Piwi-Interacting RNAs (piRNAs) Expression Profiling During Rat Liver Regeneration

Rinaldi A1, Rizzo F1, Hashim A1*, Marchese G1,2, Cordella A1,3, Sellitto A1, Memoli D1, Rocco T1, Sulas P4, Perra A4, Ledda-Columbano GM4, Columbano A4, Weisz A1
1Department of Medicine and Surgery, Laboratory of Molecular Medicine and Genomics, University of Salerno, Baronissi (SA), Italy; 2Department of Medicine and Surgery, Genomix4Life Srl, Spin-Off of the Laboratory of Molecular Medicine and Genomics, University of Salerno, Baronissi (SA), Italy; 3Fondazione IRCCS SDN, Napoli (NA), Italy; 4Department of Biomedical Sciences, Oncology and Molecular Pathology Unit, University of Cagliari, Cagliari (CA), Italy;

Piwi-interacting RNAs (piRNAs) represent the largest class of small non-coding RNAs, initially identified in the germline, that regulate key cellular processes. piRNAs are frequently encoded by genes clustered in intergenic regions of the genome and have defined characteristics: an average length of 26-32 nt, a strong preference for uracil at the 5’-end and high sequence diversity. Recent evidences suggest that the Piwi/piRNA pathway may be functionally active also in somatic tissues, but this possibility has not yet been fully explored. To elucidate the role of piRNAs in somatic cells, in particular during the process of rat liver regeneration, we measured their expression in adult rat liver by smallRNA sequencing and evaluated the possibility that this may change during the wave of cell proliferation that follows partial hepatectomy. Results show that ~1,400 ‘germline’ piRNAs are indeed expressed in rat liver, including 72 that show differential expression during regeneration of this organ following 2/3 partial hepatectomy, the majority of which are upregulated within 48h after hepatectomy and returning to basal levels by 7 days. In agreement with these results, Q-PCR analysis revealed the presence, in rat liver, of two PIWI and of other components of the piRNA biogenesis pathways, confirming that this is indeed present and functional in liver cells. These results indicate that the piRNA pathway is active in liver cells and is subject to regulation during physiological processes, such as cell proliferation, and that piRNAs may exert their regulatory functions not only in germline but also in somatic cells.

RESEARCH SUPPORTED BY: AIRC (Grant IG-13176), MIUR (PRIN 2010LC747T_002), University of Salerno (FARB 2012-2013), EU COST (Action BM1006 ‘SeqAhead’), and CNR EPIGEN Flagship Project. *A.H. is a PhD student of Research Doctorate in Experimental Physiopathology and Neurosciences’ of the Second University of Napoli, Napoli (NA), Italy.