Molecular Genetic Analysis of Rbm45/Drbp1: Genomic Structure, Expression, and Evolution

RNA recognition motif-type RNA-binding domain containing proteins (RBDPs) participate in RNA metabolism including regulating mRNA stability, nuclear-cytoplasmic shuttling, and splicing. Rbm45 is an RBDP first cloned from rat brain and expressed spatiotemporally during rat neural development. More recently, RBM45 has been associated with pathological aggregates in the human neurological disorders amyotrophic lateral sclerosis, frontotemporal lobar degeneration, and Alzheimer's. Rbm45 and the neural developmental protein musashi-1 are in the same family of RDBPs and have similar expression patterns. In contrast to Musashi-1, which is upregulated during colorectal carcinogenesis, we found no association of *RBM45* overexpression in human colon cancer tissue. In order to begin characterizing RNA-binding partners of Rbm45, we have successfully cloned and expressed human RBM45 in an Intein fusion-protein expression system. Furthermore, to gain a better understanding of the molecular genetics and evolution of Rbm45, we used an *in silico* approach to analyze the gene structure of the human and mouse Rbm45 homologues and explored the evolutionary conservation of Rbm45 in metazoans. Human *RBM45* and mouse *Rbm45* span ~17 kb and 13 kb, respectively, and contain 10 exons, one of which is non-coding. Both genes have TATA-less promoters with an initiator and a GC-rich element. Downstream of exon 10, both homologues have canonical polyadenylation signals and an embryonic cytoplasmic polyadenylation element. Moreover, our data indicate Rbm45 is conserved across all metazoan taxa from sponges (phylum Porifera) to humans (phylum Chordata), portending a fundamental role in metazoan development.

Authors: Lauren E. Price[*¶], Abigail B. Loewen Faul[‡¶], Aleksandra Vuchkovska[*], Kevin J. Lopez[*], Katie M. Fast[‡], Andrew G. Eck[*], David W. Hoferer[*‡‡], and Jeffrey O. Henderson[*‡‖§†]

Affiliations: * Department of Science and Mathematics, Judson University**,** Elgin, IL 60123, USA; ‡ Department of Biology, Tabor College, Hillsboro, KS 67063, USA; ‖ Department of Biology, Trinity International University, Bannockburn, IL 60015, USA; Department of Medicine, Division of Gastroenterology, Washington University School of Medicine, St. Louis, MO, 63110, USA; ‡‡ Present address: Department of Biology, Briar Cliff University, Sioux City, IA 51104, USA