Deliberative Democracy: Infectious Diseases

Alignment with Course Content

This module can be used to reinforce acid-base chemistry, organic line structures, and organic functional groups.

Necessary Background Knowledge

- Acid-base chemistry
- Organic acids and bases
- Units of concentration

Policy Question

There are numerous infectious diseases that have global health and economic impacts. You are on the board of a large corporation that intends to fund a large research project to attempt to eradicate one of these diseases. Pick one disease from the list below, investigate the disease, and develop a recommendation for either funding or not funding this research. Discussions in class will culminate with a vote on the top two diseases for funding consideration.

1. Malaria
2. Dengue Fever
3. Tuberculosis
4. HIV/Aids
5. Zika Virus

Module Goals

- Search and utilize published scientific data to construct an argument
- Describe why acid-base chemistry is important in drug delivery
- Address a problem with consideration of multiple variables - both scientific and socioeconomic factors

Deliberation Scaffolding

Students should consider

- How widespread is each disease? Where are they located?
- What is the disease vector of your chosen infectious disease?
- What are the current infectious disease medications/vaccines available?
- How effective are the available drugs?
- Why are there issues with the current treatment?
- What are the current challenges to have effective treatment against these diseases?
- How much is currently invested in each disease?

Instructor Notes

Implementation Suggestions

- The module topic and peer-reviewed article can be tied to acid-base chemistry through a discussion of organic acid-base structures at various physiological pH values
- The peer-reviewed assignment in an open-ended format can be completed as an in-class activity rather than outside of class
- For wrapping up on the final discussion day, choose one group that investigated each disease to make a very short (2 minute) argument for funding their disease highlighting the key points that led to their science advisory statement

Articles

Media:

https://www.nytimes.com/2016/08/15/world/venezuela-malaria-mines.html?mcubz=3

Peer reviewed:

http://pubs.acs.org/doi/abs/10.1021/jm1006484

Informative Articles Students Might Find

Note by Bill Gates-We Can Eradicate Malaria—Within a Generation

Note by Bill Gates-Mapping the End of Malaria

WHO-Malaria

Media-10 Zika Facts You Need to Know Now

Media-How a Tiny Bacterium Called Wolbachia Could Defeat Dengue

WHO-Dengue and severe dengue

Media-The Danger of Ignoring Tuberculosis

Media-Supercharged Tuberculosis, Made in India

WHO-Tuberculosis

Peer Review-Tuberculosis

WHO-HIV/AIDS

Media Paper (Multiple-Choice Assignment Ideas)

https://www.nytimes.com/2016/08/15/world/venezuela-malaria-mines.html?mcubz=3

Hard Times in Venezuela Breed Malaria as Desperate Flock to Mines

Nicholas Casey- New York Times

Example question topics:

- How has Malaria spread in Venezuela
- How is Malaria treated in Venezuela
- Effectiveness of the current drugs used to treat Malaria in Venezuela
- How to test for Malaria
- Why treatment of Malaria is difficult in Venezuela

Peer Reviewed Paper (Multiple-Choice Assignment Ideas)

Answer the following questions about the literature paper: http://pubs.acs.org/doi/abs/10.1021/jm1006484

> "Synthesis, Structure-Activity Relationship, and Mode-of-Action Studies of Antimalarial Reversed Chloroquine Compounds," by Steven J. Burgess, Jane X. Kelly, Shawheen Shomloo, Sergio Wittlin, Reto Brun, Katherine Liebmann, & David H. Peyton.

Example question topics:

- The purpose of different sections within a peer reviewed article (e.g., introduction and experimental)
- Describing the central motivating factors behind the work
- Calculating molar mass from organic compounds
- Identifying the active portions of the drugs
- Describing the importance of data presented in tables (effectiveness of drug)
- Distinguishing the differences in data presented between different tables

Peer Reviewed Paper (Alternate Open-Ended Assignment Ideas)

Answer the following questions about the literature paper: http://pubs.acs.org/doi/abs/10.1021/jm1006484

> "Synthesis, Structure-Activity Relationship, and Mode-of-Action Studies of Antimalarial Reversed Chloroquine Compounds," by Steven J. Burgess, Jane X. Kelly, Shawheen Shomloo, Sergio Wittlin, Reto Brun, Katherine Liebmann, & David H. Peyton.

1. What was the central motivating factor behind the work? That is, why did the authors start the work?
2. If the paper is hard to understand (at first), what would be your next step?
3. Why is it important that, in Figure 3, the Dd2 parasites treated with compound 22 show little or no hemozoin crystals? What does this mean about the drug, compound 22?
4. Figure 2 and Table 2 demonstrate what property about the RCQ drugs?
5. What is the importance of Table 3, relative to the rest of the paper?
6. The paper has an Experiment section, starting on page 6483. Is this section important in understanding the research conclusions?

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Deliberative Democracy: Infectious Diseases

Leader First **& Last** Name		Facilitator/Spokesperson First **& Last** Name	
Recorder First **& Last** Name		Devil's Advocate/Summarizer First **& Last** Name	

There are a numerous infectious diseases that have global health and economic impacts. You are on the board of a large corporation that intends to fund a large research project to attempt to eradicate one of these diseases. Pick one disease from the list below, investigate the disease and develop a recommendation for either funding or not funding this research. 1. Malaria, 2. Dengue Fever, 3. Tuberculosis, 4. HIV/Aids, 5. Zika Virus

What do you need to know before you can make an informed recommendation?	Why does this missing piece of information matter? (include social and science rationales)	Who will find 2-3 peer-reviewed articles about this concept?
A.		**1.** **2.** **3.**
B.		**1.** **2.** **3.**

C.		**1.** **2.** **3.**
D.		**1.** **2.** **3.**

Before doing background research, what is your group's initial stance on the two infectious diseases that should be considered for funding?

End of Day 1. Consult your textbook and find at least 2 peer-reviewed articles per question for next week.

Leader First **& Last** Name		Facilitator/Spokesperson First **& Last Name**	
Recorder First **& Last** Name		Devil's Advocate/Summarizer First **& Last** Name	

Question to scientists: ***There are a numerous infectious diseases that have global health and economic impacts. You are on the board of a large corporation that intends to fund a large research project to attempt to eradicate one of these diseases. Pick one disease from the list below, investigate the disease and develop a recommendation for either funding or not funding this research. 1. Malaria, 2. Dengue Fever, 3. Tuberculosis, 4. HIV/Aids, 5. Zika Virus***

Evidence to support your science advisory recommendation:	Source title and journal (with initials of who contributed this article):	Which lecture topics or textbook chapters cover this material?
A.		
B.		

C.		
D.		

Science Advisory Statement **(Deliberate <u>consensus</u> as a group):**

End of Day 2. Thank you for investing your time and energy on this activity!