AARHUS UNIVERSITY

# Press release

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## Basic information

Name: Luca Bordoni Email: luca.bordoni@biomed.au.dk Phone: +45 91849904

Department of: Biomedicine

Main supervisor: Sebastian Frische

Title of dissertation: The Brain Microvasculature during Cranial Hypertension: Effect of AQP4 on Capillary Flow Heterogeneity

Date for defence: 19-06-2019 at (time of day): 15:00 Place: Lille Anatomisk Auditorium (1231-424)

Press release (Danish)

Hjerneødem er en frygtet komplikation ved en række sygdomme og skader. Ødemet medfører, at trykket i kraniet stiger, hvilket fører til nedsat blodforsyning, hjerneskader og i værste fald død. Da hjerneødem kan opstå på mange måder, findes der ikke medicin, som effektivt kan modvirke det. I dag foregår behandlingen derfor overvejende via regulering af kroppens væske og saltbalance samt eventuelt kirurgiske indgreb. Formålet med forskningsprojektet var at undersøge, hvordan og hvornår blodflowet i de mindste blodkar, kapillærerne, i hjernen påvirkes under udvikling af hjerneødem. Blodflowet i kapillærerne er helt afgørende for, at hjernevævet forsynes med ilt og næring, og det er derfor vigtigt at vide, hvornår trykket i kraniet er så stort, at dette flow påvirkes. Mens et eksperimentelt fremkaldt hjerneødem udviklede sig, blev blodflowet i hjernekapillærerne målt ved hjælp af in-vivo mikroskopi i flere musestammer, herunder i mus uden vandkanalen AQP4, som er blevet foreslået som et mål for medicin til modvirkning af hjerneødem. Resultaterne viste tydeligt, at blodflowet i kapillærerne blev påvirket meget tidligt under udvikling af hjerneødem, og at bevarelse af kapillærblodflowet bør være et mål i fremtidig udvikling af ny medicin til at undgå hjerneskader efter hjerneødem.

The project was carried out by Luca Bordoni, who is defending his dissertation on 19th of June 2019, 15:00 - 17:00.

Forsvaret er offentligt of finder sted i Lille Anatomisk Auditorium (1231-424), bygning 1231 i Universitetparken, Aarhus Universitet, Vilhelm Meyers Alle 3, Aarhus.
Yderligere information: PhD studerende Luca Bordoni, email: luca.bordoni@biomed.au.dk, Telefon: +45 91849904.

Bedømmelsesudvalg:
Marco Capogna, Professor (chair of the committee, Aarhus University, Department of Biomedicine)
Maiken Nedergaard, Professor (Center for Translational Neuromedicine, University of Copenhagen)
Jerome Badaut, Research Director (Institut de Neurosciences Cognitives et Integratives d'Aquitaine Universite de Bordeaux).

Press release (English)

Capillary flow is impaired during the formation of brain edema

Edema and cerebral swelling is a feared complication of neurotrauma that causes a pressure build-up inside the cranium vault. Brain edema can produce permanent disabilities and even death. The complexity of edema formation (which we still struggle to understand completely) prevented the discovery of an effective drug to stop brain swelling.

This project was conducted to study how brain capillaries are damaged during the cerebral swelling process. The integrity of the brain microvessels network is crucial for the survival of neuronal cells. We hypothesized that clinically undetected dysregulation in capillary flow can manifest before cranial pressure raises to severe levels. The study was conducted using microsurgical techniques on rodents in combination with advanced scanning platform to image blood vessels in the brain. We observed a dysregulation of capillary circulation in the early phases of edema and in a range of mild cranial hypertension. In addition, the genetic removal of aquaporin-4, a long known but elusive target for treatment of brain edema, delayed the appearance of capillary damages. Our results strongly suggest that capillary circulation must be sustained during the earliest phase of edema formation in order to improve oxygen delivery, reduce swelling and delay the appearance of permanent brain damages. Early capillary dysregulations might be a novel and crucial etiological factor of cerebral edema.
The project was carried out by Luca Bordoni, who is defending his dissertation on 19th of June 2019.

The defense is public and takes place on 19-06-2019 at 15:00, in Lille Anatomisk Auditorium (1231-424), building 1231 in Universitetparken, Aarhus University, Wilhelm Meyers Alle 3, Aarhus. The title of the project is “The Brain Microvasculature during Cranial Hypertension: Effect of AQP4 on Capillary Flow Heterogeneity”. For more information, please contact PhD student Luca Bordoni, email: luca.bordoni@biomed.au.dk, Phone: +45 91849904

Assessment committee:
Marco Capogna, Professor (chair of the committee, Aarhus University, Department of Biomedicine);
Maiken Nedergaard, Professor (Center for Translational Neuromedicine, University of Copenhagen);
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