



FACT SHEET

Laboratory Testing for Ricin

This fact sheet provides a brief outline of how laboratory testing is done on environmental samples or human clinical specimens that may contain ricin, a poisonous protein from the castor bean plant.

How biological and chemical agents are detected

Law enforcement personnel sometimes investigate suspicious powders, or environmental surveillance systems indicate possible contamination involving a threatening agent. In other instances, hospital or commercial laboratories may come across a sample for which the presence of a threatening agent cannot be ruled out. Certain locations around the country, such as government and U.S. Postal Service offices, use sensors to test for traces of threatening agents. Threatening agents are biological organisms or chemicals that could cause harm to people's health. Processed ricin toxin is such an agent that could harm people if it is released into water, air, or food. If federal law enforcement officers feel the threat is credible, or if a hospital or commercial laboratory cannot rule out the presence of a threatening agent, suspicious samples are transferred to a nearby Laboratory Response Network (LRN) facility or to the Centers for Disease Control and Prevention (CDC) where high-confidence tests can be performed to identify the threat agent.

Biological agents are detected in environmental samples and clinical specimens using specialized tests, including rapid DNA-based tests that yield results within hours. These tests are performed by state and local public health laboratories that are LRN members.

Chemical agents can be detected in body fluids of persons (that is, in clinical specimens) exposed to these agents. Such detection can be used to identify who has been exposed and in some cases to assist in directing medical interventions. The LRN includes public health laboratories that can perform these types of analyses.

What the Laboratory Response Network is

The LRN is a national network of local, state, and federal public health, food testing, veterinary diagnostic, and environmental testing laboratories that provide the laboratory infrastructure and capacity to respond to biological and chemical terrorism and other public health emergencies. The more than 150 laboratories in the LRN are affiliated with federal agencies, military installations, international partners, and state and local public health departments.

The LRN was established in 1999 by the Department of Health and Human Services through CDC in accordance with Presidential Decision Directive 39, which outlined national antiterrorism policies and assigned specific missions to federal departments and agencies. Its founding partners are the Federal Bureau of Investigation and the Association of Public Health Laboratories. CDC maintains the LRN through a partnership with other federal agencies and private organizations.

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How the Laboratory Response Network is structured

The LRN member laboratories are designated as either “reference” or “national.” Reference laboratories can perform tests that detect and confirm the presence of a threatening agent. These laboratories ensure a timely local response in the event of a bioterrorism incident or other public health emergency. Reference laboratories are capable of obtaining test results that prompt federal, state, and local agencies to respond.

LRN reference laboratories that test for ricin in environmental samples are public health and partner laboratories with specialized procedures and test reagents provided by the LRN laboratories at CDC. “Test reagents” are chemicals that react in specific ways to help determine whether an agent, such as ricin, is present.

National laboratories are select laboratories, such as CDC and USAMRIID (United States Army Medical Research Institute of Infectious Diseases) that have unique resources to handle highly infectious agents and to identify specific strains of an agent.

Sentinel laboratories represent the thousands of hospital-based labs that are on the front lines; however, they are not LRN members in the same way that reference laboratories are. Sentinel laboratories handle clinical specimens such as blood and urine. They are not set up to do environmental tests for ricin. If sentinel laboratories come in contact with a suspicious clinical sample, they are responsible for shipping it to the appropriate reference laboratory.

Currently, 62 state, territorial, and metropolitan public health laboratories are members of the chemical testing component of the network. A designation of Level 1, 2, or 3 defines the level of network participation, and each level builds upon the preceding level.

All 62 laboratories participate in Level 3 activities, which include being trained in specimen handling, shipping and chain-of-custody procedures.

Thirty-seven labs participate in Level 2 activities. At this level, laboratory personnel are trained to detect exposure to a limited number of toxic chemical agents in human blood or urine. Analysis of cyanide and toxic metals in human samples are examples of Level 2 laboratory activities.

Ten laboratories also participate in Level 1 activities. At this level, personnel are trained to detect exposure to an expanded number of chemicals in human blood or urine, including all Level 2 laboratory analyses, plus analyses for mustard agents, nerve agents, and other toxic chemicals.

What tests can be done for ricin in environmental samples

When a reference laboratory receives an environmental sample suspected of containing ricin, the laboratory performs specific tests to detect the presence of the agent. Tests performed on ricin-suspicious samples include the following:

- **Time-resolved fluorescence immunoassay:** In this test, the laboratory technicians use an antibody that binds to ricin to enable them to detect it in environmental samples.

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- **Polymerase chain reaction (PCR):** PCR is a test used to locate and make copies of parts of the DNA contained in the castor bean plant. The search can specifically look for the DNA of the gene that produces the ricin protein.

What tests can be done for ricin in clinical samples

- **HPLC-ESI-MS:** CDC has developed a method for measuring ricinine, a marker of ricin exposure, in urine. Ricinine is present along with ricin in castor beans. CDC has transferred the ricinine testing method to 10 laboratories in the LRN. These laboratories participate in quarterly proficiency testing for the ricinine testing method.

Where you can get more information

For more information on shipping procedures, see “Laboratory Information for Chemical Emergencies” (www.bt.cdc.gov/chemical/lab.asp). For more information about ricin, visit the CDC Ricin Homepage (www.bt.cdc.gov/agent/ricin).

This fact sheet is based on CDC’s best current information. It may be updated as new information becomes available.

For more information, visit www.bt.cdc.gov/chemical,
or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).

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