AARHUS UNIVERSITY

Press release

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Basic information

Name: Hang Nguyen Nielsen Email: hnni@biomed.au.dk Phone: +45 8716 7282

Department of: Biomedicine

Main supervisor: Bente Vilsen

Title of dissertation: Mutational studies of the mechanisms of ion binding and PKA regulation of the Na,K-pump

Date for defence: 31.05.2018 at (time of day): 13.30 Place: in Auditorium A, Building 1162-013, Aarhus University, Denmark

Press release (Danish)

Mutationsstudier af mekanismen for ion binding og PKA regulering af Na,K-pumpen.

Na,K-pumpen er et membranbundet protein, som findes i alle dyreceller, hvor den skaber elektrokemiske gradienter ved transport af 3 Na-ioner ud af cellen og 2 K-ioner ind for hvert ATP, der spaltes som energikilde. Na-bindingssted III er selektivt for Na-ioner, hvorimod Na-bindingsstederne I og II er overlappende med de to K-bindingssteder. Et nyt ph.d.-projekt fra Aarhus Universitet, Health, bidrager til en dybere forståelse af struktur-funktions forhold i Na,K-pumpen ved hjælp af mutationsstudier med fokus på Na-bindingssted III. Projektet er gennemført af cand.scient. Hang Nguyen Nielsen, der forsvarer det d. 31/05 2018

Det første arbejde i afhandlingen viser, at aminosyren glutamin-925 (Gln925) i Na-bindingssted III er mere vigtigt for Na-bindingen fra ekstracellulærsiden sammenlignet med intracellulærsiden, samt at Gln925 er vigtig for binding af K-ioner, hvilket var højst uventet, givet at Gln925 er lokaliseret i det Na- specifikke bindingssted III. Dette forklares ved deltagelsen af Gln925 i et omfattende netværk af hydrogenbindinger, der inddrager K-bindingssted I. Det andet arbejde fokuserer på en serin-777 strategisk lokaliseret mellem Na-bindingsstederne I og III. Mutationsanalysen i arbejdet giver holdepunkter for den hypotese, at Na-bindingssted III besættes først og I og II sidst, når Na binder, og kaster derved nyt lys over bindingsrækkefølgen. Det tredje arbejde omhandler den molekylære mekanisme for protein kinase A regulering af Na,K-pumpen ved fosforylering af serin-938. Også her er Na-bindingssted III involveret.

Forsvaret af ph.d.-projektet er offentligt og finder sted den 31/05-2018 kl. 13.30 i auditorium A, Bygn. 1162-013, Aarhus Universitet, Ole Worms Allé 4 , 8000 Aarhus C. Titlen på projektet er ”Mutational studies of the mechanisms of ion binding and PKA regulation of the Na,K-pump”.
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Press release (English)

Mutational studies of the mechanisms of ion binding and PKA regulation of the Na,K-pump.

The Na,K-pump is a plasma membrane protein existing in all animal cells, where it creates electrochemical gradients by transporting 3Na-ions out of the cell in exchange for 2K-ions for each ATP hydrolyzed as energy source. The Na-binding site III is selective for Na-ions, whereas the Na-binding sites I and II overlap with the two K-binding sites. The research uses site-directed mutagenesis to provide a deeper understanding of the structure-function relationship of the Na,K-pump with specific focus on Na-binding site III. The project was carried out by M.Sc. Hang Nguyen Nielsen, who is defending her dissertation on 31/05 2018.

The first paper of the dissertation shows that amino acid residue glutamine-925 (Gln925) in Na-binding site III is more important for Na-binding from the extracellular side as compared with the intracellular side, and that Gln925 is critical for the binding of K-ions, as well, which was unexpected, because Gln925 is assigned to the Na-specific binding site. The explanation is that Gln925 participates in an extensive network of hydrogen bonds also involving K-binding site I. The focus of the second paper is serine-777, which is stratetically located between the Na-binding sites I and III. The mutational analysis provides evidence that Na-binding site III is occupied first, and sites I and II last, during the Na-binding process, thereby providing essential information about the binding mechanism. The third paper deals with the molecular mechanism of protein kinase A regulation of the Na,K-pump by phosphorylation of serine-938. This mechanism, as well, involves Na-binding site III.

The defence is public and takes place on 31/05-2018 at 1.30 pm in auditorium A, Building 1162-013, Aarhus University, Ole Worms Allé 4, 8000 Aarhus C. The title of the project is ”Mutational studies of the mechanisms of ion binding and PKA regulation of the Na,K-pump”.
For more information, please contact
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