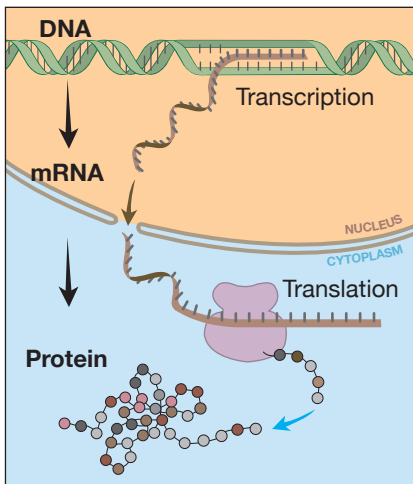


# RNA interference

— gene silencing by double-stranded RNA

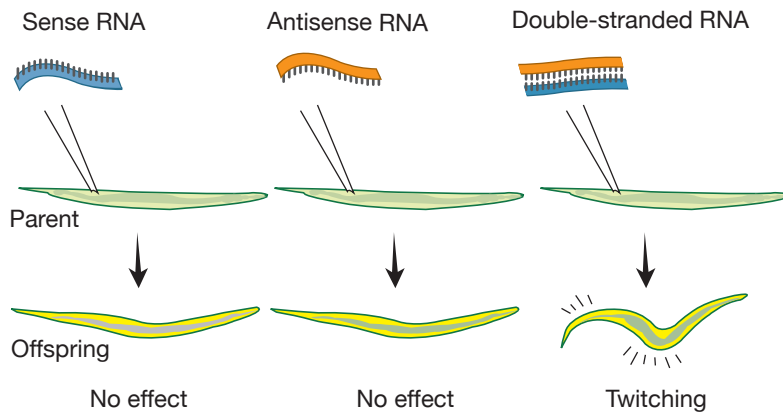
## 1. The central dogma



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.

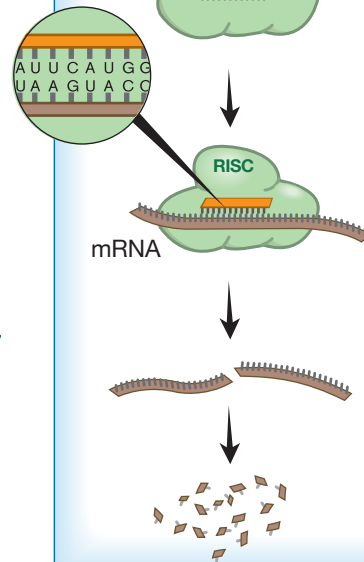
Double-stranded RNA (dsRNA) binds to the protein Dicer ...

... 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.

