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OBITUARY

Alexander Georgievich Petrenko (1959–2021)

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Alexander Georgievich Petrenko, a talented, creative biochemist, well known for his key contributions to the wider field of receptor biology, passed away on 2 May 2021, shortly after contracting COVID-19. His loss will be deeply felt by the adhesion G protein-coupled receptor (GPCR) and receptor tyrosine kinase (RTK) research communities that benefited so much from his work over the past four decades, and from their exciting personal interactions with him. As his friends and fellow GPCR researchers, we have written a tribute to Sasha, focused principally on his science career.

Alexander 'Sasha' Petrenko, BSc, MSc, PhD, DSc (Adhesion GPCR Workshop, Würzburg, 2012. Photo: Tobias Langenhan).

Alexander 'Sasha' Petrenko was born in 1959 in the industrial city of Zaporozhye, Ukraine. His parents centred their lives around their only son and passed onto him not only all their love but also all their wisdom. Sasha dearly loved and remembered them throughout his life, often citing their advice in difficult life situations. True to his upbringing as a 'wunderkind' (wonderchild), Sasha was a very assiduous and ambitious pupil at the secondary school and finished it 2 years earlier than his peers. He was readily accepted to a Lomonosov Moscow State University (LMSU) preparatory school for gifted children and eventually joined the Faculty of Chemistry of the LMSU in 1975. Sasha was an excellent student and graduated from the University in 1980 with Summa Cum Laude (the highest distinction) BSc and MSc degrees in Chemistry.

He then carried out his PhD project at the Shemyakin-Ovchinnikov Institute of Bioorganic Chemistry (IBC) of the USSR Academy of Sciences in Moscow, which at the time was one of the best molecular research institutions in the country. His project focused on probing the voltage-gated Na^+ channels with tetrodotoxin, and Sasha came close to isolating the Na^+ channels from rat brain membranes.

After completing his PhD, Sasha continued working in the IBC until 1990. During this time, he organised an interdivisional group of young researchers with the purpose of isolating and sequencing the neuronal receptor of latrotoxin (LTX), a neurotoxin from Black Widow spider venom. LTX induces massive neurotransmitter release from nerve terminals and is widely used as an invaluable tool to study the molecular mechanisms underlying synaptic communication. Based on the preceding studies of one of the authors (Yuri Ushkaryov), the group's extensive efforts led to the isolation of the first LTX receptor [1].

In 1990, Thomas Südhof invited Sasha and Yuri to visit his laboratory at the Howard Hughes Medical

Institute, University of Texas Southwestern Medical Center in Dallas, Texas. This was the time of the final throes of the Soviet Union, but getting permission to travel abroad, especially to the West, was still very difficult. During their short visit, initially only meant to help establish collaboration, they started screening a rat cDNA library using peptide sequences from the LTX receptor obtained in Moscow, and within two weeks, they isolated the first cDNA clones of the receptor. This turned out to be a novel neuronal protein, which was then termed neurexin [2] and has since earned critical acclaim as one of the main pillars that define synapse architecture. Sasha stayed in the Südhof laboratory for three years, continuing research into the structure and functions of neurexins.

In 1993, Sasha was recruited to join the Department of Pharmacology, New York University Medical Center, New York, USA, as an Assistant Professor. There, he expanded his investigation of LTX receptors. In 1996, his group isolated and sequenced another LTX receptor, a GPCR. Sasha called this protein Ca^{2+}-Independent Receptor of Latrotoxin (CIRL) [3], which was also independently described as latrophilin by the Ushkaryov laboratory. Subsequently, Sasha's laboratory made a number of critical observations on the biochemistry and physiology of CIRLs and was the first to discover the GPCR Proteolysis Site (GPS), a central feature of the adhesion GPCRs [4]. During the last decade, adhesion GPCRs have developed into an important research field for immunologists, neuroscientists, pharmacologists and cancer biologists alike, not least due to Sasha's superb scientific contributions and work for the Adhesion GPCR Consortium [5].

In 2003, Sasha returned to the IBC in Moscow, where he organised and headed the Laboratory of Receptor Cell Biology. Here, he was awarded an honorary title of Doctor of Science (DSc) for his research on the LTX receptors. However, unexpectedly, Sasha soon changed the direction of his research and moved into the area of RTK. While he and his laboratory continued their pioneering work on CIRL, they discovered the first alkali-activated cell-surface receptor and showed it to be a pH-sensitive RTK. Although the finding was serendipitous, it was completely in line with Sasha's multiple successes, which were all based on his hard work, in-depth knowledge and unfailing intuition. Importantly, his lab thus de-orphanised a well-known, but enigmatic insulin receptor-related receptor (IRR). This was such a ground-breaking discovery that it was only accepted by the RTK community after some delay [6]. During the recent years, he continued his research into the structure of IRR and made a series of beautiful observations [7].

As the head of several laboratories over many years, Sasha dealt with many colleagues, postdocs and students. For some of them, he was a faithful friend, for the others, a wise teacher, always soft-spoken, handing out advice and ready to help in difficult situations. For all of them, he was an indisputable authority, whose experience and knowledge were unshakeable. He liked people, enjoyed talking to them and knew how to take them on board. Dr Andrey Mozhaev, a recent member of Sasha's laboratory, says: 'For me, Alexander Petrenko was a very important and significant person, a scientist with a capital S. He will remain in my memory as a model of stamina and professionalism'.

Sasha always spoke lovingly about his family, often reminiscing about his childhood in Zaporozhye and his late parents. But he was particularly fond of his two daughters, Valentina and Natalia. He always kept their pictures at his desk, and any meeting, even a very important one, would be interrupted without hesitation when one of the daughters called. His daughters live in the United States, and he painfully missed them recently, especially during the coronavirus pandemic, when air travel became all but impossible. Tragically, it was SARS-CoV-2 that took Sasha away from his loved ones forever.

Sasha is survived by his daughters, Valentina and Natalia, and his second wife, Olga.

His friends and colleagues mourn Sasha's untimely death. He will forever remain in our hearts and will be deeply missed.

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