# Reason why farm kids develop fewer allergies explained

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Scientists have discovered why growing up on a farm might protect children from developing allergies. Using studies in both mice and humans, they found that exposure to farm dust increases expression of a protective protein that suppresses the inflammatory immune system by modifying the communication between the lining of the lungs and the immune system. The findings are presented today at the Joint Congress of the British and Dutch Societies for Immunology, taking place in Liverpool, UK.

Rates of allergies are increasing in the UK and Europe, with approximately one in four people suffering from a seasonal allergy, such as hay fever or allergic asthma; however, the reasons behind this are unclear. We know that children growing up on farms have fewer allergies than their urban counterparts, but there has been little evidence to show how the farm environment might protect against allergy.

A team, including Martijn Schuijs, a PhD student at the VIB-UGent Inflammation Research Center in Belgium, carried out several experiments to look at this question. Firstly, mice were exposed to a low dose of either LPS (a component of the bacterial cell wall that is found in farm dust), farm dust, or a control substance every other day for two weeks. The mice were then sensitised with house dust mite extracts (HDM), which caused them to mount an allergic response when later confronted with a high dose of HDM. Mice exposed to farm dust or LPS showed significantly lower asthmatic responses to the HDM than controls. This protection appeared to be mediated by a protein called A20 which modifies communication between the cells lining the lungs and the immune system. The researchers found that exposure to LPS or farm dust induced A20 expression in mice, which suppresses the inflammatory immune response.

These findings were then validated in human cells, using cells from the lining of the airways in the lungs taken from patients with mild, severe, or

no asthma. The immune response to HDM was weakened in cells pre-exposed with LPS, compared to controls.

Finally, the researchers examined the relationship between common genetic mutations in the gene encoding A20 (called Tnfaip3), and prevalence of asthma in 1,707 European children aged 6-12 years. Children with a mutation that altered one amino acid in the A20 protein showed higher levels of asthma; however, growing up on farms had a protective effect on those with the mutation compared to those that had not been brought up on a farm.

Altogether, these results provide the first evidence of the biological mechanisms behind why children who grow up on farms develop fewer allergies. The researchers' next step is to understand the mechanism by which farm dust induces the expression of A20 in cells. They hope that this work can lead to the development of new asthma therapies by stimulating A20 production in cells lining the airways.

Researcher Martijn Schuijs, from the VIB-UGent Inflammation Research Center in Ghent, Belgium, said: "Rates of allergies are increasing but we know relatively little about the factors that predispose an individual to develop these conditions. Our study has shown a light on why kids who grow up on farms appear to develop fewer allergies. Breathing in dust from farms seems to stimulate the production of a protein called A20, which limits inflammation in the lungs leading to lower rates of asthma.

"While this is an exciting first step, we now need to carry more studies to find out the mechanisms behind this relationship and to see if some of the functional findings from the studies using mouse models translate to humans. By targeting the A20 protein in the cells that line the airways, we hope this will lead towards the development of more effective medication for people with allergic asthma."