

Drugs in disguise heal the brain

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Credit: Aalborg University

The treatment of brain diseases is on the verge of a breakthrough. Researchers from Aalborg University are developing a new method that 'smuggles' medicine past the brain's defense systems, giving hope that diseases such as Alzheimer's can one day be cured.

Today, diseases such as Alzheimer's, Huntington's, epilepsy and Parkinson's are not curable; we can only treat the symptoms. This is due

to the fact that [brain](#) cells – unlike all the body's other organs – are enclosed in an advanced defense system that keeps medicine out.

By using a new method to 'sneak' biological medicine into [brain cells](#), AAU researchers hope that within a few years they will be able to cure a wide range of neurological diseases that we cannot treat today because medicine cannot penetrate the blood-brain barrier.

There is still some way to go before the method can be used in humans, but there are already positive results, and when it succeeds it will be a major breakthrough for medical science.

Ferry to the brain

In order to be able to penetrate the blood-brain barrier and enter the brain cells, brain researcher Torben Moos, along with a team of researchers at AAU, has developed a method he calls the 'ferry to brain'.

Simply put, the method involves making a transport system that can carry drugs through the barrier by packaging them into things that normally slip through. If the [drug](#) is stored under a shell that resembles an amino acid or protein, it is closed in. When the shell passes through the barrier, the drug will be released so that it can work directly on the brain cells.

"We're attempting to develop systems that make the brain unable to tell the difference between what we send in and what it otherwise would have gotten," says brain researcher Torben Moos, Professor in the Department of Health Science and Technology at Aalborg University.

"The goal is to make a kind of universal transport system that can always penetrate the barrier and that can be used to send different types of drugs into the brain."

The brain has its own defenses

"In order to maintain the special environment around the brain cells, there is an additional barrier between the brain and the rest of the body. This protects the brain and lets only those things penetrate that it needs," explains brain researcher Torben Moos, Professor in the Department of Health Science and Technology at Aalborg University.

"You can compare it to sitting in closed room while things float by outside. If something passes by that the brain would like to have, it can open the door and stick out a hand to grab it, but otherwise it doesn't open the door. That is how the brain communicates with its surroundings in the bloodstream," says Torben Moos.

The blood-brain barrier is vital for the brain to function properly, but if we are to treat diseased areas of the brain with medicine, it is a serious obstacle that many types of drugs cannot get past.

Results give hope

Drug treatment can broadly be divided into two different groups: Synthetic molecules that you ingest in pill form – or biological drugs which can be proteins or nucleic acids that affect the genetic development of the body's cells.

A biological drug could get a cell to stop producing a disease-causing protein or shut down a cell that produces mutated proteins that can, for example, cause hereditary diseases.

Until now we have not been able to use biological drugs to treat [neurological diseases](#) – because they cannot get past the [blood-brain barrier](#). But the method from AAU is showing positive results and

creates hope for the future.

"We have become very adept at getting through the [barrier](#) and entering the brain's blood vessels, but we still need to refine the way medicine progresses further into the brain [cells](#). You could say that we are halfway to the goal," says Professor Torben Moos.

Provided by Aalborg University

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