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RNA-protein complexes for designing functional nanostructured molecules

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Nanostructures consisting of DNA provide promising frameworks for designing nanomachines with defined shapes and sizes. However, the DNA based structures have problems when applied *in vivo*. To avoid such problems including genomic integration or immune responses, several approaches including episomal technologies have been practiced without sufficient success.

RNA-protein complexes (RNP) can also be employed to design and construct nanostructures. They have characteristic features as follows. (1) RNA can be designed by using a simple Watson-Crick base pairings like DNA nanostructure and naturally occurring tertiary interactions, (2) proteins can be exploited for reinforcement of the RNA structure and to give a function to the RNP, and (3) RNA-protein structures have potential to be produced and assembled *in vivo*. We have designed triangular shaped RNP [1].

In this study, we have further exploited the potential use of the RNPs with defined nanostructures. Various shapes (i. e. square or zigzag) of the RNP have been designed, constructed and visualized by HS-AFM. Several functional RNA-binding proteins have been successfully attached to the RNAs with defined structures to improve their physiological functions. Thus, the RNA-protein complexes are potentially useful for designing novel nanostructures linking the structures to the functions.

[1] Ohno, H.; Kobayashi, T.; Kabata, R.; Endo, K.; Iwasa, T.; Yoshimura, S. H.; Takeyasu, K.; Inoue, T. & Saito, H. (2011), 'Synthetic RNA-protein complex shaped like an equilateral triangle.', *Nat Nanotechnol* **6**(2), 116--120.