Key Stage 4
The Genetics of Alzheimer’s

Student worksheet

What is Alzheimer’s Disease?
Alzheimer’s disease (AD) is named after the doctor who first described it (Alois Alzheimer). It is a type of dementia and symptoms include difficulties with thinking, memory, problem-solving or language.
AD mainly affects people over 65, although younger people can develop it.

What causes it?
The root cause of AD is poorly understood, and may be a combination of aging, genetic susceptibility, and overall body health. These factors can contribute to toxic proteins building up in the brain. One of the proteins involved is called beta-amyloid, which forms plaques around brain cells. Another protein called tau forms tangles within brain cells.
These lead to a decrease in chemical messengers (neurotransmitters) that are involved in sending impulses between nerve cells.

Over time, nerve and brain cells die and areas of the brain shrink. The first areas usually affected are responsible for memories.

Can we prevent AD?
It is still unknown what triggers Alzheimer’s disease, but several factors are known to increase the risk of developing it.

There is strong scientific evidence, based on research, to support some of the risk factors.
Examples are old age, genetics, and poor cardiovascular health.

There may be other risk factors, and research is ongoing.

Your task
You will be given a claim about a possible risk factor for AD and some information used to support the claim.

You will need to decide how reliable the claim is – how strong is the evidence that supports it?

You should:
- Read through the claim and the evidence used to support it.
- Use the reliability checklist to check how reliable the evidence supporting the claim is. The more ticks you award, the more reliable the evidence is.
- Write a conclusion - how likely is it that this is a risk factor for AD?

Why do you think this?

http://www.oxfordsparks.ox.ac.uk/content/discovering-life-changing-dementia-treatments
Key Stage 4

Mythbusting Alzheimer’s

Claim 1: Being overweight is a risk factor for Alzheimer’s disease

Source: Alzheimer’s Disease website  Full article: [https://goo.gl/gbrYKS](https://goo.gl/gbrYKS)

### Midlife Weight Connected to Earlier Risk of Alzheimer’s

In a recent study published in a scientific journal, researchers set out to learn more about the link between obesity and Alzheimer’s.

They analysed almost 1,400 adults with no signs of a brain disorder and measured their body mass index (BMI)* at the age of 50 years old. Then, the researchers interviewed the adults every 2 years for 14 years to find signs of Alzheimer’s. During the course of the study, over 140 participants went on to develop Alzheimer’s.

The researchers found that participants who had a BMI of 25 or over, at the age of 50, were more likely to develop Alzheimer’s nearly 7 months sooner than participants who were at a healthy weight. The study also showed that the disease appeared earlier as BMI in midlife increased. For instance:

- Subjects who had a BMI of 30 at the age of 50 were more likely to develop Alzheimer’s an entire year earlier than those who had a BMI of 28.
- In addition to the nearly 1,400 participants, the research team also analysed the brains of 191 deceased subjects. They found that of the deceased, those who had a higher BMI in midlife also had a higher amount of amyloid proteins in the brain.

The study adds to recent evidence that lifestyle choices can make a difference when it comes to decreasing the risk of Alzheimer’s.

More studies will need to be done to determine if a lower BMI in midlife delays Alzheimer’s and to see if there is a specific BMI where the risk of Alzheimer’s increases.

* BMI is a measurement obtained by dividing a person's weight by the square of the person's height. A person with a BMI of over 30 (kg/m²) is said to be obese, with the range 25–30 (kg/m²) defined as overweight.
Key Stage 4

Mythbusting Alzheimer’s

Claim 2: Aluminium is a risk factor for Alzheimer’s disease

Source: Research paper published in a scientific journal  Full article: https://goo.gl/GHcRiC

Aluminium in brain tissue in Alzheimer’s disease

We do not know the cause of Alzheimer’s disease and environmental factors may yet be shown to contribute towards its onset and progression.

One such environmental factor is human exposure to aluminium.

We have made the first ever measurements of aluminium in brain tissue from 12 donors diagnosed with Alzheimer’s disease.

The concentrations of aluminium were extremely high, for example, there were values in excess of 10 μg/g tissue in 5 of the 12 individuals. Overall, the concentrations were higher than all previous measurements of brain aluminium except cases of known aluminium-induced encephalopathy*

We have supported our analyses using a novel method of microscopy to visualise aluminium in all lobes of every brain investigated. The unique data and the stunning images of aluminium in Alzheimer’s disease brain tissue raise the spectre of aluminium’s role in this devastating disease.

*A brain disease caused by aluminium poisoning

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Mythbusting Alzheimer’s

Claim 3: Head injuries are a risk factor for Alzheimer’s disease

Source: Psychology website  Full article: https://goo.gl/5kiwJe

Can Traumatic Brain Injury Lead to Alzheimer’s Disease?

There are aspects of serious head injuries that are just beginning to be understood. This includes the potential role that they may play in Alzheimer’s disease (AD).

Much of the evidence comes from looking at the brain of a person after they have died (using an autopsy). Studies suggest that a single moderate head injury can lead to increased amyloid plaques and protein tangles, two signs of AD.

It is thought that during a head injury neurons in the brain get damaged and this causes the development of the plaques. However, how this develops is still poorly understood.

To explore this link between brain injury and AD, a new research study published in the journal Neuropsychology examines cases of AD as confirmed by autopsy findings and how they relate to a history of head injuries.

A team of researchers looked at information from interviews with people with AD. They were asked if they had ever had a head injury and when this happened. After they died, the researchers studied their brains to check they had AD.

Of the 2153 participants, 197 reported some form of prior head injury and participants with no history of head injuries were used as controls. On average, participants reporting a moderate to severe head injury involving loss of consciousness began showing symptoms of dementia three years earlier than participants with no history of head injury. Even when controlling for other factors such as lifetime history of depression, family history of dementia, level of education, and medical history, the link between dementia and TBI remains strong.

While similar results have been reported in previous studies, this is the first to use autopsy results to confirm the AD diagnosis.

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### Key Stage 4

**Mythbusting Alzheimers**

### Reliability checklist

**Claim I am checking:**

<table>
<thead>
<tr>
<th>Thing to check</th>
<th>✅ or X</th>
<th>Reason I think this</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the claim based on scientific research carried out by qualified scientists?</td>
<td></td>
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<tr>
<td>Was the evidence published in a peer-reviewed scientific journal? (This shows that the study was designed, conducted, and analysed correctly)</td>
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<tr>
<td>Is the evidence based on a large sample of observations (e.g. 10,000 patients) or just a few isolated incidents?</td>
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<td>Does the evidence suggest causation and not just correlation? In other words, does the data suggest that changes in one factor actually causes changes in the other?</td>
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<tr>
<td>Are the claims in the article supported by multiple lines of evidence (e.g. from several studies)</td>
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<tr>
<td>Is there no sign of bias e.g. check if the researcher or funder might benefit from reporting the finding</td>
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<tr>
<td>Can the scientists give a scientific explanation of the findings?</td>
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