Targeted delivery into brain capillary endothelial cells for the treatment of Alzheimer disease

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Principal Investigators

Calon, Frédéric

Institution

Université Laval

Contact information of lead PI
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Canada

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Research Abstract
One third of Canadians will be affected by a brain disease during his or her lifetime. While the population is getting older, the risk of suffering from Alzheimer, stroke, Parkinson, etc. increases exponentially after age 65. Most people do not realize that the socioeconomic burden of brain diseases dwarf those of cancer and cardiovascular disease combined. Unfortunately, the research and development of new drugs for brain diseases lag behind. The main problem resides in the fact that the blood-brain barrier (BBB) severely restricts the passage of drugs from

the blood to the brain. The vast majority of advanced drugs are too large to pass through the BBB and virtually all strategies developed so far to cross the BBB without damaging it have failed in humans. Indeed, the brain is like a walled city, in which the BBB represents the walls. The total length of the BBB of a normal human brain spans approximately 600 km. We think that instead of forcing our way through the wall, we could use it as a target. Since the BBB plays a role in most brain diseases, targeting the BBB may exert a therapeutic effect deep into every corner of the brain. Moreover, the BBB itself can be used as a launching base from which drugs can be secreted into the rest of the brain. More specifically, we are proposing to use fatty nanocontainers (called liposomes) that use natural transport systems located in the BBB, the equivalent of the guarded gates in the walled city analogy. Drugs or gene medicine will be encapsulated into these liposomes, which will then be ferried inside cells of the BBB using specific vectors after a simple intravenous injection. This tactic is reminiscent of the Trojan horse strategy because the liposomes are built to trick the brain's screening system (or city guards). Therefore, the present study could lead to the development of a universal brain drug delivery system for clinical applications for brain diseases such as Alzheimer's disease.

Further information available at:

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