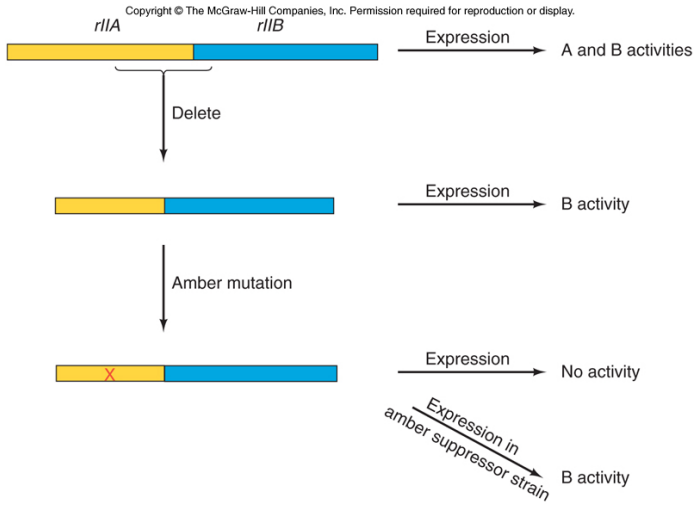
Translational Termination

- Stop Codons defined by suppressors
- Release Factors
- Ribosomal Recycling Factors
- Stop codons and the 21st amino acid

Termination Codons

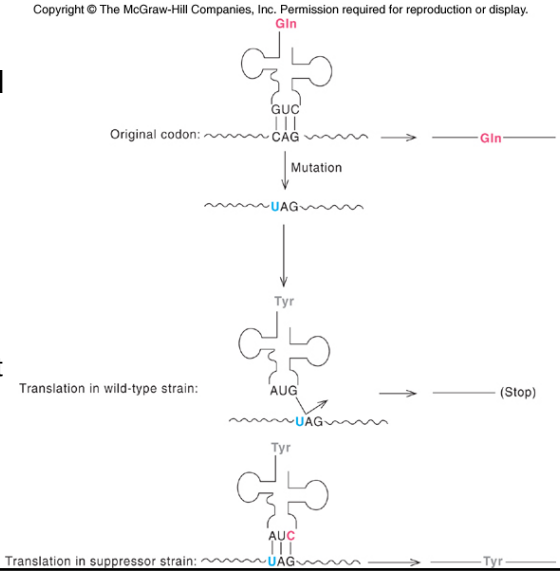
- Three codons are the natural stop signals at the ends of coding regions in mRNA
  - UAG
  - UAA
  - UGA
- Mutations can create termination codons within an mRNA causing premature termination of translation
  - Amber mutation creates UAG
  - Ochre mutation creates UAA
  - Opal mutation creates UGA

Amber Mutation Effects in a Fused Gene



Stop Codon Suppression

- Most suppressor tRNAs have altered anticodons:
  - Recognize stop codons
  - Prevent termination by inserting an amino acid
  - Allow ribosome to move on to the next codon



Termination Mutations

- Amber mutations are caused by mutagens that give rise to missense mutations
- Ochre and opal mutations do not respond to the same suppressors as do the amber mutations
  - Ochre mutations have their own suppressors
  - Opal mutations also have unique suppressors

Capecchi Assay for RF

Prokaryotic translation termination is mediated by 3 factors:

RF1 recognizes UAA and UAG

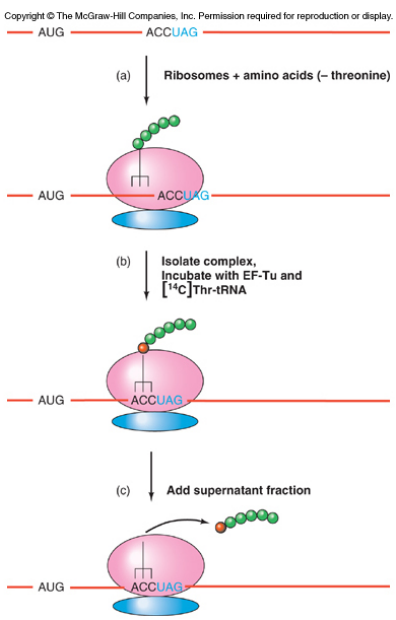
RF2 recognizes UAA and UGA

RF3 is a GTP-binding protein facilitating binding of RF1 and RF2 to the ribosome

Eukaryotes has 2 release factors:

eRF1 recognizes all 3 termination codons

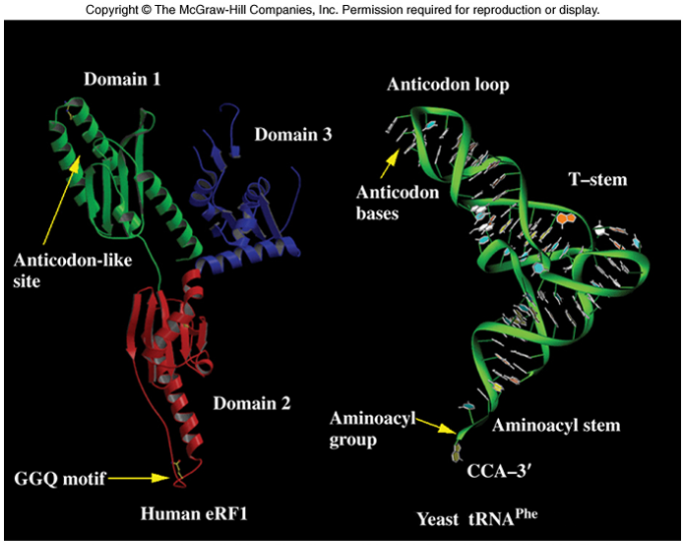
eRF3 is a ribosome-dependent GTPase helping eRF1 release



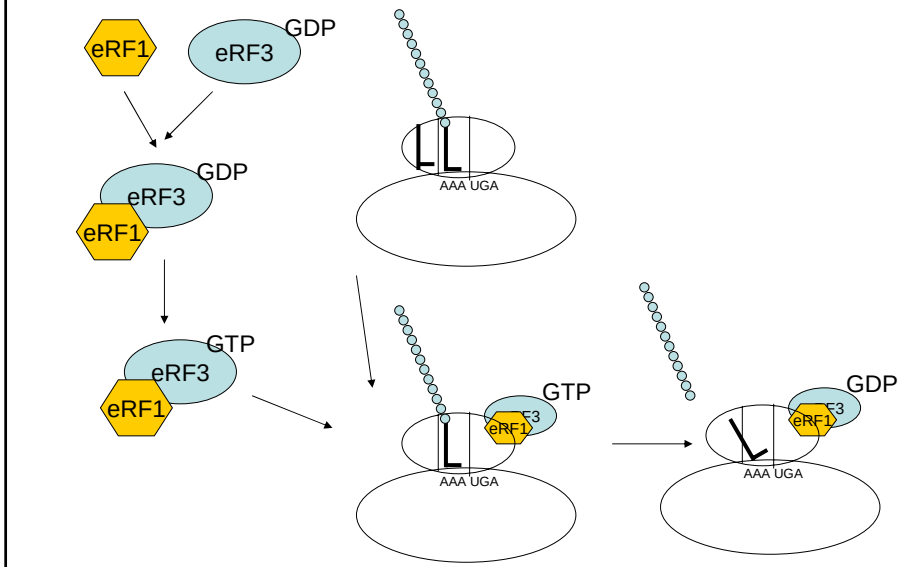
Release Factors

- Prokaryotic translation termination is mediated by 3 factors:
  - RF1 recognizes UAA and UAG
  - RF2 recognizes UAA and UGA
  - RF3 is a GTP-binding protein facilitating binding of RF1 and RF2 to the ribosome
- Eukaryotes has 2 release factors:
  - eRF1 recognizes all 3 termination codons
  - eRF3 is a ribosome-dependent GTPase helping eRF1 release the finished polypeptide

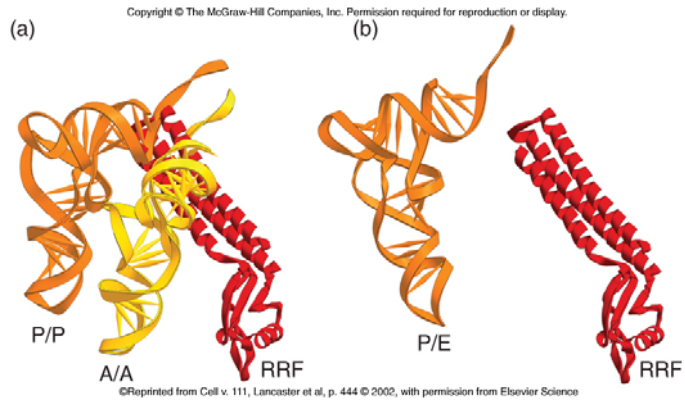
eRF1 Molecular Mimicry

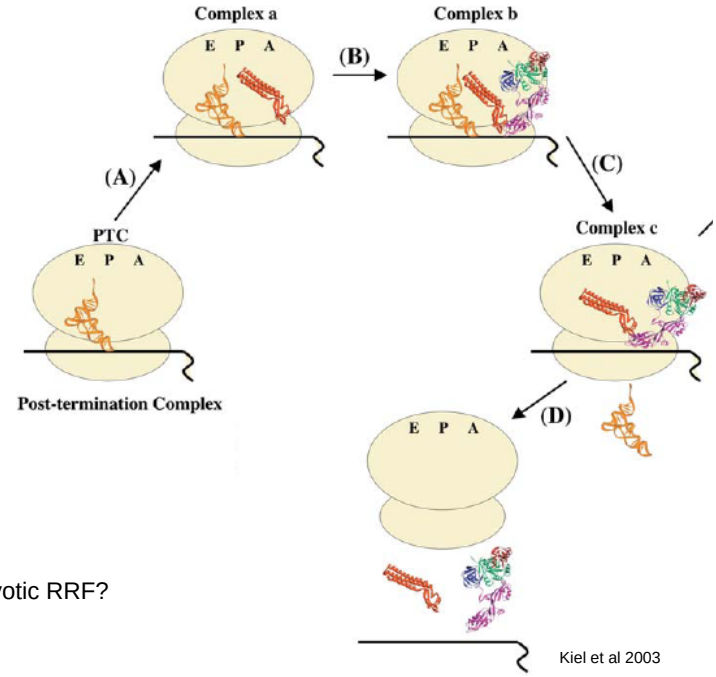


© Song, H.P., Mugnier, A.K. Das, H.M. Webb, D.R. Evans, M.F. Tuite, B.A. Hemmings, and D. Barford, The crystal structure of human eukaryotic release factor eRF1-mechanism of stop codon recognition and peptidyl-tRNA hydrolysis. Cell 100 (4 Feb 2000) f. 6, p.



Ribosome Recycling Factor

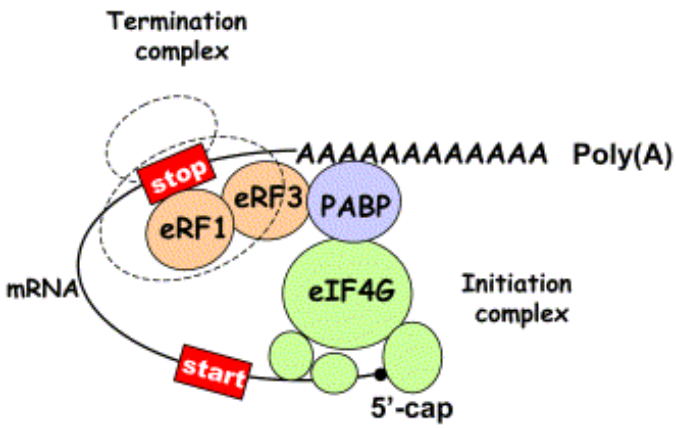




Eukaryotic RRF?

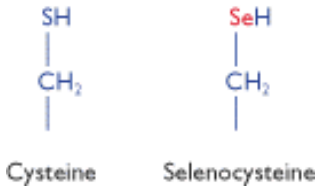
Kiel et al 2003

Ribosome Recycling



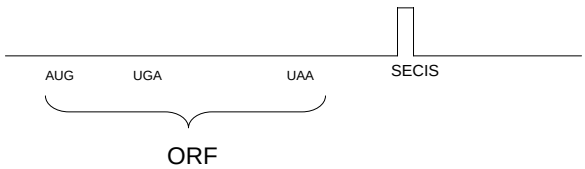
Inge-Vechtomova et al, 2003

Selenocysteine



Features of Selenocysteine Proteins

1. SelenoCysteine Insertion Sequence in 3'UTR
2. UGA Stop Codon within open reading frame



Insertion of Selenocysteine

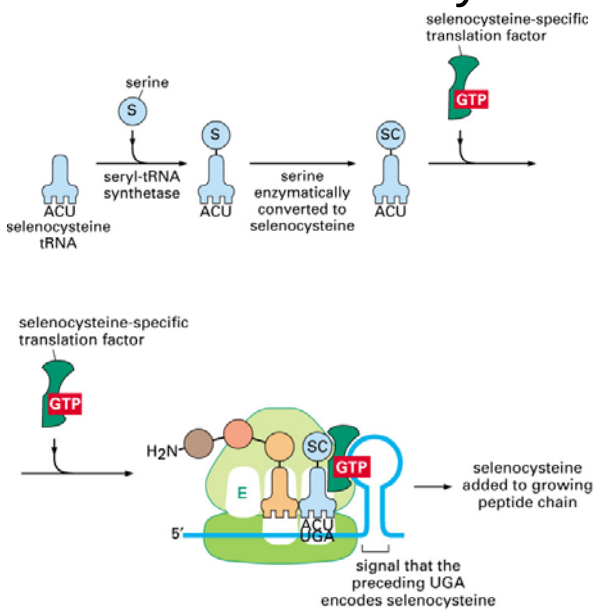
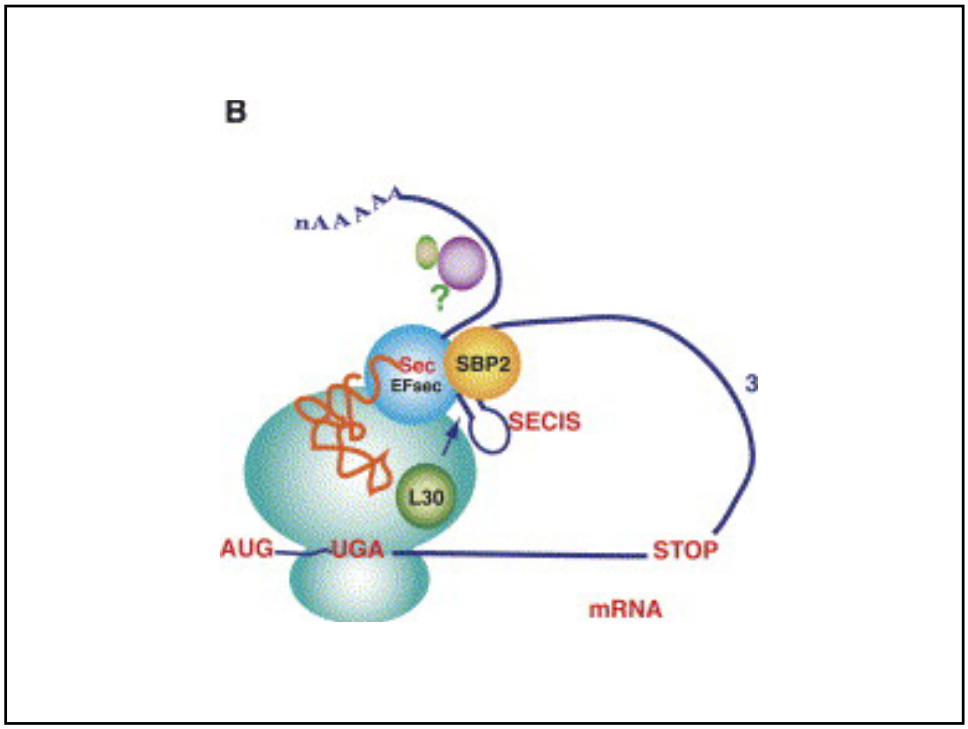


Figure 6–77 part 2 of 2, Molecular Biology of the Cell, 4th Edition.


B
nAAAAA
?
Sec
EFsec
SBP2
SECIS
3
L30
AUG
UGA
STOP
mRNA