



**RNA's dynamic and motile properties lead to its ATP-binding in driving viral dsDNA packaging and spontaneous cancer targeting with undetectable toxicity**



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### **Abstract**

The dynamic, motile, and deformative nature of RNA leads to many novel functions, including regulation, translation, and catalysis. Our long-term studies on the pRNA that drives phi29 DNA packaging motor have led to the discovery of how life systems control the revolving motion direction and the chirality of asymmetric hexameric nanomotors in transporting dsDNA genome; the invention of RNA nanotechnology; the discovery of RNA in living systems for ATP-binding and as part of the ATPase; and the design of synergistic RNA-nanoparticles for spontaneous cancer targeting with undetectable toxicity. The motile and deformative property was a combined consequence of conformational transitions due to the near-neighbor principle, change of base-pairing, breathing within complemented strands, pseudoknot formation at the 2D level, and the induced-fit and conformational capture at the 3D level. This novel property was discovered by a biophysical approach, including the total internal reflection fluorescence microscopy, the optical tweezers, and the MD simulation. Their motility and dynamic properties enhance their penetration through the leaky blood vessels of cancers, leading to highly efficient tumor accumulation, passing the glomerulus into urine for fast renal excretion and rapid body clearance, thus no toxicity. RNA nanoparticles are self-assembled, negatively charged, programmable, and multivalent. Their intrinsic negative charge prevents the negatively charged cell membrane and enhances the solubility of hydrophobic drugs. The prediction that RNA will be the third milestone in drug development has now been realized. The dynamic, motile, and catalytic activity has led to a belief that RNA is the origin of life.

### **Biography**

Dr. Guo is a pioneer of RNA nanotechnology and a fellow of the National Academy of Inventors. After 17 years as a Distinguish Young Faculty Scholar and the director of the [NIH Nanomedicine Development Center](#) at Purdue University, then he served as endowed chair of U Cincinnati and then endowed chair of U Kentucky. He is currently Endowed Chair professor in COP, the director of Center for RNA Nanobiotechnology and Nanomedicine, the President of the Intl Society of RNA Nanotech and Nanomedicine, the Editor-in-Chief of [RNA NanoMed](#), and the chairman of the [2025 Conference on Viral Biomotors](#) at Los Angeles. He received his Ph.D. from the U of Minnesota and a postdoctoral training at NIH. He was nominated as the "Innovator of the Year" of OSU in 2021, and the OSU President's Research Excellence Catalyst Award in 2024. The ScholarGPS AI ranked him #18 in Nanotechnology and #36 in RNA in world ranking.

\*\*\* ALL ARE WELCOME \*\*\*

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