Biological function of tumor suppressor Developmentally regulated GTP-binding protein 1 (DRG1) is conserved from sponges to humans

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Cancer is one of the most threatening, emerging and studied human diseases. Although the cancer research has advanced substantially and expanded our knowledge of this issue, we are still unsuccessful in eradication or conversion of cancer to a chronic disease. Therefore, we need new approaches focusing on the fundamental aspects of this disease that will answer basic questions of cancer origin and the mechanisms of spreading. Interestingly, comparative genomics studies have shown that most genes linked to human cancer emerged during the early evolution of Metazoa. Thus, basal multicellular animals, such as sponges (Porifera), may be an innovative model system for understanding the molecular mechanisms involved in cancer biology. One of the cancer-related genes/proteins that is evolutionary conserved from sponges to humans is a metastasis suppressor Developmentally regulated GTP-binding protein 1 (DRG1) which is stabilized by its interaction with Zinc finger CCCH-type containing 15 protein (ZC3H15, LEREPO4). Human DRG1 is necessary for normal cell growth and has a role as a microtubule-binding protein. The aim of this study was to evaluate the biological function of human DRG1 and its homolog from sponges, the simplest multicellular organisms. We over-expressed human DRG1 and its sponge homolog in breast cancer cell line MCF-7 and studied their biological features. In particular, we analyzed co-localization, as well as intra- and inter-species interaction of both sponge and human DRG1 with either LEREPO4 or alpha-tubulin. A tumor suppressor role of human DRG1 and its sponge homolog was compared by performing biological assays for cell apoptosis, migration and invasion. Our results on basic function of DRG1 will contribute in elucidating the origin of cancer and physiological function of genes linked with cancer.