results, may be viewed as consisting of three interactive parts. The first one is the territorial prevalence of Campylobacter spp. The second is their presence in different kinds of animal and their systems (organs), and the third are health problems that occur in consequence to their presence.

KEY WORDS: epizootiology, Campylobacter spp.

INTRODUCTION

Distribution of biological and non-biological agents, which are widely spread in nature, which are mutually interlaced and which may cause outbreaks of diseases, are permanently in the focus of attention of researchers, especially epizootiologists. Human medicine studies problems of epidemiology (Greek words epi = above, demos = people, logia = science) in humans as if they were separated from nature and need not be viewed as a part of the overall ecosystem.

Maybe the concept of epizootiology (epi = above, zoo = animal, logia = science) is more comprehensive, because it investigates the diseases that attack
animals and humans alike since the latter, due to their biological and physiological features, are part of the animal kingdom. Veterinary epidemiology includes many factors, ambience and events (Valčič, 1998) that threaten animal populations and influence their normal development and homeostasis. Complexity of the problems that disturb a normal physiological and morphological state of species (a definition of a disease given in Mala enciklopedija), demands deductive observation and analytical investigation of the reality. This does not mean that individual perception will solve a problem in general, but it will facilitate its understanding and help view all parts of the whole.

Among the many aspects that are important for monitoring the presence of Campylobacter spp., their enormous distribution deserves to be singled out. Presence of C. jejuni has been detected (Leuchfeld and Wang, 1981) in poultry and other bird species, in carnivores, herbivores and omnivores, in domestic and wild animals, in mammals and reptiles, fish, crabs and shells. However, the fact remains that the large distribution of this microorganism is not in correlation with the outbreak of the disease, at least not with the clinical manifestation of the disease. Epizootiology, as an important part of biomedicine research on Campylobacter spp. infection, must assess the importance of direct presence of these bacteria and the role of other biological and nonbiological factors.

Presence of bacteria from this genus Campylobacter in nature has encouraged many researchers to investigate their biology. It seems equally important to know where they can be found in nature and how they circulate within the ecosystem.

The aim of this study was to contribute to the understanding of the epizootiology of these bacteria by analyzing the places where they may be found. This would facilitate the monitoring of their movement and the forecast of outbreaks of the disease caused by Campylobacter.

**MATERIAL AND METHODS**

Parts of digestive tracts and reproductive organs from poultry and intestines from pigs and cattle were used for examination. A total of 60 samples from poultry digestive tract and the same number of samples of reproductive organs were examined. There were 12 samples from pigs and 6 samples from the digestive tract (abomasum, intestine) of calves. The methodology of isolation was adjusted to conditions necessary for Campylobacter spp. Campylobacter isolation was done with Columbia agar enriched with 5% of defibrinated sheep blood and an antibiotic-selective medium (bioMérieux) that contains Cefoperayon 3 mg, Colistan 2000 U, Vankomicine 2 mg and Amphotericina 0.4 mg per 200 ml of Columbia agar (Quinn et al., 1998). Microaerophilic conditions were provided by gas packs of the same producers. After making the preparation and staining according to Gram, oxidase and catalase tests (Pener, J. 1991), determination of Campylobacter was performed by Api-Campy strips (bioMérieux) and appropriate software.
RESULTS AND DISCUSSION

Of the 60 examined samples of the cecum and rectum, as parts of the digestive tract, and the magnum and uterus as parts of the reproductive tract, 42 birds were positive for the presence of Campylobacter spp., with Campylobacter jejuni present in 28 and Campylobacter coli present in 14 cases. The samples were taken from broiler breeders flock that exhibited no symptoms or changes in the production of eggs. These results represent a total finding of Campylobacter spp. in all of the examined birds. The examination of the reproductive tract in the same samples showed that 4 birds were positive: Campylobacter jejuni in 3 samples and Campylobacter coli in 1 sample (Table 1).

Table 1. Presence of Campylobacter spp. in poultry

<table>
<thead>
<tr>
<th>Material</th>
<th>Number of examined samples</th>
<th>Positive findings</th>
<th>Isolate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digestive tract — cecum + rectum</td>
<td>60</td>
<td>42 (70.0%)</td>
<td>28</td>
</tr>
<tr>
<td>Reproductive tract — uterus + magnum</td>
<td>60</td>
<td>4 (6.66%)</td>
<td>3</td>
</tr>
</tbody>
</table>

The obtained results correspond to the results reported by other authors for poultry material. Prevalence of Campylobacter spp. in poultry flocks ranges up to 100% (Blaseter et al., 1981). Our results are within the range reported by other authors (Di Modugno et al., 1997). It may also be noticed that the places where Campylobacter spp. were found (i.e., the organs from which they were isolated) correspond to the results of other authors (Di Modugno, 1997).

There were 12 samples for examination of intestines (the ileum) in pigs. The samples were taken from animals with intestinal changes characterized by large amounts of mucus and blood in the intestinal content and dilated blood vessels of mucosis (Table 2).

Table 2. Presence of Campylobacter spp. in pigs

<table>
<thead>
<tr>
<th>Material</th>
<th>Number of examined samples</th>
<th>Positive samples</th>
<th>Isolate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digestive tract — ileum</td>
<td>12</td>
<td>7 (58.3%)</td>
<td>7</td>
</tr>
</tbody>
</table>

The findings of Campylobacter spp. in the digestive tract of pigs were in agreement with the results of the authors who analyzed parenchymatose organs and digestive tract of slaughtered animals (Weber, 1985). There is a large number of different Campylobacters that have been isolated in pigs. Such flora is considered to be able to cause a disease of animals (C. hyointestinalis; Bi-
bersstein and Zee, 1990) or it has not been proved capable of causing disturbances (C. mucosalis; B iberstein and Zee, 1990).

The results of the laboratory investigation of the bovine material are presented in Table 3.

Table 3. Presence in Campylobacter spp. in calves

<table>
<thead>
<tr>
<th>Material</th>
<th>Number of examined samples</th>
<th>Positive samples</th>
<th>Isolate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Campylobacter jejuni</td>
</tr>
<tr>
<td>Digestive tract</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— jejunum</td>
<td>4</td>
<td>3 (75.0%)</td>
<td>3</td>
</tr>
<tr>
<td>Digestive tract</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— abomasum</td>
<td>2</td>
<td>1 (50.0%)</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 3 shows that Campylobacter was isolated in 66.66% of the samples from calves. Different Campylobacter spp. were isolated, including Campylobacter jejuni (Luetchefeld and Wang, 1981).

The epizootiological situation was presented from three different aspects that should not be considered separately but as segments of a whole. The aspects were introduced in order to see more clearly mutual relationships among the places where these bacteria may be found, mechanisms of their transmission, their reservoirs and consequences they may cause. The first aspect of the epizootiological situation of Campylobacteriosis is its territorial distribution, the second concerns health problems that may be caused by Campylobacter spp. and the third describes the hosts and organs in which Campylobacter spp. can be found.

Regarding territorial distribution, the literature shows that Campylobacter spp. is present in almost all countries around the world. Presence of Campylobacter on our territory was confirmed in papers of Vakanjac (1994) which report that different Campylobacter species had been found in poultry material. Blaser et al. (1981) report on the occurrence of Campylobacter in USA, isolated in human faeces, running water, fresh shells and turkeys. There are reports about isolation of Campylobacter in Asia (Itoh et al., 1982) and there is evidence of its presence in Tokyo (Japan), in materials of animal and human origin, as well as in Bangladesh (Glass et al., 1982). The presence of Campylobacter in Europe is reported in papers from Sweden (Kaiser and Svedhem, 1980), Norway (Maeland, 1982), Great Britain (Young, 1982), and Greece (Danielides et al., 1981). A bacteriological examination of faecal samples from an Australian hospital confirmed the presence of Campylobacter in Australia too (McGechie et al., 1982).

Previous results have shown that the presence of Campylobacter in a host may cause health problems. In many cases there were no problems although Campylobacter was isolated in certain materials, or at least there was no correlation between bacteriological findings of Campylobacter spp. and clinical symptoms. Campylobacter jejuni (Pener, 1991) causes abortion in sheep as well as fever and enteritis in humans. It may cause intestinal problems in calves, lambs and other animals. They are part of the normal intestinal flora in
young cattle, sheep, goats, dogs, rabbits, monkeys, cats, poultry, gulls, black-
birds, starlings and sparrows. In certain situations *Campylobacter coli* can be
pathogenic (Peneř, 1991; Adesiyun et al., 1992), when it was isolated
from digestive tracts of pigs, poultry and humans. *Campylobacter laridis* was
isolated in people suffering from diarrhoea, but it cannot be described with
certainty as a pathogen of humans and animals.

Both subspecies of *Campylobacter fetus* (Holt, 1984) are infective agents
that cause sporadic abortion of animals and extra-intestinal infections, menin-
gitis, salpingitis, embryo infection and abortion in humans. *Campylobacter
hyointestinalis* (Biberstein and Zee, 1990) is considered to be a cause
of proliferative ileitis of pigs, and it was also isolated in human faeces, from
patients with watery diarrhoea. Some biotypes of *Campylobacter sputorum*
may be found as commensal microorganisms in the oral cavity of humans, as
part of the bacterial flora in the faeces of healthy humans, as well as in the
prepuce of males and the genital tract of female cattle or in the sperm of bulls.
Its role in the above mentioned humans and animals has not been explained.
*Campylobacter mucosalis* is responsible for intestinal lesions in pigs, but this
could not be proved in bacteriological experiments. *Campylobacter cryaerop-
hilia* was found in genital tracts of cows, sheep, pigs and horses, in faeces of
different animals and in milk from cows infected by mastitis. It has been di-
covered in the digestive tract of humans complaining of abdominal pain and
diarrhoea.

*C. jejuni* was discovered in faeces of dogs and cats as reported by Bruce
(1982). It was isolated in animals with clinically manifested diarrhoea or haem-
morrhagic enteritis as well as in healthy animals, but in different percentages.

The presence of *Campylobacter* in certain bodily systems and products of
cattle was described by many authors (Luechtefeld and Wang, 1981). *Campylo-
bacter* (*C. fetus subsp. fetus*) was isolated in the placenta and abdomi-
nal content of aborted calves, and it was also discovered in the digestive tract
of calves with intestinal problems. Its presence was reported in the blood, bile
ducts and milk of cows. A typical place where some *Campylobacter* species
(*C. fetus subsp. venerealis*) may be found is bull prepuce, but without any
symptoms. It is also found in the semen of bulls and the vaginal mucous
membrane of cows. Infection is caused perorally and through mating, but also
through the vagina, cervix, uterus and ductus deferens.

In their research on campylobacteriosis in sheep, Latinović et al.
(1985) established the presence of several kinds of *Campylobacter* spp. (*C. je-
jni*, *C. fetus subsp. fetus*, *C. sputorum subsp. bubulus*) in vaginal swabs, fae-
ces and parenchymatitus organs. *Campylobacter* was isolated in the placenta
and intestinal content of aborted sheep embryo (Peneř, 1991) and it was fo-
und cause intestinal problems in lambs. Also, it may be found in the normal
intestinal flora of lambs.

Stich (1982) found *Campylobacter* spp.s in faeces of healthy pigs
awaiting to be slaughtered. Similarly, Weber et al. (1985) found *Campylo-
bacter* spp. in faeces of pigs before slaughtering, its concentration varying
with season.
Campylobacter spp. were isolated in human faeces, from patients suffering from diarrhoea, blood, abscesses and cerebrospinal fluid. They were described as cause of meningitis, salpingitis embryo infection and abortion. They were also found in the oral cavity. The infection spreads perorally. Neal and Slack (1995) report that in humans, the outbreak of Campylobacter infection depends on season and it occurs most frequently in the fall.

Fenlon et al. (1982) investigated possible causes of campylobacteriosis. Campylobacter was present in gulls, city pigeons, crows, wild geese, and even herrings. Penner (1991) found Campylobacter spp. in shells and crabs.

All papers emphasize the importance of Campylobacter spp. from the point of possible transmission of these bacteria among animals, but also to humans. Peroral transmission and transmission by mating are the most frequent means of transmission of Campylobacter spp. among animals from one species. Transmission of infection between different species is exclusively peroral.

**CONCLUSION**

1. Campylobacter spp were found in the reproductive and digestive tracts in 76.66% of the poultry material, in 58.33% of the cases in the digestive tract of pigs and in 66.66% of the cases in the material taken from calves.

2. The obtained results on Campylobacter species, their distribution and organs where they may be found in animal samples were in agreement with the literature data.

3. Our results could neither prove nor disprove that the described health problems and clinical picture were due to the studied microorganisms, whose presence we could prove, nor could we prove that these microorganisms were the sole reason for the development of such a state.

4. On the basis of the available literature and obtained results, the epizootiological situation was interpreted from three different aspects that should not be considered separately but as segments of a whole. One aspect presents prevalence on territory. The other their presence in different animal species and their systems (organs) and the third aspect present health problems that are the consequence of their presence. The first aspect is the territorial distribution of Campylobacter species, the second concerns health problems that may be caused by Campylobacter spp. and the third describes the hosts and organs in which Campylobacter spp. can be found.

5. The following pattern of transmission from animal to humans should be taken into consideration: environment (water courses, vegetated areas, game) — pets and domestic animals — animal secretions and excretions — products from animals — humans.

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ПРИСУСТОВО КАМПИЛОБАКТЕР ВРСТА У ПРИРОДИ

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Резиме

Присуство бактерија из рода кампилобактер у природи и њихов значај су разлог који подстиче многе истраживаче да изучавају њихову биолошку биолошку.

Циљ рада је да се анализирају податаке где се све ове бактерије налазе и делом сопственог основа резултата допринесе разумевању њихове епизоотиолошке чиме би се омогућило лакше прашање кретања ових бактерија и боље прогнозирање када је у питању избиране болести изазване кампилобактерима.

У раду смо као материјал користили делове дигестивног тракта и делове репродуктивних органа живине, црева свиња и говеда. Методологија изолације је била прилагођена неопходним условима приложеним за кампилобактерије врсте обезбедењем селективних подлога и микролерафичних услова. Крајњу детерминацију изолата урадили смо уз помоћ апститроапа АпиСампру и одговарајућег софтвера.

Од укупно 60 прегледаних узорака 42 јединке су биле позитивне на присуство кампилобактер врства, од тога Campylobacter jejuni је заступљен у 28 и Campylobacter coli у 14 случајева. После прегледа репродуктивног тракта 4 јединке су биле позитивне, и то Campylobacter jejuni у 3 и Campylobacter coli у 1 узорку. Из испитаних 12 свињских материјала позитивно је било 7 (Campylobacter jejuni), а код 6 материјала телади 4 је имало Campylobacter jejuni.

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На основу прегледане литературе и добијених резултата епизоотиолошка слика кампилобактер врста може да се интерпретира у три целине, које се некако не smeju посматрати одвојено него као подела која омогућава лакше сагледавање проблематике везане за ове бактерије. Једну целину чинила би територијална распрострањеност кампилобактер врста. Другу — њихово присуство у различитим животињским врстама и њиховим системима (организма) и трећу целину чинили би здравствени поремећаји који се јављају као последица присуства ових бактерија.