Innovating in Food Safety

3M™ Tecra™ Visual Immunoassay (VIA) Tests designed to detect pathogens and the toxins they release.

Food safety is a major global, public health concern for all of us and requires highly integrated initiatives and practices to assure safe food through the entire supply chain from the farm to the consumer. This is further complicated by international trade and the import and export regulations governing the food and agricultural products shipped between countries. The entire food supply system is changing rapidly and is being driven by many diverse factors including globalization, food production/processing capabilities, “value adds” to commodity foods, advancements in the field of microbiology, and the application of technologies to improve the control and detection of microorganisms.

Reliable analytic microbiological testing for pathogenic organisms remains a critical component of an effective process to assure the supply of fresh, wholesome and safe food to consumers worldwide. The 3M Tecra VIA Tests offer a full range of rapid and specific tests for the detection of pathogens and the toxins they release. 3M Tecra VIA Tests are both easy to use and fit easily into your existing lab processes. 3M offers automation that is adaptable, but not required, giving you the ability to run the exact number of tests you need either manually or semi-automated.

The 3M Tecra VIA Test is an Enzyme-Linked Immuno Sorbent Assay (ELISA) performed in a 96-well plate format based on the following:

**STEP 1: Capture of the Pathogen From Enriched Solution**
Antigens from pathogen present in the enriched solution are captured by the antibodies. All unbound material is washed away.

**STEP 2: Conjugate Binding**
Enzyme-labeled antibodies (conjugate) specific to the pathogen binds to the immobilized antigens, forming a “sandwich” of the target antigens between the two antibodies in the assay.

**STEP 3: Color Development**
Substrate is added and reacts with the conjugate to produce a green color, giving visual reading of presumptive positive results. Alternatively, the absence of pathogen is indicated by no color development.

The sensitivity of an immunoassay method relies on the specific antibodies designed to capture the pathogen antigens and the selection of the enrichment media. 3M relies on proprietary antibodies and enrichment protocols developed by 3M scientists to provide accurate and reliable results. Many of the 3M Tecra VIA Tests have received AOAC® International method approvals, as well as method recognitions by other global organizations.

3M Food Safety is dedicated to providing solutions that help mitigate risk, improve operational efficiencies and impact the bottom line while helping you to protect your brand.
Emerging Food-borne Pathogens

According to public health estimates, it is believed that there are more than 30 different microbial agents that may cause human diseases when contaminated foods are consumed. Many of these microorganisms are recognized pathogens that quite probably have caused illnesses in humans for centuries. These pathogens can be referred to as "traditional", and they mainly include *Salmonella*, *Clostridium perfringens*, *Staphylococcus aureus*, *Bacillus cereus* and *Shigella*. Throughout human evolution, *Salmonella* has been and continues to be the bacteria responsible for the highest number of infections caused by contaminated foods. *Salmonella* serovar Typhi causes one of the most severe food- and water-borne illnesses known as typhoid fever, which is responsible for serious epidemics and still afflicts many countries in the world. Other traditional pathogens also continue to cause diseases, but in recent years, we have seen that previously unknown microorganisms capable of causing food-borne illnesses have become a public health problem.

These microorganisms that have appeared recently are referred to as "emerging pathogens."

The definition of emerging pathogen can be subjected to different interpretations and it is often used for completely new pathogens as well as for already known pathogens with new characteristics. The microorganisms that can be classified as emerging include enterohemorrhagic *Escherichia coli* O157, *Listeria monocytogenes*, norovirus, *Campylobacter* and more recently, other enterohemorrhagic *E. coli* capable of producing Shiga toxins. Thanks to advances in detection technologies, it is considered that norovirus is the pathogenic microorganism responsible for more food-borne infections.

The case of *E. coli* O157 is probably the microorganism that best represents the category of emerging food-borne pathogens. It can be confirmed that the type of illness caused by this bacteria was not present prior to 1982, when the first outbreak of hemorrhagic gastroenteritis was reported. The enterohemorrhagic symptoms are very severe, and the toxins produced by this bacterium can cause complications such as hemolytic uremic syndrome affecting the kidneys, which can lead to death. In the last 20 years, illnesses from this bacterial strain have become more and more common in different regions of the world, mainly related to the consumption of contaminated ground meat. Because of the severity of this illness, *E. coli* O157 is considered to be an adulterant in ground meat under the laws of different countries which requires that this product should be tested microbiologically.

*Listeria monocytogenes* is another case of a microorganism that can be considered an emerging pathogen, since it was not until approximately 40 years ago when it was recognized that it could be transmitted by foods. *L. monocytogenes* can cause an infection attacking different organs in the body, including the central nervous system, and in pregnant women it can lead to spontaneous miscarriage. In a very high percentage of patients (20 to 30%), listeriosis causes death, which qualifies it as the most lethal food-borne infection. Fortunately, cases of listeriosis are relatively rare, but because of the severity of the illness, this bacterium was declared an adulterant in ready-to-eat dairy and meat products. The appearance of
this bacterial species as an emerging pathogen has been probably due to modern methods of processing and distribution of products with extended shelf lives. Based on its declaration as adulterant, the microbiological analysis of this microorganism is probably the pathogen most frequently tested in food production plants, especially in facilities that process meats, dairy products and, more recently, fruits and vegetables.

_Campylobacter_ and norovirus are two pathogens that are considered emerging, since their importance has also only been recognized in the last few decades. However, due to the ecological characteristics of these microorganisms, it is quite possible that they have always been present in the food supply, but they were not recognized earlier because the methodologies and techniques to detect them had not been developed. In the case of _Campylobacter_, it is a group of bacteria that naturally inhabits the gastrointestinal tract of many animals, including chickens, turkeys and pigs, which makes these meat products the principal vehicle for its transmission. The infection caused by _Campylobacter_ is not very serious in most patients, and those infected often recover after experiencing diarrhea for a few days. Because norovirus is an obligate parasite specific for humans, the natural origin of this virus is humans, and it is quite likely that it has been present in human populations since ancient times causing illnesses. Since _Campylobacter_ or norovirus are not openly declared as adulterants, the microbiological analysis of foods is relatively infrequent.

The group of non-O157 enterohemorrhagic _E. coli_ is the most recent case of emerging pathogenic bacteria that have been recognized. This recognition was confirmed after the historic outbreak in Germany caused by a strain of _E. coli_ O104, relatively new with virulence far superior to serotype O157. In September of 2011, in the U.S.A., the Department of Agriculture declared 6 of the serotypes of this group of bacterial pathogens to be adulterants in ground meat. This last case, while controversial, has demonstrated that the appearance of pathogens in foods is relatively unpredictable, but that it will very probably continue to occur with new or mutant strains, or with microorganisms that are currently known, but with unforeseen characteristics. The goal for the experts in food safety and microbiology is to be able to react as rapidly as possible to diminish the number of cases, and even more so to anticipate the appearance of new pathogens.

“There are more than 30 different microbial agents that may cause human diseases.”
Proven Results You Can Trust

3M™ Tecra™ Pathogen and Toxin Visual Immunoassay (VIA) Tests are designed to provide reliable and reproducible results regardless of the number of samples processed, providing you:

- The ability to run a single assay or up to 94 assays
- The flexibility to use an ELISA washer and/or plate reader to automate your processes

3M Tecra VIA Tests provide a full range of critical tests for use with raw materials, finished products and environmental surfaces in production facilities.

- 3M Tecra VIA for the Detection of *Salmonella*
- 3M Tecra VIA for the Detection of *Listeria*
- 3M Tecra VIA for the Detection of *E. coli* O157
- 3M Tecra VIA for the Detection of *Campylobacter*
- 3M Tecra VIA for the Detection of *Staphylococcus aureus*
- 3M Tecra VIA for the Detection of *Pseudomonas*
- 3M Tecra VIA for the Detection of Staphylococcal Enterotoxins (SET)
- 3M Tecra VIA for the Identification of Staphylococcal Enterotoxins ID (SID)
- 3M Tecra VIA for the Detection of *Bacillus* Diarrheal Enterotoxin (BDE)

Support You Can Rely On

3M Food Safety products are at work in more than 60 countries around the globe to help keep businesses such as yours moving forward. Our passion is to work with you to discover new food safety solutions that protect your brand, mitigate your risk and improve your operations. And every day, our people are there to support you locally by providing technical help and exceptional service.

To learn more about 3M Tecra VIA Tests or other product solutions from 3M Food Safety, contact your local 3M representative or visit us at www.3M.com/foodsafety.