

INDOOR ALLERGEN SCREEN – Dust Mite, Cat, Dog, Cockroach, Rodent and Mold Using ELISA

Sensitivity to indoor allergens poses a worldwide health problem to large segments of the population, and is relevant from early childhood to adulthood. Across the United States the number of people with asthma and allergies has increased dramatically. Asthma is the most common chronic illness among children in the United States and one of the most common chronic illnesses for all ages. Asthma occurs as a result of repeated inflammation of the airways related, in part, to exposure to both indoor and outdoor allergens. Sources for these allergens include pets (cats, dogs), pests (dust mites, cockroaches, mice), and mold spores. Children with combined sensitization to dust mite, cockroach and cat allergens are at increased risk of having more severe asthma. Therefore, reducing repeated human exposure to indoor allergens is important in order to reduce the frequency and severity of asthmatic attacks and to reduce the chances of developing asthma in susceptible individuals.

Where are these indoor allergens found?

Dust mites are ubiquitous in nature and are found in virtually every household. Mites prefer warm, moist surroundings, and thrive in bedding and in floor dust when humidity is high. Cockroach allergens are widely distributed in homes and schools. About 20% of homes with no evidence of cockroach infestation have significant levels of cockroach allergen in settled dust. The level of cockroach allergen in school dust is of concern because it may constitute an important occupational risk to students, teachers and other school workers. Cat allergen is very sticky and can be found in high levels on walls and other surfaces within homes. Those who touch cats or visit households with cats easily carry cat allergen from home to home, office, school, etc. Carpeting, bedding, and upholstered furniture in the home serve as reservoirs for deposited dog allergen. Cat and dog allergen can remain airborne for long periods of time, in part because these allergens are associated to a significant extent with smaller particles of <5 micrometer. Fungal (mold) spores, which are a natural part of the outdoor environment, also contain allergens. Some exposure to these spores is normal, but for sensitized people, exposure both indoors and out can lead to symptoms.

Why are allergens named *Der p1*, *Der f1*, etc?

All plants and animals are assigned scientific (or “Latin”) genus and species names. By convention, allergens are designated by the first three letters of the genus name, followed by the first letter of the species name, and finally by a sequential number to separate the first allergen discovered for that species from the second allergen discovered, etc. For example, *Der p1* designates the first allergen discovered in *Dermatophagoides pteronyssinus*, which is the scientific name for the European dust mite. Allergen names are normally italicized.

Where are these allergens produced?

Dust mite allergens are proteins that come from the digestive tract of mites and are found at high levels in mite feces. A dust mite fecal pellet is the size of a pollen grain and contains allergens (protein) called *Der p1*, *Der f1* and Mite group 2. Cockroach allergens are produced in the gastrointestinal tract, saliva, feces and body parts of cockroach. As cockroaches die in a dwelling, their decomposing body parts become part of the environmental dust, which contains multiple allergens. One of the major cockroach allergens is *Bla g2*. The major cat allergen, *Fel d1*, is produced in cat sebaceous, salivary, and anal glands and is found on cat hair. Dog allergen, *Can f1*, is found in the dander (skin scales), pelt, hair and saliva, but not in the urine or feces of dogs. Mouse (*Mus m1*), and rat (*Rat n1*) allergens are present in the urine of these animals. Mold allergens are probably digestive enzymes present

in spores or released from spores as they germinate. Very few of the many thousands of possible mold allergens have been characterized. *Alt a1* is an allergen that is present in many *Alternaria* spores, as well as those of *Stemphylium* and other related genera. *Cl a h1* is one of the allergens present in the ubiquitous fungus *Cladosporium herbarum*. *Asp f1* is an allergen produced by the medically important fungus, *Aspergillus fumigatus* that causes infections in severely immunocompromised people.

How do I test for the indoor allergens?

Dust samples for indoor allergens can be collected using a dust cassette or by using a vacuum cleaner. Dust can be collected from carpets, upholstery, bedding, or anywhere else where allergens accumulate. In some cases, it is desirable to collect samples in multiple locations in order to determine relative allergen levels in order to identify problem areas. A filter or an 8 square inch piece of cotton cloth (such as bed sheet material) can be placed between the hose and the attachment of a vacuum cleaner to collect the dust. Approximately 150 mg (about a teaspoon) of dust must be collected. The dust sample should be placed in a Ziploc bag and sent to the laboratory for analysis.

How do I submit the samples?

Indoor allergen analysis, especially dust mite allergen analysis is time sensitive. Samples should arrive at EMLab P&K as quickly as possible from the time of sampling. Refrigerate samples prior to shipping to prevent deterioration of allergens in transit due to mites or mold growth. Ship samples using a cold pack or a cooler. Submit a Chain of Custody with your samples, authorizing us to analyze the samples and indicating which allergens you would like us to test for. A Chain of Custody can be downloaded at www.emlabpk.com.

How are the samples processed in the lab?

Upon receipt in our laboratory, samples are checked against the Chain of Custody, logged into our Labserve™ database and subjected to ELISA analysis. ELISA analyses are performed in batches, so turnaround time can vary slightly. The sample is processed according to EMLab P&K's standard protocols and controls. A portion of the dust sample received is weighed, extracted and then analyzed for dust mite, cockroach, cat, mouse, rat, and mold allergens. The analysis is an ELISA methodology that uses monoclonal antibodies.

How do I interpret the results?

Test results are expressed as micrograms (µg) or units (U) of allergen per gram (g) of dust. A level of 2.0µg of dust mite allergen per gram of dust is the generally recognized threshold for sensitization and symptom development among susceptible individuals. Cat allergen levels in the range of 1–8µg/g of *Fel d1* per gram of dust is considered to pose a significant risk for sensitization. Studies have shown that children exposed to *Bla g2* at a level of 0.08µg/g or higher developed skin sensitivity and children who were exposed to more than 0.2µg/g of *Bla g2* became sensitized. Sufficient evidence is not yet available for establishing threshold risk levels for dog, mouse, rat, or mold allergens. Detectable levels of dog, mouse or rat allergen may indicate unusual exposure. Mold allergens are ubiquitous both outdoors and indoors, and sensitivity levels have not yet been determined.

Where can I get more information?

For further information about indoor allergens and other microbiological testing needs, contact EMLab P&K at 866.888.6653.