Egg White and Milk Allergens

Prevalence of sensitization to specific food allergens varies depending on age and various environmental factors. It is currently estimated that prevalence of milk allergy in infants is 2 – 2.5% and egg hypersensitivity around 1 – 2%. Most children “outgrow” cow’s milk allergy by the third year of life, but 10 – 25% retain the sensitivity. Egg allergic children are also likely to develop tolerance by late childhood (3 - 5 years old) (Cianferoni and Spergel 2009). Gallus gallus domesticus (chicken) and Bos domesticus (cow) are the most common animals kept for food consumption worldwide.

Of the individuals suffering from food allergy, 31% of the children and 8% of the adults are allergic to egg (Frémont et al. 1997). Ovomucoid, Gal d 1, represents approx. 11% of the egg white protein content. This heat-stable trypsin inhibitor (Besler et al. 1999) is the immunodominant protein fraction in egg white, even though ovalbumin, Gal d 2, with approx. 54% is the most abundant egg white protein. Ovalbumin has been used most extensively in research as model allergen (Bernhisel-Broadbent et al. 1994). This heat-labile phosphoglycoprotein is an inactive member of the serine protease inhibitor superfamily (serpins) (Huber and Carroll 1999) and can be an additive in a number of vaccines. Ovotransferrin, Gal d 3, also known as conalbumin (12 - 13% of egg white), has a strong iron-binding capability and thus can be used as an antioxidant, antimicrobial or iron-supplementing agent, in food and particularly infant food (Tong et al. 2013).

Cow milk has a protein content of 3 - 3.5%, including caseins and whey proteins. Casein (Gal d 8) is heat- and digestion-stable and found in milk, cheese and dairy products. 63% of milk-allergic children show IgE binding to Gal d 8 in enzyme immunoassay (Bernard et al. 1998). Over 90% of the milk allergic patients show presence of Gal d 5 (β-lactoglobulin) specific IgE antibodies (Gjesing et al. 1986). Bovine serum albumin (Gal d 6) occurs as a minor allergen in cow’s milk (Werfel et al. 1997). Its main role is the transport, metabolism and distribution of ligands and the protection from free radicals (Farrell et al. 2004). More than 90% of cow milk allergic patients show IgE binding to this allergen (Gjesing et al. 1986). β-Lactoglobulin is resistant to acid hydrolysis, heat-labile and known as one of the best characterized lipid-binding proteins (Del Val et al. 1999). Lactoferrin (Gal d Lactoferrin) is, like Gal d 5 and 6, present in the whey fraction of milk and can be found in most species at levels below 1% (Schanbacher et al. 1993). Nevertheless, it is a major allergen of milk. This iron-binding glycoprotein of the transferrin family has antimicrobial activity and is therefore used as disinfectant substance in food industry (Taylor et al. 2004). Most milk-allergic patients are sensitized to several proteins with great variability regarding IgE response (Ward et al. 2002).

DIARECT’s non recombinant allergens are purified from either hen egg or cow milk.

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References:
- Besler et al. (1999) Int Arch Allergy Immunol. 115 (3): 235-44
- Frémont et al. (1997) Allergy: 52 (2): 224-228
- Tong et al. (2013) Int J Food Properties. 17 (2): 293-308
- Wel et al. (2002) Allergy Asthma Immunol. 89: 3-10

In some countries the use of certain antigens in diagnostic tests may be protected by patents. DIARECT is not responsible for the determination of these issues and suggests clarification prior to use.

Figure: Immunodot analysis of blood donors (BD 1 - 2) and allergy samples (PS 1 - 3) for IgE antibodies against individual purified milk allergens. Bos d 8, Bos d 5 and Bos d Lactoferrin were printed in quadruplicates on nitrocellulose membrane. Anti-IgE antibody (6) and human IgE (6) were printed as positive controls, HSA (6) and Buffer (8) as negative controls.

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