

Giving mice a cold virus offers hope of new asthma treatments

January 27 2008

Scientists have been able to recreate rhinovirus infection, which is behind most common colds, in a small animal for the first time.

For fifty years since they were discovered, it had been thought that rhinoviruses could only infect humans and chimpanzees. But now a team of scientists led by Professor Sebastian Johnston at the MRC/Asthma UK Centre in Allergic Mechanisms of Asthma at Imperial College London, has been able to infect mice with rhinoviruses.

Rhinoviruses are an unwelcome inconvenience for the majority of the population as they cause around three quarters of common colds. However they can also have serious consequences. In susceptible people, they can be fatal. They can lead to the hospitalisation of infants, pneumonia in people with weakened immune systems and they trigger most asthma attacks. They are also the major cause of acute attacks of COPD (chronic bronchitis and emphysema), and are thus the major killer in these diseases.

Professor Johnston said: “Until now it has not been possible to study rhinovirus infection in small animals. This has been a major obstacle to developing new treatments and there is currently no effective treatment for rhinovirus infection.”

It had been thought that mice and other small animals were resistant to rhinoviruses. Of the 100 known strains of rhinovirus, 90 per cent use a binding molecule, called ICAM-1 that is found on the surface of human

cells, as their receptor. But the viruses are unable to bind to the mouse version of this receptor.

Professor Johnston explained: "We previously found that once inside the mouse cell a rhinovirus reproduces itself as well as it does in human cells. But the virus couldn't infect the mouse cell because the receptor (acting like a door key) couldn't get into the cell.

"Now we've modified the mouse receptor so it is more like a human one. This means the virus can infect the cells of these modified mice."

Professor Johnston added: "We found that mice with the modified receptor were susceptible to infection with a rhinovirus. If combined with an allergen (ovalbumin which is found in egg white) that could cause an allergic reaction in the lungs, the virus could make the response worse and lead to an 'asthma attack'."

The team was able to observe that when the virus was combined with an allergic reaction, the mouse responded similarly to humans. This means it provides a good model for the study of severe asthma attacks.

"These mouse models should provide a major boost to research efforts to develop new treatments for the common cold, as well as for more potentially fatal illnesses such as acute attacks of asthma and of COPD."

The research was funded by the Medical Research Council, Asthma UK and GlaxoSmithKline.

The chief executive of the Medical Research Council, Sir Leszek Borysiewicz said: "This important and fundamental discovery will enable us to understand the effects rhinoviruses and common colds have on our health. It will open up new paths to finding treatments which have been delayed for many years and provides us with the opportunities for

further breakthroughs in the future.”

Leanne Male, Assistant Director of Research at Asthma UK commented: "Ninety per cent of people with asthma tell us that colds and flu triggers their asthma symptoms but as yet there is no specific treatment for virally induced asthma attacks and steroid treatments are only partially effective against them. We welcome this latest advancement as it will lead to a greater understanding of viral infections and their link with asthma and may help the development of a suitable treatment for virus-induced asthma attacks, thus greatly improving the lives of the 5.2 million people with the condition in the UK."

Journal details: Mouse models of rhinovirus-induced disease and exacerbation of allergic airway inflammation. Published online in *Nature Medicine*.

Source: Imperial College London

Citation: Giving mice a cold virus offers hope of new asthma treatments (2008, January 27) retrieved 26 April 2024 from

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