Notes for teachers

At a glance

Alzheimer’s disease (AD) is a degenerative disease of the brain that causes dementia. Many people who have relatives with AD are worried that they will also develop the disease – but is AD inherited? In this activity students will explore this question by studying family trees, drawing genetic crosses and interpreting information about genes and alleles.

Learning Outcomes

- Students understand what risk factors for a disease are
- Students use a checklist to critique a claim

Each pair of students will need

- Copy of student worksheet page 1
- Copy of student worksheet page 2, 3 or 4
- Copy of student worksheet page 5

http://www.oxfordsparks.ox.ac.uk/content/discovering-life-changing-dementia-treatments
Possible Lesson Activities

1. Starter activity
   - Ask the students if they know what dementia is, what the symptoms are. They may have experienced a family member with the disease, so sensitivity is called for here. Discuss the fact that dementia is collection of symptoms caused by diseases that affect the brain. It is important to point out that it is not an inevitable part of ageing, it is caused by disease so could be prevented or treated but currently there is no cure.
   - Play the animation ‘Discovering Life-Changing Dementia Treatments’, which outlines the causes of AD, and the work going on in Oxford to help discover treatments.

2. Main activity: Exploring the genetics
   - Give each student a copy of page 1 of the student worksheet and ask them to read through it. This contains background information about AD and sets the task.
   - Ask students to work in pairs, and give each a copy of the first family tree (page 2 of the student worksheet). Ask them to study the family tree and discuss if they think AD is inherited and their evidence for this.
     
     **In family 1 Camille’s sister developed AD in old age and so did her Grandfather. No other members of the family had it. This is not strong evidence that AD is inherited.**

   - Now give each pair the family tree of family 2 (page 3) and ask them to compare the pattern of inheritance and if they think this suggests that AD is inherited.
     
     **In family 2 Matt’s mother developed AD at a young age (45). Several other members of his family also had the disease. There is strong evidence that AD is passed from parent to child.**

   - After hearing their ideas, give each pair a copy of page 4 of the student worksheet. This explains that there are two types of AD – early and late onset. The students use this information to give advice to Camille and Matt on their chance of developing AD.
     
     Students should draw a genetic cross to work out the probability that Matt’s (and his siblings) have inherited the faulty gene.
     
     **You may wish to provide a hint that it is not autosomal recessive especially if students are not used to this style of investigation, or provide the worksheets in a different order.**

3. Plenary
   - Discuss what the class have discovered.
     
     **Camille’s sister has late-onset AD. This means that Camille (and her children/grandchild) have an increased risk of developing AD because they may have inherited the APOE e4 allele, or a risk allele for another gene. However, not all people who have the allele will develop the disease.**

     **Matt’s mother has early-onset AD. This means that she has inherited a faulty gene from her father (who also had the disease). Matt (and his siblings) have a 50% chance that they have inherited the faulty gene and will develop the disease. Matt can have a genetic test to see if he has the faulty gene.**

   - As a class, discuss how further research into the genetic causes of AD can help find effective treatments. For example, finding out how a fault in a gene changes the protein structure can help researchers work out what causes AD. Also, gene therapy may be possible as a treatment.

http://www.oxfordsparks.ox.ac.uk/content/discovering-life-changing-dementia-treatments
Weblinks

https://www.oxfordsparks.ox.ac.uk/content/discovering-life-changing-dementia-treatments

Oxford Sparks animation

https://www.alzheimers.org.uk/

The website for Alzheimer’s society, which contains information about the disease.