



# APPLE

Molecular Allergology



## Improved diagnostics in apple allergy

– distinguish between pollen-related and LTP-dependent fruit allergy

# Take the diagnosis and management of apple-allergic patients to a whole new level

## Distinguish between pollen related apple allergy and fruit allergy due to LTP sensitization

The cause of apple allergy shows regional differences; it may be due to LTP sensitization or to grass-pollen cross reactivity in Southern Europe while in Northern and central Europe birch pollen related apple allergy is more common.<sup>1,2</sup>

- Sensitization to Mal d 3 (an LTP protein) indicates a fruit allergy where peach is often the primary sensitizer.<sup>3,4</sup>
- The presence of IgE antibodies to profilin (e.g. Phl p 12) alone is indicative of a grass-pollen related apple allergy.<sup>5,6</sup>
- Sensitization to Mal d 1 (a PR-10 protein) is seen in birch-pollen allergic patients and is caused by cross-reactivity with the main birch allergen Bet v 1.<sup>4,7</sup>

## Improve the risk assessment using allergen components

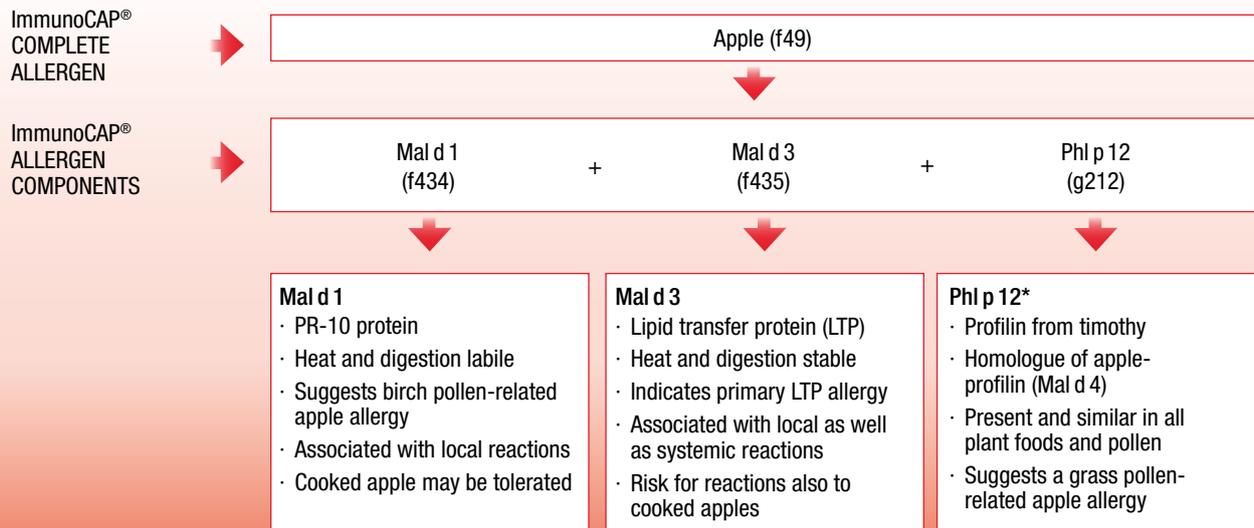
- Patients with IgE antibodies to Mal d 3 are at higher risk of developing systemic reactions.<sup>3</sup>
- Fruit allergic patients without concomitant pollinosis are at higher risk of systemic reactions.<sup>8,9</sup>
- IgE antibodies to Mal d 1 and/or profilin and not to Mal d 3 suggest that predominantly local oral symptoms may occur.<sup>2,3</sup>

## Improve management of apple allergic patients

- Apple allergic patients sensitized to Mal d 3 may tolerate peeled apples.<sup>10</sup>
- In patients sensitized to Mal d 3, other fruits and nuts should be considered as potential causes of allergic reactions (peach, apricot, cherry, hazelnut, walnut etc).<sup>4</sup>
- Apple allergic patients sensitized to Mal d 1 and/or profilin may often tolerate cooked apples.<sup>1</sup>



## Recommended test profile



### \*Profilins

Profilins are so similar across species, that any profilin may be used as a surrogate marker. If preferred profilin from birch (Bet v 2) or peach (Pru p 4) can be used instead.

## Did you know that?

### *Regional differences:*

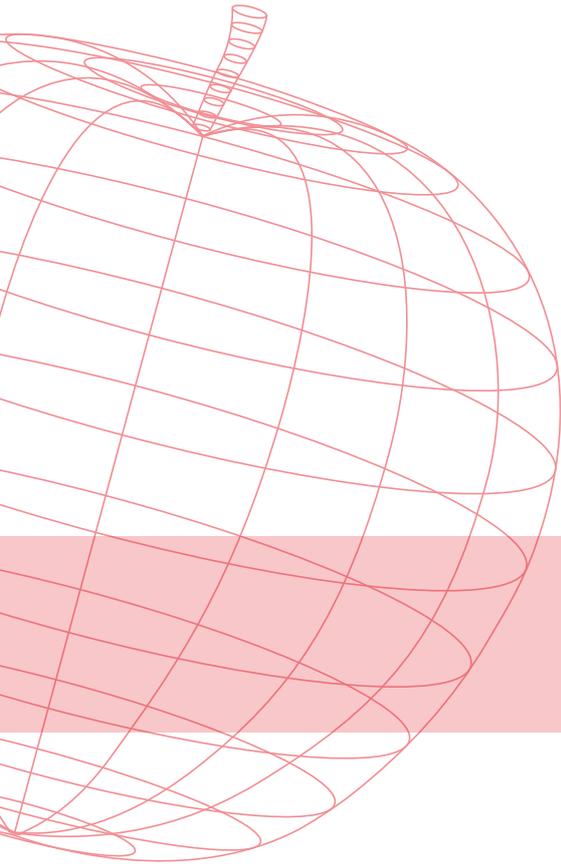
- The prevalence of pollen related apple allergy in Northern and Central Europe is approximately 2%. Up to 80% of birch allergic patients have concomitant plant food allergies, where apple and hazelnut allergies are the most common.<sup>11</sup>
- Fruit allergy driven by LTP-sensitization, common in Southern Europe, may lead to cross-reactivity with other fruits and nuts.<sup>12</sup>
- Fruit allergy in Southern and Central Europe may also be a consequence of grass pollen cross-reactivity caused by profilin sensitization.<sup>5,6</sup>

### *Symptoms and disease progression*

- Allergic reactions in patients with sensitization to LTP range from oral allergy syndrome to severe anaphylaxis. Over time, the patient may react more severely to the same food.<sup>8,9</sup>
- In pollen dependent food allergy the patient has initially suffered from pollinosis and later developed symptoms from eating plant derived foods such as apple.<sup>3,6</sup>

### *Apple and its allergens*

- LTP is localized predominantly in the fruit peel, but peeled fruit may also elicit reactions.<sup>13</sup>
- PR-10 proteins are found mainly in the fruit pulp. These proteins are sensitive to heat and digestion, hence symptoms are commonly restricted to oral itching and most patients tolerate cooked apple.<sup>11</sup>
- Different apple cultivars contain varying amounts of allergens.<sup>13</sup>



## Make a precise assessment

ImmunoCAP Allergen Components help you differentiate between "true" allergies and cross-reactivity

## Make a substantiated decision

A better differentiation helps you give relevant advice and define the optimal treatment

## Make a difference

More informed management helps you improve the patient's well-being and quality of life

**References:** 1. Schmidt Andersen M-B. et al. Identification of European allergy patterns to the allergen families PR-10, LTP and profilin from Rosaceae fruits. *Clinic Rev Allergy Immunol.* 2011; 41 (1):4–19. 2. Le TM et al. Anaphylactic versus mild reactions to hazelnut and apple in a birch-endemic area: Different sensitization profiles? *Int Arch Allergy Immunol.* 2012; 160 (1):56–62. 3. Fernandez-Rivas M. et al. Apple allergy across Europe: how allergen sensitization profiles determine the clinical expression of allergies to plant foods. *J Allergy Clin Immunol.* 2006 Aug; 118 (2): 481–8. 4. Asero R. Lipid transfer protein cross-reactivity assessed in vivo and in vitro in the office: pros and cons. *J Invest Allergol Clin Immunol.* 2011; 21 (2): 129–36. 5. van Ree R. et al. Pollen-related allergy to peach and apple: an important role for profilin. *J Allergy Clin Immunol.* 1995; 95 (3): 726–34. 6. Asero R. et al. Detection of clinical markers of sensitization to profilin in patients allergic to plant-derived foods. *J Allergy Clin Immunol.* 2003; 112 (2): 427–32. 7. Cudowska B. et al. Lipid transfer protein in diagnosis of birch-apple syndrome in children. *Immunobiology.* 2008; 213 (2): 89–96. 8. Fernandez-Rivas M. et al. Allergy to Rosaceae fruits without related pollinosis. *J Allergy Clin Immunol.* 1997; 100 (6 Pt 1): 728–33. 9. Fernandez-Rivas M. et al. Allergies to fruits and vegetables. *Pediatr Allergy Immunol.* 2008 Dec; 19 (8): 675–81. 10. Fernandez-Rivas M and Cuevas M. Peels of Rosaceae fruits have a higher allergenicity than pulps. *Clin Exp Allergy.* 1999; 29 (9): 1239–47. 11. Vieths S. et al. Current understanding of cross-reactivity of food allergens and pollen. *Ann NY Acad Sci.* 2002; 964: 47–68. 12. Rodriguez J. et al. Clinical cross-reactivity among foods of the Rosaceae family. *J Allergy Clin Immunol.* 2000; 106 (1 Part 1): 183–9. 13. Zuidmeer L and van Ree R. Lipid transfer protein allergy: primary food allergy or pollen/food syndrome in some cases. *Curr Opin Allergy Clin Immunol.* 2007 Jun; 7 (3): 269–73.

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