Campylobacter detection and strain identification

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Technology description

Development of a technology for a simple, sensitive, Campylobacter detection and strain identification kit that generates specific, reproducible results.

Description

Researchers affiliated with the National Microbiology Laboratory (NML) in Winnipeg, Manitoba, Canada have developed the technology for a simple, sensitive,Campylobacterdetection and strain identification kit that generates specific, reproducible results.

The Challenge

Campylobacteris the leading cause of bacterial gastroenteritis in the developed world.

Symptoms ofCampylobacterinfection are diarrhea, abdominal cramps, vomiting, and fever. Dysentery may also occur.

Campylobactercan be found in food and water. Poultry is the major source of humanCampylobacterinfection. Between 2.1 and 2.4 million cases of human illness caused by theCampylobactermicroorganism occur in the United States yearly, and the death toll from the pathogen approaches 1,000.

Detection of theCampylobacterpathogen is crucial to preventingCampylobacterspread, treatingCampylobacterdisease, and establishing the epidemiology ofCampylobacterinfection. Although the disease is sporadic in distribution, outbreaks have been reported.

Identification ofCampylobacterstrains is important for tracing the transmission history of the strain or strains causing disease and for facilitating the recall of contaminated food.

MostCampylobacterdetection and strain identification technologies are less than ideal.Campylobacteris difficult to grow, necessitating detection technology not overly dependant on sample amplification. Detection sensitivity is an issue. Those technologies that can identify strains employ Restriction

Fragment Length Polymorphism (RFLP) or DNA probe techniques, and because these techniques are complex, widespread use of presently available strain identification technologies is problematic.

An easy-to-use, sensitive, rapidCampylobacterdetection kit that simultaneously detects and identifies all species ofCampylobacterwith a high degree of sensitivity is urgently needed.

Application area

The NML kit’ s ease of use, sensitivity, and reliability makes widespread use of it at many levels of medical practice, medical research, and food and water inspection possible and practical. It has civilian and military applications and, potentially, a worldwide market.

Advantages

The kit can, in three hours, simultaneously detectCampylobacterand identify the strains ofCampylobactermost often responsible forCampylobacterdisease even when the pathogens are present at very low levels.

It does not use the complex RFLP or DNA probe techniques.

No other Campylobacter detection technology simultaneously detects and identifies so many species of Campylobacter.

The NML kit uses a Multiplex Polymerase Chain Reaction (PCR) assays to simultaneously detect in a single assay genes that identify all strains of theCampylobacterspeciesC. jejuni,C. coli,C. lari,C. upsaliensis, andC. fetus.

A double-stranded DNA helix can be separated longitudinally, and each strand that results from the split can serve as a template for growth of a DNA strand identical to the one from which the template.

The kit contains primers, each designed to attach to a separated DNA strand. If a DNA strand from one of the targeted genes is present in the sample being tested, the appropriate primer will attach to it and a DNA strand will grow. This growth indicates the presence of the gene and the Campylobacter strain associated with it.

The NML kit targets the genes hipO and 23S rRNA to detect C. jejuni, the gene glyA to detectC. coli,C. lari, andC. upsaliensis, and the gene sapB2 to detectC. fetus.

The kit contains an amplification mixture that facilitates DNA strand growth and a positive control that confirms the test conditions are conducive to such growth.

Samples, such asfoodorstool specimens, suspected of contamination with any or all of theCampylobacterspecies known to cause disease may be tested directly in a single assay and do not require preparation or pathogen isolation.

Institution

Public Health Agency of Canada (PHAC) - Agence de la santé publique du Canada (ASPC)