

2. Proceed to the next slide entitled "Alzheimer's causes loss of memory and thinking skills" that shows a diagram of the symptoms and stages of Alzheimer's disease.
 - a. What does it mean that Alzheimer's disease is a *progressive* disease?

 - b. Read the symptoms for mild, moderate, and severe Alzheimer's disease. Based on the symptoms Greg O'Brien described in the first video, at what stage is his disease? Use evidence to support your reasoning.

3. Next, watch the video about how Alzheimer's differs from normal aging. According to the study referenced in the video, if you are a person who does not appear to have evidence of neurological disease or memory loss at age 70, what is the percent chance that you will develop Alzheimer's disease?

4. Proceed to the slide with the graph entitled "Projected Number of People with Alzheimer's Disease in the United States."
 - a. Define the term dementia.

 - b. Write a sentence to explain how dementia and Alzheimer's disease are related.

 - c. Currently, about how many people in the United States over the age of 65 suffer from Alzheimer's disease?

5. Click on the graph to switch the image to a second graph entitled "Projected Number of People Over the Age of 65 in the United States." You can switch back and forth between the graphs by clicking on the image.
 - a. What is projected to happen to the number of people with Alzheimer's disease and the number of people over age 65 in the United States over the next 40 years?

 - b. Based on the information provided, can you think of an explanation for the trends identified in the question above?

6. Proceed to the next slide with the puzzle pieces and the heading: "There is no treatment for Alzheimer's disease."
 - a. What is a drug target? Why is it important to identify a drug target to treat a disease?

 - b. What are currently available treatments for Alzheimer's able to do? Not able to do?

7. Proceed to the slide where you write down your research questions and ideas. Write down at least three questions or ideas either in the Post-it notes in the Click & Learn or in the space below. They may go in any of the categories listed. ***If you write your questions/ideas in the Click and Learn, take a screen shot of what you wrote.***

PART 3: Evidence from different research areas

Work through the three modules (Anatomy, Genetics, and Histology) to examine the evidence studied in different areas of research to better understand Alzheimer's disease. Record your responses to the questions from each module in the appropriate section below.

Anatomy

1. What is an autopsy and why would one be performed?

2. Proceed to the slide with images of brains from Alzheimer's patients and age-matched controls.
 - a. What is an *age-matched control*? Why is it important to include in this type of study?

 - b. Identify three difference(s) between the brain of someone with Alzheimer's disease and a normal brain of someone the same age.

3. Proceed to the slide with the video.
 - a. Where in the brain does Alzheimer's disease start?

- b. How does this relate to the symptoms that patients with Alzheimer's disease experience?

4. Proceed to the next slide. If you want to make any changes to your notes at the end of the section, make sure to do so. **Take a screen shot after you have added your questions/ideas or write them below.**

Genetics

1. Read the information in the first three slides until the description of the APP protein.
 - a. Researchers have found that the gene that codes for APP is on which chromosome?

 - b. Does everyone have a copy of this gene? Explain your answer.

2. Proceed to the slide that shows how APP is cut to produce beta amyloid. What is the relationship between beta amyloid and APP?

3. Review the information about mutations. Which do you think would be more likely to have an effect on protein function: a silent mutation or a missense mutation? Explain your answer.

4. Compare the DNA sequences of individuals with Alzheimer's disease and their family members. Two codons in the APP gene sequence are different in the two patients with Alzheimer's disease compared to individuals without the disease. Consider the first codon that's different and complete the table below.

	Codon in DNA template strand	Codon in mRNA	Amino Acid
APP gene in individuals without Alzheimer's disease			
APP gene in individuals with Alzheimer's disease			

Does the change in this codon represent a silent or a missense mutation? Explain.

5. Consider the second codon that's different and complete the table below.

	Codon in DNA template strand	Codon in mRNA	Amino Acid
APP gene in individuals without Alzheimer's disease			
APP gene in individuals with Alzheimer's disease			

Does this change in codon represent a silent or a missense mutation? Explain.

6. Consider what you discovered about the types of mutations in questions 4 and 5. How could these types of mutations result in Alzheimer's disease?

7. Proceed through the rest of the interactive, until you reach the slide with a pedigree. Has Alzheimer's disease been associated with genes other than *APP*? Provide evidence from the interactive that supports this claim.

8. Proceed to the next slide.

- a. Does Alzheimer's disease always have an autosomal dominant inheritance pattern? Provide evidence that supports this claim.

- b. Is Alzheimer's disease always linked to a mutation in a single gene? Provide evidence that supports this claim.

- c. Do doctors always know exactly what causes an individual's Alzheimer's disease? Provide evidence that supports this claim.

9. Proceed to the last slide with the notes. If you want to make any changes to your notes at the end of the section, make sure to do so. **Take a screen shot after you have added your questions/ideas or write them below.**

Histology

1. Proceed to the slide with the images of the histology (tissues) of a normal brain and a brain with Alzheimer's disease. List two differences that you notice.

2. Proceed to the slide with the video. Watch the video and read the information in the following three slides.
 - a. How are plaques related to beta amyloid?

 - b. How are tangles related to tau?

 - c. How are plaques and tangles related to the symptoms of Alzheimer's disease?

3. Proceed to the last slide with the notes. If you want to make any changes to your notes at the end of the section, make sure to do so. **Take a screen shot after you have added your questions/ideas or write them below.**

PART 4: Drug Development (Optional)

1. Which molecules did you identify as possible targets for a drug to treat Alzheimer's disease, and why did you choose those targets?
2. After watching the video, would you revise your answer above? If yes, how?
3. Proceed to the slide describing the phases of the U.S. drug development process and click on the image to expand it. List one thing that surprised you about the drug development process and explain why it was surprising.
4. Consider the three drugs that are currently in clinical trials for the treatment of Alzheimer's disease. Based on what you learned in this interactive, do you think each of these drugs would be more likely to treat a patient with symptoms of mild, moderate, or severe Alzheimer's disease? Explain your answer.
5. Proceed to the slide with the video of Dr. Rudy Tanzi. How is neuroinflammation related to Alzheimer's disease? In your response, include how glial cells are involved in this process.
6. Proceed to the final slide. If you want to make any changes to your notes at the end of the section, make sure to do so. **Take a screen shot after you have added your questions/ideas or write them below.**

PART 5: Apply Your Knowledge

After completing the Click & Learn and answering the questions in Parts 1 through 4 of this worksheet, use this information to consider the following scenarios and answer the associated questions. (Note: These are made-up scenarios based on published scientific studies and patient stories.)

Scenario 1

Carol recently turned 50 and is worried about developing Alzheimer's disease. Her mother suffered from Alzheimer's before she passed away at age 68, but her father is now 82 years old and has never shown symptoms. Carol has had genetic testing, and doctors found that she has the same *APP* mutation as her mother.

1. Based on this information, what is the likelihood (percentage) that Carol will develop Alzheimer's disease?
2. Is it possible that Carol may develop Alzheimer's later in life but doesn't show any signs now? Explain.
3. Carol has a sister who has **not** been tested for the *APP* mutation. What is the likelihood (percentage) that Carol's sister has the same *APP* mutation as Carol and their mother?

Scenario 2

David is 58 and starting to lose things and forget words. Neither of David's parents had Alzheimer's disease. David's children are concerned that he might be developing Alzheimer's disease.

1. The doctor diagnoses David with dementia. Does this mean that he has Alzheimer's disease? Explain your answer.
2. Given his family history, is David likely to have an *APP* mutation associated with Alzheimer's disease? Explain your answer.

