Editorial

Unfolding the role of PKC isoforms in intestinal physiology

Volume 3 Issue 4 - 2016

Patrice G Bouyer, Natasa Petreska, Jesse Smallwood
Department of Biology, Valparaiso University, USA

Correspondence: Patrice G Bouyer, Department of Biology, Valparaiso University, Neils Science Center, Valparaiso, USA, Tel 2194645487, Fax 2194645489, Email patrice.bouyer@valpo.edu

Received: July 18, 2016 | **Published:** August 02, 2016

Editorial

The protein kinase C (PKC) family has twelve isoforms,[1] and the number of biological events driven by PKC isoforms is expanding. Some of the pathways the PKCs are involved encompass, but not restricted to: cell division, migration, apoptosis, protein trafficking, regulation of ion transport and barrier function.[1–3] Maintenance of intestinal barrier function is critical in order to preserve normal transepithelial transport as well as to prevent pathogens and toxins from entering the body.[4] For instance, PKCα, PKCβII, PKCδ, PKCε or PKCh have been shown to modulate intestinal barrier integrity during inflammation or cell injury,[3] by phosphorylating tight junction proteins or cytoskeleton proteins.[3,4] Some of the previous mentioned PKC isoforms are also involved in the regulation of ion transport in the intestine. For example, PKCα is a well known regulator of the Na/H exchanger, which participates in NaCl absorption in the intestine.[5] PKCε and PKCδ are implicated in the internalization of the Na-K-2Cl cotransporter 1, and thus decrease in fluid secretion in the colon.[6] In addition PKCδ has been also suggested to decrease Cl^- secretion in the colon by blocking the K^+-channel KCNQ1.[7]

As mentioned, the same isoform can be involved in very different biological processes. Thus, one important question arising from these observations: How is the same isoform driving specifically different biological events? Specificity is conveyed by the spatio-temporal distribution of the isoform, which is dependent on the association of the isoform with specific binding proteins such as receptor activated C kinase, A kinase anchoring protein or annexins.[8,9] The second mechanism being the target proteins phosphorylated by PKC isoform such as myristoylated, alanine rich C kinase substrate or adducing.[9,10] To date the proteins implicated in the specificity of the PKC isoform in intestinal biology (*e.g.,* ion transport, barrier function) remains elusive. Much work is need if we intend to understand how barrier function and ion transport are regulated by the PKC in normal and disease states in the intestine. Defining the scaffolding and target proteins of the PKC isoform may prove very useful targets to treat diseases such intestinal inflammation or cancer.11

Acknowledgements

None.

Conflict of interest

The author declares no conflict of interest.

References

1. Steinberg SF. Structural basis of protein kinase C isoform function. *Physiological reviews*. 2008;88:1341–1378.
2. Alvi F, Idkowiak Baldys J, Baldys A, et al. Regulation of membrane trafficking and endocytosis by protein kinase C: emerging role of the pericentrion, a novel protein kinase C–dependent subset of recycling endosomes. *Cellular and Molecular Life Science*. 2007;64:263–270.
3. Farhadi A, Keshavarzian A, Ranjbaran Z, et al. The role of protein kinase C isoforms in modulating injury and repair of the intestinal barrier. *The Journal of Pharmacology and Experimental Therapeutics*. 2006;316:1–7.
4. Shen L, Weber CR, Raleigh DR, et al. Tight junction pore and leak pathways: a dynamic duo. *Annual Review of Physiology*. 2011;73:283–309.
5. Kato A, Romero MF. Regulation of electroneutral NaCl absorption by the small intestine. *Annual Review of Physiology*. 2011;73:261–281.
6. Tang J, Bouyer P, Mykoniatis A, et al. Activated PKCδ and PKCε inhibit epithelial chloride secretion response to cAMP via inducing internalization of the Na+–K+–2Cl– cotransporter NKCC1. *The Journal of Biological Chemistry*. 2010;285:34072–34085.
7. O'Mahony F, Alzamora R, Chung HL, et al. Genomic priming of the antisecretory response to estrogen in rat distal colon throughout the estrous cycle. *Molecular Endocrinology*. 2009;23:1885–1899.
8. Hoque M, Rentero C, Cairns R, et al. Annexins – scaffolds modulating PKC localization and signaling. *Cellular Signaling*. 2014;26:1213–1225.
9. Blackshear PJ. The MARCKS family of cellular protein kinase C substrates. *The Journal of Biological Chemistry*. 1993;268:1501–1504.
10. Larsson C. Protein kinase C and the regulation of the actin cytoskeleton. *Cellular Signaling*. 2006;18:276–284.
11. Kang JH, Toita R, Kim CW, et al. Protein kinase C (PKC) isozyme–specific substrates and their design. *Biotechnology Advances*. 2012;30:1662–1672.