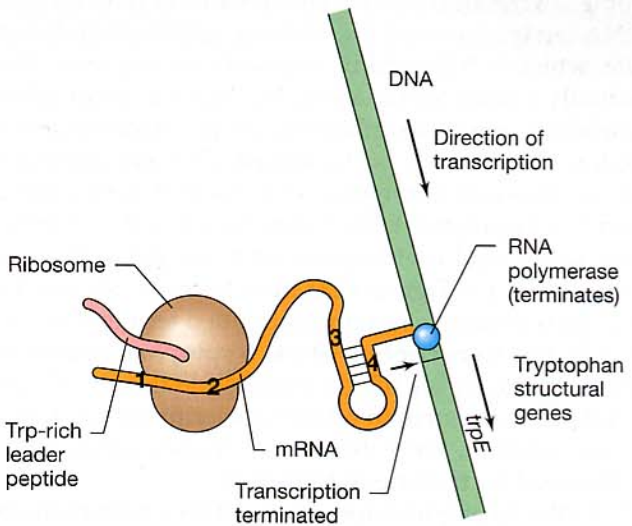
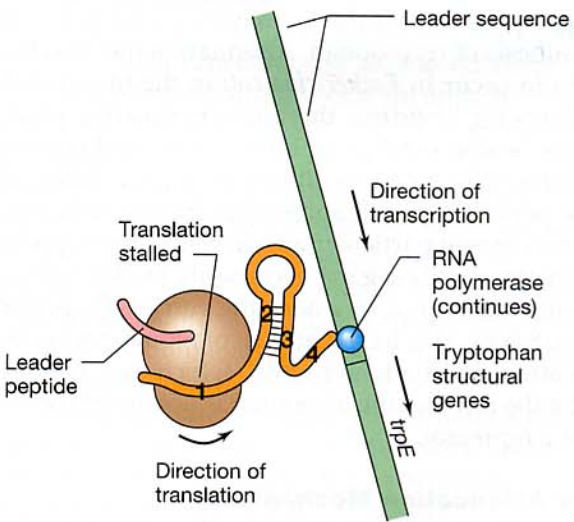


Excess tryptophan: transcription terminated



Tryptophan-starved: transcription not terminated



**Figure 8.21** Control of transcription of tryptophan operon structural genes by attenuation in *Escherichia coli*. The leader peptide is coded by regions 1 and 2 of the mRNA. Two regions of the growing mRNA chain are able to form double-stranded loops, shown as 2:3 and 3:4. Under conditions of excess tryptophan, the ribosome translates the complete leader peptide, and so region 2 cannot pair with region 3. Regions 3 and 4 then pair to form a loop that terminates RNA polymerase. If translation is stalled because of tryptophan starvation, loop formation via 2:3 pairing occurs, loop 3:4 does not form, and transcription proceeds past the leader sequence. If the ribosome cannot begin translation of the leader because of some translational block *other* than tryptophan starvation, then loop 3:4 will be free to form, and transcription is also terminated.