

## **Mechanisms and developmental roles of transcription termination**

Life is built on faithful expression of genetic information written on DNA. Gene, the main unit of the information, encodes a protein. When a gene is expressed, copies of the DNA sequence, called RNA, are produced, transported to the protein synthesis machine “ribosome” and translated into proteins. Development from the embryo to mature adult requires ordered and orchestrated expression of numerous genes. Genes are aligned, separated by intergenic spaces, on long DNA strands. A protein called Pol II scans DNA from the starting to the ending point of a gene to produce its copy, RNA. This process, called transcription, has to be terminated exactly at the end of each gene, otherwise wasteful copies of intergenic spaces as well as unwanted copies of downstream genes can be produced. Thus, transcription termination is a fundamental process, which ensures faithful gene expression. A protein called XRN2 plays a major role in transcription termination, using its activity to destroy RNA. All animals, vertebrates or invertebrates, have XRN2, and they cannot develop without it. However it is unclear which function of XRN2, transcription termination or others, is important for development. Emerging evidence suggest existence of another mechanism for transcription termination, but how it works remains unknown. We aim to elucidate how XRN2 supports animal development, by transcription termination or other functions, and how XRN2-independent transcription termination works, using the nematode *Caenorhabditis elegans* (*C. elegans*) as an animal model. Since basic biological processes and many genes are conserved between *C. elegans* and humans, findings from this project may be applicable to human biology. Given that both dysregulation of XRN2 and defects in transcription termination have been implicated in cancer and the pathology of viral infection, the proposed research may also provide insights into the etiology of these human diseases and expand therapeutic potentials.