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Imaging thin air can spot lung disease

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HOW do you investigate airflow inside a living lung? The problem is beyond conventional medical imaging techniques, which only show body fluids or solid tissue.

One idea, dreamed up 8 years ago, is to fill the patient's lungs with an isotope of helium and use a modified magnetic resonance imaging (MRI) scanner to trace the gas's movement. And at last, researchers at the Harvard-Smithsonian Centre for Astrophysics have built a cheap and simple device to do just this.

Conventional MRI machines detect water in the body. To generate the image, the spins of the hydrogen nuclei have to be lined up, by subjecting them to a strong magnetic field. A radio pulse then nudges them out of alignment, and when they fall back they emit radiation. Differences in the strength and frequency of the signal returned indicate different types of tissue. The lungs - being largely full of air - show up as black cavities.

Nuclei of helium-3 can also be used for magnetic resonance imaging. This would normally require a very strong superconducting magnetic field to align the nuclei, but by using a pulse of laser light to align the nuclei in the helium-3 before the patient breathes it in, the Harvard team were able to use a modified MRI scanner with a much weaker magnetic field.

Ron Walsworth, who is leading the development of the new imaging machines, built a scanner using simple copper coils to produce the magnetic field in place of the bulky and expensive superconducting magnets otherwise required. The team has submitted details of the project and their first images to the journal *Magnetic Resonance in Medicine*.

Eventually, the scanners could become vital tools in the diagnosis of lung disease such as asthma and emphysema.

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