

Using the Patchliner to investigate Duchenne Muscular Dystrophy

Tools:
Patchliner

Dr. Alessandro Cerchiara
featured by Nanion Technologies



Alessandro Giovanni Cerchiara is a young PhD settled in Bari. In February 2024, he completed his PhD studies in Pharmaceutical Sciences in the laboratories of Pharmacology headed by Professor Annamaria De Luca, under the supervision of Professors Ornella Cappellari and Paola Imbrici for the training in organoids/myogenesis and electrophysiology, respectively.

Introduction

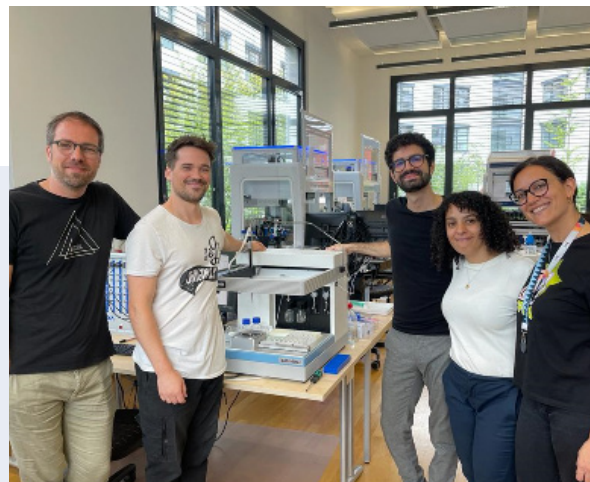
As a member of the team of Pharmacology, coordinated by Professor Annamaria De Luca, at the Department of Pharmacy – Drug Sciences of the University of Bari Aldo Moro, I had the unique opportunity to visit Nanion as a PhD student to increase my expertise in electrophysiology. The company kindly welcomed me, and it became for me like a home away from home. Thanks to the Nanion team, I learned in detail the automated patch clamp technique (i.e. Patchliner) and I deepened my knowledge in ion channels, pharmacology and electrophysiology. Each member of Nanion's family supported me during my experiments and exchanging ideas with them was a great opportunity to better understand electrophysiology and automated patch clamp. The Patchliner is a great instrument which allowed me to accelerate the part of my PhD project regarding ion channels role in skeletal muscle myogenesis, also thanks to its user-friendly commands and software. Furthermore, it was easy to set customized protocols before starting an experiment and changing parameters on-the-fly. My visiting period at Nanion and with the Patchliner grew my passion in ion channels and patch clamp even more. It was an experience that I won't easily forget!

Alessandro in the lab

Alessandro spent 3 months at Nanion's headquarters in Munich working with the Patchliner and was welcomed to the lab by the Nanion team: Tom, Martin, Nouran and Maria Giustina.

Can you give us a brief summary of your PhD?

"The long-term interests of the group where I did my PhD are neuromuscular disorders, with a main focus on Duchenne Muscular Dystrophy (DMD), an inherited genetic condition with severe and progressive development. Ion channel pharmacology for rare channelopathies is another field of interest. The research activity is mainly dedicated to exploring the pathogenic mechanisms at the basis of these disorders, as well as to the preclinical evaluation of potentially effective treatment options in these incurable disorders. These goals are pursued via the use of *in vitro* cellular models, 3D organoids and animal models, by means of several techniques for the multidisciplinary evaluation of functional, structural, and molecular parameters relevant to the pathology, with specific expertise in electrophysiology (e.g. current and voltage clamp). During my PhD, I was directly responsible for muscle precursor cell cultures and electrophysiological studies for developing functional 3D muscle organoids. Specifically, I used the patch clamp technique for biophysical and pharmacological characterization of ion currents in wild-type and dystrophic myocytes both of murine and human origin. Furthermore, since dystrophin (lacking in dystrophic settings) indirectly interacts with ion channels, their role could be important for the development and differentiation (myogenesis) of mature muscles. Ion channels are, in fact, pivotal for maintaining the resting membrane potential, priming excitation-contraction



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Dr. Alessandro Cerchiara, University of Bari

coupling, and regulating calcium homeostasis. Also, maturation of myofibers during myogenesis likely relies on ion channel function and expression changes to reach the full state of differentiation. Thus, it is possible to better understand the relationship between the involvement of ion channels and myogenesis both in wild-type and dystrophic settings by using patch clamp techniques. Moreover, muscle specific ion channels can represent useful biomarkers to monitor the myofiber differentiation state, also of the muscle organoid, and they could also be appealing drug targets.”

What brought you to Nanion?

“Since our laboratory has long-term expertise in the biophysical and pharmacological characterization of different ion channels in various primary and secondary rare channelopathies, it was important to acquire a tool for reproducible and efficient electrophysiological characterization and screening of different drugs to speed up preclinical research. So, in the frame of an ongoing collaboration with Nanion, the company hosted me as a visiting PhD student for three months to have an insight and learn advanced electrophysiology techniques, such as automated patch clamp. Moreover, the experience at Nanion was useful to implement the automated patch-clamp technology in Professor De Luca's laboratory.”

What was your project at Nanion?

“At Nanion, I used the Patchliner for two main purposes related to my PhD project: assess the Na_v channel isoform selectivity of mexiletine-like compounds, a long-term interest in the laboratory in Bari, and to perform – for the first time with an automated patch clamp platform - an electrophysiological characterization of human-derived skeletal muscle cells.”

What was your best moment during your time at Nanion?

“Now, it is difficult to pick up just one best moment at Nanion, since I really enjoyed every moment, from the experiment-related moments to the lunch breaks. The “Patchliner team” helped me to better understand the instrument from the electrophysiology part to the user-friendly software they developed; I was supported by each member of the team, when I was doubtful about some experiments: each one of them taught me really a lot about automated patch clamp, data analysis and more. Moreover, I really enjoyed - other than exchanging ideas about experiments and automated patch clamp – having lunch together both in the Nanion building and the nearby restaurants. For me, Nanion team members were not only hard-working colleagues, but also kind friends. In addition, Nanion made me grow even more my passion and knowledge for electrophysiology and I really owe them a lot. By using the Patchliner, I rapidly advanced my PhD project and especially with the pharmacological characterization of mexiletine-derived compounds on different Na_v channel types of interest for therapeutic and/or side effects. Furthermore, for the first time, I successfully recorded ion currents from myocytes, confirming the Patchliner as an outstanding tool for academic research.”



Alessandro and the team enjoying a well-earned break.

Alessandro enjoyed his time at Nanion, not only from a scientific perspective but also from a personal perspective, enjoying lunches out with the Nanion team at local restaurants. Here enjoying lunch with Maria Giustina, Rasmus, Kefan, Nouran, Marta, Tom and Martin.