DIISOCYANATES PANEL

Scientific Information Statement Summary

TDI Antibody Testing

Toluene diisocyanate (TDI) is a chemical compound that reacts rapidly with polyols and amines to produce flexible polyurethane foam. Regulated safety measures are followed to help keep worker exposure to TDI within acceptable limits. However, workers who were previously exposed to TDI at levels higher than the established workplace exposure limits may experience asthma-like symptoms when they are re-exposed to TDI. These asthma-like symptoms can occur even at relatively low levels of exposure. This is known as "TDI-induced asthma" and some cases are considered to be the result of antibody formation resulting in allergic disease, although the exact mechanism remains unclear.

The human immune system produces several types of antibodies as a general defense against organisms and substances that are foreign to the body. However, this alone is not considered to be a definitive indication of allergic disease, such as asthma. Allergic disease occurs when the immune system reacts to a foreign substance and causes a response that might result in sneezing, itchy eyes, hives, or breathing difficulty. Antibody production is only one of the components of this type of response.

A person’s immune system may become sensitized to TDI. In some cases, additional low-level exposures to TDI may bring on asthma-like symptoms. The immune systems of individuals exposed to TDI may produce two types of TDI-specific antibodies, IgG and IgE. To determine whether an individual has developed antibodies to TDI, available methods typically combine an individual’s blood sample with a TDI-protein conjugate prepared in a laboratory. The levels of TDI-specific IgG and IgE antibodies in the blood sample are then measured. Currently, there is not a standardized test method for TDI antibody testing, and the results of available test methods are often not precise or reliable. The detection of TDI-specific IgG and IgE antibodies does not mean that an individual has TDI-induced asthma, nor does their absence mean that a person’s immune system has not been sensitized. While it is true that people who have worked with TDI and have TDI-specific IgE antibodies in their blood may be more likely to have an asthmatic reaction upon re-exposure to TDI, some people who have no adverse symptoms after re-exposure to TDI also have TDI-specific antibodies. Only a percentage of individuals with TDI asthma test positive for TDI antibodies indicating the possibility of a non-antibody-mediated immune mechanism for some cases of diisocyanate asthma. Other factors contributing to this poor reliability include a lack of standardized and validated test reagents and methods. Also, detection of apparent "TDI-specific antibodies" may be due to a cross-reaction and may not represent specific exposure to TDI. Until a validated, standardized test method for detecting TDI antibodies is developed, the results of available testing must be interpreted with caution.

Currently available TDI antibody tests alone are not sufficient to diagnose TDI-induced asthma. A more reliable way to diagnose TDI-induced asthma is for a qualified occupational health physician to examine workers with these symptoms to determine if there is a relationship between asthmatic symptoms and certain activities in the workplace. This method of diagnosis combines a careful examination of the individual’s work history, the results of a respiratory questionnaire, along with careful monitoring of the individual's lung function during routine work with TDI.

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