RNA Polymerase II synthesizes a messenger RNA copy of the DNA template strand. In the image above and to the right the DNA template strand is cyan and the mRNA being made is magenta. When the mRNA copy of a gene is complete, it is translated into a protein by ribosomes in the cytoplasm of the cell.

**Diseases Associated with RNA Pol II**

- **Werner’s Syndrome** is a rapid aging disease that starts in adolescence and causes death around 50 years old. In cells with two bad copies of Werner’s protein, RNA Pol II transcription rates are half the normal rate of 3000 nucleotides per minute.

- **Alpha-Amanitin Poisoning** causes death within 10 days unless the patient is treated immediately. Alpha-amanitin reduces transcription rates to 5 or 6 nucleotides per minute and that’s not enough to sustain the life of a cell.

- **Cockayne Disease** is a rapid aging disease that causes death in the early teens. In this disease RNA Pol II cannot backtrack to fix mistakes in the DNA, although it can carry out transcription at normal rates.

**Primary Citation**

1. Structural Basis of Transcription: An RNA Polymerase II Elongation Complex at 3.3 Angstrom Resolution, Averett L. Gnatt, Patrick Cramer, Jianhua Fu, David A. Bushnell, Roger D. Kornberg, Science, Volume 292, page 1876

**Other References**

2. Structural Basis of Transcription: α-Amanitin-RNA Polymerase II Cocrystal at 2.8 angstrom resolution, David A. Bushnell, Patrick Cramer, and Roger D. Kornberg, PNAS, online Jan. 22, 2002