Long Noncoding RNAs in Aging

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Editor Note

Aging is associated with increasing the risk of disease and death. Recently, increasing evidences suggest that many long noncoding RNAs (lncRNAs) function through specific interactions with other cellular factors, namely proteins, DNA, and other RNA molecules. LncRNAs play important roles in a wide range of age-related diseases, such as cancer, cardiovascular pathologies, and neurodegenerative disorders. Some lncRNAs have been studied for decades, but the broad range of expressed IncRNAs and their impact on protein expression programs has only come into view in recent years [1].

Many long noncoding RNAs are reported to execute their cellular functions by associating with chromatin modifying factors. Gonzalez et al discovered a new function for lncRNAs in the establishment and maintenance of cell-specific alternative splicing via modulation of chromatin signatures. Some of the examples of lncRNAs are described here [2].

The H19 long noncoding RNA has been implicated in human genetic disorders and cancer by regulating the expression of different genes. Zou et al reported that H19 plays an important role in controlling the intestinal epithelial barrier function by serving as a precursor for microRNA 675 (miR-675) [3]. Holdt et al found an association of ANRIL but not CDKN2A, CDKN2B, C9orf53, and MTAP, with atherosclerosis and Chr9p21 genotype in a large cohort. Further studies may be needed to determine whether ANRIL expression is a marker or modulator of atherosclerosis susceptibility at Chr9p21 [4]. Abdelmohsen et al demonstrated that ncRNA 7SL is upregulated in cancer cells, but its impact upon the phenotype of cancer cells is unknown. They found that by influencing p53 levels, 7SL and HuR affect gene expression programs modulated by p53, suggesting that targeting 7SL may be effective in the treatment of cancers with reduced p53 levels [5]. Yoon et al found that HOTAIR levels are highly upregulated in senescent cells, causing rapid decay of targets Ataxin-1 and Snurportin-1, and preventing premature senescence. These results uncover a role for a lncRNA, HOTAIR, as a platform for protein ubiquitination [6].

With advancing age, the body’s ability declines to store energy, mobilize energy stores, sense changes in energy availability and utilization. The age-associated increases in adiposity reduced pancreatic function, and loss of muscle mass lead to major pathologic conditions seen in the elderly [7]. LncRNAs are implicated in the aging process, age-related diseases and provide a suitable and effective way to design treatments in future.

References