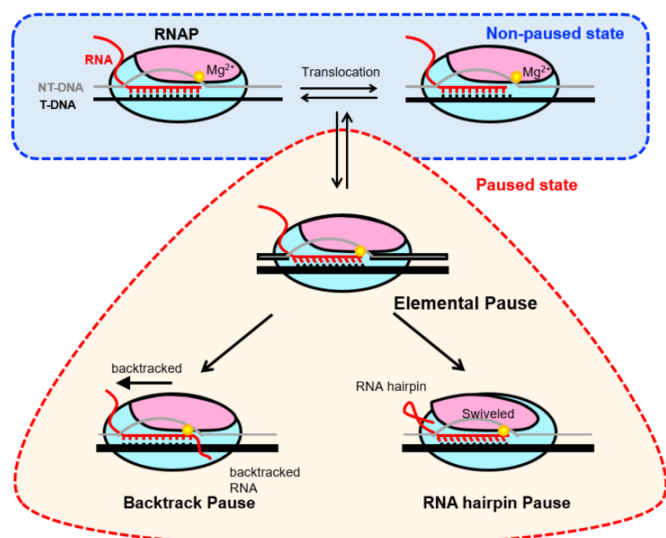
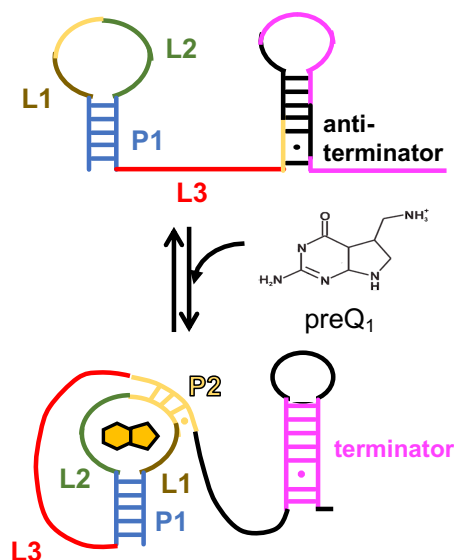


Figure 1



Schematics diagram of transcriptional pauses (edited from Kang, JMB, 2019). Elemental pause can be stabilized into either backtrack pause or RNA hairpin pause

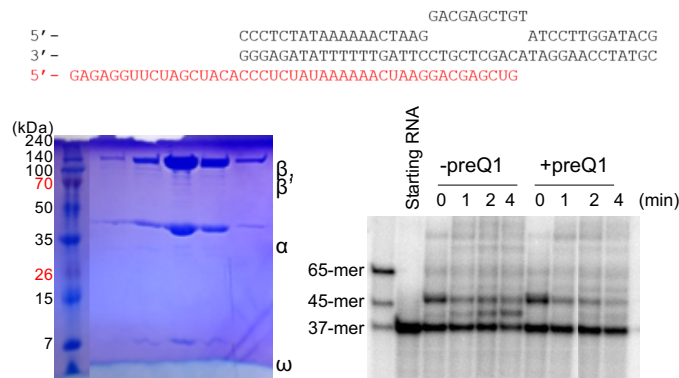
Figure 2



Schematics diagram of the preQ1-I riboswitch and its pseudoknot formation upon the ligand binding, leading to terminator hairpin formation (modified from Widom, Mol. Cell, 2018)

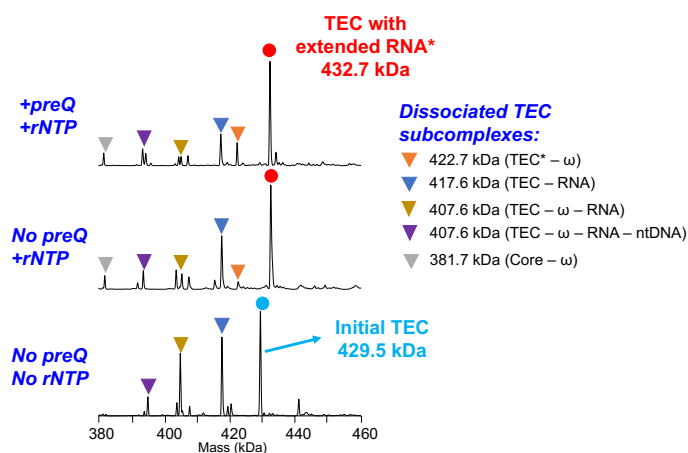
Figure 3

Nucleic acid scaffold



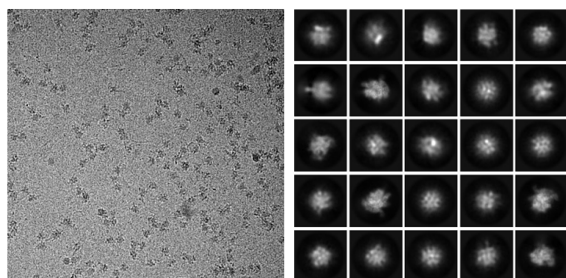
quePEC complex assembly condition (top) optimized nucleic acid sequence, (lower, left) SDS-PAGE image of the gel-purified EcoRNAP, (lower right) urea-denaturing PAGE image from que pause transcription assay

Figure 4



quePEC complex was assessed by native mass spectrometry (collaborated with Dr. Olinare in Chiat Lab at Rockefeller University). From the spectra, we found out all the RNAs assembled properly with RNAP and DNAs were extended by the addition of the substrates rNTP

Figure 5



(left) Representative motion-corrected cryo-EM image. (middle) Selected 2D class images from the quePEC micrographs. (right) One of the resulting 3D reconstructions. From the collected data, we could obtain three different conformers with 3.1 Å ~ 3.7 Å resolutions, but could not observe the riboswitch region