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REVIEW PAPER: *CLOSTRIDIUM PERFRINGENS* THE SEVERE GASGANGRENE

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ABSTRACT

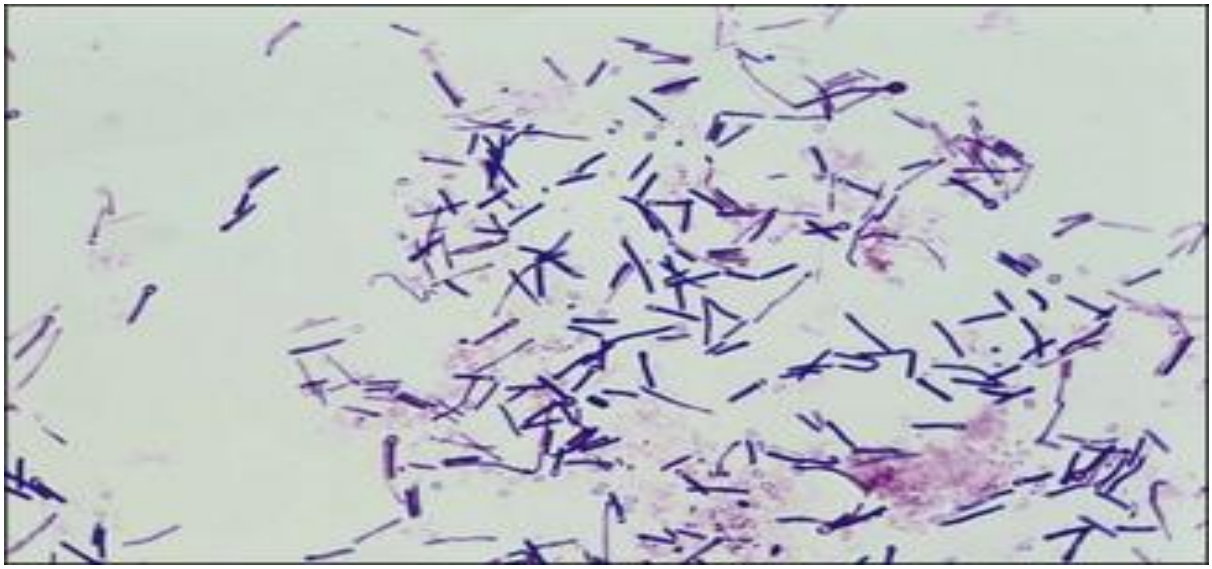
Food poisoning and other diseases are caused by *Clostridium perfringens*, a gram-positive, rod-shaped bacteria that also produces several enterotoxins. The chronic disease gas gangrene, which causes excruciating agony and inflammation, damages the body's muscles, organs, and tissues. The condition where the tissue is inundated with blood and mucus is extremely dangerous, and it is here that *Clostridium perfrigens* manifests its effects. *Clostridium sp*. is also connected to a type of enteroxin that affects chronic disease, leg swelling, liver swelling, progeny infection, and blood. A coagulated organ is one of the main signs of gasgangrene, and it needs to be treated medically to prevent the severity of the condition. Severe sickness produced by *Clostridium perfignans* was associated with a highly contagious yet bloody muscle pyogenic infection. The anaerobic bacteria *Clostridium perfringens* and *Clostridium botulinum* produce neurotoxins as well as respiratory and muscle paralysis. The current study is focused on the sources of Clostridium bacterial infections, prevention measures related to diseases that were previously treatable, and the severity of such diseases.

KEYWORDS: *Clostridium perfringens***,** enterotoxins, gas gangrene, *Clostridium perfringens* enterotoxin (CPE).

INTRODUCTION

HISTORY ABOUT CLOSTRIDIUM SPP.

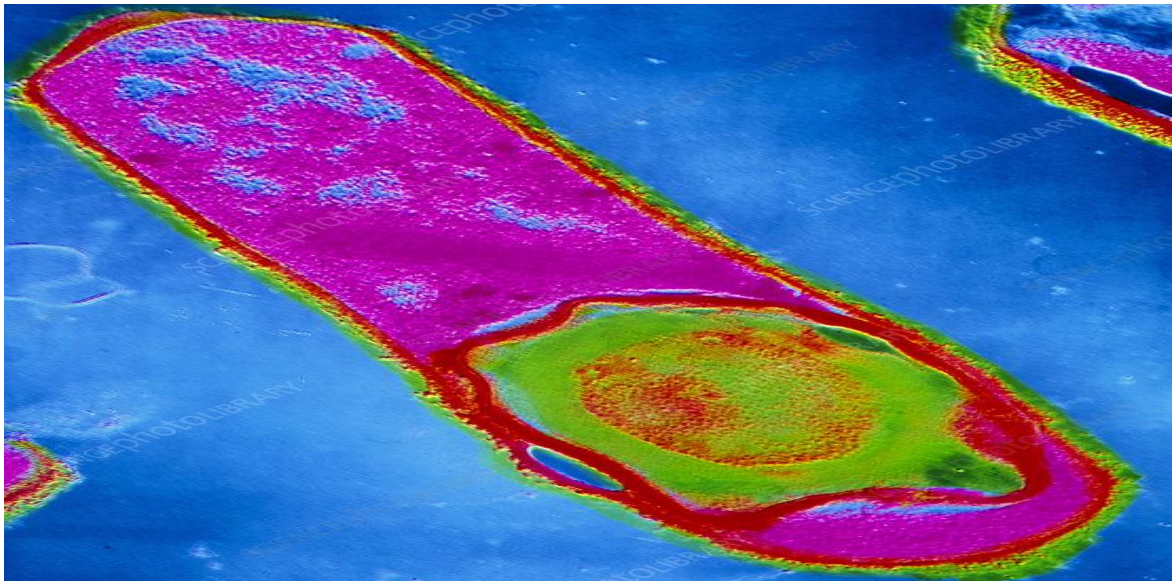
The enterotoxin produced by *C. perfringens* leads to diarrhoea and pain in the abdomen. An outbreak can be caused by improper food handling procedures, including inadequate heating, cooling, and reheating. Clinical symptoms usually last a short time and are minor. Either quantitative cultures of the implicated foods or stool samples that are enterotoxin-positive are used to make the diagnosis of *C. perfringens* foodborne illness. The use of antibiotics is not recommended.[1] the gram-positive, aerobic bacteria Especially in soil and the gastrointestinal systems of people and animals, *Clostridium perfringens* is abundantly present in nature. The extracellular enzymes and poisons that *C. perfringens* produces are assumed to work in concert and contribute to its pathogenesis, which includes the pathophysiology of food poisoning and gas gangrene.[2]



The spores have a classic "drum-stick" appearance because they are round, terminal, and protrude from the mother cell. Clostridium tetani sporing rods in Gram-stained[30]

Due to its propensity to create strong protein toxins, many of which are extracellular, *Clostridium perfringens* can cause a wide range of histotoxic and enterotoxic illnesses in both humans and animals. The current system for dividing *C. perfringens* strains into toxinotypes A through E is based on their capacity to produce a combination of four types of toxins, including alpha toxin, beta toxin, epsilon toxin, and iota toxin. This system was finalised in the 1960s.[3] Throughout the past century, digestive disorders in both humans and animals have been linked to the fast-growing bacteria *Clostridium perfringens*, which is known to secrete >20 deadly toxins. It is necessary to revisit this pathogen because of recent developments in genomic analysis and experimental methods.[4] Food poisoning caused by *Clostridium perfringens* type A is one of the more prevalent illnesses in industrialised nations. Moreover, this bacterium causes the uncommon but serious food-borne necrotizing enteritis. It has been established that the virulence factor causing the signs of *C. perfringens* type A food poisoning is *C. perfringens* enterotoxin (CPE).[5] Clostridium perfringens is a common gram-positive anaerobic bacteria found in soil, animal and human gastrointestinal tracts, and other natural environments. *C. perfringens* produces extracellular enzymes and toxins that are considered to work in concert and contribute to the pathogenesis of its diseases, including gas gangrene and food poisoning.[6] It is believed that *Clostridium perfringens* enterotoxin (CPE) is the virulence factor in C. perfringens type A food poisoning and that it may also be involved in other human and livestock disorders.[7]

SOURCES OF INFECTION



Clostridium perfringens bacterium[31]

The common bacterial pathogen *Clostridium perfringens* (C. perfringens) can infect humans and animals and cause diseases like chronic granulomatous infection in humans (NE) in poultry.[8] Several human illnesses, including food poisoning and gas gangrene, as well as numerous animal illnesses, are caused by *Clostridium perfringens*. Much progress has recently been made in the genetic development of *C. perfringens*.[9] Surface- or interface-adherent biofilm is present. It shields bacteria from the environment and harmful compounds, and it may also contribute to pathogenicity. In contrast to other bacterial species, Clostridium species have less well-documented biofilms that are found on both hosts and in the environment.[10] Infections with histotoxins and conditions of gastrointestinal origin, like enteritis and enterotoxemia, are frequently brought on by *Clostridium perfringens* in both people and animals. This gram-positive, anaerobic bacteria is very virulent due to its prodigious toxin production capacity.[11] Toxin genes expressed by plasmids are what *Clostridium perfringens* uses to generate intestinal infections. These toxin genes are linked to insertion sequences that may aid in their transfer and mobilisation, resulting in the development of additional toxin plasmids with similar backbones. The occurrence of related toxin plasmids in otherwise unrelated *C. perfringens* strains is probably explained by the fact that the majority of toxin plasmids carry a transfer of clostridial plasmid loci mediating conjugation.[12] Epsilon toxin (ETX), a highly fatal disease that has significant effects on the farming of domestic ruminants, notably sheep, is produced by Clostridium perfringens type B and D strains. ETX is a member of the pore-forming toxin family that resembles aerolysin.[13] microorganism that is anaerobic Many toxins that are expressed by *Clostridium perfringens* aid in the development of illness in both people and animals. A pore-forming, cholesterol-dependent cytolysin known as perfringolysin O (PFO, also known as a toxin) is one such toxin (CDC). PFO is released as a water-soluble monomer that identifies and adheres to membranes via cholesterol.[14] The rapid-growing bacteria *Clostridium perfringens*, which is known to generate >20 deadly toxins, has been linked for more than a century to intestinal illnesses in both humans and animals. It is appropriate to revisit this clinically and veterinary-significant pathogen in light of recent developments in genomic analysis and experimental methods.[15] Around the world, public health issues include wound infections. Nonetheless, improvements in antimicrobial therapies and surgical methods have been developed. Multi-drug-resistant (MDR) bacterial strains are becoming more common as a result of improper or excessive usage of antibiotics to prevent and cure bacterial illnesses.[16] One of the most significant gastrointestinal disease-causing pathogens in newborn horses is Clostridium perfringens type C. Enterocolitis in horses of all ages is now known to be significantly influenced by Clostridium difficile. We are not aware of any reports describing simultaneous infection by these two bacteria in foals, despite the fact that infections by C. perfringens type C or C. difficile are often encountered.[17] One of the four main bacterial organisms responsible for food poisoning is *Clostridium perfringens* type A. A few confusing species suggest that differential biochemical characterization is crucial. Both types of heat-sensitive and heat-resistant spore-forming bacteria can make you sick.[18] Animal necrosis, enteritis, and traumatic gangrene are primarily brought on by *Clostridium perfringens* (CP), one of numerous clostridial species of gram-positive bacteria. According to certain accounts, CP can give patients with biliary tract infections severe emphysematous cholecystitis. However, co-infection of the bloodstream with *C. perfringens* and other aerobic bacteria (such as E. coli) is very uncommon and frequently fatal.[19] There is an extremely high death rate (70–100%) associated with infection with Clostridium perfringens, which can lead to massive hemolysis and renal failure. The severity of the infection is influenced by the existence of underlying diseases, including cancer and diabetes.[20] The leading cause of histotoxic and intestinal infections in people and other animals is *Clostridium perfringens*. Up to three NanH, NanI, and NanJ sialidases can be produced by this gram-positive anaerobic bacterium. There is still debate over the function of sialidases in histotoxic illnesses such as gas gangrene (clostridial myonecrosis).[21] An important pathogen for both humans and animals, *Clostridium perfringens* causes a wide range of ailments, including gastrointestinal and histotoxic conditions. Due to their ability to remain dormant in the environment and spring back to life when exposed to nutrients in food or the human body, C. perfringens spores are essential for understanding this bacteria's pathogenicity.[22] Gas gangrene, a potentially fatal infection characterised by fever, pain, edoema, myonecrosis, and gas generation, is hypothesised to be significantly influenced by *Clostridium perfringens* alpha-toxin.[23] Gas gangrene is mostly brought on by the bacterium. It is a disease that has a prognosis of death if treatment is not received in a timely manner and is linked to wound infection. The spread of poisons in the body causes shock, unconsciousness, and death in the absence of early drastic surgery, antibiotic medication, and (if accessible) hyperbaric treatment. Pathogens can serve as a substrate for the creation of biological weapons because of the power of the toxins they release. It might be used to spread food poisoning outbreaks, and spore contamination in missiles could enhance the likelihood that soldiers who have been injured will get gas gangrene. Epsilon toxin, the third-most potent bacterial toxin, is produced by *C. perfringens* types B and D. It is a potential instrument for bioterrorism because the toxin can spread as an aerosol, and there are currently no effective treatments or preventative measures for poisoning.[24,25]

TREATEMENT FOR DISEASE WHICH CAUSED BY *CLOSTRIDIUM PERFRIGENS*

Furthermore, as demonstrated by infection models, predisposing environmental variables are crucial for the

production of *C. perfringens*-associated enteritis. Environmental pollution, stomach and intestinal pH, intestinal microbiota, nutrition, concurrent infections, and medical interventions can all have an impact on *C. perfringens'* ability to colonise the gut, proliferate, and produce toxins. Probiotics, prebiotics, organic acids, essential oils, bacteriophages, lysozymes, bacteriocins, and antimicrobial peptides are a few feed additives that may help prevent C. perfringens-associated enteritis.[26] Even after receiving antibiotic treatment, petrol gangrene is a painful, rapidly progressive, and possibly lethal infection. Many soldiers perished from this illness during the First World War. Dr. Alexis Carrel invented a contentious technique for killing the gas gangrene-causing *Clostridium perfringens* bacteria present in heavily fertilised soils by irrigating wounds with Dakin's solution.[27] With their strong resistance to the different preservation techniques commonly used to eliminate foodborne pathogens, enterotoxigenic Clostridium perfringens spore contamination on food contact surfaces is a severe concern for the food business.[28] The cause of *C. perfringens* type A food poisoning (FP) and nonfood-borne (NFB) human gastrointestinal disorders is enterotoxigenic *Clostridium perfringens* type A. Producing meat free of *C. perfringens* has become a major challenge for the meat industry due to its capacity to develop extremely resistant endospores.[29]

CONCLUSION

When an illness reaches a very chronic level, it is typically difficult to treat, and some soil-borne infections are difficult to understand in the early stages. Most often, contagious disease transmission occurs during water, air, and food-related activities. Infections like clostridia are types of infections that cause muscular paralysis while counteracting neurotoxin levels and blood flow due to their enterotoxin and spore-forming abilities. These infections are extremely dangerous in some cases, but some infections are treatable; otherwise, organ failure was seen. As there was no medical care available in the past, mortality rates were high. Nevertheless, when there was medical care available, it was not treated at a basic level. The ancient history of Clostridium is linked to tetanus and diphtheria enterotoxins. The antibiotic is able to inhibit bacilli from growing, but endospores exhibit resistance, which is the real cause of the uncontrollable activity of Clostridia gasgangarene.

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