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College of Veterinary Medicine

Campylobacter infection

A Graduation Project Submitted to the Department Council of the Internal and Preventive Medicine-College of Veterinary Medicine/ University of Al-Qadisiyah in a partial fulfillment of the requirements for the Degree of Bachelor of Science in Veterinary Medicine and Surgery.

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بِسْمِ ٱللَّهِ ٱلرَّحْمَٰنِ ٱلرَّحِيمِ

فَتَعَٰلَى ٱللَّهُ ٱلْمَلِكُ ٱلْحَقُّ ۗ وَلَا تَعْجَلْ بِٱلْقُرْءَانِ مِن قَبْلِ أَن يُقْضَىٰٓ
إِلَيْكَ وَحْيُهُۥ ۖ وَقُل رَّبِّ زِدْنِى عِلْمًا ﴿١١٤﴾

صَدَقَ اللهُ العَظِيمُ

من سورة طه

Certificate of Supervisor

I certify that the project entitled (**Campylobacter infection**)was prepared by**Mustafa Ehsan and Ghassan Saget**under my supervision at the College of Veterinary Medicine / University of Al-Qadisiyah.

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30 / 5/ 2020

Certificate of Department

We certify that **Mustafa Ehsan and Ghassan Saget**have finished their Graduation Project entitled (**Campylobacter infection**) and candidate it for debating.

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Summary

Campylobacter is an important cause of disease in humans and animals. Disease in animals is much less common, but the bacterium is often found in healthy pets. When illness occurs, the most common sign in humans and animals is diarrhea. • Campylobacter can sometimes spread beyond the intestinal tract, resulting in severe, even life-threatening infection of other parts of the body, particularly in animals or people who are very young, old, or have a weakened immune system. • The risk of transmission of Campylobacter between animals and people can be reduced by increasing awareness of how it is transmitted and some common-sense infection control measures.

infection with Campylobacter (campylobacteriosis) is one of the most commonly diagnosed causes of bacterial diarrhea in humans worldwide.. The most common sources of Campylobacter in humans arecontaminated food, especially raw/undercooked meat (particularly chicken), or any food that has come in contact with raw chicken, and unpasteurized milk. Infections have also been associated with contact with live chickens or cattle, swimming in natural water sources, and drinking untreated water**.**

Most species of domestic animals including cattle, sheep, chickens, turkeys, dogs, cats, and pigs, are susceptible to infection.

we can protect animals from campylobacteriosis Do not feed raw or undercooked meat or poultry to your pets. Do not allow animals to eat contaminated food or water. If your pet develops diarrhea, isolate the animal to limit exposure to other animals and contact your veterinarian. we can protecthumanfrom campylobacteriosis by use safe food preparation techniques. Wash your hands and all cooking equipment with soap and warm water after handling raw meat**.**

CAMPYLOBACTER INFECTION

1.INTRODUCTION

Campylobacter is group of bacteria that normally inhabit the intestines of animals. For Pet Owners • Campylobacter is the most common known cause of bacterial diarrhea in people in the developed world. • There are several species of Campylobacter found in both people and animals. The most common species that cause disease in humans are C. jejuni andC. coli, which account for up to 95% of all human cases. Campylobacter jejuni is most often found in chickens, but it is found in pets as well. The most common species found in dogs and cats is C. upsaliensis, which uncommonly infects humans. Cats can also commonly carry C. Helveticas, but it's unknown if this species makes people ill at all. (1)

Is a genus of Gram-negative bacteria. *Campylobacter* typically appear comma- or s-shaped and are motile some *Campylobacter* species can infect humans, sometimes causing campylobacteriosis, a diarrheal disease in humans. (2)

Campylobacteriosis is usually self-limiting and antimicrobial treatment is often not required, except in severe cases or immunocompromised patients.(3) . The most known source for *Campylobacter* is poultry, but due to their diverse natural reservoir, *Campylobacter* spp. can be transmitted ***via*** water.(4).

Other known sources of *Campylobacter* infections include food products, such as unpasteurized milk and contaminated fresh produce. Sometimes the source of infection can be direct contact with infected animals. (5)

Most cattle , sheep , dogs and cats have no signs of illness when they're infected with Campylobacter. If they do getsick, they usually get mild to

moderate diarrhea, which is more likely to happen in animals that are less than six months old .Animals that have other intestinal infections at the same time (e.g. Salmonella, Giardia, parvovirus, worms) may also be more likely to get sick. Occasionally an animal may get very sick from Campylobacter, in which case they may vomit, have a fever or pass blood in their diarrhea . (1 ,5)

Campylobacter have been implicated in human disease, with *C. jejuni* (80–90%) and *C. coli* (5-10%) being the most common. (6).

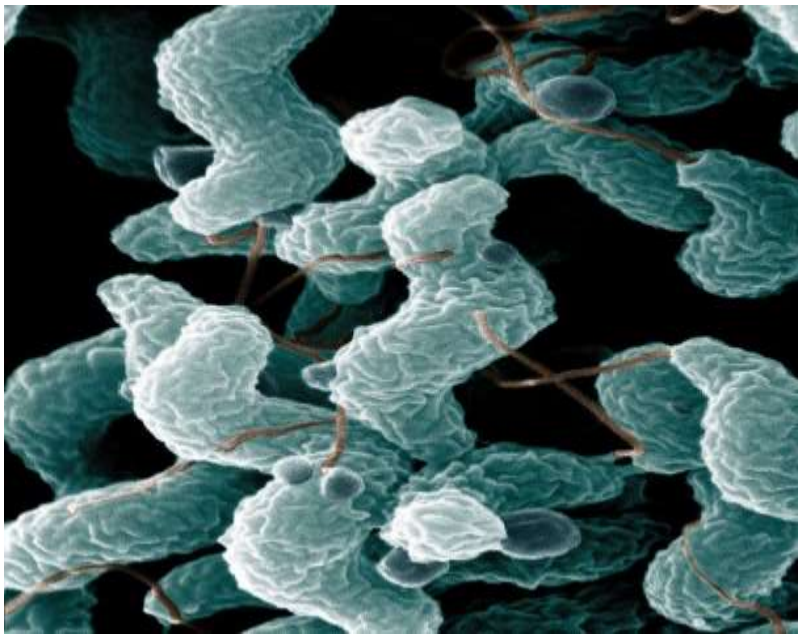
C. jejuni is recognized as one of the main causes of bacterial food borne disease in many developed countries. (7,8)

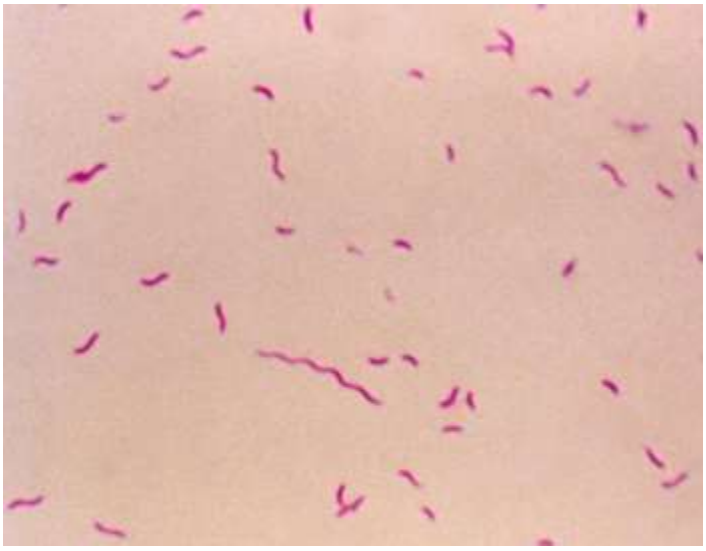
It is the number one cause of bacterial gastroenteritis in Europe, with over 246,000 cases confirmed annually. *C. jejuni* infection can also cause bacteremia in immunocompromised individuals, while *C. lari* is a known cause of recurrent diarrhea in children.(9) *C. fetus* can cause spontaneous abortions in cattle and sheep, and is an opportunistic pathogen in humans.(10)

2.LITERATURES REVIEW

2.1 MORPHOLOGY AND PHENOTYPE

Campylobacter spp. Generally appear as curved or comma-shaped rods, and are able to move via unipolar or bipolar flagella they grow best between 37–42 °C in a microaerophilic environment.(11). When exposed to atmospheric oxygen, *C. jejuni* is able to change into a coccal form.] Most species of *Campylobacter* are positive by the oxidase test and catalase test and are able to reduce nitrate. The number of known quinolone-resistant *Campylobacter* strains is growing. It is suggested that this is caused by the overuse of quinolone antibiotics in animal agriculture. (12)





2.2 GENOMICS

The genomes of several *Campylobacter* species have been sequenced, beginning with *C. jejuni* in 2000.(14,15) These genome studies have identified molecular markers specific to members of *Campylobacter*[*citation needed*]. *Campylobacter* ssp. genomes are rather small compared to those of other gastrointestinal pathogens, with sizes ranging between 1.60 and 1.90 Mbp.(16) A characteristic of most *Campylobacter* genomes is the presence of hyper variable regions, which can differ greatly between different strains.(17)

Studies have investigated the genes responsible for motility in *Campylobacter* species. Some *Campylobacter* species contain two flagella genes in tandem for motility, *flaA* and *flaB*. These genes undergo interagency recombination, further contributing to their virulence.(18)

2. 3 BACTERIOPHAGE

The confusing taxonomy of *Campylobacter* over the past decades makes identifying the earliest reports of *Campylobacter* bacteriophages difficult. Bacteriophages specific to the species now known as *C. coli* and *C. fetus* (previously *Vibrio coli* and *V. fetus*), were first isolated from cattle and pigs during the 1960s, and *Campylobacter* bacteriophages therapy is an ongoing area of research in the age of bacterial antibiotic resistance.([19,20,21])

2.4 PATHOGENESIS

Campylobacter can cause a gastrointestinal infection, campylobacteriosis. The incubation period is 24–72 hours after infection.(22) This is characterized by an inflammatory, sometimes bloody diarrhea or dysentery syndrome, mostly including cramps, fever, and pain.(23,24) The most common routes of transmission are fecal-oral, ingestion of contaminated food or water, and the eating of raw meat. Foods implicated in campylobacteriosis include raw or under-cooked poultry, raw dairy products, and contaminated produce.(25) *Campylobacter* is sensitive to the stomach's normal production of hydrochloric acid: as a result, the infectious dose is relatively high, and the bacteria rarely cause illness when a person is exposed to less than 10,000 organisms. (6) Nevertheless, people taking antacid medication (e. g. people with gastritis or stomach ulcers) are at higher risk of contracting disease from a smaller number of organisms, since this type of medication neutralizes normal gastric acid.

In humans, the sites of tissue injury include the jejunum, the ileum, and the colon. Most strains of *C jejuni* produce cytolethal distending toxin, which inhibits cell division and impedes activation of the immune system. This helps the bacteria to evade the immune system and survive for a limited time inside intestinal cells. *Campylobacter* has, on rare occasions, been suggested to cause hemolytic uremic syndrome and thrombotic thrombocytopenic purport, though no unequivocal case reports exist. In some cases, a *Campylobacter* infection can be the underlying cause of Guillain–Barré syndrome. Gastrointestinal perforation is a rare complication of ilea infection.(26) *Campylobacter* has also been associated with periodontitis.(4)

2.5 DETECTION

Campylobacter testing needs to be done to manage the risk of food borne *Campylobacter* and reducing the level of food

borne *Campoboteriosis*, to protect people and to determine if a person is infected with *Campylobacter*.(26)

In humans

Usually, detection of *Campylobacter* in humans is done by laboratory culturing a stool sample or swab of the rectum collected by a healthcare provider. Results take about 48–72 hours for preliminary results. Confirmation test and testing to determine the species of Campylobacter or drug sensitivities of the organism require additional time.(27)

In livestock

Usually, detection of Campylobacter in livestock is done by laboratory culturing a faecal sample. Results take about 48–72 hours.(28)

In meat

Usually, detection of Campylobacter in meat is done by laboratory culturing a homogenized sample. Results takes about 48–72 hours.(28)

2.6 TREATMENT

The infection is usually self-limiting and, in most cases, symptomatic treatment by liquid and electrolyte replacement is sufficient to treat human infections. Symptoms typically last 5–7 days. (25) Treatment with antibiotics has little effect, and is discouraged except in high-risk patients. (29) Diagnosis of campylobacteriosis is made by testing a fecal specimen. Standard treatment in high-risk cases is azithromycin, a microcline antibiotic, especially for *Campylobacter* infections in children, (30) although other antibiotics, such as quinolone, tetracycline and other macro ides are sometimes used to treat gastrointestinal *Campylobacter* infections in adults. (31) In case of systemic infection, other bactericidal antibiotics are used, such as ampicillin, amoxicillin/clavulanicacid,or aminoglycosides. Fluoroquin olone antibiotics,suchas ciprofloxacin or levofloxacin, may no longer be effective in some cases, due to resistance. (32) In addition to antibiotics, dehydrated children may require intravenous fluid treatment in a hospital.

2.7 EPIDEMIOLOGY

United Kingdom

In January 2013, the UK's Food Standards Agency (FSA) warned that two-thirds of all raw chicken bought from UK shops was contaminated with *Campylobacter*, affecting an estimated half a million people annually and killing about 100 of them. (33) In June 2014, the FSA started a campaign against washing raw chicken, as washing can spread germs onto clean surfaces by splashing. (34) In May 2015, cumulative results for samples taken from fresh chickens between February 2014 and February 2015 were published by the FSA and showed 73% of chickens tested positive for the presence of *Campylobacter*. (35)

United States

Campylobacter infections increased 14% in the United States in 2012 compared to the rate from 2006 to 2008. This represents the highest reported number of infections since calendar year 2000. (25)

High prevalence of *Campylobacter* (40% or more) has been reported in raw chicken meat in regional retail stores in the US, which remained steady from 2005 through 2011.[36] The last USDA quarterly progress report on *Salmonella* and *Campylobacter* testing of meat and poultry, for July–September 2014, showed a low prevalence of *Campylobacter* spp. in ground chicken meat, but a larger prevalence (20%) in mechanically separated chicken meat (which is sold only for further processing).(36,37)

Canada

Food Net Canada has reported that *Campylobacter* was the most common pathogen found on packaged chicken breast, with nearly half of all samples testing positive.

Additionally, *Campylobacter* and *Salmonella* were the most common causes of gastrointestinal illness in Canada. (38)

New Zealand

In August 2016, an estimated 8,000+ residents of Havelock North, a town with around 13,000 residents, had gastric illness after the water supply was thought to be contaminated by *Campylobacter*. (39,40,41)

Norway

In June 2019, an estimated 2,000 residents of Askøy municipality got sick due to the presence of *C. jejuni* in the water supply. Two deaths were connected to the outbreak, and it was the largest outbreakof *Campylobacter* in Norway. (42) The suspected source of the contamination was thought to be horse faeces, which leaked into a drinking water pool. (43) A *C. jejuni* water isolate thought to be the cause of the outbreak was examined with human isolates, and showed the highest pathogenic potential in vitro, transcriptomic and genomic investigations. This could suggest why the isolate was able to cause an outbreak. (44)

Sweden

During the period of August 2016 to June 2017 there was a large outbreak of *C. jejuni* in Sweden. It was the largest outbreak that has been reported so far. 5000 more cases than would be expected during this period were reported to the authorities. The source of the outbreak was contaminated chicken meat that came from the same producer. The reason for the increased incidence and elevated levels of *Campylobacter* was reported to be an improperly installed washing plant, where dirty water was accidentally used to wash transport cages. (45)

3.DISCUSSION

Theodor Escherichia was the first to describe in 1886 what are known today as Campylobacter's in the stool samples of infants, who perished from a disease he named "cholera infant". (13) In the following years until the end of the century, a number of publications appeared, describing the occurrence of such "Spirilla" in cases of "cholera-like" and "dysenteric" disease. These organisms were mainly found in the colon or associated with mucous in diarrheal stool specimens. *Vibrio*-like bacteria were also described by Sir John McFadden and Stockman in 1913 in fetal tissues of aborted sheep (14) For several years Campylobacter were continuously referred to as ‘‘Vibrio-like organisms’’, until 1963 when Seybold and Verona gave the name "*Campylobacter*" to the genus based on their

shape and microaerophilic growth requirement and after showing significant biological differences with *Vibrio* species. (13)

4. Recommendations[

4.1 Recommendations for the public and travelers

The following guidance will help people to stay safe while travelling:

- Ensure food is properly cooked and still hot when served.
- Avoid raw milk and products made from raw milk. Drink only pasteurized or boiled milk.
- Avoid ice unless it is made from safe water.
- When the safety of drinking water is questionable, boil it, or if this is not possible, disinfect it with a reliable, slow-release disinfectant agent (usually available at pharmacies).
- Wash hands thoroughly and frequently using soap, in particular after contact with pets or farm animals, or after having been to the toilet.
- Wash fruits and vegetables carefully, particularly if they are eaten raw. If possible, vegetables and fruits should be peeled.

4.2 Recommendations for food handlers

WHO provides the following guidance for people handling food :

- Both professional and domestic food handlers should be vigilant while preparing food and should observe hygienic rules of food preparation.
- Professional food handlers who suffer from fever, diarrhea, vomiting, or visible infected skin lesions should report to their employer immediately.
- The WHO *Five keys to safer food* serve as the basis for educational programmers to train food handlers and educate consumers. They are especially important in preventing food poisoning. The Five keys are:
    - keep clean

- separate raw and cooked
- cook thoroughly
- keep food at safe temperatures
- use safe water and raw materials.

5.CONCLUSIONS

Campylobacter spp. remain important human pathogens. Thepresence of high levels of these bacteria on Animals confront consumers and caterers with particular difficulties. Available data suggest that it is almost impossible to prevent the spread of Campylobacter spp

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