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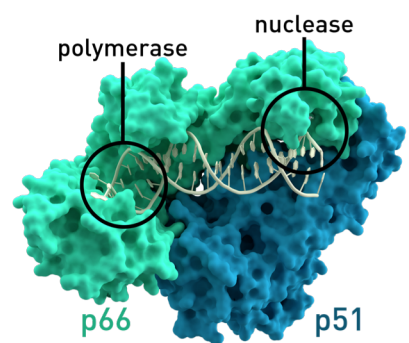
Hybrid instruction: Engaging students  
using COVID-19 biochemistry case  
studies and active learning

## Problem: Engage students in biochem while teaching online...

### **Pull from experience teaching "online – remotely"**

- Involve both asynchronous and synchronous teaching
- Utilize multiple approaches to keep students attention while online: i.e. different active learning approaches
- Create a mix of independent and group work to keep a culture of a community
- Include creative ways to apply their knowledge
- Have multiple low and medium opportunities to build on the skills and concepts
- Use traditional and unique self-assessment approaches

*anyone try this before?*

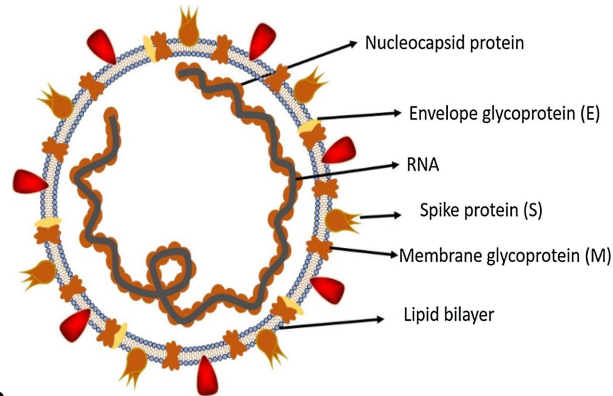


## Need a topic to apply these “hybrid” learning tools...

*How to engage?*

### What do we usually use?

- Myoglobin and Hemoglobin
- Antibodies IgG
- ATCase
- Chymotrypsin
- Myosin
- Hmmmmm what else????



**COVID!!!**

Errr I mean...

**COVID-19**

## Modular multi-engagement techniques for Biochemistry (MMET fBiochem)

*the person responsible for this title has been sacked*

- Backward planning approach to design multi-modules
- Use ASBMB Foundational Concepts and reflect the Threshold Concepts



### Select Learning Goals/Outcomes

- Discuss and analyze the structural impact of covalent and noncovalent on protein structure and protein interactions
- Compare primary and tertiary structures of macromolecules and relate to similar proteins and their functions
- Predict the effects of mutation on the activity, structure or stability of a protein
- Explain how RNA processing occurs and how splicing affects the diversity of gene products
- Understand how a mutation arises and how it could affect the organism from gene fitness to expression



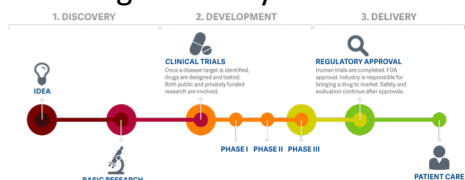
## Video Presentation and Interactions

- Group work to answer key biochemical/molec biological questions
- Several resources/websites/papers/video tutorials provided
- Each group presents their research/response in a shared video
- Groups peer-evaluate for clarity, accuracy and general presentation
- Individuals watch JUST the video and answer the questions from the video
- Instructor also evaluates based on scientific maturity and evidence for the presented conclusions

- Seventeen current unique prompts/questions ranging from virus diversity, molecular biology of virus and structure-function of S, M and other proteins
- Student groups are required to meet with instructor to ensure their work is on track and to explain the expectations
- Students use given resources and are encouraged to find additional information for their presentation
- Off-line team approach helps connect students not face to face
- Both group and individual review ensures broader understanding of concepts while reinforcing the concepts from the mind map
- Low stake peer-evaluation discussion threads further encourages thinking

## Medicinal Chemistry – COVID Therapeutics

- Traditional group questions/answers
- Flipped(ish) approach where resources and videos are assigned
- THEN “live” synchronous class sessions discuss findings and questions before groups work on answers.
- Resources include several ASBMB articles and professionally maintained websites on drug pipeline
- Also introduce concepts of controls and drug discovery



ASBMB Home

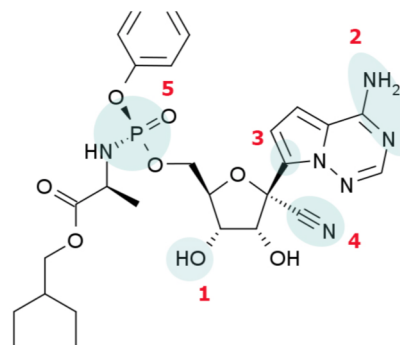
Submit Advert

ASBMBTODAY

Science

Opinions

ASBMB Today > Science > What makes remdesivir a promising antiviral?



Phosphate

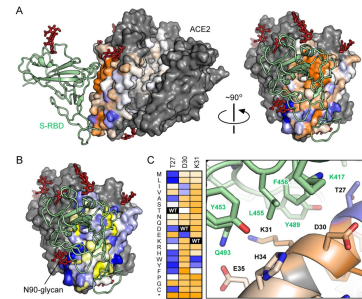
"You see all that fotsam and jetsam coming off at the 5' hydroxyl?" said Katherine Soley-Radtke. Among medicinal chemists, this type of protecting group is casually known as "a McGuigan protide." Designed by medicinal chemist Chris McGuigan in the 1990s,



## ACE2 Receptor – Spike Protein Research Paper

- Supported research paper using a video of the author
- Another video by Kristin Procko (no relation) shows modeling of protein interactions and intermolecular forces
- Video of instructor helping students focus on the science as the research is very complicated
- Research find key residues for ACE receptor binding
- Great potential diagnostic and therapeutic application
- Guided questions for students
- Flipped discussion mode possible
- Some students want to learn modeling – links provided for PyMOL tutorials on resource page

*A must see video!*



### Erik Procko

ASSISTANT PROFESSOR OF BIOCHEMISTRY  
PROFESSOR OF BIOPHYSICS AND  
QUANTITATIVE BIOLOGY

#### Research Topics

Computational Biology, Protein Structure, Receptor  
Biochemistry

#### Disease Research Interests



## Mutational Analysis – Research Papers

*Shhhhh brand new – not tested...*

**Capitalize and build on student's understanding of protein structure function and molecular biology**

- Use student-generated video for review
- Group and independent work
- Two different approaches including science communication

### New Point Mutation in S protein D614G has been identified and making a “splash” in media

- Media links with different interpretations on the impact of mutation on virus
- Peer reviewed papers with slightly different view
- Students in a group asked to analyze the media representation for accuracy and bias
- Asked to create their own lay-audience article. This could be a podcast, blog... creativity...
- Opens up questions for pre-print papers and version changes/updates

### Investigation of the polybasic cleavage site of spike protein mutations/additions (aka furin protease site) that are not found in SARS genome.

- Four publications are provided to limit confusion – students are encouraged to research beyond the given examples
- Use discussion boards for asynchronous interactions using given talking points/prompts
- Can be done as group work or individual
- Opportunity for traditional in-class or synchronous interactions discussion

