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3

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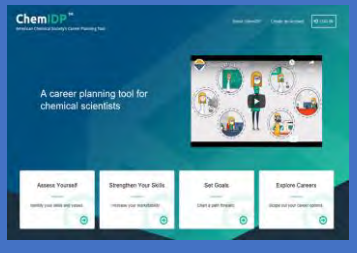

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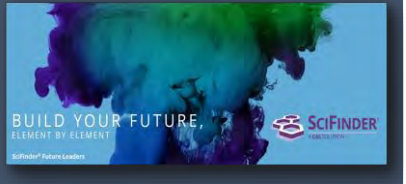

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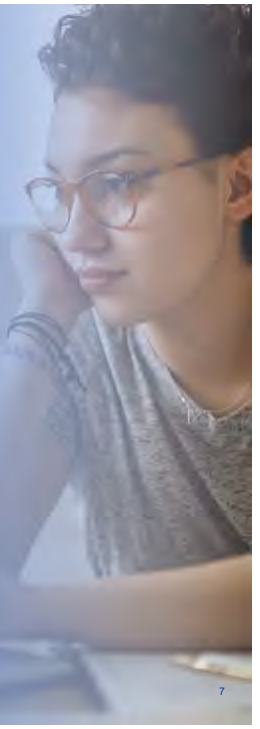

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Q&A
ACS Career Consultants
Networking

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ACS Efforts and Resources on COVID-19

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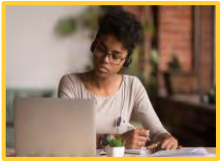
www.acs.org/covid-19

9

ACS Career Navigator: Your Home for Career Services

Whether you are just starting your journey, transitioning jobs, or looking to brush up or learn new skills, the **ACS Career Navigator** has the resources to point you in the right direction.

We have a collection of career resources to support you during this global pandemic:

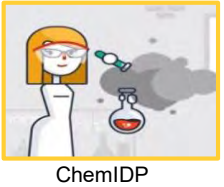


Professional Education

Virtual Career Consultants

ACS Leadership Development System

Career Navigator LIVE!



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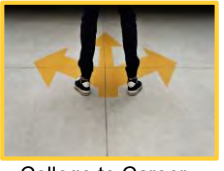

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10

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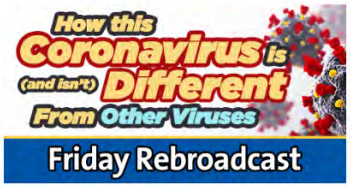
Upcoming Broadcasts



Friday, June 26, 2020 at 2-3pm ET
Speakers: Kristin Omberg, Pacific Northwest National Laboratory and Brenda Hogue, Arizona State University
Moderator: Sue Morrissey, American Chemical Society

Register for Free!

What You Will Learn

- How the "novel" coronavirus, SARS-CoV-2 is related to the larger family of coronaviruses
- How this coronavirus is transmitted and how people can become infected
- How long the virus remains in the environment and how to kill it

Co-produced with: ACS External Affairs & Communications

Tuesday, June 30, 2020 at 2-3pm ET
Speakers: LaTrease Garrison, American Chemical Society / Thomas Holme, Journal of Chemical Education / Heather Weck, American Association of Chemistry Teachers
Moderator: Dawn Del Carlo, ACS Division of Chemical Education

Register for Free!

What You Will Learn

- The resources our community of educators have found most effective for teaching chemistry online
- How the broader education community is working together
- Ways remote education is advancing STEM education

Co-produced with: American Association of Chemistry Teachers, ACS Education, and ACS Publications

Wednesday, July 1, 2020 at 2-3pm ET
Speakers: Will Fuentes, Maestro Group
Moderator: Paula Christopher, American Chemical Society

Register for Free!

What You Will Learn

- How to prepare for an interview
- How to conduct the interview remotely
- How to follow up after the interview

Co-produced with: ACS Diversity Programs and the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS)

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aaps American Association of Pharmaceutical Scientists

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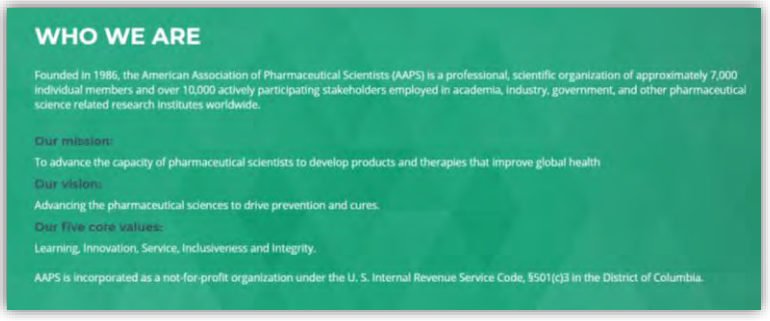

Members of the American Association of Pharmaceutical Scientists (AAPS) gathered during the 2013 AAPS Annual Meeting and Exposition to discuss why they chose a career in pharmaceutical sciences and how AAPS has helped foster their journey. The I Am AAPS video series displays the diversity of AAPS membership while exhibiting one common goal: to impact global health.

https://www.aaps.org

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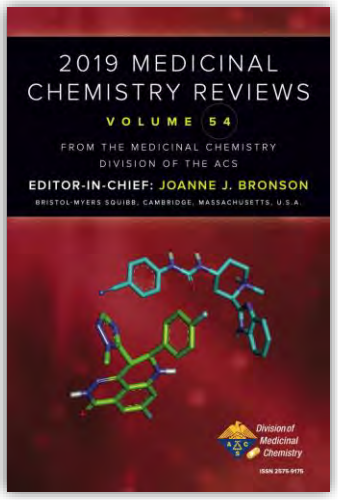

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- Abstracts of MEDI programming at national meetings
- Access to student travel grants and fellowships

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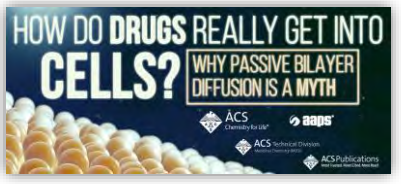
13

Catch up on 2020's Free Open Access Recordings!

Join Angela Zhou, an Information Scientist at CAS, as she provides an overview of published scientific information relevant to COVID-19 research with an emphasis on patents in the CAS content collection. https://www.acs.org/content/acs/en/acs-webinars/drug-discovery/covid-19.html

Join Research Fellow Li Di of Pfizer as she discusses why design principles that increase passive permeability are effective approaches to increase oral bioavailability, enhance brain penetration, and reduce renal clearance.
https://www.acs.org/content/acs/en/acs-webinars/drug-discovery/passive-permeability.html



Join Douglas Kell, Research Chair in Systems Biology at the University of Liverpool to discover how drugs pass through cell membrane solely by hitchhiking on membrane transporters and why so-called "passive diffusion" through any bilayer in real cells is negligible.
https://www.acs.org/content/acs/en/acs-webinars/drug-discovery/so-lute-carriers.html

14

THIS ACS WEBINAR WILL BEGIN SHORTLY...

15

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Enabling Technologies for Revealing Druggable Paths in RNA Biology

Amanda Garner
Associate Professor, College of Pharmacy, Department of Medicinal Chemistry, University of Michigan

Matt Disney
Full Professor, Department of Chemistry and Department of Neuroscience, The Scripps Research Institute

Presentation slides are available now! Edited recordings are an exclusive ACS member benefit.

www.acs.org/acswebinars

This ACS Webinar is co-produced with ACS Division of Medicinal Chemistry, American Association of Pharmaceutical Scientists, and ACS Publications

16

COLLEGE OF PHARMACY
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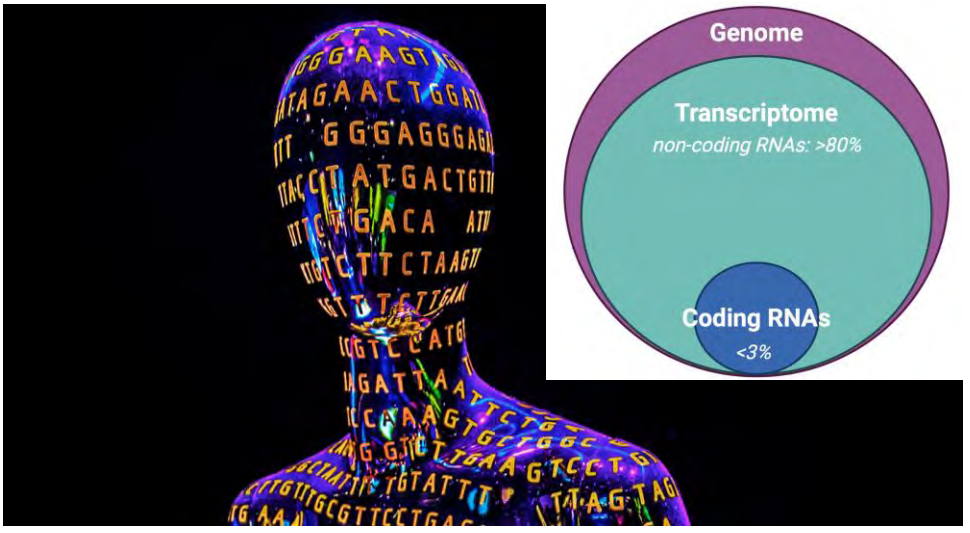
Enabling Technologies for Revealing Druggable Paths in RNA Biology

Amanda L. Garner, Ph.D.
Associate Professor
Department of Medicinal Chemistry
University of Michigan

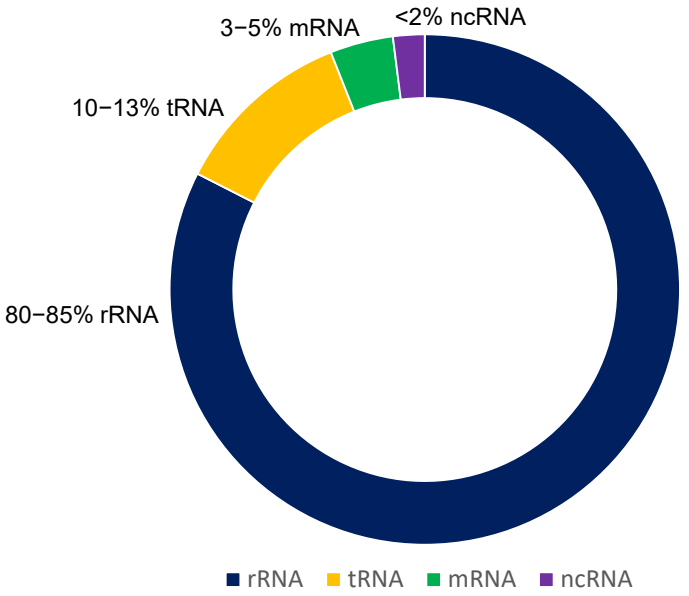
The Human Genome Project

Sequencing of the human genome promised many new drug targets:



https://web.ornl.gov/sci/techresources/Human_Genome/project/journals.shtml

The Landscape of Human RNAs



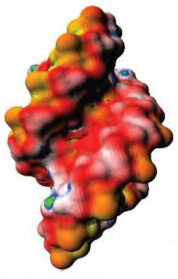
ncRNAs:
- microRNA
- piRNA
- Y RNA
- snoRNA
- snRNA
- lncRNA

replication
transcription
splicing
translation
RNA biogenesis

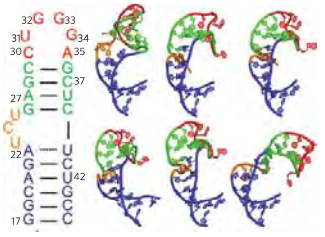
EMBO Rep. **2001**, *2*, 986; *Nat. Rev. Genet.* **2014**, *15*, 423

Challenges of RNA-Targeted Drug Discovery

Highly electronegative



Highly dynamic

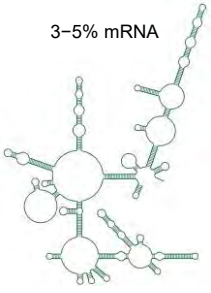


RNA abundance

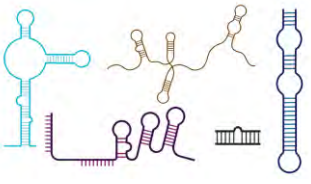
80−85% rRNA

10−13% tRNA

3−5% mRNA



<2% ncRNA

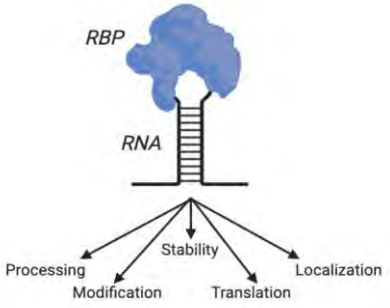


Fut. Med. Chem. **2019**, *11*, 2487

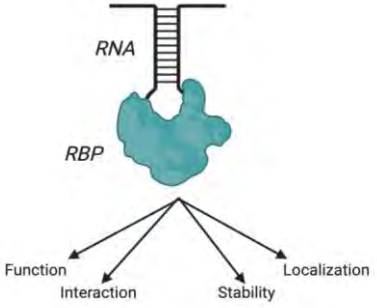
Regulation of RNA Biology via RNA-Binding Proteins

RNA-protein interactions (RPIs) play critical roles in regulating many aspects of RNA biology:

RBP acting on RNA



RNA acting on RBP



>1,500 RBPs have been identified to date and disruption of RPI networks have been linked to many human diseases

Nat. Rev. Genet. **2014**, *15*, 829; *Nat. Rev. Mol. Cell Biol.* **2015**, *16*, 533; *Trends Cancer* **2017**, *3*, 506; *Nat. Rev. Mol. Cell Biol.* **2018**, *19*, 327; *Pharmacol. Ther.* **2019**, *203*, 107390

Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

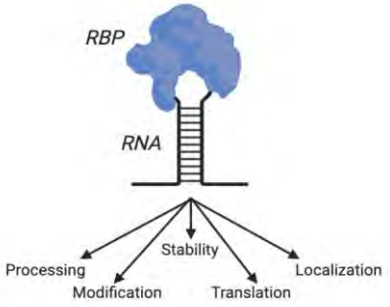
Which of the following human proteins has been identified as an RNA-binding protein? (Select all that apply)

- RNase H
- Fragile X Mental Retardation Protein (FMRP)
- GAPDH
- Cyclin A
- None of the above

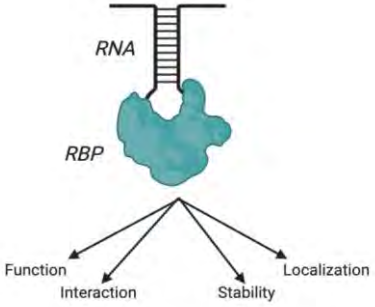
Regulation of RNA Biology via RNA-Binding Proteins

RNA-protein interactions (RPIs) play critical roles in regulating many aspects of RNA biology:

RBP acting on RNA

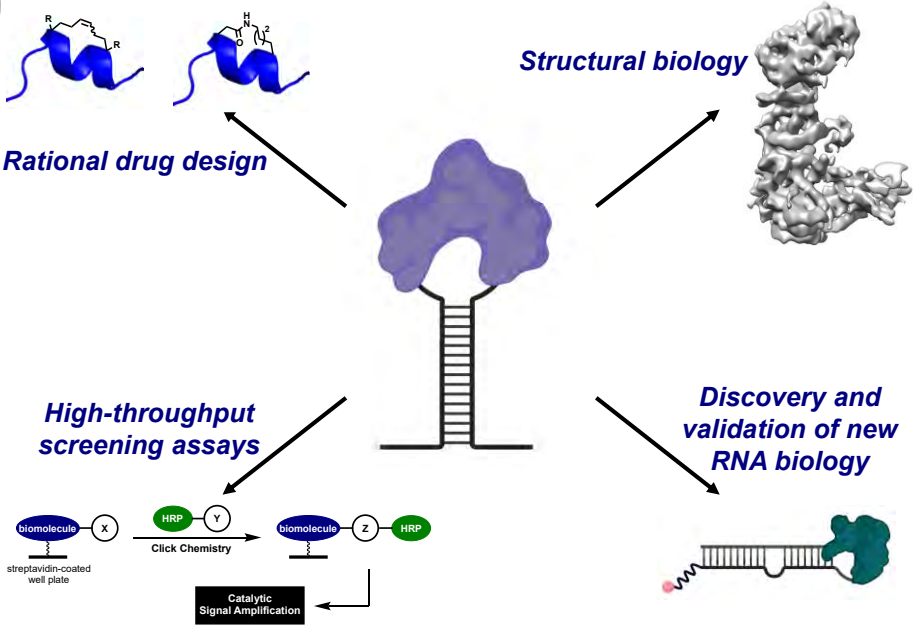


RNA acting on RBP



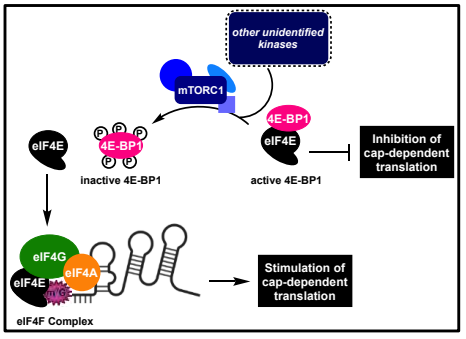
HYPOTHESIS:
Targeting RBPs is an alternative strategy for drugging RNA biology

A Multi-Faceted Approach for Studying RNA-Binding Proteins



Garner Lab Research in Targeting Translational Control: From Coding to Non-Coding RNA Biology

Cap-Dependent Translation Initiation

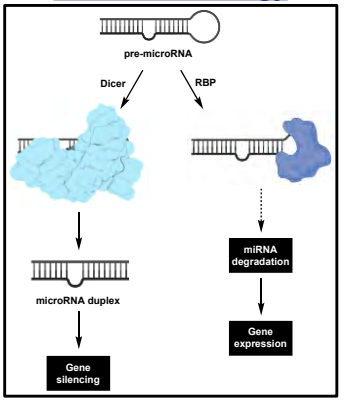


Assay Development:
ACS Comb. Sci. **2017**, *19*, 763; *ChemBioChem* **2019**, *20*, 40

eIF4E-Targeted Inhibitors:
Eur. J. Med. Chem. **2019**, *166*, 339 ; *J. Med. Chem.* **2019**, *62*, 4967; *Org. Biomol. Chem.* **2019**, *17*, 6414; *Eur. J. Med. Chem.* **2020**, submitted

4E-BP1 Kinase Discovery:
Cell Chem. Biol. **2019**, *26*, 980; *FEBS Lett.* **2020**, *594*, 1307

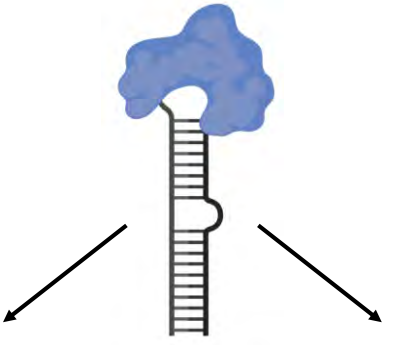
microRNA Biology



microRNA Maturation:
Bioconj. Chem. **2015**, *26*, 19; *Chem. Commun.* **2016**, *52*, 8267; *Top. Med. Chem.* **2018**, *27*, 79; *SLAS Discovery* **2018**, *23*, 47; *ACS Med. Chem. Lett.* **2019**, *10*, 816; *Met. Enzymol.* **2019**, *623*, 85

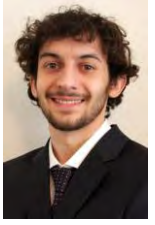
microRNA-Protein Interactions:
ACS Med. Chem. Lett. **2018**, *9*, 517 ; *ACS Comb. Sci.* **2019**, *21*, 522; *J. Biol. Chem.* **2019**, *294*, 17188; *bioRxiv*

A Multi-Faceted Approach for Studying Pre-microRNA-Protein Interactions



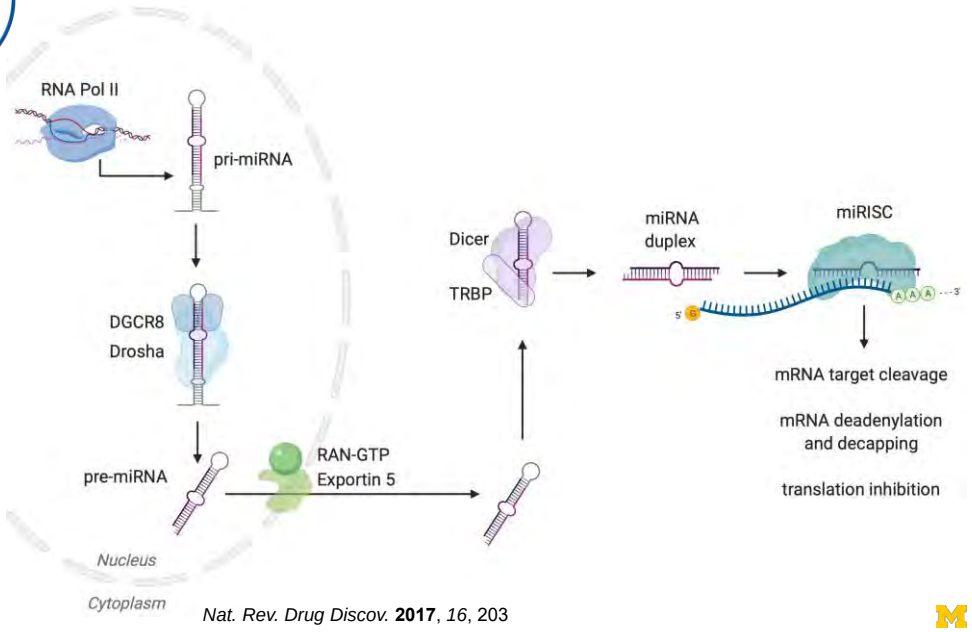
High-throughput screening assays

Validation of new RNA-protein interactions



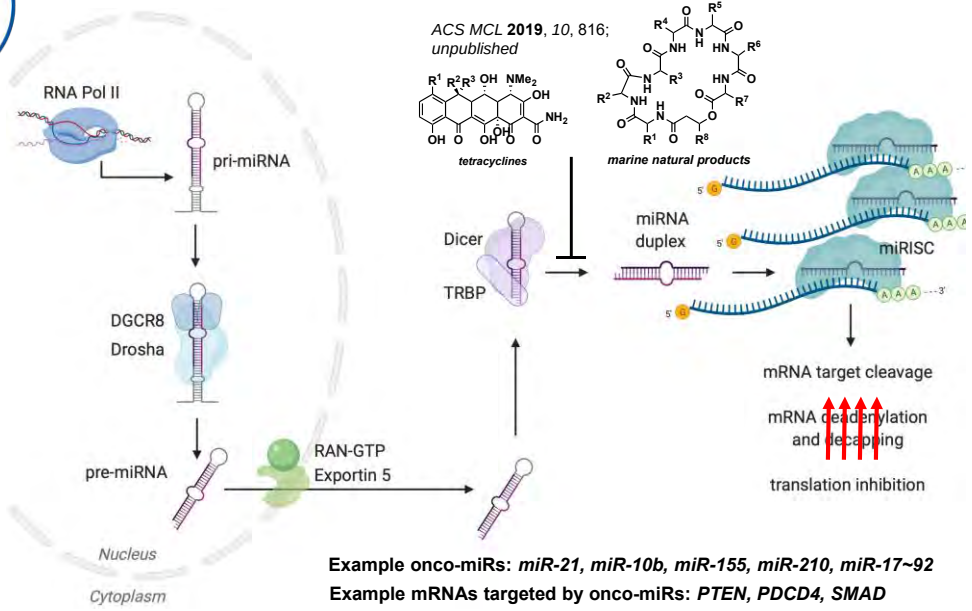
Dan Lorenz Sydney Rosenblum

microRNA Biogenesis and Activity



Nat. Rev. Drug Discov. **2017**, *16*, 203

Aberrant Regulation of microRNAs in Cancer

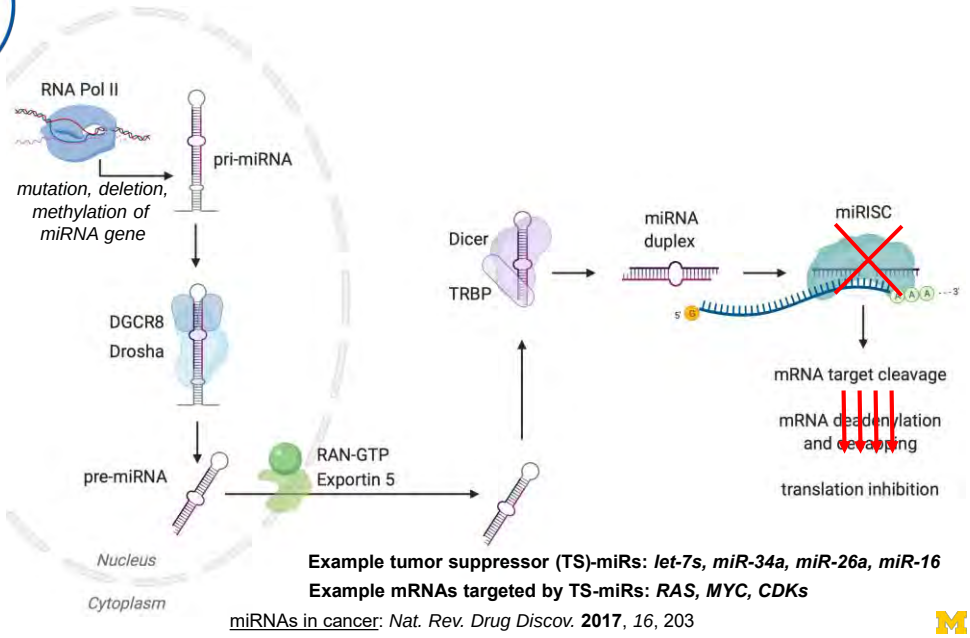


Example onco-miRs: ***miR-21, miR-10b, miR-155, miR-210, miR-17~92***

Example mRNAs targeted by onco-miRs: ***PTEN, PDCD4, SMAD***

miRNAs in cancer: *Nat. Rev. Drug Discov.* **2017**, *16*, 203

Aberrant Regulation of microRNAs in Cancer



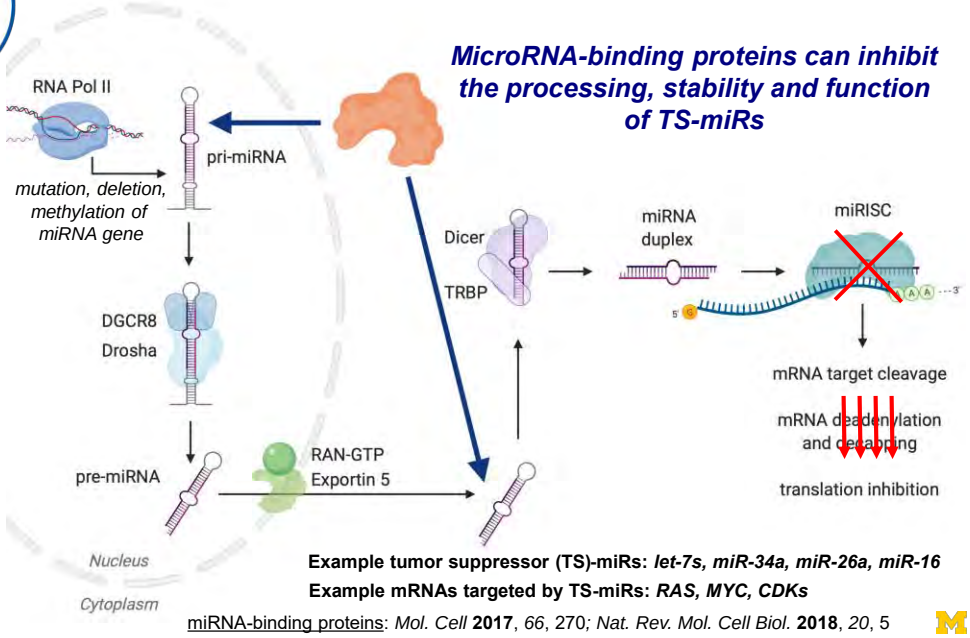
Example tumor suppressor (TS)-miRs: *let-7s, miR-34a, miR-26a, miR-16*

Example mRNAs targeted by TS-miRs: *RAS, MYC, CDKs*

miRNAs in cancer: *Nat. Rev. Drug Discov.* **2017**, *16*, 203

Aberrant Regulation of microRNAs in Cancer

MicroRNA-binding proteins can inhibit the processing, stability and function of TS-miRs



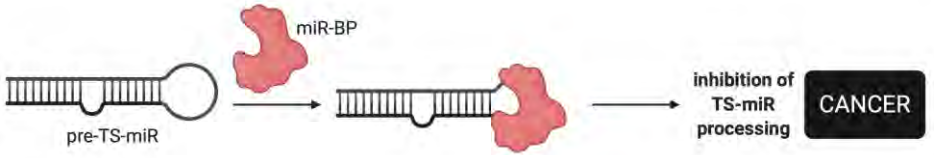
Example tumor suppressor (TS)-miRs: *let-7s, miR-34a, miR-26a, miR-16*

Example mRNAs targeted by TS-miRs: *RAS, MYC, CDKs*

miRNA-binding proteins: *Mol. Cell* **2017**, *66*, 270; *Nat. Rev. Mol. Cell Biol.* **2018**, *20*, 5

Targeting microRNA-Protein Interactions for the Restoration of Tumor Suppressor microRNAs

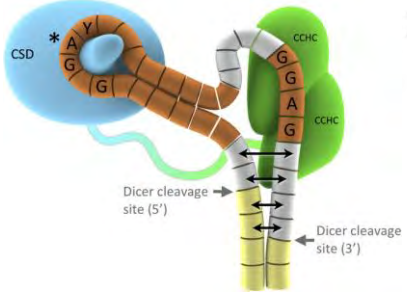
miRNA-binding proteins negatively regulate the maturation of TS-miRs:



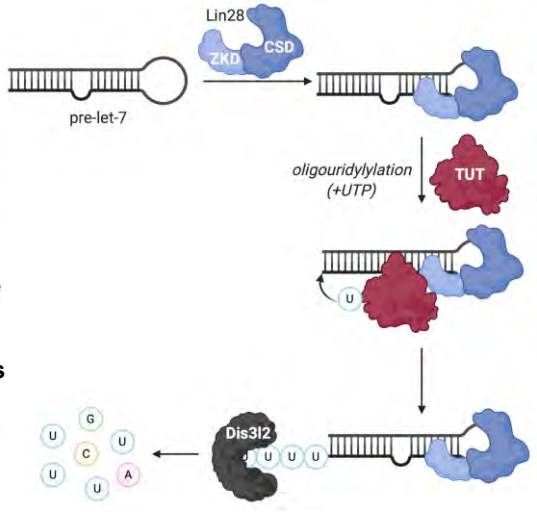
microRNA-binding proteins: *Nat. Rev. Cancer* **2011**, *11*, 644; *Nat. Rev. MCB* **2018**, *20*, 5

Targeting microRNA-Protein Interactions for the Restoration of Tumor Suppressor microRNAs

Lin28 is a negative regulator of the TS-miRs pre-let-7:



Lin28 uses 3 RNA-binding domains to achieve high affinity and specificity for pri- and pre-let-7 family members



let-7–Lin28: *Science* **2008**, *320*, 97; *Cell* **2011**, *147*, 1080; *RNA* **2013**, *19*, 613

Audience Survey Question

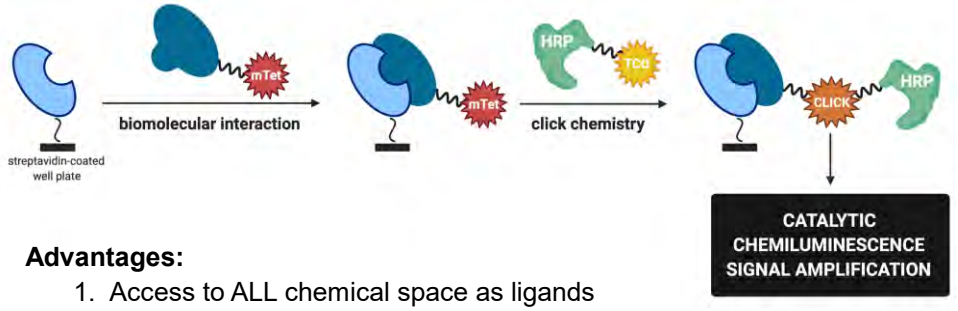
ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

Aside from pre-let-7 family members, how many other RNAs do you think Lin28 interacts with?

- 0
- 10
- 100
- 500
- Greater than 1,000

High-throughput Screening for the Discovery of Pre-let-7−Lin28 Interaction Inhibitors

catalytic Enzyme-Linked Click Chemistry Assay (cat-ELCCA):

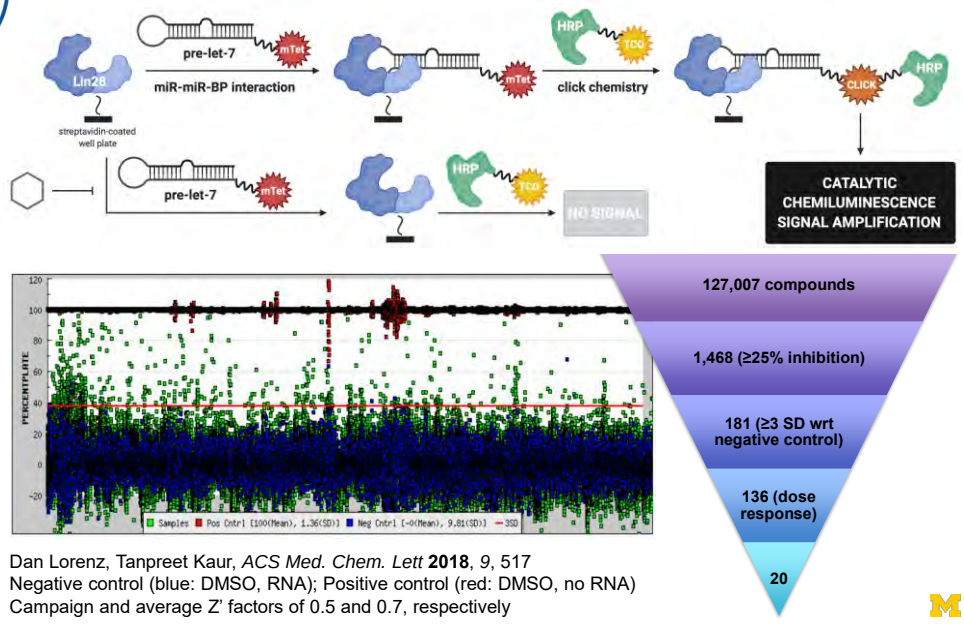


Advantages:

1. Access to ALL chemical space as ligands
2. Not subject to compound interference
3. Highly sensitivity due to catalytic signal amplification
4. All reagents are commercial or readily obtained: user friendly
5. No need for antibodies: widely applicable to any system

Garner and Janda: *Angew. Chem., Int. Ed.* **2010**, *49*, 9630; *Chem. Commun.* **2011**, *47*, 7512
Garner Lab: *Bioconj. Chem.* **2015**, *26*, 19; *Chem. Commun.* **2016**, *52*, 8267; *ACS Comb. Sci.* **2017**, *19*, 763; *Chem. Commun.* **2018**, *54*, 6531

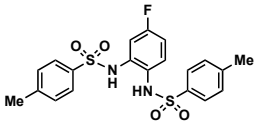
High-throughput Screening for the Discovery of Pre-let-7−Lin28 Interaction Inhibitors



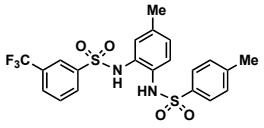
Dan Lorenz, Tanpreet Kaur, *ACS Med. Chem. Lett* **2018**, *9*, 517
Negative control (blue: DMSO, RNA); Positive control (red: DMSO, no RNA)
Campaign and average Z' factors of 0.5 and 0.7, respectively

High-throughput Screening for the Discovery of Pre-let-7−Lin28 Interaction Inhibitors

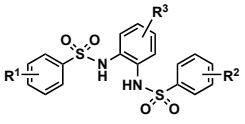
N, N'-(1,2-Phenylene)dibenzenesulfonamides as Lin28 inhibitors:



CCG-233094
IC_{50}: 8.3 nM



CCG-234459
IC_{50}: 10.3 nM



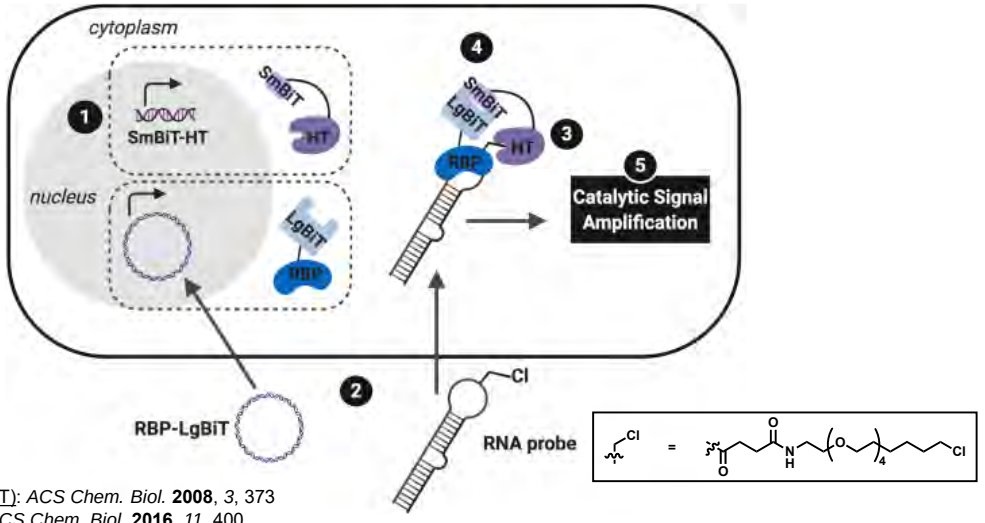
R^1	R^2	R^3	IC_{50} (nM)
m-Cl, p-Me	m-Cl, p-Me	H	2.3
m-Cl, p-Me	m-Cl, p-Me	F	3.7

Lin28A/B-binding (K_d ~300 nM) small molecules with inhibitory activity against Lin28−pre-let-7 interactions

Dan Lorenz, Tanpreet Kaur, Erin Gallagher, *ACS Med. Chem. Lett.* **2018**, *9*, 517

Live-Cell Assay Development for Detecting microRNA-Protein Interactions

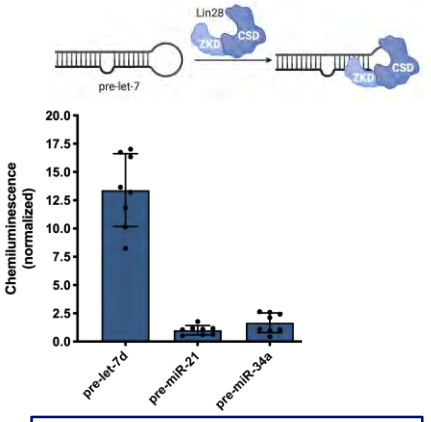
RNA interaction with Protein-mediated Complementation Assay (RiPCA):
assay scheme



HaloTag (HT): *ACS Chem. Biol.* **2008**, *3*, 373
NanoBiT: *ACS Chem. Biol.* **2016**, *11*, 400
Sydney Rosenblum, Dan Lorenz, *bioRxiv* **2020**

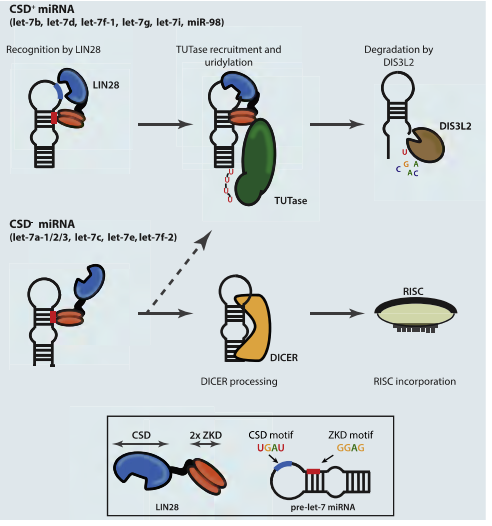
Live-Cell Assay Development for Detecting microRNA-Protein Interactions

RNA interaction with Protein-mediated Complementation Assay (RiPCA):
specificity of detection



Selective detection of CSD⁺ pre-let-7s binding to Lin28

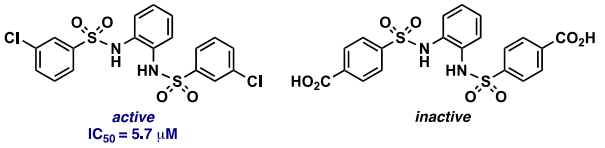
Sydney Rosenblum, *bioRxiv* **2020**

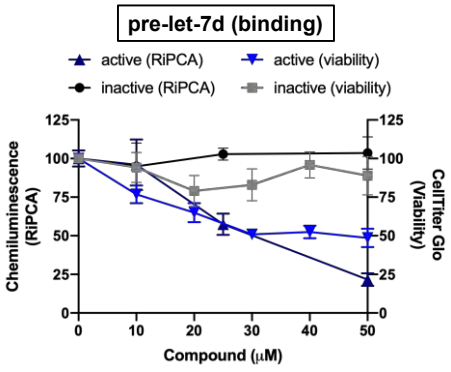


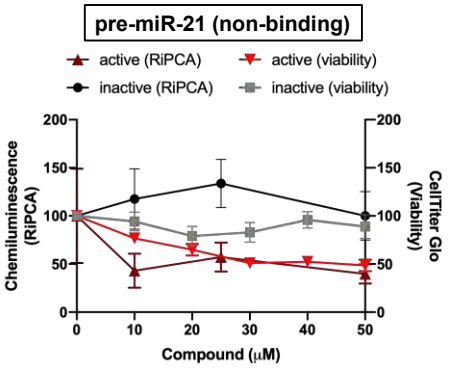
Let-7/Lin28: *Mol. Cell* **2018**, *71*, 271

Live-Cell Assay Development for Detecting microRNA-Protein Interactions

RNA interaction with Protein-mediated Complementation Assay (RiPCA):
small molecule inhibitors



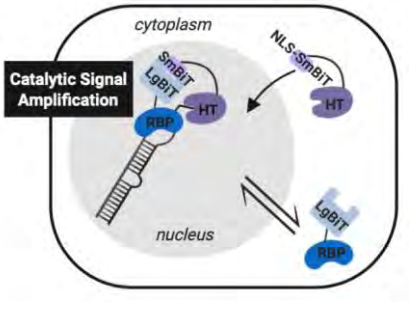


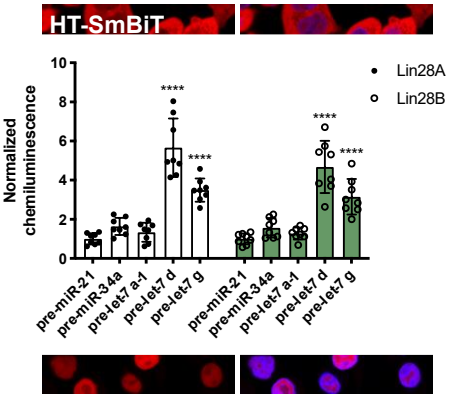


Sydney Rosenblum, *unpublished results*

Live-Cell Assay Development for Detecting microRNA-Protein Interactions

Nucleus-Specific Live-Cell Assay for Detecting RNA-Protein Interactions:
nuc-RiPCA

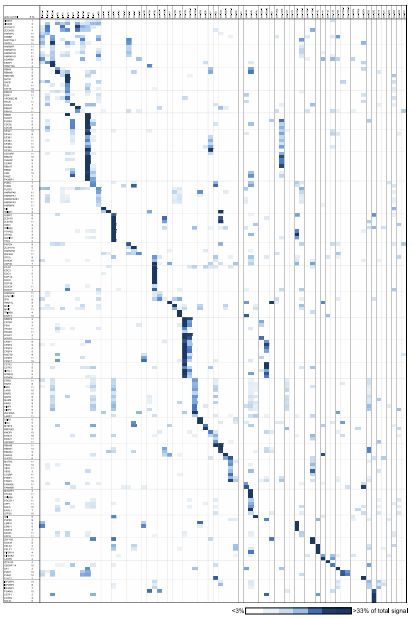


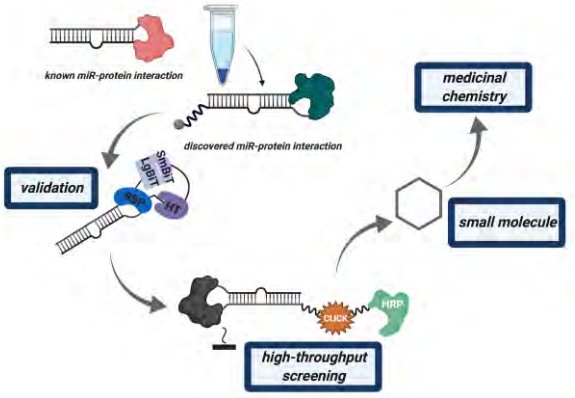


Detection of pre-let-7−Lin28 interaction in the cytoplasm and nucleus

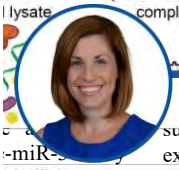
Sydney Rosenblum, Dan Lorenz, *bioRxiv* **2020**

A Pipeline for the Investigation of pre-miRNA-Protein Interactions as New Therapeutic Targets

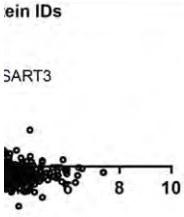




Mol. Cell **2017**, *66*, 270



Validation of SART3 as a Protein and Maturation Regulator



specific contaminant
over twenty different
ets. To identify high-
or proteins that were
l, as well as the
oing so, we quickly
ous cell carcinoma
ells 3) as the most

by flow cytometry with propidium iodide-stained cells. In both A549 and H1299 parental cell lines, substantial growth arrest in the G1 phase was observed upon overexpression of SART3 (Figure 3B). In addition to cell cycle profiles, we analyzed apoptosis and cellular senescence in these populations. Only a modest increase in apoptosis was detected in let-7i + miR-34a overexpressing A549 cells by Western blot using an antibody for cleaved caspase 3 (Figure S2), and no induction of beta-galactosidase staining was found (data not shown). We first compared the N- and C-termini of SART3 to the full-length protein using an empty

C-terminal RNA-recognition motifs give rise to selective pre-miR-34a binding

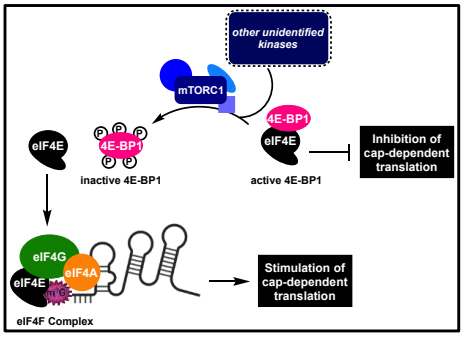
Having characterized a consistent phenotype related to SART3 expression in two NSCLC cell lines, we next sought to elucidate a potential mechanism for recognition of pre-miR-34a by SART3. SART3 is a ~110 kDa nuclear RNA-binding protein comprised of multiple HAT-A2 tetratricopeptide repeat (HAT) domains, two neighboring nuclear localization sequences (NLS), and two RNA-recognition motifs (RRMs) (Figure S2). Further supporting our findings, we noted that SART3 had also been detected as a pre-miR-34a–RBP in [43] in a similar experimental report, which identified this interaction across several cancer cell lines (Figure S2). From these results, important for RNA recognition and binding (3,94). Within SART3 specifically, the HAT domains have been shown to play a role in pre-mRNA 3′-end processing, ubiquitin-specific protease (USP) recruitment, protein-protein interactions, and spliceosome recycling activity (69,71-73,77,78). The NLS allows SART3 to function as a nuclear protein, and the RRMs, although differing in sequences, are both thought to contribute to RNA recognition, binding, and splicing activity (72,73).

Recognizing that each of these regions of SART3 has the capacity to be involved in miRNA regulation, we asked which of these domains were crucial for binding to pre-miR-34a. To this end, we generated 3′ FLAG constructs to express different variants of SART3, each containing deletions or truncations of one or more domains of the protein (Figure 4A). To assess the binding activity for each construct, we transiently transfected HEK293T cells with each plasmid and subsequently performed pre-miR-34a pulldown experiments as outlined in Figure 1A. Pre-miR-34a binding relative to pre-let-7d was then visualized by Western blot using an antibody for the FLAG epitope tag.

We first compared the N- and C-termini of SART3 to the full-length protein using an empty

Garner Lab Research in Targeting Translational Control: From Coding to Non-Coding RNA Biology

Cap-Dependent Translation Initiation



Assay Development:
ACS Comb. Sci. **2017**, *19*, 763; *ChemBioChem* **2019**, *20*, 40

eIF4E-Targeted Inhibitors:
Eur. J. Med. Chem. **2019**, *166*, 339 ; *J. Med. Chem.* **2019**, *62*, 4967; *Org. Biomol. Chem.* **2019**, *17*, 6414; *Eur. J. Med. Chem.* **2020**, submitted

4E-BP1 Kinase Discovery:
Cell Chem. Biol. **2019**, *26*, 980; *FEBS Lett.* **2020**, *594*, 1307

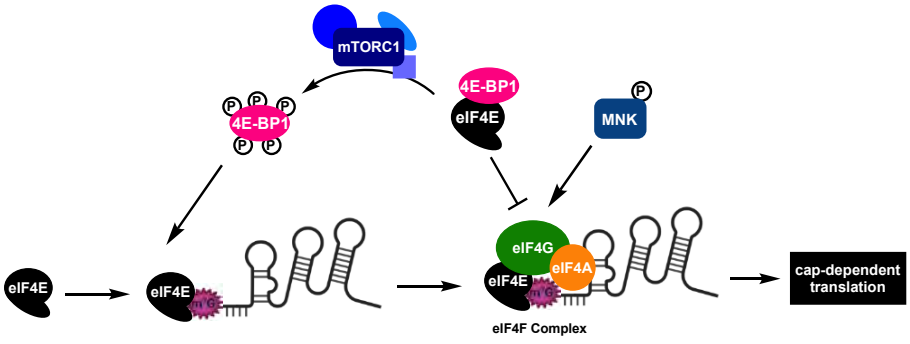
microRNA Biology

microRNA Maturation:
Bioconj. Chem. **2015**, *26*, 19; *Chem. Commun.* **2016**, *52*, 8267; *Top. Med. Chem.* **2018**, *27*, 79; *SLAS Discovery* **2018**, *23*, 47; *ACS Med. Chem. Lett.* **2019**, *10*, 816; *Met. Enzymol.* **2019**, *623*, 85

microRNA-Protein Interactions:
ACS Med. Chem. Lett. **2018**, *9*, 517 ; *ACS Comb. Sci.* **2019**, *21*, 522; *J. Biol. Chem.* **2019**, *294*, 17188; *bioRxiv*

eIF4E: An RBP Regulating Cap-Dependent Translation

eIF4E is a translational oncogene:

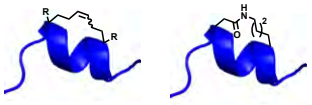


- **Cap-dependent transcripts** encode for **growth factors and oncogenes** (e.g. c-Myc, cyclin Ds, VEGF, ODC)
- **eIF4E** is the **rate-limiting initiation factor** and is **overexpressed in many human cancers** making it a **translational oncogene**

Nat. Rev. Cancer **2010**, *10*, 254

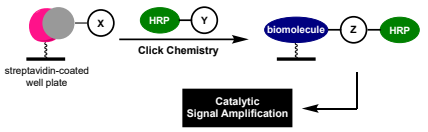
A Multi-Prong Approach for Targeting eIF4E, an RBP Initiating Cap-Dependent Translation

4E-BP1 stapled peptides



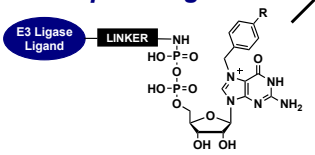
J. Med. Chem. **2019**, *62*, 4967;
Org. Biomol. Chem. **2019**, *17*, 6414;
submitted

High-throughput screening



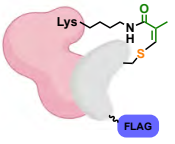
ACS Comb. Sci. **2017**, *19*, 763

Cap analogues



Eur. J. Med. Chem. **2019**, *166*, 339

Chemoproteomics



Cell Chem. Biol. **2019**, *26*, 980;
FEBS Lett. **2020**, *594*, 1307

A Multi-Prong Approach for Targeting eIF4E, an RBP Initiating Cap-Dependent Translation

4E-BP1 stapled peptides

J. Med. Chem. **2019**, *62*, 4967;
Org. Biomol. Chem. **2019**, *17*, 6414;
submitted

High-throughput screening

ACS Comb. Sci. **2017**, *19*, 763

Cap analogues

Eur. J. Med. Chem. **2019**, *166*, 339

Dylan Mitchell

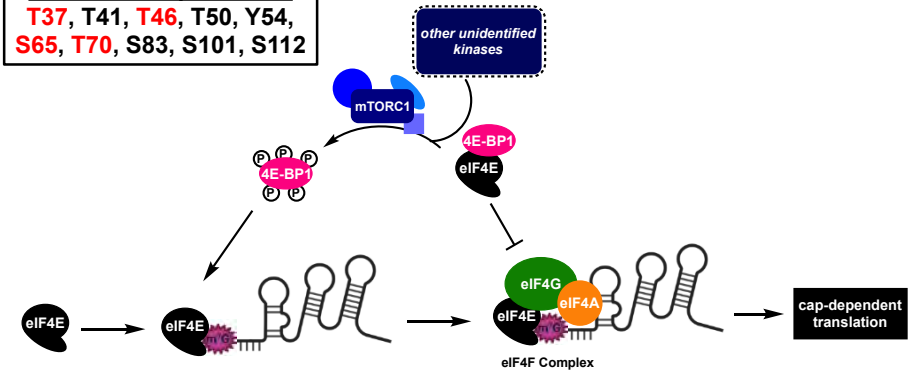
Chemoproteomics

Cell Chem. Biol. **2019**, *26*, 980;
FEBS Lett. **2020**, *594*, 1307

4E-BP1, the Guardian of eIF4E and Cap-Dependent Translation

Regulation of 4E-BP1 through phosphorylation and its complexities:

4E-BP1 Phospho-sites:
T37, T41, T46, T50, Y54, S65, T70, S83, S101, S112



4E-BP1 phosphorylation and drug resistance: *Cancer Cell* **2010**, *17*, 249; *PNAS* **2011**, *108*, E699; *Nature* **2012**, *485*, 55; *Cancer Res.* **2012**, *72*, 6468; *Cell Cycle* **2012**, *11*, 594; *Oncogene* **2013**, *33*, 1367; *Oncogene* **2014**, *33*, 1590; *J. Cell Sci.* **2014**, *127*, *788*

Audience Survey Question

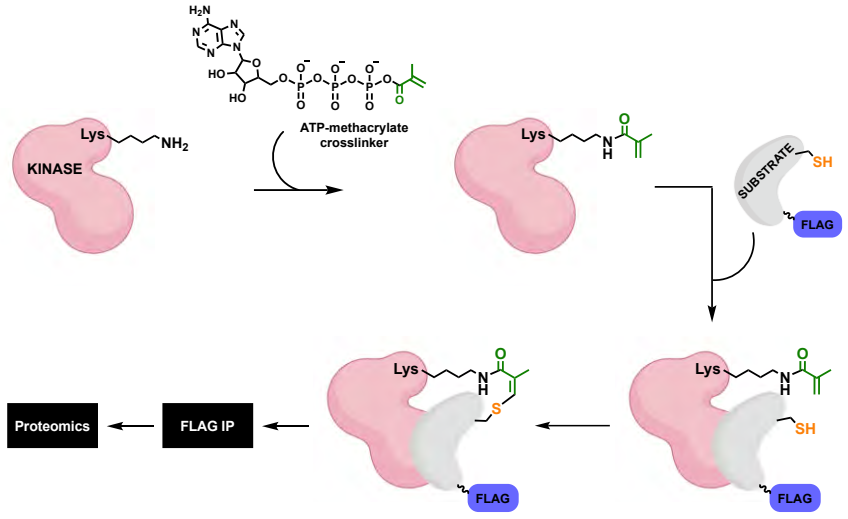
ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

Of the ~140,000 identified human phospho-sites, how many have been annotated to the kinase responsible for the phosphorylation event?

- ~10,000
- ~25,000
- ~50,000
- ~100,000
- ~140,000

Chemoproteomic Approach to Identify Novel 4E-BP1 Kinases

Phosphosite-Accurate Kinase-Substrate X-linking Assay (PhAXA):

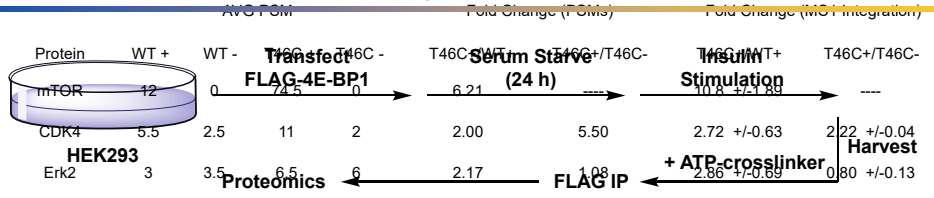


ATP crosslinker probe: *Chem. Biol.* **2014**, *21*, 585
Previous generations of this approach: *JACS* **2004**, *126*, 9160; *JACS* **2008**, *130*, 17568

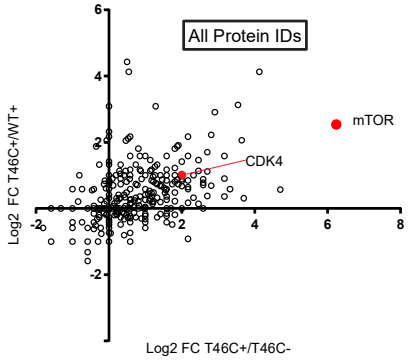
A

All Kinases Identified

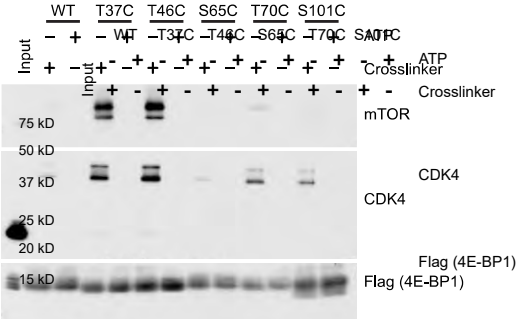
PhAXA to Identify Novel 4E-BP1 Kinases



B



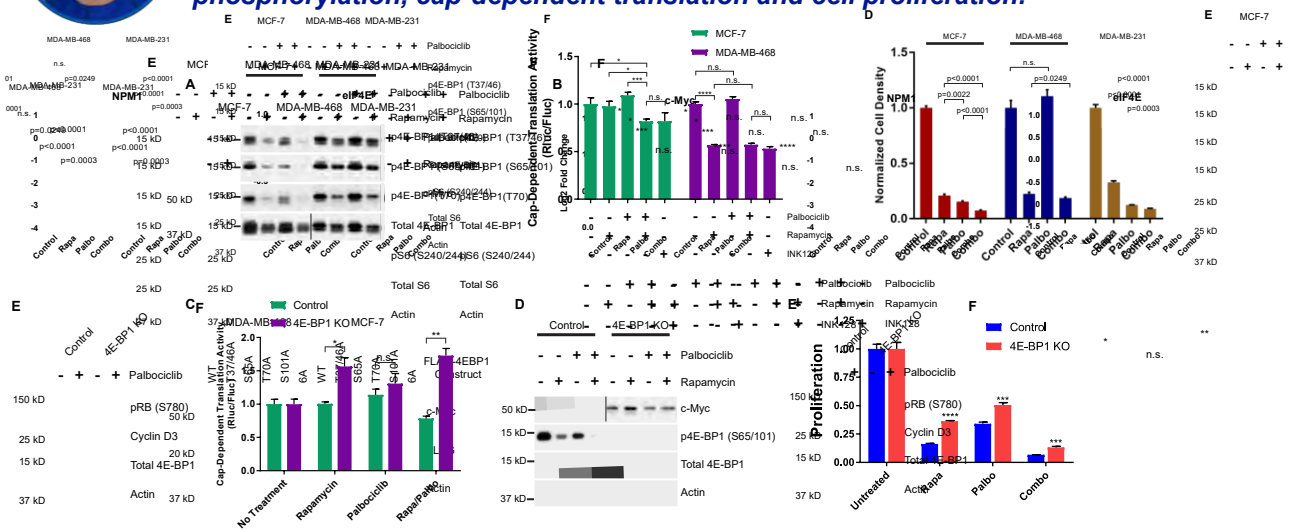
C



Dylan Mitchell, *Cell Chem. Biol.* **2019**, *26*, 980

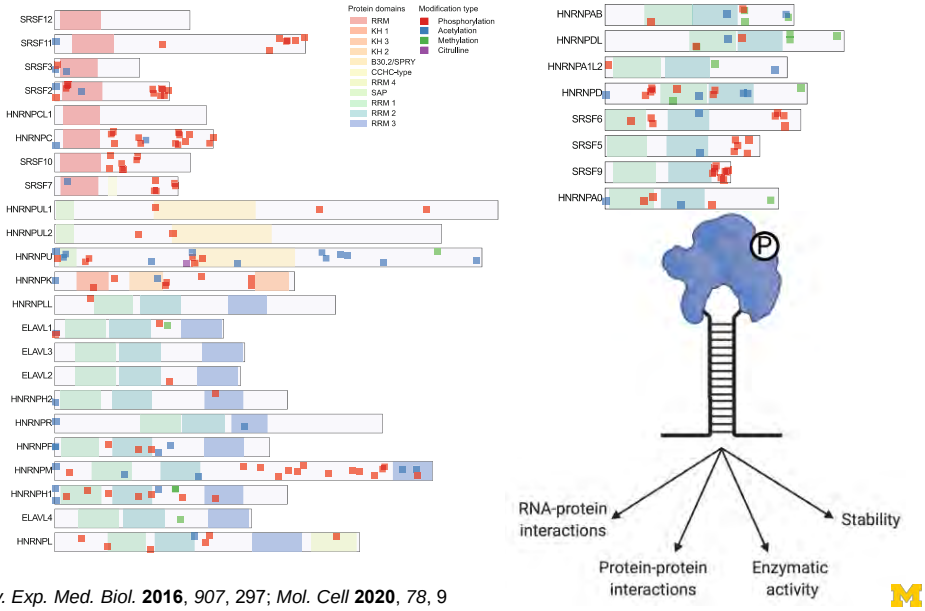
PhAXA Identifies CDK4 as a Novel 4E-BP1 Kinase

Pharmacological inhibition of mTORC1 and CDK4 cooperate to antagonize 4E-BP1 phosphorylation, cap-dependent translation and cell proliferation:



Cell Chem. Biol. **2019**, *26*, 980

Future Work: Using PhAXA to Annotate Kinases Acting on Human RBPs

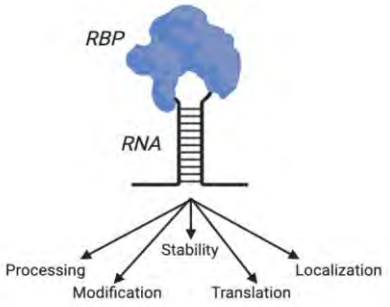


Adv. Exp. Med. Biol. **2016**, *907*, 297; *Mol. Cell* **2020**, *78*, 9

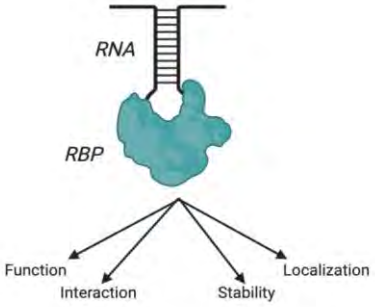
Take-Aways from Today's Webinar

RNA-protein interactions (RPIs) play critical roles in regulating many aspects of RNA and disease biology

RBP acting on RNA

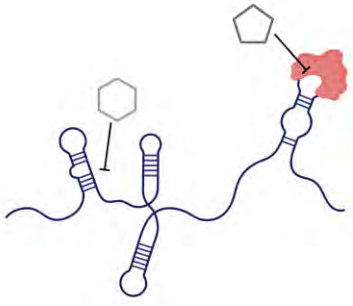


RNA acting on RBP



Many interdisciplinary approaches will be needed to reveal the druggability of these interactions and how to advance the field toward clinical applications

Additional Resources on RBPs and Drugging RNA Biology



Small molecules targeting RNA:

Matt Disney (Scripps), Amanda Hargrove (Duke), Thomas Hermann (UCSD), Jay Schneekloth (NCI), Gabriele Varani (UW), Steve Zimmerman (UIUC)

Select References:

Disney: *Drug Disc. Today* **2019**, *24*, 2002;
JACS **2019**, *141*, 6776
Al-Hashimi (Duke): *bioRxiv* 2020.05.02.074336
Hargrove: *ACS Chem. Biol.* **2019**, *14*, 2691
Garner Ed.: *RNA Therapeutics* **2017** in *Topics in Medicinal Chemistry*

RNA-binding proteins:

Richard Gregory (Harvard), Michael Kharas (MSK), Gene Yeo (UCSD)

Select References:

Yeo: *Mol. Cell* **2020**, *78*, 9
Hentze: *Nat. Rev. MCB* **2018**, *19*, 327
Jankowsky: *Nat. Rev. MCB* **2015**, *19*, 533
Tuschl: *Nat. Rev. Genet.* **2014**, *15*, 829

RNA-modifying enzymes:

Chuan He (UChicago), Samie Jaffrey (Weill Cornell), Tony Kouzarides (Cambridge)

Select References:

Blackaby: *Med. Chem. Rev.* **2020**, *upcoming!*
Kouzarides: *Nat. Rev. Cancer* **2020**, *20*, 303
He: *Cell* **2017**, *169*, 1187

Acknowledgments

Contributing Researchers

miRNA	eIF4E/4E-BP1
Dan Lorenz	Emilio Cardenas
Tanpreet Kaur	Alyah Chmiel
Sam Kerk	Erin Gallagher
Sydney Rosenblum	Oleta Johnson
Jorge Sandoval	Arya Menon
Emily Sherman	Lauren Mishra
Rachel Torrez	Dylan Mitchell
Yihao Zhuang	James Song

Collaborators

Martha Larsen, Steve Vander Roest (UM CCG)
Ashu Tripathi, David Sherman (UM NPDC)
Melanie Ohi (UM LSI)
Alexey Nesvizhskii and UM PRF
Andrew Hsieh (Fred Hutchinson)
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University of Michigan College of Pharmacy

Center for the Discovery of New Medicines, University of Michigan

American Brain Tumor Association

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Rogel Cancer Center, Michigan Medicine

National Cancer Institute R01 CA202018

Dr. Ralph and Marion Falk Medical Research Trust

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NIGMS T32 GM007767 T32 GM008353 T32 GM008597

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55

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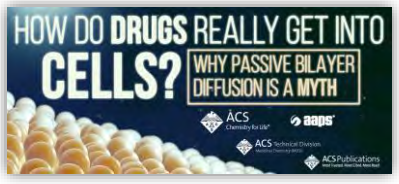
Join Research Fellow Li Di of Pfizer as she discusses why design principles that increase passive permeability are effective approaches to increase oral bioavailability, enhance brain penetration, and reduce renal clearance.
https://www.acs.org/content/acs/en/acs-webinars/drug-discovery/passive-permeability.html



Join Douglas Kell, Research Chair in Systems Biology at the University of Liverpool to discover how drugs pass through cell membrane solely by hitchhiking on membrane transporters and why so-called "passive diffusion" through any bilayer in real cells is negligible.
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56

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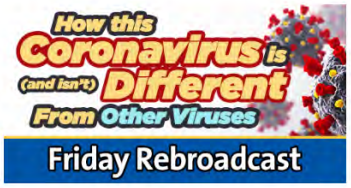

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Speakers: LaTrease Garrison, American Chemical Society / Thomas Holme, Journal of Chemical Education / Heather Weck, American Association of Chemistry Teachers
Moderator: Dawn Del Carlo, ACS Division of Chemical Education

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What You Will Learn

- The resources our community of educators have found most effective for teaching chemistry online
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What You Will Learn

- How to prepare for an interview
- How to conduct the interview remotely
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Amanda Garner
Associate Professor, College of Pharmacy, Department of Medicinal Chemistry, University of Michigan

Matt Disney
Full Professor, Department of Chemistry and Department of Neuroscience, The Scripps Research Institute

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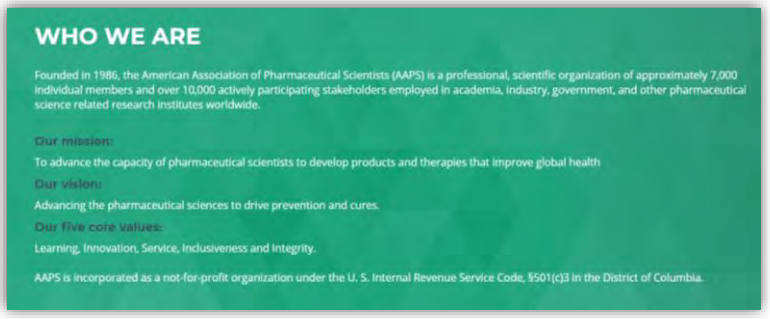

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59

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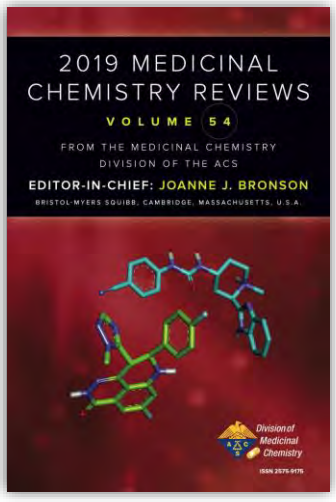

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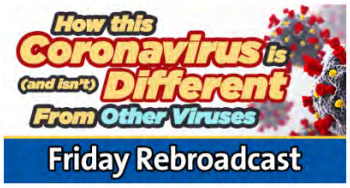

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