JOURNYS Submission Guidelines

Last updated: Sept. 2020

The following guidelines provide details we ask writers to follow when submitting their manuscript. We may not be able to consider manuscripts that do not follow these guidelines.

Keep in mind that JOURNYS, like any other scientific publication, practices an active peer review process, meaning that even if your article follows all guidelines it only increases your chances of being selected for publication and does not exempt you from participating in our editing cycle. After articles are published we perform two rounds of additional editing: one staff editing process for grammatical errors and content, and one Scientist Review Board editing process for accuracy (with experts in your field). After acceptance, there is still further author commitment and we require you to respond to comments, make additional edits, and keep active email communication until publication. Being unable to communicate with our editing team also can cause rejection of your submission.

MAIN TEXT

1. Manuscripts must be submitted as a Google Docs file only. Please submit a sharing link, and make sure that the link gives **editing** access.
2. Articles above word count (not including references) can only be deferred or rejected, please make sure your article type is below the word count limits:
    a. Review: 750-2,000 words
    b. Original Research: 750-2,500 words
    c. Op-Ed: 750-1,500 words
    d. DIY: 500-1,000 words
3. Text should be in 12 pt, Times New Roman, double spaced, with 1" margins, and left aligned.
4. Mathematical equations and chemical formulas (anything with superscripts or subscripts) must be embedded in the main text as **images**, but can be originally typed in Google Docs' native equation formatter, Microsoft Word's native equation formatter, or in LaTeX (exported as images).
5. Manuscripts should begin with a title in bolded 16 pt font that is aligned to the center of the page. Titles should be no longer than 90 characters.
    a. The writer's name, high school, and (optional) contact information should follow in 12 pt font on normal, also center-aligned.
    b. The text of the article should follow after one complete new line.
6. Section headings, if provided, should be in bolded 12 pt font and left-aligned. Text should follow section headings on the immediate next line.

    a. An abstract, if present, should simply be considered the first section of the manuscript and follow the formatting above.
7. Units should be expressed using the International System of Units (SI). An abbreviated list of rules may be found at: https://physics.nist.gov/cuu/Units/checklist.html. We do, however, have two alterations from SI rules:
    a. Digits of numerical values with more than 4 digits on the left of the decimal point should be separated using commas (,), while digits of numerical values with more than 4 digits on the right of the decimal point should not be separated.
        i. Years or other large numbers that are not classically separated by commas should not be separated by commas.
    b. Numbers smaller than or equal to ten should be spelled out rather than enumerated, unless referring to a term that typically uses an enumerated number (such as Type 1 Diabetes).
8. Latin abbreviations such as "i.e." and "e.g." should be followed by a comma (e.g., this parenthetical).

TABLES AND FIGURES

1. Tables should be created using the native table functions in Google Docs. Tables should be captioned as: "**Table #:** Descriptive caption". (Note that "Table #" is bolded, and that the "Descriptive caption" is unbolded and lowercase)
    a. Note: while tables are acceptable to a certain extent in our journal, we highly encourage plotting data as graphical figures and we will not publish tables if we deem them unnecessary.
2. Figures should be labeled in the same format as Tables. They should be cited as "Figure #" in the body text at least once, and are highly preferred to be **embedded** in the text approximately where they are referenced, in addition to separate copies.
3. **Writers should also provide a high quality copy of figures in a shared folder with their submission form.** Figures should be provided in a lossless file format, such as .png or .tiff, labeled Fig1, Fig2, etc.
    a. Graphs should have their axes labeled. Titles of graphs should be used as their caption.
    b. We would also like any tables to be published in separate Google Docs files in this folder, labeled by Table1, Table2, etc.

REFERENCES

1. In-text citations should be cited in the order they appear with bracket notation. Specifically, they should appear in increasing order; i.e., the first reference cited in the

text of the manuscript should be labeled as [1], the second reference cited in the text of the manuscript should be labeled as [2], etc.

   a. In-text information that uses references from multiple sources should separate the references by a comma and a space or a dash; i.e., [1, 2], [3-6].
   b. Please do not format the references in superscript.

2. References should be listed on a separate page at the end of the manuscript with the title "**References**" in bolded, 12 pt font.
3. References should be cited in AMA style. We recommend using https://zbib.org/, easybib.com, or citationmachine.com to format references.
   a. We use one alteration from AMA style: Journal titles, when included in a reference, should be written out using their full name. Journal titles should **not** be abbreviated using ISO or PubMed standards.

PLAGIARISM

1. JOURNYS adopts a zero-tolerance policy for plagiarism. Articles should paraphrase information cited from other sources with the appropriate notation for references, or should use quotation marks to indicate information quoted directly from a source. Plagiarized articles will be immediately removed from the publication cycle, and the author's high school may be notified depending on the severity of the plagiarism.
2. Writers may not publish their articles in other science magazines or research journals. We ask that writers who have submitted their manuscript to multiple publications rescind their submissions to other publications if published in JOURNYS.

CONTENT

1. Article topics should be school-appropriate. For instance, an article about the effects of marijuana on the adolescent brain would be acceptable, but an article teaching students different ways to do marijuana would not be.
2. Writers should aim to make their article topics new and original. Writers should look through previous JOURNYS issues to check that their topic does not repeat past topics.

See the following pages for an example of a properly formatted review article. Another example for an original research article with sections and properly formatted equations can be found here. Contact eic@journys.org for any further article-specific inquiries.

A Tale of Two Poisons

Jonathan Kuo, Torrey Pines High School

Imagine you're walking through an airport. While walking toward your terminal, you stumble into a nondescript woman, who accidentally spills part of her drink on your torso. You quickly excuse yourself and rush to your terminal, which is boarding its final passengers. You're a bit out of breath at this point and feel a tad nauseous, but you figure it's just from the stress of working for the past few days and from the fact that you rarely exercise anyway. Minutes later, as you're settling into your seat, you begin feeling nauseous. You puke, you find it increasingly difficult to breathe, and you eventually die from apnea, or cessation of breathing.

Although this scenario may seem reminiscent of an action movie, a similar event occurred last February when Kim Jong-un's half-brother Kim Jong-nam was assassinated at Kuala Lumpur International Airport in Malaysia. According to the BBC, Kim was attacked by two young women, one who splashed a liquid on his face, and one who covered his face with a cloth laced with liquid. After alerting the receptionist at the airport of his distress, he was quickly rushed to the hospital, but died from a seizure en route. An autopsy revealed that the nerve agent VX was involved in his death [1].

VX is one of those nasty chemicals that governments outlaw and chemists refuse to work with. Synthesized by British scientist Dr. Ranajit Ghosh in 1952 when he was searching for an alternative pesticide to the organochloride DDT (dichlorodiphenyltrichloroethane), VX belongs to a similar class of compounds called organophosphates. Organophosphates are deadly because they inhibit an enzyme called acetylcholinesterase (AChE), which helps break down the

neurotransmitter acetylcholine during synaptic transmission. AChE's active site has two main portions that interact with molecules: an anionic site that forms electrostatic interactions and an esteratic site made of several catalytic amino acids. Both sites are located deep within a gorge consisting of aromatic amino acids, contributing to the high specificity of AChE. When AChE acts normally on acetylcholine, the quaternary nitrogen moiety of choline—basically the part of acetylcholine attached to a nitrogen atom—is held in place by the anionic site, positioning the acetyl group in the esteratic site. AChE then hydrolyzes acetylcholine, resulting in acetic acid and choline as shown in Figure 1. However, when an organophosphate such as VX interacts with AChE, the phosphate moiety of VX covalently binds to and blocks the esteratic site, preventing normal AChE function, as shown in Figure 2 [2].

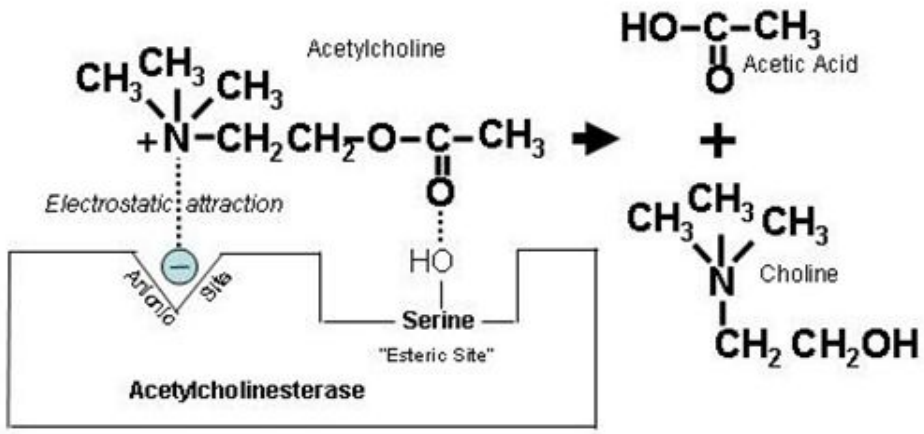

Figure 1: Positioning and hydrolysis of ACh [3]

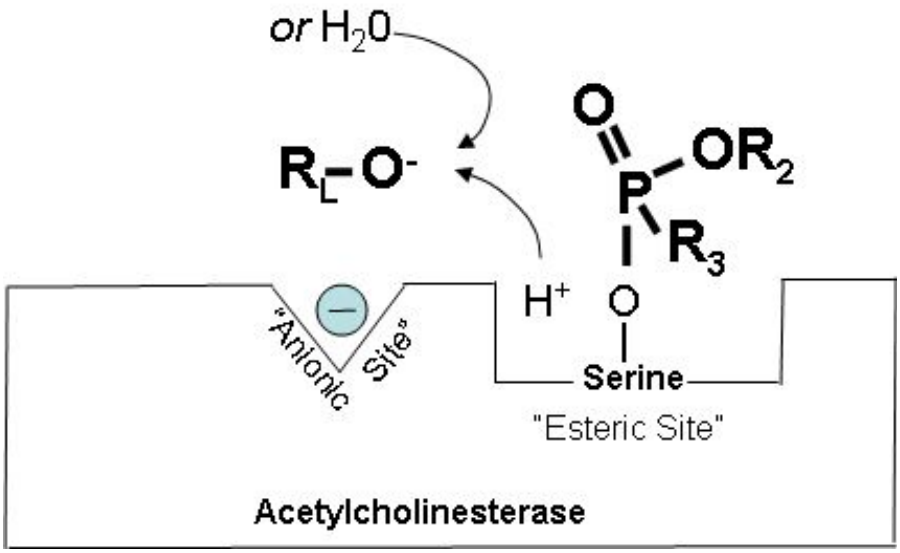

Figure 2: Inhibition of AChE by an organophosphate [3]

Typically, acetylcholine binds to muscarinic receptors, receptors found in classical neuromuscular junctions; autonomic motor fibers; and nicotinic receptors, receptors found throughout the cerebral cortex, hippocampus, and brainstem. Upon administration of VX, acetylcholine lingers in these areas, repeatedly stimulating postsynaptic neurons and resulting in symptoms typical of excess cholinergic signaling—first sweating and twitching, then nausea, vomiting, diarrhea, coma, and eventually respiratory system failure. Because acetylcholine also plays a role in the brain, cognitive effects may occur; but, these symptoms have not been precisely identified since patients exposed to VX typically die before a psychological examination.

An important detail of Kim Jong-nam's assassination, however, is that the two women involved in the attack did not die. Acute toxins such as VX are typically characterized by a measure called LD_{50}, which is the minimum dose of a toxin that kills 50% of a sample population. Bajgar reports that, in humans, an oral dose of VX has an LD_{50} of 5 mg/70

kg—which is easily less than a drop of liquid for the average woman. Because of VX's high toxicity, as well as its extremely low volatility, it is unlikely that both women managed to avoid any contact with VX or simply wipe VX off of their skin.

VX has one more property that makes it a good assassination weapon: it's a binary poison. In other words, VX can be synthesized as two relatively non-lethal compounds: Agent QL (a phosphonite compound) and either Agent NE (elemental sulfur) or Agent NM (a sulfur-based compound). This offers two reasonable methods that could have allowed the women to survive the attack: a) they could have self-administered VX antidotes such as atropine, which blocks muscarinic receptors to protect the nervous system from excess stimulation, or obidoxime, which stops organophosphates from binding to acetylcholinesterase. Or b) each women was given one of the ingredients to VX, which would then react on Kim Jong-nam's face without killing themselves. It's more likely that Agent NM (sulfur compound) was used rather than Agent NE (elemental sulfur), because the reaction between Agent QL and Agent NE is highly exothermic [4], and no descriptions of burns to his face have been reported [1].

Fortunately, it's likely that VX won't pose any human risk from mad scientists messing around in their basements or conspiracy theorists trying to destroy the world. Synthesis of VX is achieved through a four-step process known as the transester process, which is relatively short in the world of organic chemistry: phosphorous trichloride is methylated and reacted with ethanol, undergoes nucleophilic attack by an ethanolamine, then reacted with sulfur; the mixture is left to isomerize *in situ* (in its original solution) to produce a mixture of two enantiomers of VX, both of which are deadly [5]. However, such a synthesis requires a well-equipped chemistry laboratory to prevent inhalation of toxic fumes at any step of the process as well as a good knowledge of

organic chemistry to work up products and actually isolate VX from any side products made during the synthesis. Additionally, the reagents to make VX require some sort of chemical license to work with, which can be hard to obtain for the average citizen.

VX and other organophosphates could pose a greater risk from governments seeking to engage in chemical warfare. Modern use of chemical warfare was first established in World War I with the utilization of chemicals such as chlorine gas (Cl_2), phosgene ($COCl_2$), and mustard gas ($C_4H_8Cl_2S$). Nerve agents soon followed these toxic agents, with a set of nerve agents known as the G-series synthesized by German scientists (hence the name G-series); this series includes well-known agents such as sarin and soman. However, due partly to the sheer destruction caused by chemical agents, they played a far less prominent role in World War II than they did in World War I. Indeed, chemical agents have been banned multiple times in the modern era, beginning with the Geneva Protocol in 1925, then followed by the Biological and Toxin Weapons Convention in 1972 and further sanctions such as the 1993 Chemical Weapons Convention in future years [6]. However, as demonstrated by the attack on Kim Jong-nam, chemical warfare has certainly not been untouched by political entities such as North Korea, and thus could play a role in future armed conflicts.

In general, you shouldn't be too worried about attacks from organophosphates such as VX unless you're a high-profile individual that is at risk for assassination, in which case VX is merely one item on your bucket list of dangers. So, feel no fear: you can walk through airports safely, and chemical attacks might be one of the few scenarios where the TSA's no-liquid policy might actually save your life.

References

[1] North Korean leader's brother Kim Jong-nam killed at Malaysia airport. BBC News. http://www.bbc.com/news/world-asia-38971655. Published February 14, 2017.

[2] Massoulié J, Pezzementi L, Bon S, Krejci E, Vallette F-M. Molecular and cellular biology of cholinesterases. *Progress in Neurobiology*. 1993;41(1):31-91. doi:10.1016/0301-0082(93)90040-y.

[3] Cholinesterase Inhibitors: Including Insecticides and Chemical Warfare Nerve Agents Part 4 - Section 11 Management Strategy 3: Medications 2-PAM (2-Pyridine Aldoxime Methylchloride) (Pralidoxime). Centers for Disease Control and Prevention. https://www.atsdr.cdc.gov/csem/csem.asp?csem=11&po=23. Published October 16, 2010.

[4] Tucker J. *War of Nerves: Chemical Warfare from World War I to Al-Qaeda.* New York, NY: Anchor; 2007.

[5] Benschop HP, Jong LPAD. Nerve agent stereoisomers: analysis, isolation and toxicology. *Accounts of Chemical Research*. 1988;21(10):368-374. doi:10.1021/ar00154a003.

[6] Chemical and Biological Weapons. International Committee of the Red Cross. https://www.icrc.org/en/document/chemical-biological-weapons. Published April 8, 2013.