PLoS ONE, 2015, vol.10, N3

Comparative genomic analysis of buffalo (Bubalus bubalis) NOD1 and NOD2 receptors and their functional role in in-vitro cellular immune response

Brahma B., Kumar S., De B., Mishra P., Patra M., Gaur D., Chopra M., Gautam D., Mahanty S., Malik H., Malakar D., Datta T., De S.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2015 Brahma et al. Nucleotide binding and oligomerization domain (NOD)-like receptors (NLRs) are innate immune receptors that recognize bacterial cell wall components and initiate host immune response. Structure and function of NLRs have been well studied in human and mice, but little information exists on genetic composition and role of these receptors in innate immune system of water buffalo-a species known for its exceptional disease resistance. Here, a comparative study on the functional domains of NOD1 and NOD2 was performed across different species. The NOD mediated in-vitro cellular responses were studied in buffalo peripheral blood mononuclear cells, resident macrophages, mammary epithelial, and fibroblast cells. Buffalo NOD1 (buNOD1) and buNOD2 showed conserved domain architectures as found in other mammals. The domains of buNOD1 and buNOD2 showed analogy in secondary and tertiary conformations. Constitutive expressions of NODs were ubiquitous in different tissues. Following treatment with NOD agonists, peripheral lymphocytes showed an IFN-γ response along-with production of pro-inflammatory cytokines. Alveolar macrophages and mammary epithelial cells showed NOD mediated in-vitro immune response through NF-κB dependent pathway. Fibroblasts showed pro-inflammatory cytokine response following agonist treatment. Our study demonstrates that both immune and nonimmune cells could generate NOD-mediated responses to pathogens though the type and magnitude of response depend on the cell types. The structural basis of ligand recognition by buffalo NODs and knowledge of immune response by different cell types could be useful for development of non-infective innate immune modulators and next generation anti-inflammatory compounds.

http://dx.doi.org/10.1371/journal.pone.0119178