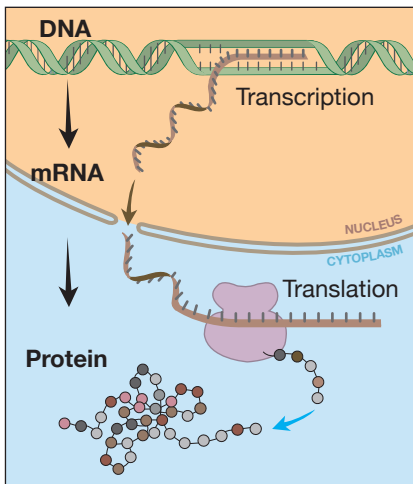


RNA interference

— gene silencing by double-stranded RNA

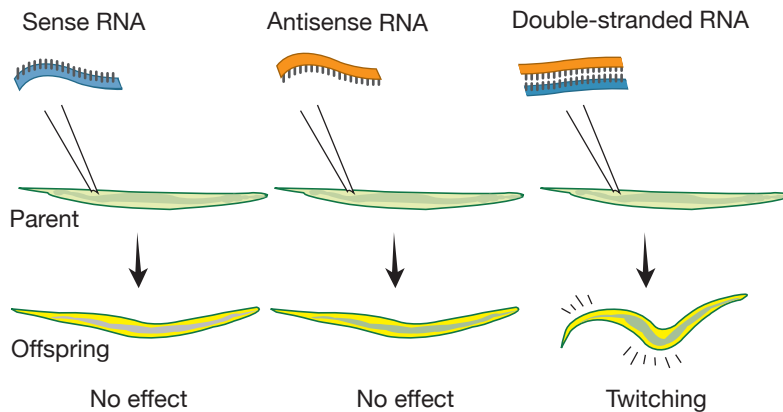
1. The central dogma



Our genome operates by sending information from double-stranded DNA in the nucleus, via single-stranded mRNA, to guide the synthesis of proteins in the cytoplasm.

2. The experiment

RNA carrying the code for a muscle protein is injected into the worm *C. elegans*. Single-stranded RNA has no effect. But when double-stranded RNA is injected, the worm starts twitching in a similar way to worms carrying a defective gene for the muscle protein.



3. The RNAi mechanism

RNA interference (RNAi) is an important biological mechanism in the regulation of gene expression.

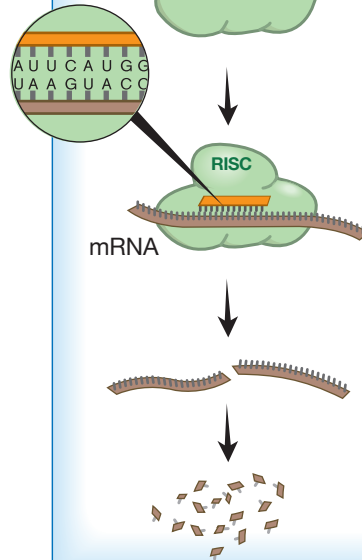
Double-stranded RNA (dsRNA) binds to the protein Dicer ...

... which cleaves dsRNA into smaller fragments.

One of the RNA strands is loaded into a RISC complex...

...and links the complex to the mRNA strand by basepairing.

mRNA is cleaved and destroyed. No protein can be synthesized.



4. Several processes in the cell use RNAi

A. When an RNA virus infects the cell, it injects its genome consisting of double-stranded RNA. RNA interference destroys the viral RNA, preventing the formation of new viruses.

B. Synthesis of many proteins is controlled by genes encoding microRNA. After processing, microRNA prevents the translation of mRNA to protein.

C. In the research laboratory, dsRNA molecules are tailor-made to activate the RISC complex to degrade mRNA for a specific gene.

