

What are non-coding RNA's?

RNA (Ribonucleic acid) derived from DNA (Deoxyribonucleic acid) by transcription 'process of synthesizing RNA from DNA.'

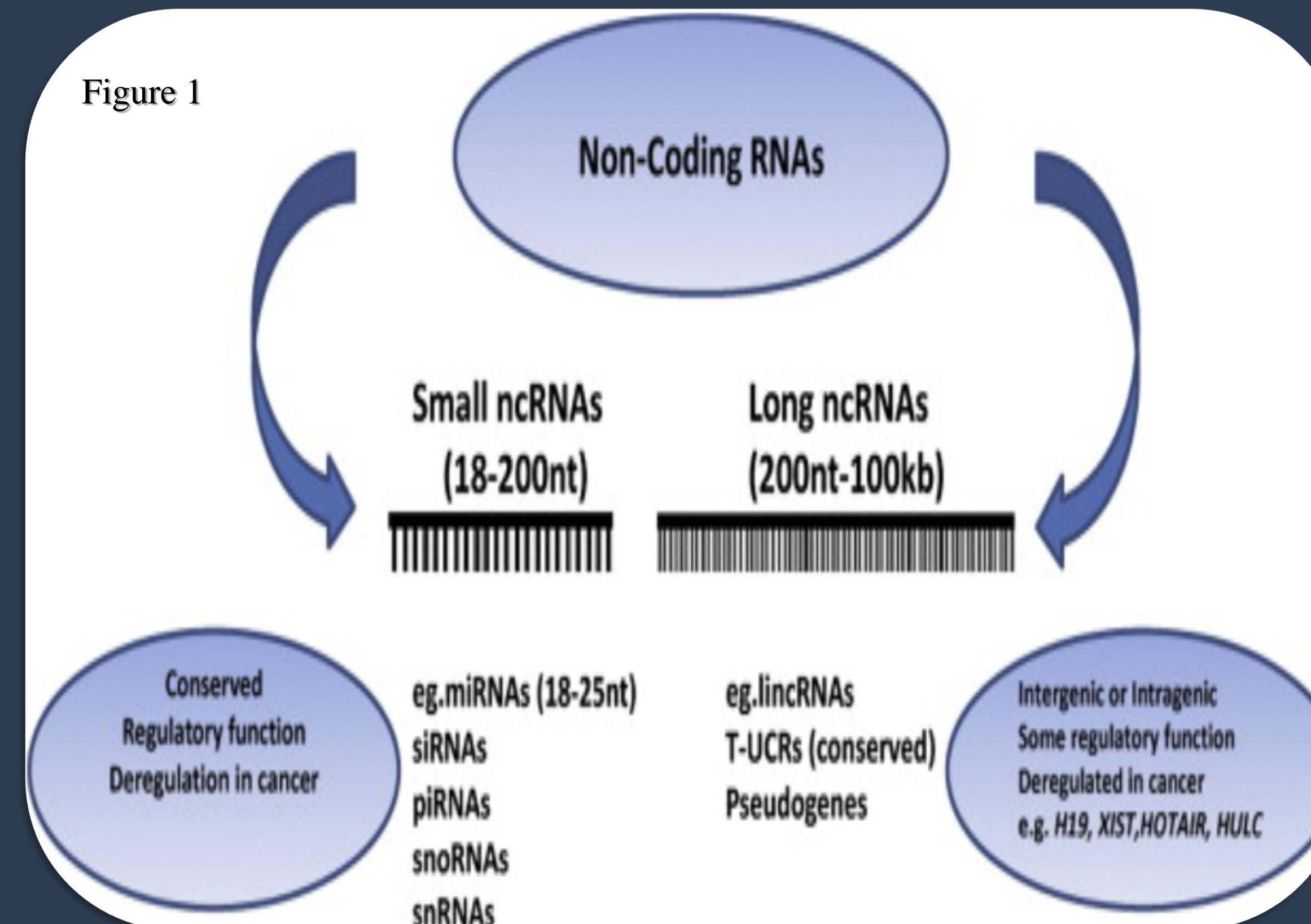
Non-coding RNA's are a functional RNA molecule that are transcribed from DNA, but not translated into proteins.

Psychiatric disorders

Complex and heterogeneous disorders of the brain, they are a behavioural or mental pattern that causes significant distress. Arising from destruction of several factors based of neurology, genetics, surrounding environment and life experiences.

Non-coding RNA's

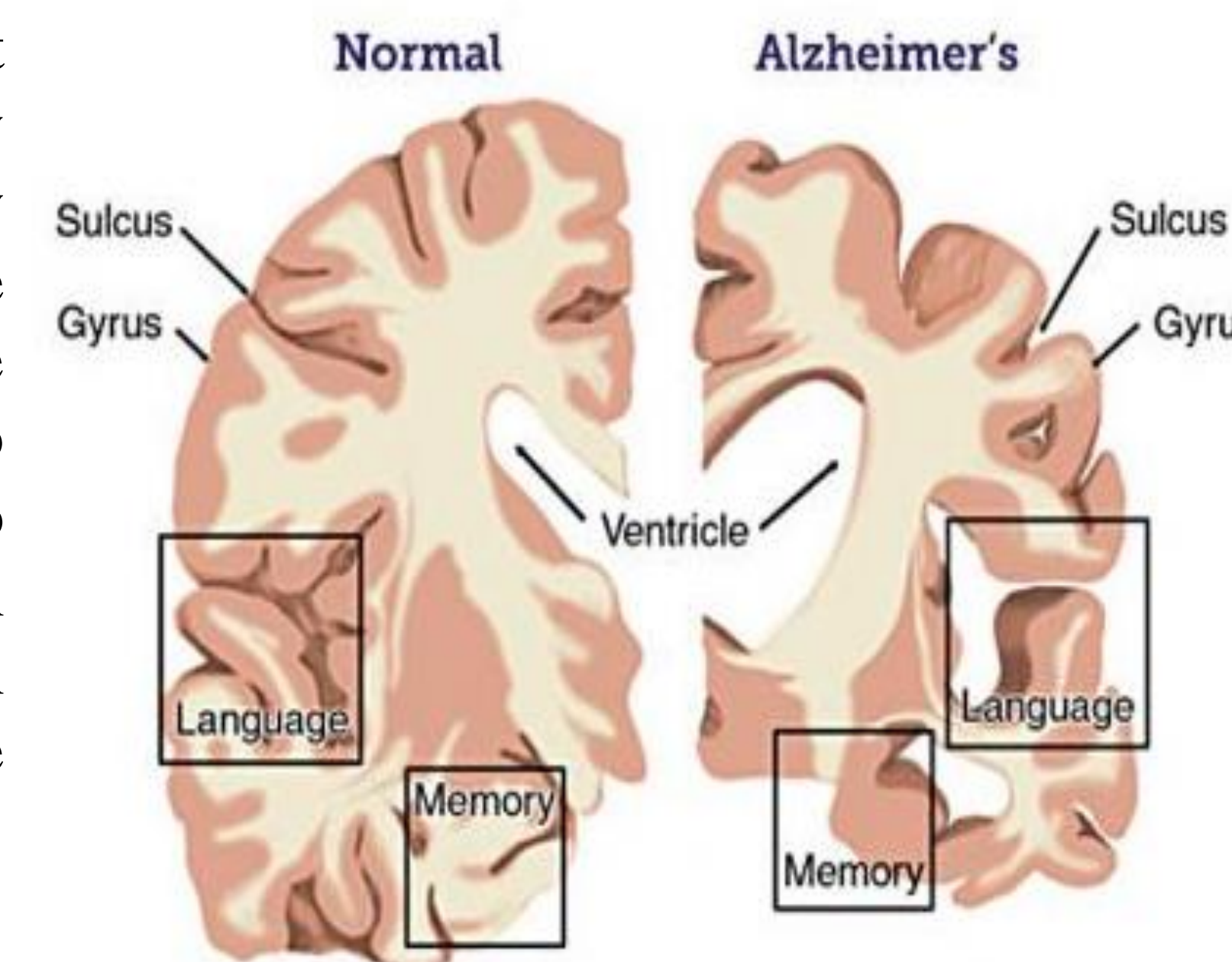
For a long time it has been known that a gene is a sequence of DNA which is transcribed into (mRNA) and then translated into amino acid sequences, the building blocks of proteins. There are about 24,000 of these traditional genes and their protein-coding regions constitute only 2% of the 3 billion bases of DNA. The other 98% of DNA has been thought to be 'junk'. Until recently it has been discovered that more than half of all human DNA isn't transcribed and translated into amino acid sequences. These are the non-coding RNA's which come in different sizes(Figure1). They all generally function to regulate gene expression at the transcriptional and posttranscriptional level. (2)



Alzheimer's

Alzheimer's is a brain disease that causes memory loss usually affecting the elderly population(Figure 2). Recent research shows that non-coding RNA, specifically miRNAs and long non coding RNAs have increasingly been implicated in AD. Studies on humans and mouse models suggest that miRNAs are expressed in AD. These have been implicated in the regulation of amyloid-b peptide, inflammation, cell death and other main patho mechanisms of AD. Also regulation of miRNAs varies in blood, and vertebral spinal fluid indicating alterations in AD. Together with brain specific miRNAs they could be potential AD bio marks.(3)

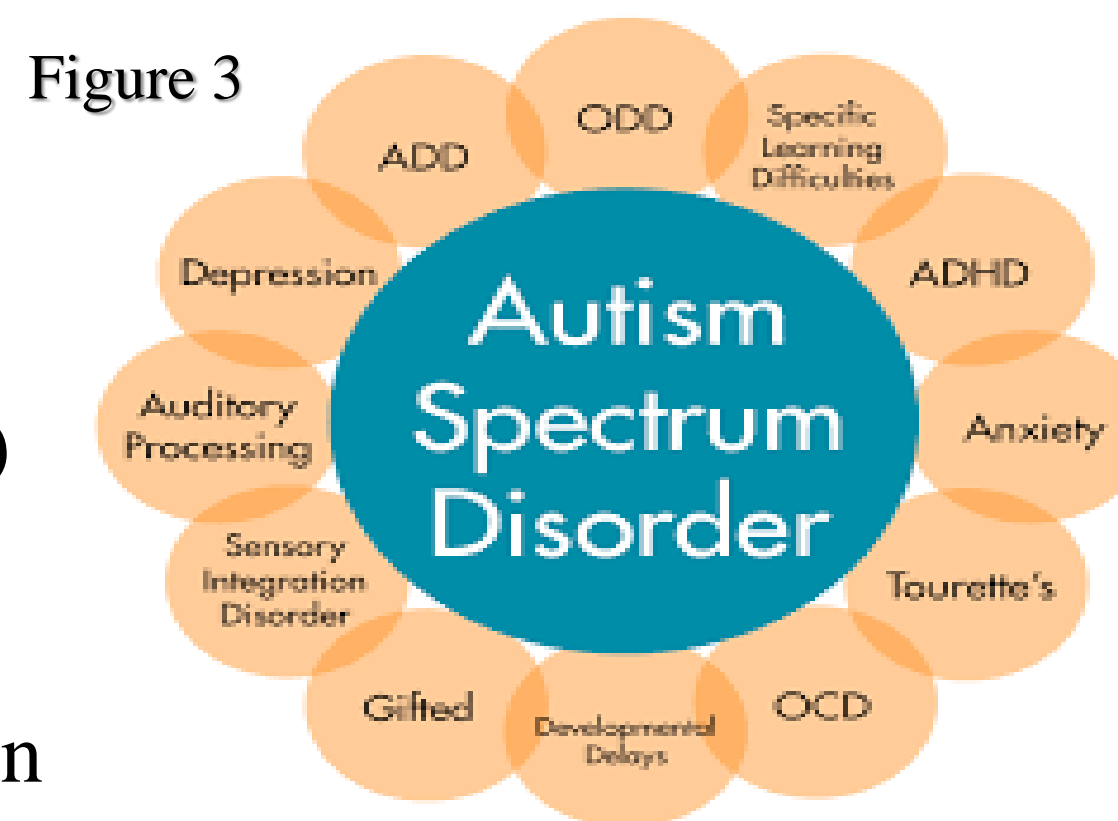
Figure 2 Brain Cross-Sections



Noncoding RNAs in Autism Spectrum Disorders

Recent studies have suggested that lincRNAs are more abundant in the human brain and are involved in neurodevelopment and neurodevelopmental disorders, including autism spectrum disorders (ASDs) (Figure 3) Researchers have found noncoding antisense RNA transcripts at approximately 40% of loci previously implicated in ASD. They have confirmed the expression of 10 antisense RNAs in different post-mortem human brain tissues. The expression of five antisense transcripts was found to be region-specific, suggesting a role for these ncRNAs in the development and function of specific brain regions connected to ASD. (4)

Figure 3



Conclusion

Future of ncRNAs research and use in diagnosis:

Investigations into the changes in ncRNA expression that occur during brain development may help us understand what impact these molecules may have in brain development as well as disorders.

Research on noncoding RNAs will help to confirm the hypothesis and develop diagnostic algorithms for ADHD patients, also as an important step in the implementation of personalized medicine in psychiatry.

The ability of ncRNAs to regulate transcription factors and chromatin remodelling proteins represent additional mechanisms to influence long-term neuroadaptations involved in memory formation. (1)

Reference

1. Robert Plomin and Oliver S. P. Davis, The future of genetics in psychology and psychiatry: Microarrays, genome-wide association, and non-coding RNA J Child Psychol Psychiatry. 2009 Jan; 50(1-2): 63-71. doi: 10.1111/j.1469-7610.2008.01978.x
2. Cao, Yeo G, Muotri AR, Kuwabara T, Gage FH Noncoding RNAs in the mammalian central nervous system. Mol Neurobiol. 2013 Feb;47(1):382-93. Non-coding RNAs in Alzheimer's disease.
3. CNS Neurosci Ther. 2017 Aug Long noncoding RNA and its contribution to autism spectrum disorders.Tang J, Yu Y, Yang W