

Study of T cells in allergy and resolution

Area of research interest: [Food hypersensitivity](#)

Study duration: 2004-07-01

Planned completion: 1 January 2009

Project code: T07042

Conducted by: Cambridge University

Background

The immunological mechanisms that induce clinical allergy or resolution are not well established and need further investigation.

There are number important immune molecules involved in food allergy these include:

- food specific immunoglobulin (Ig) E antibodies in the development and persistence of clinical allergy
- T-helper 2 lymphocytes for the regulation of specific IgE
- T regulatory cells and interleukin (IL)10 in resolution of allergy

More information is needed on the role played by T-lymphocytes in the pathogenesis of food allergy, and their relevance for diagnosis and as predictors of severity and likely cross-reactivity.

There is also a need to determine what differences exist between the quantity and/or quality of allergen-specific T-lymphocyte responses in individuals who are sensitised to a particular food allergen and those who are not.

Research Approach

This longitudinal study followed 60 children (aged two to 15) with challenge-confirmed egg allergy for three years. Also included in the study were two control groups (sensitised but non-allergic and non sensitised non-egg allergic) of 20 children each.

Egg-allergic patients underwent repeated annual open oral egg challenges with well cooked egg. If their response was negative, uncooked (pasteurised) egg was introduced over time to confirm resolution or persistence of allergy.

Blood samples were taken and used to measure specific IgE as well as total and specific IgG.

T cell proliferation and T-helper cytokine production (IL-4/10 and interferon-gamma) were measured annually, using frozen peripheral blood mononuclear cell samples and employing flow cytometry and intracellular staining methods to demonstrate changes in children whose allergy resolves or persists.

Subjects from both control groups were tested at enrolment and again in the final year of the project.

Key findings of our results

The resolution of egg allergy is associated with a change in the cytokine-producing phenotype of egg allergen ovalbumin (OVA)-specific T cells from T-helper 2 (Th2) to T-helper 1 (Th1). This is accompanied by an increase in the production of OVA-specific IgG4 and a decrease in the production of egg-specific IgE.

- The resolution of egg allergy takes place over many years.
- Children outgrow allergy to well-cooked egg approximately twice as quickly as they outgrow allergy to uncooked egg.
- The data supports the initiation of home reintroduction of well-cooked egg for children aged two to three years who have had previous mild reactions and no asthma under the supervision of an allergy clinician.
- Resolution continued to occur in older children, so even if there is an earlier positive challenge, attempts at reintroduction should be continued.

The study has increased our understanding of the mechanisms underlying the resolution of food allergy in young children, characterising the humoral (antibody) and cellular mechanisms involved. This will help to stimulate greater understanding about the origins of sensitisation and clinical allergy.

This study has also characterised, for the first time, the different ways in which children resolve allergy to different kinds of egg (well-cooked versus uncooked egg). It has also influenced the advice provided in the national guidelines for the management of egg allergy published by the British Society for Allergy and Clinical Immunology.

Published Papers

1. Clark, A., Islam, S., King, Y., Deighton, J., Szun, S., Anagnostou, K. and Ewan, P. (2011), A longitudinal study of resolution of allergy to well-cooked and uncooked egg. *Clinical & Experimental Allergy*, 41: 706–712.
2. Tay, S.S., Clark, AT., Deighton, J., King, Y., Ewan, P.W. (2007) T cell proliferation and cytokine responses to ovalbumin and ovomucoid detected in children with and without egg allergy. *Clinical & Experimental Allergy*, 37: 1519-1527.
3. Tay, S.S., Clark, AT., Deighton, J., King, Y., Ewan, P.W. (2007) Patterns of immunoglobulin G responses to egg and peanuts are distinct: ovalbumin-specific immunoglobulin responses are ubiquitous, but peanut-specific immunoglobulin responses are up-regulated in peanut allergy. *Clinical and Experimental Allergy*, 37: 1512-1518.

Research report

England, Northern Ireland and Wales

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