Campylobacteriosis in the South Bohemian Region – a Recurrent Problem

Hamplová L.[1], Kotrbová K.[2], Príkazská M.[3]

[1]Medical University College, Prague, Czech Republic
[2]Faculty of Health and Social Studies, University of South Bohemia in České Budějovice, Czech Republic
[3]Centre for Epidemiology and Microbiology, National Institute of Public Health, Prague, Czech Republic

ABSTRACT

Aim: Campylobacteriosis is among the most frequently reported foodborne diseases in both the Czech Republic (CR) and South Bohemian Region (SBR). Campylobacteriosis has been a notifiable disease in the CR since 1984. The objective of this study is the analysis of the data reported to the surveillance system between 2005 and 2014 to describe the seasonal variation, age specific incidence, and route of transmission of campylobacteriosis in the South Bohemian Region.
Material and Methods: The data reported to the surveillance system EPIDAT from 2005 to 2014 were analysed in order to determine the incidence trends and seasonality, age distribution, and route of transmission of campylobacteriosis in the South Bohemian Region.
Results: Campylobacteriosis incidence in the South Bohemian Region follows the same annual pattern as in the Czech Republic. There is a very slight declining trend in the incidence over the study period. A strong seasonal variation was observed, with a late summer peak and a winter low. An exception to the regularity of the incidence pattern was an outbreak notified in 2010. The most affected age groups are children 1 to 5 years and newborns (0 age group). In the other age groups, the incidence has a declining tendency. The most common vehicles for the transmission of campylobacteriosis are chicken and meat products while other vehicles and routes of transmission have been reported exceptionally.
Conclusion: Only one third of cases have been notified along with the suspected route of transmission. The most common route of transmission is through the consumption of contaminated chicken and meat, including smoked meat products. Therefore, the measures targeting consumers and also producers of poultry, meat, and unpasteurized milk products may contribute to the reduction of campylobacteriosis incidence.

KEYWORDS:

campylobacteriosis – incidence – age specific incidence – mode of transmission – public health

SOUHRN

Hamplová L., Kotrbová K., Príkazská M.: Kampylobakterióza v Jihočeském kraji – opakovaný problém
Cíl: Kampylobakterióza patří mezi nejčastěji hlášené potravinami způsobené nemoci v České republice i v Jihočeském kraji. Údaje o kampylobakterióze jsou zaznamenávány od roku 1984. Cílem tohoto článku je analyzovat data nahlášená do kontrolního systému z let 2005–2014, popsat sezonní odchylky, věkově specifický výskyt a přenosovou cestu kampylobakteriózy v Jihočeském kraji.
Materiál a metody: Prováděli jsme analýzu dat nahlášených do kontrolního systému EPIDAT z let 2005–2014, obzvlášť trendy a sezonnost výskytu, rozdělení podle věku a způsob přenosu kampylobakteriózy v Jihočeském kraji. Roční výskyt kampylobakteriózy v Jihočeském kraji kopíruje výskyt v České republice, jak nasvědčuje analýza sekundárních dat.
Výsledky: Ve zkoumaném období se projevuje velmi mírně klesající trend. Bylo zjištěno výrazné sezonní kolísání s vrcholem koncem léta a minimem v zimě. Výjimkou z pravidelnosti výskytu bylo prudké šíření zaznamenané v roce 2010. Nejpostiženější jsou děti ve věku od 1 do 5 let a novorozenci (skupina věku 0). Výskyt ve všech ostatních věkových skupinách má klesající tendenci. Nejčastějším prostředkem šíření je kuřecí i jiné maso a výjimečně i jiné prostředky a cesty šíření.
Závěr: Pouhá třetina případů je nahlášena s předpokládanou cestou přenosu. Nejběžnější zjištěnou cestou šíření je kuřecí i jiné maso včetně uzených masných výrobků. Ke snížení výskytu kampylobakteriózy by proto mohla přispět opatření zaměřená na spotřebitele i producenty drůbeže, masa a nepasterizovaných mléčných výrobků.

KLÍČOVÁ SLOVA:

kampylobakterióza – incidence – věkově specifický výskyt – způsob přenosu – veřejné zdraví

Epidemiol. Mikrobiol. Imunol., 65, 2016, č. 3, s. 193–197

INTRODUCTION

Campylobacter is a bacterium that can cause an illness called campylobacteriosis in humans. With over 190,000 human cases annually, this disease is the most frequently reported foodborne illness in the European Union (EU). However, the actual number of cases is believed to be around nine million each year. The cost of campylobacteriosis to public health systems and to lost productivity in the EU is estimated by EFSA to be around EUR 2.4 billion a year [1]. Campylobacteriosis is also the most frequently notified foodborne communicable disease in the Czech Republic over the last ten years [2]. Epidemiological data on campylobacteriosis have been reportable in this country since 1984. In 2003, 53 486 cases of acute enteric infections were reported, with 20 063 (almost 40 %) being diagnosed as campylobacteriosis. The incidence of campylobacteriosis showed a progressive increase since 1984 to peak in 2002 with a following slight decline in 2003. The morbidity from campylobacteriosis is highest in the age group 0–4 years. The most frequent causative agent is *Campylobacter jejuni*. Ready-to-eat meals, poultry, confectionery, and eggs seem to be most often implicated in outbreaks of campylobacteriosis in public catering and families. Sporadic cases of campylobacteriosis are mostly associated with the ingestion of poultry and minced meat products [3]. The most common species causing human infection are *C. jejuni, C. coli,* and *C. lari*. The incubation period is usually between two and five days (24 hours–7 days). Clinically, it is a typical acute gastroenteritis with fever and headache [4]. Severe complications, including reactive arthritis and Guillain-Barré syndrome can be triggered by *Campylobacter* infection [5]. The sources of campylobacteriosis are warm blooded animals, mainly livestock. Poultry is a major reservoir and source of transmission of campylobacteriosis to humans [4, 6, 7, 8]. The risk factors include the consumption of contaminated animal products and water, contact with infected animals, especially some wild bird species [9], and international travel. Outbreaks occur rarely and the majority of cases are sporadic. The ingestion of contaminated food or water is the usual route of transmission, while person to person transmission appears to be rare. *C. jejuni* infection is one of the most widespread infectious diseases of the last century.

The incidence and prevalence of campylobacteriosis have increased in both developed and developing countries over the last ten years. A dramatic rise in cases in North America, Europe, and Australia is alarming, and data from parts of Africa, Asia, and the Middle East indicate that campylobacteriosis is endemic in these areas [10, 11, 12], especially in children [13, 14]. The annual number of notified campylobacteriosis cases has increased since 2001–2010 not only in Germany but also in other European countries [15]. In Poland, campylobacteriosis increased by 30 % in 2012 in comparison to 2011 [12]. In the Czech Republic, campylobacteriosis is the most frequently notified bacterial intestinal infection over the last ten years. The incidence of campylobacteriosis in 2005–2014 oscillated between 175 per 100 000 inhabitants (18 412 cases in 2012) to 296 per 100 000 (30 264 cases in 2005). The objective of this study is the analysis of the data reported to the surveillance system from 2005 to 2014 to describe the seasonal variation, age specific incidence, and route of transmission of campylobacteriosis in the South Bohemian Region.

MATERIAL AND METHODS

Under the Czech law, any case of communicable disease is mandatorily notified. Campylobacteriosis data are collected regularly by the national notification system EPIDAT [2]. Epidemiological data on campylobacteriosis in the Czech Republic has been available since 1984. The system collects all relevant information on individual cases including microbiological confirmation and characteristics of the case. For the analysis, we used the data aggregated by month, year, age group, and gender. Our focus was on the data from the South Bohemian Region and the period 2005–2014. We determined the trend of the incidence, age specific incidence, seasonal variation as well as the main suspected vehicles of the disease. The incidence rates were calculated using the population data for 2009, i.e. from the middle of the assessed period, from the Czech Statistical Office (CZSO) [16]. The age specific incidence rates were calculated the same way using the 2009 population data.

RESULTS

The incidence of campylobacteriosis in the South Bohemian Region has basically the same dynamics as in the Czech Republic (Fig. 1). During the period 2005–2014, a total of 10872 cases of campylobacteriosis were reported in the South Bohemian Region. Similar to the national data, we found the same first fluctuating declining trend until 2008 and a very mildly declining trend until 2013. Campylobacteriosis incidence in SBR dropped from 228 per 100 000 inhabitants in 2005 to 180 per 100 000 in 2014. This trend with a very gentle slope of no statistical significance (linear regression coef -0.04 with $p = 0.7$) in SBR turned into a sudden increase in the incidence in 2010 and had an impact on the national figures as well. In 2014, we observed an increase in cases in both the SBR and CR.

Campylobacteriosis shows seasonal variation with regular peaks in late summer and a low in winter (Fig. 2). There is a consistent seasonal variability in the incidence of campylobacteriosis over the ten-year period. On average, the summer incidence exceeding 250 per 100000 is three or more times higher than the winter one dropping down to 60–70 per 100 000 inhabitants. The cyclic function explains 62% of the seasonal variation ($R2 = 0.62$). The data show that there was an exception from this regularity in 2010. An outbreak occurred in winter 2010 and reached the same extent as the summer incidence, 365 per 100 000.

Age and gender distribution (Fig. 3) shows the highest incidence rates in 1–4 year-old children, i.e. approximately 270 cases per 100 000. Children under one year of age were affected less often, with around 150 cases per 100 000. The incidence in higher age groups has a decreasing tendency with a slight rise in the elderly 65 + years. In childhood, boys are more often affected than girls while among middle aged adults, women have a little higher incidence than men.

When we assessed the trends separately by age group (Fig. 4), similar tendencies were observed in all age groups, with an additional peak in 2010. This peak was mainly expressed in age groups from 1 to 24 years. The exception was the 0 age group where the outbreak peak did not appear in 2010. In older age groups, the peak was very small and did not exceed the range of the yearly fluctuations.

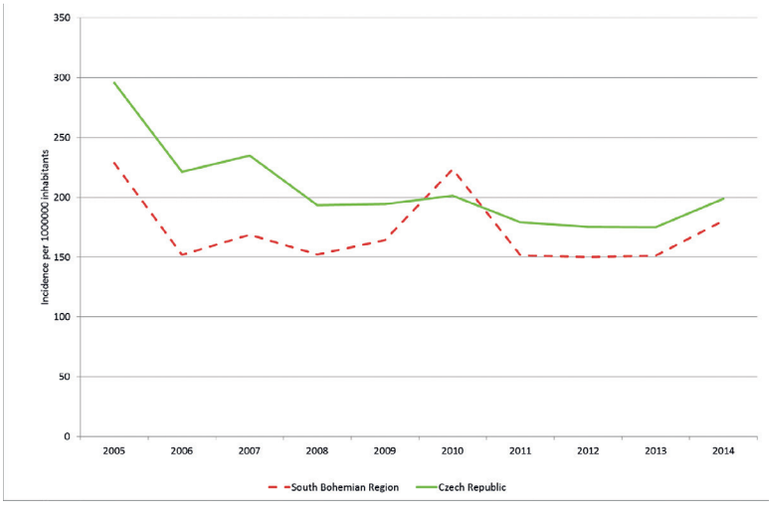

Figure 1. Campylobacteriosis 2005–2014, South Bohemian Region and the Czech Republic

The annual campylobacteriosis incidence in the South Bohemian Region showed a similar trend as did the national data from the same period 2005–2014, with the exception of 2010 when an outbreak occurred in the winter season. Campylobacteriosis incidence in this outbreak period was thrice as high as the average expected for that season.

Differences in the age specific incidence may be explained by different types of nutritive behaviour. In the age group under one year, the lowest incidence can be expected in infants aged 0 to 3 months who are breastfed or formula fed in that period of life. The probable route of infection in these children is through contaminated hands or cross-contaminated food. Cross-contamination of food, particularly vegetables and fruits, may be a plausible explanation for the rare notification of these vehicles. Slightly higher incidence in the old age groups can be explained by higher vulnerability of the elderly population as well as differences in the serotypes involved [17]. A severe disease including systemic inflammatory response syndrome (SIRS) in the elderly may result in higher-than-average notification [18].

For 3310 cases (30% of a total of 10 872 notified cases), a probable vehicle was reported. For all other cases, the vehicle was either unknown (5 884, 54%) or was not reported (1 678, 15%) (Fig 5). In 1198 cases, two vehicles were suspected and in 1037 cases, three possible vehicles (or routes of transmission) were indicated. Chicken and other poultry are the most commonly reported vehicles which were involved in 1 979 cases (60 % of the valid notified vehicles). Other vehicles were sausages and minced meat, suspected in 491 (15 %) cases and unpasteurized milk, reported to be involved in 213 (6 %) cases. During the study period, the proportion of cases with indicated vehicles rose from 26 % in 2005 to 48 % in 2010. Since that year, this proportion dropped back to 22 % of cases.

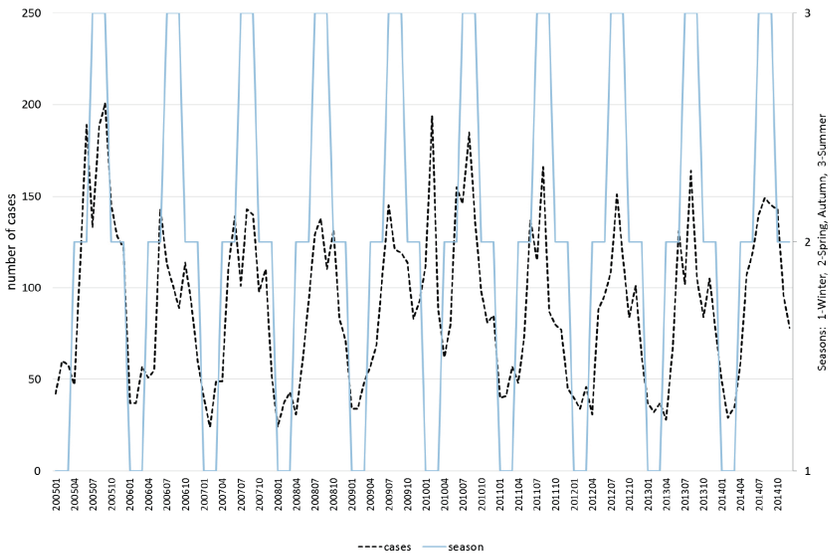

Figure 2. Campylobacteriosis incidence, monthly notification in 2005–2014, in the South Bohemian Region, the Czech Republic

DISCUSSION

We investigated the incidence of campylobacteriosis in the South Bohemian Region. EPIDAT, the national notification system, uses ICD10 (International Statistical Classification of Diseases and Related Health Problems – 10th revision) codes instead of case definitions. However, it is usual that cases notified under a specific code (A04.5) are those confirmed microbiologically. Gastrointestinal infections without microbiological confirmation are classified as other gastrointestinal infections, e.g. under code A04.9. In outbreak situations, some cases of campylobacteriosis may not be microbiologically confirmed.

The majority of the notified vehicles are identified by experienced professionals (personal communication). The difficulties in tracing the vehicle and source of infection (route of transmission) stem from the fact that the vast majority of cases are sporadic and that the suspected food is no longer available for microbiological investigation. The range of vehicles implicated in campylobacteriosis in the South Bohemian Region is consistent with the notified modes of transmission all around Europe [18].

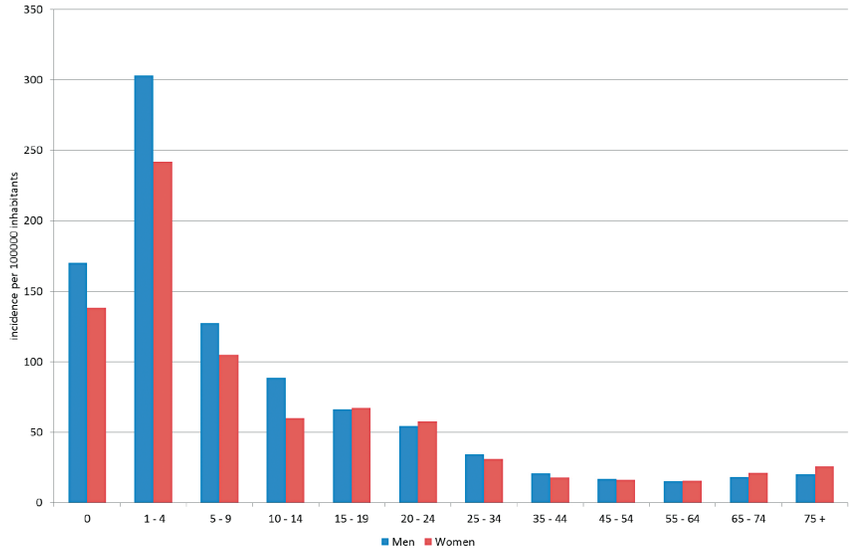

Figure 3. Campylobacteriosis, age and sex specific average incidence, 2005–2014, the South Bohemian Region, the Czech Republic

Rapid increase in cases notified early in 2010 was an exception from the usual seasonal variation in the South Bohemian Region. The excess incidence of campylobacteriosis was attributed to the consumption of unpasteurized milk from milk vending machines, reported by a vast majority of patients [19]. In January 2010, the Regional Public Health Authority of the South Bohemian Region notified 44 cases of campylobacteriosis, in which the probable route of transmission was through unpasteurized milk. In February, 82 cases were reported and in March, 20 cases emerged, with the same vehicle suspected. Before this outbreak, unpasteurized milk was only very rarely considered as a potential vehicle of infection [3]. Investigations revealed that many of the patients consumed raw milk without any additional heat treatment. Based on this finding, the State Veterinary Administration launched a nationwide campaign aimed at the identification of selected pathogens in raw milk (*Listeria monocytogens, Campylobacter spp, Staphylococcus aureus, Salmonella spp,* and *Escherichia coli*). The veterinary and public health service professionals have educated operators of the milk vending machines as well as consumers on the risks arising from the consumption of unpasteurized milk. Measures targeting consumers and also producers of poultry, meat, and unpasteurized milk products may help to reduce campylobacteriosis incidence, as was observed with the measures applied to the handling of unpasteurized milk during the 2010 winter outbreak of campylobacteriosis [19].

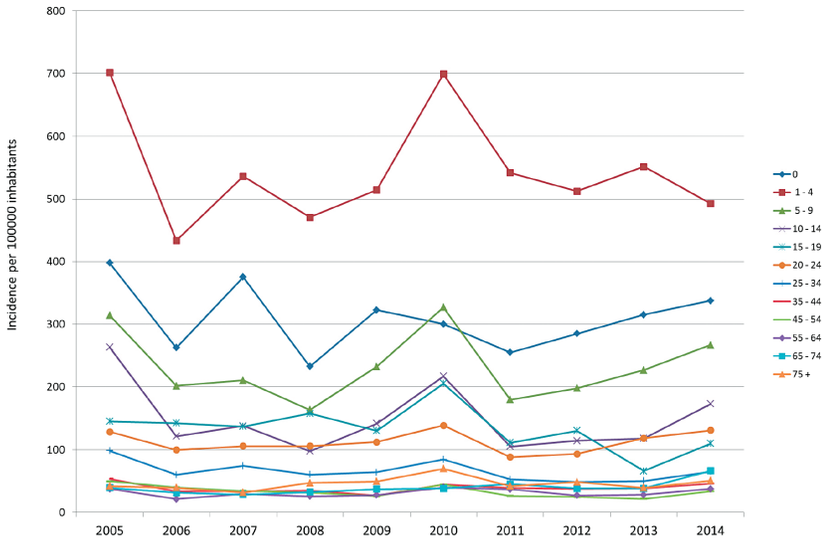

Figure 4. Campylobacteriosis, age specific incidence, 2005–2014, the South Bohemian Region, the Czech Republic

CONCLUSION

Campylobacteriosis was the leading foodborne disease in 2007 through 2014. The incidence of *Campylobacter* has a strong seasonal variation, with a late summer peak. Children from 1 to 4 years are the most affected age group. Zero-year-olds are less affected, and the age specific incidence declines in the older age groups. The most common route of transmission was notified to be chicken [20] and meat, including smoked meat products. Exceptionally, unpasteurized milk was suspected as the vehicle. Measures targeting consumers and also producers of poultry, meat, and unpasteurized milk products may contribute to the reduction of campylobacteriosis incidence. Safe handling of raw meat and other raw food ingredients, thorough cooking, and good kitchen hygiene can prevent or reduce the risk posed by contaminated food.

REFERENCES

1. European Food safety Authority. Campylobacter. [online]. [cit 2015-10-06]. Available at www:<http://www.efsa.europa.eu/en/topics/topic/campylobacter.
2. EPIDAT. National Institute of Public Health, Prague. [online]. [cit 2015-11-03]. Available at www:<http://www.szu.cz/publikace/data/infekce-v-cr.
3. Prikazská M, Príkazský V, Beneš C. Trends in the incidence of salmonellosis and campylobacteriosis in the Czech Republic. Epidemiologie,

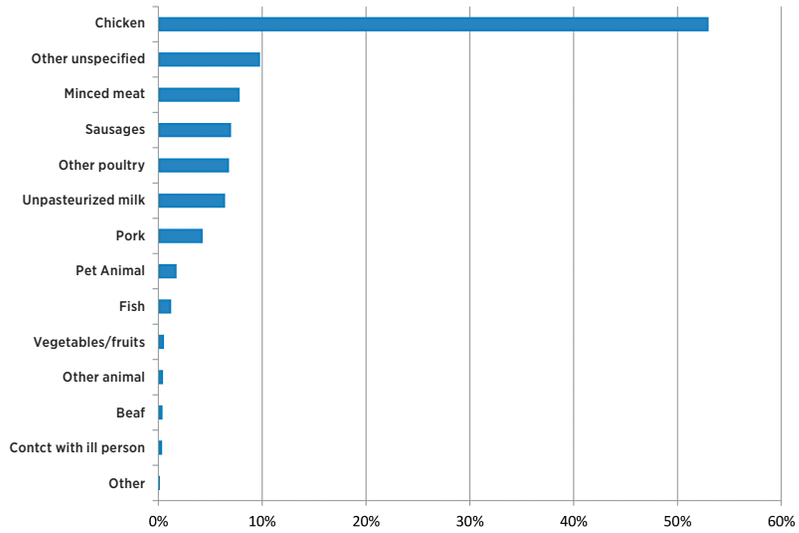

Figure 5. Campylobacteriosis, mode of transmission, 2005–2014, the South Bohemian Region, the Czech Republic (n = 3310 notified cases)

mikrobiologie, imunologie. 2004; 53(3):100–105, ISSN 1210-7913.
4. Polák P, Juránková J, Husa P. Kampylobakterióza. Klinická mikrobiologie a infekční lékařství. 2014; 20(2):50-54. ISSN 1211-264X.
5. Nyati KK, Nyati R. Role of Campylobacter jejuni Infection in the Pathogenesis of Guillain-Barré Syndrome: An Update. BioMed Research International. 2013. [online]. [cit 2015-11-03]. Available at www:<http://www.hindawi.com/journals/bmri/2013/852195/
6. Miller WG, Mandrell RE. Prevalence of Campylobacter in the food and water supply: incidence, outbreaks, isolation and detection. In Ketley JM, Konkel ME editors. Campylobacter. Molecular and cellularbiology. Horizon Bioscience, Wymondham UK. 2005; 101-163. ISBN 1-904933-05-X.
7. Dasti JI, Tareen AM, Lugert R, et al. Campylobacter jejuni: a brief overview on pathogenicity-associated factors and disease-mediating mechanisms. International Journal of Medical Microbiology. 2010; 300(4):205- 211, ISSN 1438-4221.
8. Hermans D, Pasmans F, Messens W et al. Poultry as a host for the zoonotic pathogen Campylobacter jejuni. Vector Borne Zoonotic Diseases. 2012; 12(2): 89–98. ISSN 1530-3667.
9. Cody AJ, McCarthy ND, Bray JE et al. Wild bird-associated Campylobacter jejuni isolates are a consistent source of human disease, in Oxfordshire, United Kingdom. Environmental Microbiology Reports. 2015; 7(5):782-8. ISSN 1758-2229.
10. Scallan E, Hoekstra RM, Angulo FJ, et al. Foodborne illness acquired in the United States-major pathogens. Emerging Infectious Disease journal. 2011; 17(1):7–15.
11. Schielke A, Rosner BM, Stark K. Epidemiology of campylobacteriosis in Germany - insights from 10 years of surveillance. BMC Infectious Diseases. 2014. [online]. [cit 2015-11-12]. Available at www:<http://bmcinfectdis.biomedcentral.com/articles/10.1186/1471-2334-14-30.
12. Sadkowska-Todys M, Kucharczyk B. Campylobacteriosis in Poland in 2012. Przeglad epidemiologiczny. 2014; 68(2):239-241. ISSN 0033-2100.
13. Ang CW, Teunis PF, Herbrink P, et al. Seroepidemiological studies indicate frequent and repeated exposure to campylobacter spp. during childhood. Epidemiology and Infection. 2011; 139(9):1361–1368. ISSN 0950-2688.
14. Ruthanne, M. New information about pediatric foodborne infections: the view from FoodNet. Current Opinion in Pediatrics. 2008; 20(1): 79–84, ISSN 1040-8703.
15. Kaakoush NO, Castaño-Rodríguez N, Mitchell HM et al. Global epidemiology of campylobacter infection. Clinical Microbiology Reviews. 2015; 28(3): 687–720, ISSN 0893-8512.
16. Czech statistical office. [online]. [cit 2015-11-06]. Available at www:<https://www.czso.cz/csu/czso/statistics.
17. Miller G, Dunn GM, Reid TM, et al. Does age acquired immunity confer selective protection to common serotypes of Campylobacter jejuni? BMC Infectious Diseases, 2005. [online].[cit 2015-11-12]. Available at www:<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1208888/5.66.
18. Polák P, Vrba M, Bortlíček Z, Juránková J, Freibergerová M, Husa P, Kamelander J, Dastych M. Kampylobakteriózy na klinice infekčních chorob fakultní nemocnice Brno v letech 2011–2013: retrospektivní studie. Epidemiologie, mikrobiologie, imunologie. 2015; 64(3):153–159. ISSN 1210-7913.
19. European Centre for Disease Prevention and Control. 2014.[online]. [cit 2015-12-06]. Available at www:<http://ecdc.europa.eu/en/publications/Publications/food-waterborne-diseases-annual-epidemiological-report-2014.pdf.
20. Karpíšková R, Koláčková I, Vyletělová M et al. Milk vending machines study – detection of causative agents of food-borne infections in raw milk. Centre for Epidemiology and Microbiology, National Institute of Public Health, Prague. 2011; 20(6):212–214. ISSN 1804-8668.
21. Bardoň J, Koláčková I, Husičková V, et al. Výskyt a charakteristika termotolerantních kampylobakterů v potravinovém řetězci člověka. Epidemiologie, mikrobiologie, imunologie. 2014; 63(3):232–237, ISSN 1210-7913.

Acknowledgement
The authors thank MUDr. Vladimír Príkazský, CSc., for his insightful advice, comments, and suggestions and help with preparing the paper.

Do redakce došlo dne 8. 2. 2016.

Adresa pro korespondenci:

MUDr. Lidmila Hamplová, Ph.D.
Vysoká škola zdravotnická, o.p.s. v Praze 5
Duškova 7
150 00 Praha 5
e-mail: hamplova@vszdrav.cz
lidmilahamplova@seznam.cz