PULSE EXPERIENTIAL TEAM ASSIGNMENT

1. Title of your PULSE experiential assignment.
Provide a creative and informative title.

Written In the Code: Exploring Huntington's Disease

2. Please summarize your PULSE experiential assignment (max 300 words).
Provide a non-technical (lay) summary of your PULSE assignment. Prompts to think about: What is the topic? What is the format? Why did you choose this topic and format? The summary for lay audience is a brief and accessible summary of the assignment that is used to explain complex ideas, technical writing and scientific terms to people who do not have prior knowledge of the subject (e.g., high school science level). This summary should include the importance, impact, and content of your assignment to a broader audience.
[Team 23 is an example of an informative lay summary.]

Huntington's disease is a genetic brain disease that slowly damages the brain over time, causing problems with movement, thinking, and behavior. Patients may experience common symptoms like jerky noncontrolled movements, trouble with walking and balancing, and trouble with speaking or swallowing. It's typical for symptoms to start in adulthood but in some cases, they can appear in youth too. In either case, they get worse as time goes on.

For our PULSE assignment, we created an educational interactive module to explain Huntington's disease to the general audience. Our goal with this project was to try to make complex medical information understandable and highlight that research on this disease is ongoing. We decided to focus on this disease specifically because of its progressive nature which can affect families and patients deeply. This format of learning aims to combine clear explanations regarding the disease with interactive visual components so that learners can retain information as they scroll through the module.

The module covers what Huntington's disease is, how genetics can play a role, how symptoms are usually managed, what scientists are exploring for future therapeutic options, how the brain is affected, and finally, the cause, mechanism, long-term effects, outcome and distribution are also described. The module is focused on helping the audience understand why this disease is important and how future research can help improve the lives of people with this disease. It emphasizes the challenges of Huntington's while making the content meaningful, interactive, and self-paced. This format allows users to explore concepts at their own speed, giving them time to understand more challenging ideas, while the interactive components help keep users engaged with the material.

3. Provide up to 6 keywords relevant to your PULSE experiential assignment.
3-6 keywords are ideal.

Trinucleotide expansion, HTT Gene, neurodegenerative disease, Chorea, Huntingtin protein, Autosomal dominant inheritance

4. Identify the course topic with which your PULSE assignment most aligns.
Refer to the various topics outlined under 'Course content and Schedule' in the syllabus (e.g. Inflammation).

Diseases of the Central Nervous System

5. What are the learning outcomes?
There should be a minimum of 2 learning outcomes for your assignments. For further information on learning outcomes, the Centre for Teaching and Learning offers information: https://teaching.uwo.ca/curriculum/coursedesign/learning-outcomes.html

- Identify the type of disease Huntington's is and what the affected cell type is.
- Identify the 3 major categories of Huntington's symptoms. Name examples for each category.
- Identify what the mutated gene in Huntington's disease is.
- Identify what the likelihood is that a parent will pass on the disease to a child, if only one or both parents are affected.
- Describe symptom management strategies for Huntington's disease.
- Summarize current and emerging experimental therapies for HD.
- Explain the neuronal pathways affected in HD and their link to motor symptoms.
- Describe the etiology, pathogenesis, complications/sequelae, prognosis and epidemiology of Huntington's disease.
- Outline the stages of Huntington's disease.

6. Why did the team select the chosen topic and the medium? How will the topic and medium of choice help learners?

Our assignment choice of media as an interactive learning module is used to explore Huntington's Disease. This media was chosen since students can learn about Huntington's disease at their own pace with visual and written components to aid them. This way rather than following the conventional format of lectures compressed into 1-2 hours or readings alone, this allows students to be actively engaged when learning and at their own pace. Also, at the end of the module we included a 10-question quiz based on the information the module covers. This further enforces the importance of engagement as the students can then apply their recent learning and see if there's areas that need further attention to build confidence for when exams occur.

Huntington's disease was chosen as our topic to express the importance of this neurological disorder that has a clear genetic cause, yet no cure currently exists. Its hereditary nature means it affects not only individuals diagnosed, but also entire families who face the uncertainty of inheritance. Therefore, we believe it is especially important to study Huntington's disease to better understand its progression and to support ongoing research toward effective treatments and potential cures. We hope the use of the interactive module for this neurological disease can be engaging to students to understand its importance.

7. Did the team use an artificial intelligence (AI) technology tool? If so, which AI technology tool(s) did the team use? What other technology tools did the team use? Is the technology tool novel? Is the team using this technology tool in a novel fashion? If the team did not use technology tool, why did the team decide against using the technology tool(s)?

Please include details (e.g., for what purpose was the tool used for? Why was the tool the best tool to use for your assignment? Are there alternative tools that were considered?)

In this assignment, the AI technology tools we used were a combination of **ChatGPT** and **Google Gemini**.

- **Chat GPT**
  - Purpose: Was used to brainstorm ideas for the title of the assignment and generate diagrammatic images.
  - Why Chosen: Convenience and preference for this platform for some members over others to be used to generate images, for this assignment to make sure images were generated correctly pre-existing membership was used. This allowed as many image generations as possible to be done according to cross referencing accuracy.
- **Google Gemini**
  - Purpose: Was used to generate diagrammatic images.
  - Why Chosen: Convenience and preference for this platform for some members over others to be used to generate images, for this assignment no membership was used making it doable to generate as many images as possible until correct with cross-referencing.

In this assignment, the non-AI technology tools we used were **Genially**

- Purpose: Used as a platform for assignment presentation in an interactive format to allow information to be organized in a visually structured and engaging way rather than a traditional static presentation.
- Why Chosen: Genially is a platform that allows self-paced learning, enabling users to navigate through content at their own speed according to their own preferences. This was seen as important to help enhance engagement and deeper understanding. Compared to conventional tools for presentation, Genially allows active participation rather than passive learning, which makes the learning experience more immersive.

8. How is your PULSE experiential assignment innovative and/or novel?

Describe what about the PULSE assignment is innovative/novel. Is there a particular component or content that is innovative/novel? How is it different from other content that already exists?

Our PULSE assignment is innovative because it presents Huntington's disease complexities in a more engaging and interactive way using the platform Genially. We designed our project so users can actively interact with the content through clickable elements and a quiz.

What makes the assignment novel is how it breaks down dense and challenging information into something that feels accessible and easier to follow. Students can learn the information at their own pace, making the module accessible to learners both slow and quick. The interactive component encourages users to stay engaged and check their understanding at the end to complete the module, rather than just passively reading through information or waiting till a much later date to test themselves.

Overall, this approach is different from most existing content, which tends to be text heavy. Thus, by focusing on interactivity and engagement, our project creates a more effective and memorable learning experience.

9. If you used an AI tool, please copy and paste the prompt(s)/question(s) used along with the output(s)/answer(s) from the AI tool.

The response here is to allow others to replicate the team's work. If the prompts/outputs are lengthy (over 1 page), please attach it as a separate document and note below [Please see attached document].

Please see the attached document.
Group 36 pulse assignment AI.docx

10. If you did not use an AI tool, please attach a copy of the team's notes to the assignment.

The response here is to allow others to observe the 'behind the scenes' team's work.

Please see the attached document.
group 36 pulse assignment notes.docx

11. How did the team ensure the veracity of the information presented in the PULSE assignment?

The response should highlight how the team has ensured that the information presented in the assignment is evidence-based and not spreading misinformation. You should specifically mention which databases (if any) or textbook materials you used, and how you kept track of the sources/references for each claim. If AI provided you with false information, please describe how the team has fact-checked the AI response and the legitimate (scientific) sources you used. A reference document should be provided in the reference section (15. References) below. Please ensure to include in-text citations in your assignment where applicable.

Our team decided to try and ensure that our project was as accurate as possible by not using AI for any research or information gathering. Since AI can make mistakes, this was a simple way to ensure that we did not spread misinformation unknowingly. The second way we insured accurate information was by using trustworthy sites. Lots of our information came from the Mayo Clinic, Cleveland Clinic and National Center of Biotechnology Information through the National Institutes of Health. Mayo and Cleveland clinic are highly regarded hospitals in the United States that have many qualified doctors ensuring the accuracy of the information being put out on their websites. The National Institutes of Health is a government run website with many articles reviewed by experts. Information that came from other sources aligned with the information that was obtained from these well-known and trusted sources in the scientific community. This helped us confirm that those sites also contained accurate information that was safe to use in our project for the information that we did not directly find on the well-known sites. We kept track of the resources we used for our assignment as we did the research. We had a google document that we would put our notes in, accompanied by the website that the information came from. This process allows us to ensure credit goes to all the correct sources for our claims.

12. Write a meaningful team reflection about the PULSE session (max 250 words).

Prompts to help your team write the reflection: Were there any team/individual biases that surfaced when creating content for the assignment? Did the team implement any practices to ensure the content was equitable, diverse, and/or inclusive? How has the PULSE assignment helped with the team's learning? If the team had to estimate, how long did the assignment take? What worked well for your team? What would the team do differently next time? What were the opportunities and challenges with creating the PULSE assignment to help others' learning? Were there any barriers or limitations?

Our team worked extremely well together. We had no individual biases that surfaced causing issues for our project. We didn't set any specific practices to ensure diverse and inclusive content, but after reviewing our final draft we believe we accomplished this. This assignment allowed our team to not only learn about Huntington's disease but also how to put together a tool for learning. It required us to get in the minds of an instructor which provided us with a new skill set that could be very useful in the future. We would estimate that between individual and group work sessions the project took approximately 40 hours to complete. We found that checking in with each other roughly every week to see how we were progressing on the project worked extremely well as it held everyone accountable. If we were to do the project again, I think that we would start the composition of our project slightly earlier to avoid the busy exam season. We felt like this was a very special opportunity to create a project that may be helpful to future students learning and hopefully to guide future students interests into neurological diseases. The major challenge with this PULSE assignment is making sure that the project we create is in terms such that people without the same background knowledge can understand. Overall, there were no major hurdles that our group experienced; we worked as a very cohesive unit and were able to produce an excellent learning tool.

13. Write the contributions of individual team members using unique initials.

Example: All team members contributed to the design of the prompts used in the technology tool, ChatGPT (GPT-3.5). T.K and T.K2 fact checked the information presented by ChatGPT using published literature on PubMed (PMID 29211319, 32477271). Y.Z finalized and formatted the final infographic and compiled the prompts and outputs. P.E was involved in…

All team members worked together to complete the composition of the interactive module, the document questions, citation list, and all fact checking.

- **S.C** researched and composed the information in part 1 of the learning module.
- **J.H** researched and composed the information in part 4 of the learning module. Also composed part 5 (quiz) based on their own information researched and information researched from S.C and G.B.
- **G.B** researched and composed the information in part 2 and 3 of the learning module.

15. References

Please provide a numbered reference list with Nature citation style. [Please feel free to use citation management software (i.e., free citation manager, e.g., Zotero and Mendeley)]

References

1. Huntington's Disease [Internet]. Cleveland (OH): Cleveland Clinic; 2023 Sep 27 [updated 2025 Dec 12; cited 2026 Mar 11]. Available from: https://my.clevelandclinic.org/health/diseases/14369-huntingtons-disease
2. Google. Gemini [Software]. Version 3 Flash. Mountain View (CA): Google; 2026 [cited 2026 Mar 19]. Available from: https://gemini.google.com
3. Huntington's Disease [Internet]. Rochester (MN): Mayo Clinic. 2024 Apr 25 [cited 2026 Mar 11]. Available from: https://www.mayoclinic.org/diseases-conditions/huntingtons-disease/symptoms-causes/syc-20356117
4. Austedo XR ® (deutetrabenazine) extended-release. Recognizing HD Chorea: Types of Movement. YouTube. 2023 Oct 10 [cited 2026 Mar 12]. Available from: https://www.youtube.com/watch?v=LAMGRuhtdxA
5. Huntington's disease [Internet]. Bethesda (MD): MedlinePlus. 2020 Jul 1 [cited 2026 Mar 11]. Available from: https://medlineplus.gov/genetics/condition/huntingtons-disease/#inheritance
6. Schenkel L. Molecular Genetics [Lecture notes as PDF]. 3500: Introduction to Human Pathology, University of Western Ontario. 2025 Nov 7 [cited 2026 Mar 12]. Available from: https://westernu.brightspace.com/content/enforced/126670-UGRD_1259_3645/Lecture%20Notes/Lecture%20Notes%202025-2026/Section%20B%20-%20F25/Molecular%20Genetics%202025.pdf
7. Mahalingam S, Levy LM. Genetics of Huntington Disease. American Journal of Neuroradiology. 2013 Nov 14;35(6):1070–1072. Available from: https://pubmed.ncbi.nlm.nih.gov/24231851/
8. Biochemical Testing Method [Internet]. Melbourne (VIC): Huntington's Victoria. 2024 Mar 20 [cited 2026 Mar 12]. Available from: https://huntingtonsvic.org.au/how-is-genetic-testing-done/
9. Genetic testing for Huntington Disease [Internet]. Rome, IT: Lega Italiana Ricerca Huntington. 2019 Jul 29 [modified 2021 May 24; cited 2026 Mar 12]. Available from: https://www.lirh.it/en/genetic-testing
10. Bethesda (MD): National Institute of Diabetes and Digestive and Kidney Diseases. Vesicular monoamine transporter 2 (VMAT2) inhibitors [Internet]. U.S. National Library of Medicine; 2019 [cited 2026 Jan 27]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK548187/#:~:text=Tetrabenazine%20(tet%22%20ra%20ben',the%20outcome%20of%20these%20diseases.
11. Chu A, Wadhwa R. Selective serotonin reuptake inhibitors [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK554406/
12. Meldrum B, Chapman A. Anticonvulsant Drug Mechanisms [Internet]. www.ncbi.nlm.nih.gov. Lippincott-Raven; 1999. Available from: https://www.ncbi.nlm.nih.gov/books/NBK28163/

13. Ferguson MW, Kennedy CJ, Palpagama TH, Waldvogel HJ, Faull RL, Kwakowsky A. Current and possible future therapeutic options for Huntington's disease. Journal of Central Nervous System Disease. 2022 May 21;14. doi:10.1177/11795735221092517. Available from: Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC9125092/
14. Han I, You Y, Kordower JH, Brady ST, Morfini GA. Differential vulnerability of neurons in Huntington's disease: The role of Cell Type-specific features. Journal of Neurochemistry. 2010 May 17;113(5):1073–91. doi:10.1111/j.1471-4159.2010.06672.x. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC2890032/
15. Cepeda C, Wu N, Andre V, Cummings D, Levine M. The corticostriatal pathway in Huntington's disease. Progress in Neurobiology. 2006 Nov 3;81:253–71. doi:10.1016/j.pneurobio.2006.11.001. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC1913635/
16. Irfan Z, Khanam S, Karmakar V, Firdous SM, El Khier BSIA, Khan I, et al. Pathogenesis of Huntington's Disease: An Emphasis on Molecular Pathways and Prevention by Natural Remedies. Brain Sciences [Internet]. 2022 Oct 14;12(10):1389 [cited 2026 Mar 22]. Available from: https://www.mdpi.com/2076-3425/12/10/1389
17. Alzheimer's Association. Huntington's Disease [Internet]. Alzheimer's Association. 2019 [cited 2026 Mar 22]. Available from: https://www.alz.org/alzheimers-dementia/what-is-dementia/types-of-dementia/huntington-s-disease
18. National Institute of Neurological Disorders and Stroke. Huntington's Disease [Internet]. National Institute of Neurological Disorders and Stroke. 2025 [cited 2026 Mar 22]. Available from: https://www.ninds.nih.gov/health-information/disorders/huntingtons-disease
19. Mo C, Hannan AJ, Renoir T. Environmental factors as modulators of neurodegeneration: Insights from gene–environment interactions in Huntington's disease. Neuroscience & Biobehavioral Reviews. 2015 May;52:178–92 [cited 2026 Mar 22]. Available from: https://doi.org/10.1016/j.neubiorev.2015.03.003
20. BioRender. BioRender [Internet]. www.biorender.com. Biorender; 2025 [cited 2026 Mar 24]. Available from: https://www.biorender.com/
21. Ajitkumar A, De Jesus O. Huntington Disease [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2023 [cited 2026 Mar 22]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK559166/
22. OpenAI. ChatGPT [Internet]. ChatGPT. OpenAI; 2025 [cited 2026 Mar 28]. Available from: https://chatgpt.com/
23. Medina A, Mahjoub Y, Shaver L, Pringsheim T. Prevalence and Incidence of Huntington's Disease: An Updated Systematic Review and Meta-Analysis. Movement Disorders [Internet]. 2022 Sep 26;37(12) [cited 2026 Mar 28]. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10086981/

16. Annotated Bibliography

An annotated bibliography is a list of sources (books, articles, websites, etc.) that you used for your project. Each entry has two parts:

1. *Citation – written in the required citation style (same formatting and order as the Nature citation style in your list of references).*
2. *Annotation – a short paragraph that summarizes, evaluates, and explains how the source is useful for your assignment.*

Why do this?

- *Helps you keep track of your research.*
- *Shows your instructor you read and understood your sources.*
- *Develops critical thinking by requiring you to evaluate the quality and relevance of each source.*

Write the annotation (about 150–200 words each)

- *Summary: Briefly describe the main argument or purpose of the source.*
- *Evaluation: Comment on the credibility, strengths, or weaknesses of the source.*
- *Relevance: Explain how you will use this source in your assignment.*

1. Huntington's Disease [Internet]. Cleveland (OH): Cleveland Clinic; 2023 Sep 27 [updated 2025 Dec 12; cited 2026 Mar 11]. Available from: https://my.clevelandclinic.org/health/diseases/14369-huntingtons-disease

This source provides an overview of what Huntington's disease is touching on symptoms, causes, management and prognosis. The Cleveland clinic is a credible source as it is a well-respected academic medical center in the United States of America. The information is thoroughly researched with the article writers consulting many of the doctor's part of the Cleveland clinic team. This ensures both medical accuracy as well as writing accuracy. I found this to be a very strong resource as it nicely explained the two different types of Huntington's disease, in other overview articles that I read this was left out. I didn't see any weaknesses with this article as I was able to easily find all the information that I was looking for. I used this source for the assignment for all the information regarding the basic definitions of Huntington's disease and the two different types of Huntington's disease as well as the differences in how they present clinically. It was also used to make question 4 in the quiz section for both the question and options.

2. Google. Gemini [Software]. Version 3 Flash. Mountain View (CA): Google; 2026 [cited 2026 Mar 19]. Available from: https://gemini.google.com

Google Gemini is an AI service that allows you to ask it questions, do tasks for you and generate content. It generates the information based on information that it finds on the internet, you can typically ask where it gets the information and it will provide you with the websites. This is a very strong resource because it has a variety of functions that it can help you with. The downfall to this source is that it can be wrong. Sometimes it is difficult to trust the information that it puts out and you are required to fact check it. I used this source for the generation of most of our images as they are copyright free and to generate the citation. The images generated by Gemini can be found in every part of the presentation to help provide context to the information. It involved simply typing in a prompt describing what I wanted in the image and then Gemini would create that for me. This AI tool was not used at all for the gathering of information in this project.

3. Huntington's Disease [Internet]. Rochester (MN): Mayo Clinic. 2024 Apr 25 [cited 2026 Mar 11]. Available from: https://www.mayoclinic.org/diseases-conditions/huntingtons-disease/symptoms-causes/syc-20356117

This source provides information on Huntington's disease regarding symptoms, causes, diagnosis and treatment. Mayo Clinic is a highly reliable source for medical information as a top-ranked academic medical centre where content is written and reviewed by medical experts. It is widely recognized for evidence-based information on diseases, symptoms, and treatments. For this assignment, the source supported the genetic etiology of Huntington's disease in part 4 explaining it as an inherited disorder. This source was also used to obtain the information regarding the symptoms of Huntington's disease as in part 1 and explained how the symptoms arise while providing examples of each. Additionally, it emphasized that there is currently no cure to stop disease progression, a key idea in part 2. The article identified medications such as tetrabenazine, deutetrabenazine, and antipsychotics used to manage chorea, behavior, and mental health, supporting part 3. The article also highlighted the importance of supportive therapies and their roles such as physiotherapy, speech therapy and occupational therapy which is interesting and worth mentioning in the module alongside drug based approaches specifically because of their large impact on quality of life. It was also used to make question 6 in the quiz section for both the question and options.

4. Austedo XR ® (deutetrabenazine) extended-release. Recognizing HD Chorea: Types of Movement. YouTube. 2023 Oct 10 [cited 2026 Mar 12]. Available from: https://www.youtube.com/watch?v=LAMGRuhtdxA

This source provided an accurate example of what chorea physically looks like in Huntington's patients. This comes from a drug company that works to try and manage chorea symptoms, so in terms of demonstrating chorea it is a credible source. This is a very strong resource as it shows both a mild and severe form of chorea giving the audience an idea of how the disease progresses. The only weakness in this video is that there is no audio. This makes it slightly unclear on if

the mild patient is being asked to do the hand movements or if she is doing that involuntarily due to the chorea. I used this source directly in the learning module to give the students a chance to see how chorea affects patients directly. I find that visual tools often help with learning so I believe this was a good use of the source.

5. Huntington's disease [Internet]. Bethesda (MD): MedlinePlus. 2020 Jul 1 [cited 2026 Mar 11]. Available from: https://medlineplus.gov/genetics/condition/huntingtons-disease/#inheritance

This source provides an introductory description of Huntington's disease and how it is inherited. This source appears to be credible as it is associated with the National Library of Medicine and is an official website of the American government. It is stated on their website that all information is created with the consolation of health care professionals again supporting its credibility. The strength of this Medline plus article was the depth of information it provided regarding the inheritance at the level of the gene and even the repeats. It did a very good job explaining what the different number of repeats meant for patients. Its weakness was that there was no mention of possible treatments and or management but rather just the daunting facts about life expectancy. In terms of information for the assignment I obtained all my information regarding the gene involved, the specific trinucleotide expansion as well as the meaning of different repeat numbers.

6. Schenkel L. Molecular Genetics [Lecture notes as PDF]. 3500: Introduction to Human Pathology, University of Western Ontario. 2025 Nov 7 [cited 2026 Mar 12]. Available from: https://westernu.brightspace.com/content/enforced/126670-UGRD_1259_3645/Lecture%20Notes/Lecture%20Notes%202025-2026/Section%20B%20-%20F25/Molecular%20Genetics%202025.pdf

This was a resource that was provided to me in this class, it provides a summary of the topics covered in our molecular genetics lecture. This includes types of mutations, molecular basis of disease, inheritance patterns and epigenetics. This resource is very credible as it directly comes from one of our instructors in this course who is a molecular geneticist. The strengths of this resource were that it really explained all the genetics components very well, specifically the trinucleotide expansion section which was particularly useful for this assignment. The only weakness to this resource was that it was intended as a class lecture, so Huntington's disease is merely only mentioned as an example, but the information was still very useful. The information I used for this assignment came from the trinucleotide expansion section, where it explains that process quite thoroughly. I also obtained the information regarding Huntington's expansion during spermatogenesis, compared to oogenesis from this note set.

7. Mahalingam S, Levy LM. Genetics of Huntington Disease. American Journal of Neuroradiology. 2013 Nov 14;35(6):1070–1072. Available from: https://pubmed.ncbi.nlm.nih.gov/24231851/

This article goes into depth about the genetics behind Huntington's disease and a basic overview of what the disease itself is. It discusses the functions of the Huntingtin gene as well as the significance of the protein that it normally produces. This article appears to be credible as it is in a peer-reviewed journal called the American Journal of Neuroradiology. The information also seems to line up with what I have read in my other sources regarding repeat numbers and clinical manifestations. This was a very strong resource for me as it provided lots of information regarding the genetic component of the disease rather than just the surface clinical manifestations. I did not identify any weaknesses as I was able to find all the information I was looking for in this article. For this assignment I used the information about how the Huntington allele is more unstable during spermatogenesis which is why the trinucleotide expansion predominantly occurs during that process. It was also used to make questions 3 and 7 in the quiz section for both the question and options.

8. Biochemical Testing Method [Internet]. Melbourne (VIC): Huntington's Victoria. 2024 Mar 20 [cited 2026 Mar 12]. Available from: https://huntingtonsvic.org.au/how-is-genetic-testing-done/

This resource is a website dedicated to Huntington's disease, it provides a wide variety of information from biochemical testing methods, symptoms of the disease, genetic basis of the disease all the way to research and clinical trials currently being done for the disease. This seems to be a credible source as the organization has been around for over 50 years trying to raise awareness about the disease. The information on this site also has appeared in other articles that I have read further supporting the credibility. A major strength that this website had was diagrams that went along with the information they were providing. This made it much easier for me as I learned to understand the material. There were no weaknesses that I identified while using this website. The information I used for this assignment was only the information regarding how the genetic tests are performed. This discussed the process of PCR as well as gel electrophoresis.

9. Genetic testing for Huntington Disease [Internet]. Rome, IT: Lega Italiana Ricerca Huntington. 2019 Jul 29 [modified 2021 May 24; cited 2026 Mar 12]. Available from: https://www.lirh.it/en/genetic-testing

This website is a foundation website that researches Huntington's as well as trying to improve the lives of families affected by the disease. The website has many different components from the symptoms of the disease, the genetic basis,

the journey that a patient may go through and measures to try and manage the disease. I found this resource to be strong in describing the different ranges of the CAG expansions and what they would mean for a patient that receives those results. The only weakness from this source is that it is Italian, so the website had to be translated, hopefully everything was translated as it was intended to be. I used the specific CAG expansion ranges provided on this website to help explain what a result would mean if a patient were to get tested for Huntington's. There was a lot of other useful information on this website, but I found it later in my research and had already obtained most of my information from other sources.

10. Bethesda (MD): National Institute of Diabetes and Digestive and Kidney Diseases. Vesicular monoamine transporter 2 (VMAT2) inhibitors [Internet]. U.S. National Library of Medicine; 2019 [cited 2026 Jan 27]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK548187/#:~:text=Tetrabenazine%20(tet%22%20ra%20ben',the%20outcome%20of%20these%20diseases.

This resource provided a detailed overview of vesicular monoamine transporter 2 (VMAT2) inhibitors. The article explains in detail how VMAT2 inhibitors like tetrabenazine, deutetrabenazine, and valbenazine reduced dopamine release by preventing monoamines from entering synaptic vesicles. This mechanism decreases excessive dopaminergic signaling which can help decrease chorea. This article was useful for the module because it went into more detail regarding the drugs, their doses and their functional mechanism which the mayo clinic resource did not. Additionally, this source went into detail about possible side effects of the drugs and their initial doses which I thought would be interesting to include in a learning module. This source was credible because it came from the US national library of medicine and the article was peer-reviewed. The article is technical compared to the mayo clinic resource but extremely insightful in providing clear mechanistic insights.

11. Chu A, Wadhwa R. Selective serotonin reuptake inhibitors [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK554406/

This source provided me with an overview of selective serotonin reuptake inhibitors (SSRIs). It provided detailed information about the mechanism of action of these drugs, clinical uses, administration, and common side effects. I used this source to explain how SSRIs are commonly prescribed to manage psychiatric symptoms associated with Huntington's disease, such as depression. The authors describe how SSRIs, including citalopram, escitalopram, fluoxetine, and sertraline, function by inhibiting the reuptake of serotonin at the synaptic cleft. This mechanism allows serotonin to remain active for a longer period, enhancing neurotransmission without significantly affecting other neurotransmitters. The article also outlines typical administration methods which I mentioned in the module. Additionally, the source discusses potential side effects, such as weight changes, gastrointestinal distress, and sexual dysfunction, which

are important considerations when prescribing these medications especially for patients with conditions like Huntington's. This reference was useful for providing clear, clinically relevant information on SSRI pharmacology and supporting the explanation of their role in symptom management for individuals with Huntington's disease, and the information was credible since it came from a peer reviewed article. It was also used to make question 8 in the quiz section for both the question and options.

12. Meldrum B, Chapman A. Anticonvulsant Drug Mechanisms [Internet]. www.ncbi.nlm.nih.gov. Lippincott-Raven; 1999. Available from: https://www.ncbi.nlm.nih.gov/books/NBK28163/

This source outlines the mechanisms of action of anticonvulsant medications and their effects on neuronal activity. I used it to explain how anticonvulsants and mood stabilizers, such as carbamazepine and lamotrigine, can be used to help manage mood instability in individuals with Huntington's disease. The authors describe how these drugs suppress excessive neuronal firing by prolonging the inactivation of voltage-gated sodium channels. By stabilizing neuronal membranes and reducing rapid firing, these medications help regulate abnormal brain activity associated with mood and behavioral symptoms, which is information that I mentioned in the learning module. The source also differentiates clinical applications, noting that carbamazepine is commonly prescribed for focal seizures, while lamotrigine is often used for generalized seizures and mood stabilization. This information supported the explanation of why these medications may be beneficial for managing bipolar-like symptoms in Huntington's disease. This source was credible because it came from the US national library of medicine and the article was peer-reviewed. The article is technical in wording but extremely insightful in providing clear mechanistic insights for anticonvulsant drugs.

13. Ferguson MW, Kennedy CJ, Palpagama TH, Waldvogel HJ, Faull RL, Kwakowsky A. Current and possible future therapeutic options for Huntington's disease. Journal of Central Nervous System Disease. 2022 May 21;14. doi:10.1177/11795735221092517. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC9125092/

This review article outlines emerging experimental and future therapy strategies to manage Huntington's disease. The focus of this article was mostly on approaches that would target underlying genetic mechanisms that result in the mutated version of the huntingtin protein responsible for symptoms experienced by HD patients. I used this source to describe ASOs which are single standard oligonucleotide analogues that bind to mRNA and promote degradation to reduce overall mutant HTT levels. Other therapies that the article discussed was RNAi through viral vectors, stem cell transplantations, antibody approaches, and RNA targeting small molecules. It was also used to make question 9 in the quiz section for both the question and options. The article is really useful in that it not only describes these future outlooks but also gives some information on trials and limitations which I used for the module as well. This peer-reviewed journal was

valuable for its preclinical and clinical insights on these future therapies and provides a direction to the possibility of research involved and emerging in bettering treatment options for Huntington's disease.

14. Han I, You Y, Kordower JH, Brady ST, Morfini GA. Differential vulnerability of neurons in Huntington's disease: The role of Cell Type-specific features. Journal of Neurochemistry. 2010 May 17;113(5):1073–91. doi:10.1111/j.1471-4159.2010.06672.x. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC2890032/

This journal paper explains why certain areas of the brain and the neurons in those areas are more prone to degeneration in Huntington's disease compared to other areas. The authors focused on the striatum which is particularly vulnerable in degenerating as Huntington's disease progresses. They looked at differences in cell structure, metabolism, and protein transport to explain selective neuron loss. I ended up using this source to explain that not all neural areas are affected by this disease in the same way. The authors also highlighted that mutant HTT protein impairs intracellular processes in the neurons of the striatum, specifically medium spiny neurons. It was also used to make question 10 in the quiz section for both the question and options. Overall, as a peer-reviewed journal paper, this paper was highly valuable for explaining the biological basis of why HD is selective and affects certain pathways more than others in the brain. This helped link some of the more gene-based therapies discussed earlier to actual processes in the cell.

15. Cepeda C, Wu N, Andre V, Cummings D, Levine M. The corticostriatal pathway in Huntington's disease. Progress in Neurobiology. 2006 Nov 3;81:253–71. doi:10.1016/j.pneurobio.2006.11.001. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC1913635/

This journal paper examines how Huntington's disease disrupts the corticostriatal pathway in the brain and how this circuit functions to control motor initiation. I used this source to describe the degeneration of MSNs in the striatum that was touched upon in the previous source. The authors explained that neurons in the indirect pathway are affected more severely as earlier than those in the direct pathway. This means that because the indirect pathway is important for stopping unwanted movements its degeneration can lead to classic symptoms like chorea and reduced motor control. As the disease progressed it also affects the direct pathway which is responsible for initiating movements. As a result movements become harder to start, and slower overall leading to rigidity and bradykinesia. Additionally, the article highlights three specific pathways: corticostriatal → basal ganglia → thalamocortical loop, direct vs indirect basal ganglia pathways, and cortical projection pathway. These were described in detail in the module.

16. Irfan Z, Khanam S, Karmakar V, Firdous SM, El Khier BSIA, Khan I, et al. Pathogenesis of Huntington's Disease: An Emphasis on Molecular Pathways and Prevention by Natural Remedies. Brain Sciences [Internet]. 2022 Oct 14;12(10):1389 [cited 2026 Mar 22]. Available from: https://www.mdpi.com/2076-3425/12/10/1389

This article covers the pathogenesis of Huntington's disease, which specifically covers molecular pathways and how natural remedies can be used for prevention. With research regarding how the defensive effect of nature-derived products provides therapeutic efficacy against HD. Recent reports (2022) on natural drugs have enlightened the protective role against HD via antioxidant, anti-inflammatory, antiapoptotic, and neurofunctional regulation. This article belongs to Huntington's Disease and Pain: Clinical Outcome, Cognitive Processing, Neurophysiological Pattern and Neuroanatomical Basis, which is a special issue of a journal called Brain Sciences. This journal is an international, peer-reviewed, open access journal on neuroscience, published monthly online by MDPI. Overall, this is a very credible source provided through MDPI (Multidis ciplinary Digital Publishing Institute), which has 512 diverse and open access journals, including 503 peer-reviewed journals and 9 conference journals, supported by more than 295,000 academic experts. The relevance of this article was to apply it to the sequence of events in Huntington's disease development part and specify the name of the Huntingtin gene in the etiology section of our assignment. It was also used to make question 2 in the quiz section for both the question and options. It simply laid out the five stages of Huntington's disease in a way digestible for readers and students.

17. Alzheimer's Association. Huntington's Disease [Internet]. Alzheimer's Association. 2019 [cited 2026 Mar 22]. Available from: https://www.alz.org/alzheimers-dementia/what-is-dementia/types-of-dementia/huntington-s-disease

This source provides a clear overview of Huntington's disease as a progressive, inherited neurodegenerative disorder caused by a defective gene on chromosome 4. It was used in this assignment to support discussion of the disease's etiology, particularly its genetic basis and how the mutation leads to brain degeneration over time. The explanation of inheritance patterns and disease progression helps reinforce key concepts related to genetic transmission and symptom development. The source is highly credible, as it is published by the Alzheimer's Association, a well-established nonprofit organization dedicated to advancing research, education, and support for individuals affected by neurodegenerative diseases. Its content is designed to be accurate, evidence-based, and accessible to a broad audience. A major strength is its clarity and ability to communicate complex medical information in an understandable way. However, a limitation is that it provides a general overview rather than detailed molecular or mechanistic explanations, making it less suitable for in-depth scientific analysis.

18. National Institute of Neurological Disorders and Stroke. Huntington's Disease [Internet]. National Institute of Neurological Disorders and Stroke. 2025 [cited 2026 Mar 22]. Available from: https://www.ninds.nih.gov/health-information/disorders/huntingtons-disease

This website is provided by the NIH's National Institute of Neurological Disorders and Stroke, which specifically covers Huntington's disease (HD). It provides readers with a moderate in-depth reading of what HD is, who's more

likely to get it, how it's diagnosed and treated, how to care for loved ones who have HD, and more. For our assignment we used the section talking about who is more likely to get HD, which focused on the genetic aspect of HD for how the defect of the htt gene causes formation of abnormal CAG repeats leading to HD development. This gene is heritable and this source explained it to also be able to occur without a family history and is acquired, called sporadic HD. It was also used to make question 5 in the quiz section for both the question and its options. This website is very credible as it is an official website of the United States Government. This website has major strengths with providing readers easily accessible knowledge about how to care for family members with HD, latest updates on treatment research and even additional resources to find more out about HD with phone numbers.

19. Mo C, Hannan AJ, Renoir T. Environmental factors as modulators of neurodegeneration: Insights from gene–environment interactions in Huntington's disease. Neuroscience & Biobehavioral Reviews. 2015 May;52:178–92 [cited 2026 Mar 22]. Available from: https://doi.org/10.1016/j.neubiorev.2015.03.003

This source is a review article from ScienceDirect explaining how environmental factors for people with Huntington's disease (HD) are placed in could alter/modulate their HD. Because HD has been viewed mainly as only genetic, this article is important to show how HD can be modulated by mental and physical activity, stress and diet. Overall, this review describes subsequent human and preclinical studies identifying environmental modulation of motor, cognitive, affective and other symptoms found in HD. ScienceDirect is a highly reliable and authoritative database for academic research, owned by the reputable publisher. It provides access to millions of peer-reviewed journal articles and book chapters across science, technology, health, and social sciences. It is a premier source used by researchers and students worldwide. This source was used in our assignment to explain HD etiology through genetic and environmental insults. Where it was used to aid supporting information in our section covering genetic insults and was used to specifically cover how stress was seen to accelerate memory and olfactory deficits and worsen cellular dysfunctions in HD mice regarding environmental insults. It was also used to make question 1 in the quiz section for both the question and its options.

20. BioRender. BioRender [Internet]. www.biorender.com. Biorender; 2025 [cited 2026 Mar 24]. Available from: https://www.biorender.com/

BioRender is a web-based scientific illustration tool designed to help researchers, students, and educators create professional-quality figures quickly and efficiently. The platform provides access to a large library of over 40,000 scientifically accurate icons and templates, along with functions that allow users to design diagrams without requiring advanced artistic skills. This source is credible as it originates from the official BioRender platform and is supported by institutional documentation. However, as a company produced source it primarily highlights the benefits of the tool and may not fully address its limitations, such as

subscription costs or licensing restrictions for publication use. BioRender is not copyright free because they own the icons, templates, and graphics in their library, but when you make a figure, you own the final figure, but it still contains BioRender's copyrighted elements and needs to be cited as done in our assignment. For our assignment this platform was used to create an image showing CAG Trinucleotide Repeat Tract Healthy vs Disease State based on information from "17".

21. Ajitkumar A, De Jesus O. Huntington Disease [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2023 [cited 2026 Mar 22]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK559166/

This book is provided by the NIH's National library of Medicine from the National Center for Biotechnology Information. This book is called "Huntington Disease", mainly its purpose being to determine the evaluation of patients with Huntington disease. The book covers many topics from etiology, epidemiology, pathophysiology, history, treatment/management, diagnosis, prognosis, etc. Overall, having the strength of being a very in-depth source for readers to find information regarding all main facets of Huntington's disease, which even includes review questions at the end. This website is very credible as it is an official website of the United States Government. For our assignment this book was used in many sections: contributors to the pathogenic process (Ubiquitin-protease system), complications/sequelae, prognosis (anticipated course of disease, morbidity and mortality) and epidemiology (prevalence and geographical importance). It was also used to AI generate an Incidence vs Prevalence map using ChatGPT.

22. OpenAI. ChatGPT [Internet]. ChatGPT. OpenAI; 2025 [cited 2026 Mar 28]. Available from: https://chatgpt.com/

ChatGPT is an artificial intelligence chatbot that uses large language models to generate human-like responses to text-based prompts. The platform is trained on a mixture of licensed data, human-created data, and publicly available information, allowing it to provide detailed explanations and generate coherent text across a wide range of topics. While ChatGPT is highly useful for idea generation and clarification, concerns remain regarding accuracy, potential bias, and academic integrity. Overall, it is a valuable tool when used responsibly and with proper verification of information. This source was used for the generation of images as they are copyright free. The images specifically generated using ChatGPT were a diagram of Complication of Huntington's Disease and a map of Huntington's Disease: Incidence vs. Prevalence. These images were able to be generated by typing in a prompt describing what was wanted in the image and then ChatGPT would create that. This AI tool was not used at all for the gathering of information in this project.

23. Medina A, Mahjoub Y, Shaver L, Pringsheim T. Prevalence and Incidence of Huntington's Disease: An Updated Systematic Review and Meta-Analysis. Movement Disorders [Internet]. 2022 Sep 26;37(12) [cited 2026 Mar 28]. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10086981/

This article is provided by the NIH's National library of Medicine from the National Center for Biotechnology Information. The article provides the most recent and credible in-depth information regarding prevalence and incidence of Huntington's Disease. Its main purpose is to systematically review and meta-analyze the incidence and prevalence of Huntington's disease, which uses data published from February 2022 and they performed additional analyses based on the continent information was from. Overall, the analysis by continent demonstrated that the prevalence of HD was significantly higher in Europe and North America than in Africa. The minor increase in prevalence (more so than incidence) demonstrated in this updated review could relate to the enhanced availability of testing options to patients. This website is very credible as it is an official website of the United States Government. Limitations of this paper were listed by the author as including variable case ascertainment methods and lacking case validation data. For our assignment this source was used for the incidence rates analyzed and to AI generate an Incidence vs Prevalence map using ChatGPT.