Life Sciences

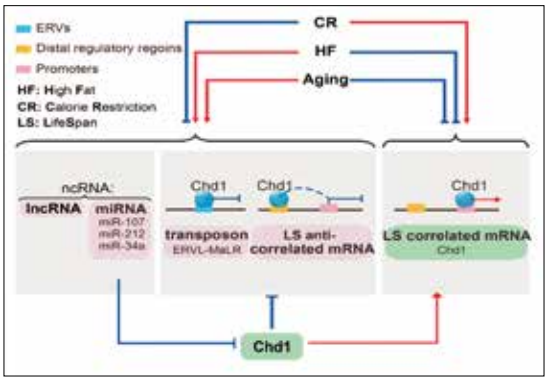
Scientists Reveal Impact of Dietary Interventions on Noncoding RNAs and Transposons

Lifestyle interventions, such as modulating dietary macronutrients, caloric intake, and energy expenditure, can considerably affect the susceptibility to aging-related diseases and, in some cases, an organism's lifespan. Calorie restriction (CR) without malnutrition and other interventions (*e.g.*, voluntary exercise (Ex)) are known to reduce the occurrence of aging-related conditions, including obesity, type II diabetes, and cardiovascular diseases. CR, without a compensatory increase in food intake, consistently extends both mean and maximal lifespan in multiple species. However, little is known about the mechanisms regulating the transcriptional program for longevity across multiple interventions, especially at the epigenetic level.

Recently, a team of scientists led by Prof. Jing-Dong Jackie HAN and colleagues from the CAS-MPG Partner Institute for Computational Biology (PICB), Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences (CAS) have gained important progress in exploring the mechanisms regulating ncRNAs and transposons expression by dietary restriction.

The researchers profiled liver microRNA (miRNA), coding and long non-coding RNA (lncRNA) expression by high-throughput deep sequencing in mice across multiple energy intake and expenditure interventions. They found that expression of miRNAs, lncRNAs, and transposable elements was largely repressed by lifespan extension interventions. The study also revealed that protein-coding mRNAs positively correlated with lifespan are highly targeted by miRNAs, and miRNA-targeting interactions mainly target chromatin-related functions. Furthermore, the researchers experimentally validated miR-34a, miR-107, and miR-212-3p targeting of the chromatin remodeler *Chd1*, and demonstrated the role of *Chd1* in mimicking high fat diet and aging induced gene expression changes, and activation of transposons.

These findings reveal that lifespan-extending interventions caused a dramatic global repression of transposons, and this repression safeguards chromatin from leaky transcription and deregulation of gene expression, at least in part, through novel miRNA-chromatin remodeler interactions.



Through liver RNA sequencing and microRNA sequencing in mice across multiple energy intake and expenditure interventions, Green *et al*. found lifespan extending interventions largely repressed the expression of miRNAs, lncRNAs, and transposable elements; miRNAs preferentially target mRNAs whose expression positively correlated with lifespan, and modulate expression by targeting genes with chromatin-related functions. (Image by courtesy of Dr. Jing-Dong Jackie HAN's lab, PICB)

The study, entitled "Impact of Dietary Interventions on Noncoding RNA Networks and mRNAs Encoding Chromatin-Related Factors", was published in *Cell Reports* on March 21, 2017.

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