**BBC**

**Breakthrough in delivering drugs to the brain**

By James Gallagher Health reporter, BBC News

A new way of delivering drugs to the brain has been developed by scientists at the University of Oxford.

They used the body's own transporters - exosomes - to deliver drugs in an experiment on mice.

The authors say the study, in [Nature Biotechnology](http://dx.doi.org/10.1038/nbt.1807), could be vital for treating diseases such as Alzheimer's, Parkinson's and Muscular Dystrophy.

The Alzheimer's Society said the study was "exciting" and could lead to more effective treatments.

Research barrier

One of the medical challenges with diseases of the brain is getting any treatment to cross the blood-brain barrier.

The barrier exists to protect the brain, preventing bacteria from crossing over from the blood, while letting oxygen through.

However, this has also produced problems for medicine, as drugs can also be blocked.

In this study the researchers used exosomes to cross that barrier.

Exosomes are like the body's own fleet of incredibly small vans, transporting materials between cells.

The team at Oxford harvested exosomes from mouse dentritic cells, part of the immune system, which naturally produce large numbers of exosomes.

They then fused the exosomes with targeting proteins from the rabies virus, which binds to acetylcholine receptors in brain cells, so the exosome would target the brain.

They filled the exosomes with a piece of genetic code, siRNA, and injected them back into the mice.

The siRNA was delivered to the brain cells and turned off a gene, BACE1, which is involved in Alzheimer's disease.

The authors reported a 60% reduction in the gene's activity.

"These are dramatic and exciting results" said the lead researcher Dr Matthew Wood.

"This is the first time this natural system has been exploited for drug delivery."

Customised

The research group believes that the method could modified to treat other conditions and other parts of the body.

Dr Wood said: "We are working on sending exosomes to muscle, but you can envisage targeting any tissue.

"It can also be made specific by changing the drug used."

The researchers are now going to test the treatment on mice with Alzheimer's disease to see if their condition changes.

The team expect to begin trials in human patients within five years.

Dr Susanne Sorensen, head of research at the Alzheimer's Society, said: "In this exciting study, researchers may have overcome a major barrier to the delivery of potential new drugs for many neurological diseases including Alzheimer's.

She said the blood-brain barrier had been an "enormous issue as many potential drugs have not been properly tested because you couldn't get enough of them into the brain."

She added: "If this delivery method proves safe in humans, then we may see more effective drugs being made available for people with Alzheimer's in the future."

Dr Simon Ridley, head of research at Alzheimer's Research UK, said: "This is innovative research, but at such an early stage it's still a long way from becoming a treatment for patients.

"Designing drugs that cross the blood brain barrier is a key goal of research that holds the promise of improving the effectiveness of Alzheimer's treatments in the future."

Exosomes may have other medical applications.

Alexander Seifalian, a professor of nanotechnology and regenerative medicine at University College London, told the BBC: "Experimental evidence indicates that exosomes can prime the immune system to recognize and destroy cancer cells, making them a potential tool as cancer vaccines."

He also said exosomes "could well form the cornerstone of nanoscale drug delivery systems of the future."

He added: "The apparent versatility and established biosafety of exosomes underscores the potential of these biological membrane vesicles to be of tremendous potential in the realm of nanotechnology and regenerative medicine."

**The Express**

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**Breakthrough in Britain's fight to beat** **Alzheimer's**  
  
**BYLINE:** Victoria Fletcher  
  
**SECTION:** EDITORIAL; Pg. 15

SCIENTISTS have overcome a key problem in treating common memory and brain disorders, which could herald a new generation of treatments.

A "dramatic and exciting" study has revealed a novel way to get medicines into the brain to treat conditions such as Alzheimer's, Parkinson's, motor neurone disease and muscular dystrophy.

Until now, it has been very difficult to get drugs into the brain because of an efficient filter known as the blood-brain barrier.

One of the only ways has been to inject medicines directly into the brain.

Now a team from Oxford University has discovered how to hide medicines from this filter by attaching them to tiny molecules, released by cells, called exosomes.

Scientists can send drugs into the brain to switch off a gene linked to Alzheimer's disease.

But they believe it may be a few more years before the technique is safe enough to test on humans.

Dr Matthew Wood, from the department of physiology, anatomy and genetics, who led the work, said: "These are dramatic and exciting results.

"It's the first time new biological medicines have been delivered effectively across the blood-brain barrier to the brain."

Exosomes are small capsules that are produced by most cells in the body.

They can break away from the cell and travel around the body, taking genetic material with them. They are thought to help cells to "talk" to each other.

Dr Wood added: "We've shown that a natural system could be exploited to deliver drugs.

"We believe we can use this same technology for Alzheimer's, motor neurone disease, Parkinson's and Huntington's.

"The next steps are to test the exosomes in a mouse model of Alzheimer's disease to see if it makes a difference to disease progression."

The trial showed that when the drug was attached to exosomes and injected into the blood system of mice, it crossed the bloodbrain barrier and ended up in the brain.

Once there, the type of drug delivered was able to switch off a gene linked to Alzheimer's.

This led to a 60 per cent drop in the brain of the problem enzyme linked to the gene.

Last night, a spokesman for the Alzheimer's Society said the discovery was "very exciting".

He said: "The blood-brain barrier protects the brain from harmful chemicals but also makes it difficult for drugs to reach the target cells.

If this delivery method proves safe in humans we may see more effective drugs being made available for people with Alzheimer's in the future.

"More research is now needed.

Dementia research is desperately underfunded.

"To make the breakthroughs we need, we must invest now."

The Oxford University study, partly funded by the Muscular Dystrophy Campaign, is published in Nature Biotechnology.

**The Mirror**

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3 Star Edition

GENE GENIUS;   
HOPE FOR ALZHEIMER'S AND MND AS DRUGS DELIVERED STRAIGHT TO BRAIN  
  
**BYLINE:** DANNY BUCKLAND  
  
**SECTION:** NEWS; Pg. 18  
  
**LENGTH:** 197 words

SCIENTISTS have successfully switched off a gene thought to cause Alzheimer's by using a new way to deliver drugs directly to the brain.

A team of University of Oxford researchers exploited tiny particles called exosomes, which are released by cells, to administer drugs into the brains of mice.

The exosomes are injected into the blood and are able to carry the drugs past the blood-brain barrier.

In the past, efforts to treat Alzhe-imer's have been hampered by the difficulty of getting drugs past this barrier to the brain.

Scientists hope this target mechanism could be used to administer drugs for brain diseases such as Parkinson's, motor neurone disease and muscular dystrophy.

But they warned it will be some time before they can carry out tests on humans.

Lead scientist Dr Matthew Wood said: "These are dramatic and exciting results.

"It's the first time new 'biological' medicines have been delivered effectively across the blood-brain barrier to the brain."

Dr Susanne Sorensen, of the Alzheimer's Society, welcomed the findings but said more research was needed.

She added: "If this is safe, then we may see more effective drugs being made available for people with Alzheimer's.

**The Sun (England)**

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SCIENTISTS have found a way to deliver Alzheimer's drugs directly to the brain - boosting hopes of better treatment.

An Oxford University team switched off a gene implicated in the disease using particles released by cells called exosomes.

If injected into the blood, exosomes can carry a drug to the brain across the usually impermeable blood-brain barrier.

The results were "significant" in mice but must still be tested on humans.

**TELEGRAPH**

**Alzheimer's hope after new drug discovery**

## Scientists have found a new way to deliver Alzheimer's drugs directly to the brain, sparking hopes that more effective treatment could be made available to sufferers.

Efforts to treat the disease have been hampered over the last 50 years by the difficulty of administering drugs to the brain to slow or halt its progression.

But a team of University of Oxford researchers has successfully switched off a gene linked to Alzheimer's in the brains of mice by exploiting tiny particles naturally released by cells, called exosomes.

The exosomes, injected into the blood, are able to carry a drug across the normally impermeable blood-brain barrier to the brain where it is needed.

It is hoped that the method, if successfully tested in humans, could resolve the difficulty in administering potential new drugs for many neurological diseases including Parkinson's, motor neurone disease and muscular dystrophy.

But the researchers cautioned that although the results were significant and promising, a number of steps must be taken before this form of drug delivery can be tested in humas.

Lead scientist Dr Matthew Wood of Oxford's Department of Physiology, Anatomy and Genetics said: ''These are dramatic and exciting results.

It's the first time new 'biological' medicines have been delivered effectively across the blood-brain-barrier to the brain.

''This is the first time this natural system has been exploited for drug delivery.''

Over the years, many drugs have been developed to target specific parts of the disease pathways.

But while these have shown good results in the lab, getting them to the right part of the body to see any effect in humans has often proved problematic.

Delivering any such type of therapy to the brain would currently have to involve neurosurgery and nothing administered intravenously would be able to cross from the blood into the brain.

''The major barrier for these drugs is delivery,'' Dr Wood said. ''This problem becomes even greater when you want to reach the brain.

The blood-brain barrier - which stops most things in the blood stream from crossing to our brains - is much too great an obstacle.

''We've shown that a natural system could be exploited to deliver drugs across the blood-brain barrier.

We believe we can use this same technology for Alzheimer's, motor neurone disease, Parkinson's and Huntington's.''

But safety tests would be needed before the exosomes could be tested in humans, he said.

The Alzheimer's Society welcomed the findings but said more research was needed to see if the method would be effective for Alzheimer's sufferers.

Dr Susanne Sorensen, head of research at the charity, said: ''In this exciting study, researchers may have overcome a major barrier to the delivery of potential new drugs for many neurological diseases including Alzheimer's.

''The blood-brain barrier protects the brain from harmful chemicals but also makes it difficult for drugs to reach the target cells.

If this delivery method proves safe in humans, then we may see more effective drugs being made available for people with Alzheimer's in the future.''

:: The study, partly funded by the Muscular Dystrophy Campaign, is published in Nature Biotechnology.

# MAIL ONLINE

# Alzheimer's breakthrough as scientists find out how to deliver drugs directly to the brain

# By [David Derbyshire](http://www.dailymail.co.uk/home/search.html?s=y&authornamef=David+Derbyshire)

**The technique overcomes the blood-brain barrier that protects the brain from harmful chemicals but also stops drugs reaching target cells**

Scientists have found a new way to deliver drugs directly to the brain, raising hopes of more effective treatments for Alzheimer’s disease sufferers.

A team from University of Oxford successfully switched off a gene implicated in Alzheimer’s disease in the brains of mice by exploiting tiny particles naturally released by cells, called exosomes.

The exosomes, injected into the blood, act as 'drugs vehicles' - crossing the normally impermeable blood-brain barrier to the brain where they are needed.

This barrier is a natural defence against potentially harmful chemicals floating around the body but has also stopped useful drugs reaching the brain as well.

The scientists say the research, published in the journal Nature Biotechnology, is still at an early stage - and is many years from being tested in people.

But it could also make it easier to treat Parkinson’s disease, motor neurone disease and muscular dystrophy.

Lead scientist Dr Matthew Wood said: 'These are dramatic and exciting results.

'It’s the first time new ‘biological’ medicines have been delivered effectively across the blood-brain-barrier to the brain.

'This is the first time this natural system has been exploited for drug delivery.'

Over the years, many drugs have been developed to target specific parts of the disease pathways.

But while these have shown good results in the lab, getting them to the right part of the body has often proved problematic.

The major barrier for these drugs is delivery,' said Dr Wood said.

'This problem becomes even greater when you want to reach the brain.

The blood-brain barrier - which stops most things in the blood stream from crossing to our brains - is much too great an obstacle.

'We’ve shown that a natural system could be exploited to deliver drugs across the blood-brain barrier.

We believe we can use this same technology for Alzheimer’s, motor neurone disease, Parkinson’s and Huntington’s.'

Safety tests would be needed before the technique could be used on people, he added.

The Alzheimer’s Society welcomed the findings but said more research was needed to see if the method would be effective.

Dr Susanne Sorensen, head of research at the charity, said: 'In this exciting study, researchers may have overcome a major barrier to the delivery of potential new drugs for many neurological diseases including Alzheimer’s.

'The blood-brain barrier protects the brain from harmful chemicals but also makes it difficult for drugs to reach the target cells.

If this delivery method proves safe in humans, then we may see more effective drugs being made available for people with Alzheimer’s in the future.'

The study is published in Nature Biotechnology.