



# Hong Kong RNA Club



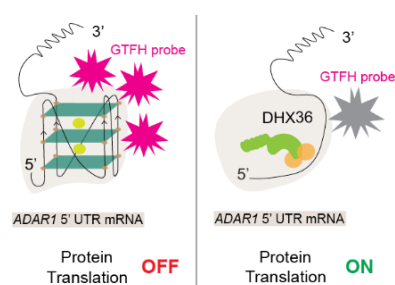
## RNA Enthusiast Spotlight (Jan 2023)



Miss Kaixin Lyu (Kathy) is currently a PhD student in Dr. Chun Kit Kwok's lab in the Department of Chemistry, City University of Hong Kong. In 2020, she was awarded the CityU Research Tuition Scholarship and won the Journal of Materials Chemistry B Poster Prize in 2019 in the seventh International Meeting on Quadruplex Nucleic Acids. She has been in the Hong Kong RNA Club team for over 4 years. She can be reached at [kaixinlyu2-c@my.cityu.edu.hk](mailto:kaixinlyu2-c@my.cityu.edu.hk)

Kathy mainly focuses on the RNA G-quadruplex (rG4) structure mechanistic roles in translational regulatory pathways and disease pathology. She is also interested in the rG4 binding partners and molecular basis of interactions.

Recently, Miss LYU has reported an rG4 structure in the 5'UTR of *ADAR* (Adenosine Deaminase Acting on RNA) *in vitro* and *in vivo* using multi-disciplinary assays. Notably, the binding and resolving effect of rG4-specific helicase DHX36 on this rG4 was monitored using fluorescently turn-on rG4 probe. The results have verified *ADAR1* rG4 inhibits native translation with DHX36 modulating its formation in cells.



### Recent representative publications:

Lyu, K., Chen, S.B., Chow, E.Y., Zhao, H., Yuan, J.H., Cai, M., Shi, J., Chan, T.F., Tan, J.H., Kwok, C.K. An RNA G-Quadruplex Structure within the ADAR 5'UTR Interacts with DHX36 Helicase to Regulate Translation. *Angewandte Chemie*. 61, e20203553 (2022).

Ji, D., Lyu, K., Zhao, H. & Kwok, C.K. Circular L-RNA aptamer promotes target recognition and controls gene activity. *Nucleic Acids Res.* 49, 7280-7291 (2021).

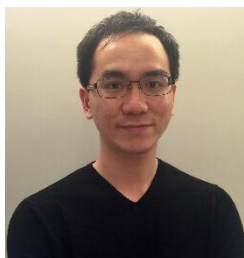
Lyu, K., Chow, E.Y.C., Mou, X., Chan, T. & Kwok, C.K. RNA G-quadruplexes (rG4s): genomics and biological functions. *Nucleic Acids Res.* 49, 5426-5450 (2021).

Chow, E.Y.C., Lyu, K., Kwok, C. K. & Chan, T.F. rG4-seeker enables high-confidence identification of novel and non-canonical rG4 motifs from rG4-seq experiments. *RNA Biology* 17, 903-917 (2020).

Lyu, K., Chen, S. B., Chan, C. Y., Tan, J. H., & Kwok, C. K. Structural analysis and cellular visualization of APP RNA G-quadruplex. *Chemical Science*. 10, 11095 - 11102 (2019).

Kathy's favorite RNA is Amyloid precursor protein (APP) mRNA. She said it is surely an interesting transcript, and the accumulation of its proteolytic cleavage product  $\beta$ -amyloid peptide ( $A\beta$ ) is related to Alzheimer's disease (AD). Interesting, she and others have found several rG4 structures on the coding region sequences and 3'untranslated region of *APP* mRNA, which can be explored and investigated to regulate APP protein and  $A\beta$  level, and potential be important therapeutic target for treatment and/or prevention of this neurodegenerative disease.

Kathy shared that there are no limits on what one can achieve with his/her life, except the limits one set for him/herself. She added that we all have times when we feel down, depressed, and struggled in work and life, and people who work in science is no exception. To her, the best way to distract and recharge is by exercising and sleeping. Lastly, she added "Always remember to hug someone you love."



Dr. Chun Kit Kwok (Kit) is an associate professor in the Department of Chemistry at the City University of Hong Kong. In 2019, he was awarded the CityU President Award and Croucher Innovation Award. In 2021, he was recognized as elected member of Hong Kong Young Academy of Science (YASHK) and Hong Kong Institute for Advanced Study Rising Star in Chemistry. In 2022, he won the CityU Outstanding Researcher Award.

Dr. Kwok's current research focus is to explore the role of RNA structures and interactions in biology, especially the functions of G-quadruplex structures/interactions and non-coding RNA structures/interactions in the transcriptome and their relevance to gene regulation, RNA metabolism and diseases. Another key direction in the Kwok lab is to develop targeting tools such as aptamers for detection, imaging, intervention of these important RNA structures and interactions. Please find more information on the website. [www.kitkwok.com](http://www.kitkwok.com)

### Recent representative publications

Lyu, K., Chen, S.B., Chow, E.Y., Zhao, H., Yuan, J.H., Cai, M., Shi, J., Chan, T.F., Tan, J.H., **Kwok, C.K.** An RNA G-Quadruplex Structure within the ADAR 5'UTR Interacts with DHX36 Helicase to Regulate Translation. *Angewandte Chemie*. 61, e20203553 (2022).

Zhao, H., Wong, H.Y., Ji, D., Lyu, K. & **Kwok, C.K.** Novel L-RNA Aptamer Controls APP Gene Expression in Cells by Targeting RNA G-Quadruplex Structure. *ACS Appl. Mater. Interfaces*. 14, 30582- 30594 (2022).

Chen, X., Xue, G., Zhao, J., Zhang, Y., Zhang, Z., Wang, W., Li, Y., Yuan, J., He, J., Chan, C.Y., Liu, Y., Chen, W., Zhao, Y., Hu, P., Sun, H., **Kwok, C.K.** & Wang, H. *Lockd* promotes myoblast proliferation and muscle regeneration via binding with DHX36 to facilitate 5' UTR rG4 unwinding and *Anp32e* translation. *Cell Rep*. 39, 110927 (2022).

Umar, M.I., Chan, C.Y. & **Kwok, C.K.** Development of RNA G-quadruplex (rG4)-targeting L-RNA aptamers by rG4-SELEX. *Nat Protoc*. 17, 1385-1414 (2022).

Mou, X., Liew, S. W. & **Kwok, C.K.** Identification and targeting of G-quadruplex structures in MALAT1 long non-coding RNA. *Nucleic Acids Res*. 50, 397- 410 (2022).

The RNA discovery that fascinates Dr. Kwok the most is the discovery of the catalytic properties of RNA (Ribozyme), as it provides fundamental support to the RNA World hypothesis (RNA precedes DNA and protein), and offer immense potentials for biotechnological applications such as therapeutics and diagnostics.

Dr. Kwok's favorite quote is "He who has a why to live for can bear almost any how" by Friedrich Nietzsche. As principal investigator and mentor, he enjoys the thrill of doing cutting-edge research with his young and talented team members, and seeing their mindsets and skillsets develop over time. He hopes that one day there will be an RNA-theme center/institute in Hong Kong, which can inspire, recruit, educate, and retain more talents to work on the RNA science and technology in Hong Kong.



Kwok Lab zoom meeting during COVID-19

# Hong Kong RNA Club

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