Aleksandr Vasilyev, J Nephrol Ther 2017, 7:5(Suppl)
DOI: 10.4172/2161-0959-C1-044

16th EUROPEAN NEPHROLOGY CONFERENCE

October 02-03, 2017 Barcelona, Spain

Aleksandr Vasilyev

New York Institute of Technology, USA

Zebrafish as a model of nephron development and repair

Studies of mammalian kidney development and repair after injury are complicated by complex architecture of metanephric kidney and the inherent difficulty of *in vivo* imaging in mammals. Both of these problems are absent in embryonic and larval zebrafish which has a simple pronephric kidney that closely resembles mammalian nephron in segment identity and arrangement. By using fluorescently labeled zebrafish, we were able to show that collective cell migration lies at the center of nephron development and repair. We showed that it drives kidney segment position, shape and growth during kidney development and maturation. We were also able to show that collective migration is the primary repair mechanism after acute kidney injury. The strength of this *in vivo* model allows us to directly visualize the sub-cellular, cellular and organ-level interactions driving kidney development and repair. In addition, it allows an efficient and robust *in vivo* screening of the potential chemical modifiers of the involved cellular and molecular mechanisms. Here we report results of a chemical screen using a Lopac1280 library that strongly suggest that Src and MAPK signaling is involved in mediating collective cell migration during kidney development. We also use the novel zebrafish kidney injury model to show that kidney obstruction and not increased cell proliferation is the driving force leading to rapid cyst initiation in the zebrafish model of ADPKD. This finding sheds new light on the nature of the "third hit" suggested by inducible mouse models of ADPKD. Overall, ur findings show great potential for transgenic zebrafish as a model of kidney development, morphogenesis and pathophysiology.

Biography

Aleksandr Vasilyev received his PhD from Rosalind Franklin University of Medicine and Science in 2001 and his MD degree from the same university in 2004. He then completed his Residency training in Anatimic Pathology at Massachusetts General Hospital in 2007 and a Research Fellowship in Renal Pathology in 2009. In 2009, he became an Instructor in Pathology at the Massachusetts General Hospital/Harvard Medical School, and in 2013, he started as an Assistant Professor in Biomedical Sciences at the New York Institute of Technology, College of Osteopathic Medicine. He uses zebrafish to study kidney development and regeneration.

avasilye@nyit.edu

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