piRNAs degrade paternal mRNAs in late spermatogenesis

Funded by the National Natural Science Foundation of China and the Ministry of Science and Technology of China, Prof. Liu Mofang's research group at Shanghai Institute of Biochemistry and Cell Biology, Chinese Academy of Sciences reported the novel function of piRNAs in targeting and degrading protein coding genes in mouse spermatids, which was published in *Cell Res* (2014, 24(6): 680—700).

Unlike oocytes, which contain abundant maternal mRNAs and proteins to support early embryogenesis, sperms possess few mRNAs and are believed to only donate their genetic information that remains silent until zygotic activation. It has remained elusive how the large variety of mRNAs in late spermatids are purged during spermiogenesis. Besides, spermatogenesis in mammals is characterized by two waves of piRNA expression: one corresponds to classic piRNAs responsible for silencing retrotransponsons, and the second wave is predominantly derived from nontransposon intergenic regions in pachytene spermatocytes, but the function of these pachytene piRNAs is largely unknown.

The researchers in Prof. Liu's laboratory have demonstrated that pachytene piRNAs are assembled with their binding protein MIWI and deadenyalse CAF1 to form a piRNA-induced silencing complex (pi-RISC), promoting deadenylation and decay of their targets through imperfectly base-pairing with the target mRNAs (Figure A). Furthermore, pi-RISC is assembled in elongating spermatids and mediates the degradation of thousands of mRNAs in this late stage of spermatid development (Figure B and C). Their study uncovers a male germ cell-specific mRNA degradation program that utilizes the enormous repertoire of targeting capacity of piRNAs, and documents a key function of pachytene piRNAs in development.

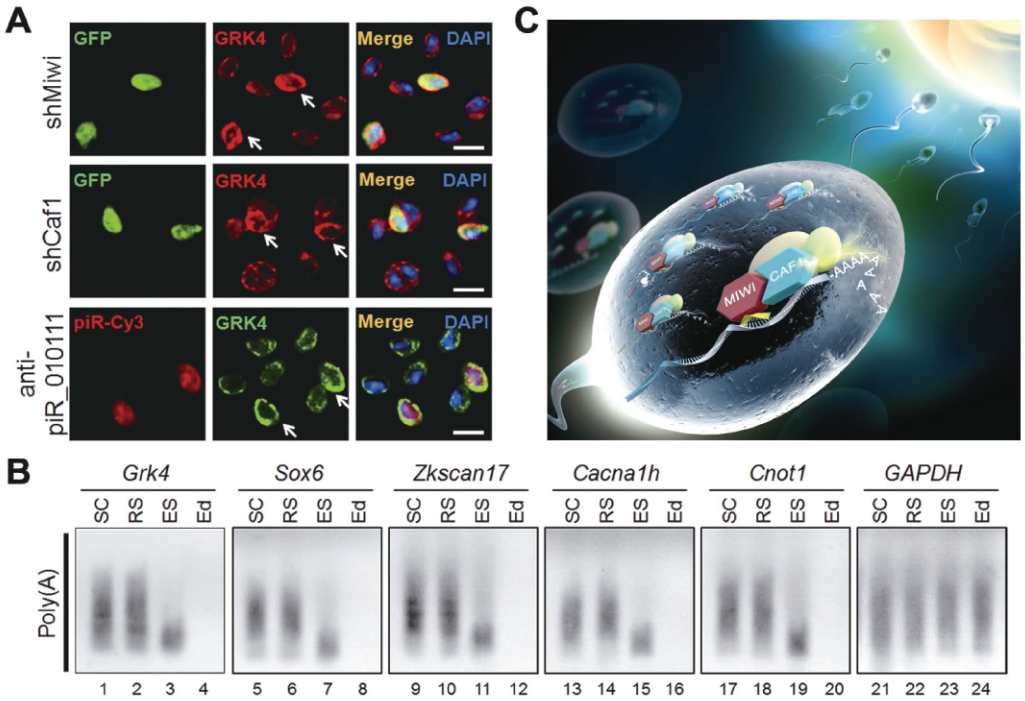

Figure A, The components of pi-RISC (MIWI, CAF1 and piRNAs) are required for piRNA target repression. B, PAT assays of Poly(A) tails of the piRNA target mRNAs in enriched SC, RS, ES, and Ed, with GAPDH serving as a nontarget control. C, A model for mouse pachytene piRNAs guided massive paternal mRNAs deadenylation and decay during spermiogenesis.