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Research • Terminology • Activities

How did a high school science project uncover a potential new treatment for Alzheimer's disease?

Claire Su

How did a high school science project uncover a potential new treatment for Alzheimer's disease?

It was an 8th Grade biology lesson that inspired **Claire Su**, a high school student at **BASIS Ahwatukee** in the US, to conduct her own scientific research project. After learning about the gene that causes people to perceive the taste of brussels sprouts differently, she decided to investigate the links between this gene and Alzheimer's disease. Mentored by scientists at **Arizona State University**, Claire not only discovered that supertasters have a lower risk of Alzheimer's, but she also found that a drug currently used to treat diabetes could be repurposed to prevent cognitive decline.

Claire Su

BASIS Ahwatukee, Phoenix, Arizona, USA

Field of research
Computational neuroscience

Research project
Investigating the links between the TAS2R38 taste gene and Alzheimer's disease

Research paper
TAS2R38 taster variants-linked MGAM expression in Alzheimer's disease: a novel target for precision drug repurposing. Su et al. (2026) **doi: 10.3389/fnagi.2026.1768436**

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PROFILE

Talk like a ...

computational neuroscientist

Allele – a variation in a gene

Alternative allele – an allele that is different to the reference allele in the human reference genome

Alzheimer's disease – a progressive brain disorder that causes cognitive decline

Cognitive decline – the loss of cognitive abilities such as thinking and memory

Genotype – the alleles that a person has for a particular gene (e.g., the taster genotype defines which TAS2R38 alleles a person has, categorising them as a supertaster, nontaster or heterozygote)

Heterozygote – a person whose TAS2R38 gene contains both the reference allele and the alternative allele

MGAM – the gene that produces an enzyme to digest starch

TAS2R38 – the gene that influences a person's ability to taste certain bitter compounds, such as those found in brussels sprouts

Do you like brussels sprouts? These vegetables famously divide opinion over whether they are delicious or disgusting. If you can't stand brussels sprouts, you aren't being a fussy eater – you probably have a genetic disposition to find the taste unpleasant.

"The TAS2R38 gene is a taste receptor that affects people's sensitivity to bitter compounds, such as those in brussels sprouts," says Claire Su, a high school student at BASIS Ahwatukee in the US. "If someone has the supertaster variant of the gene, they can perceive bitter taste compounds and so may have an aversion to foods containing these." People with the nontaster variant are unable to taste the bitter compounds in brussels sprouts, and heterozygotes' taste perceptions lie between supertasters and nontasters.

What inspired Claire to research taste genes?

Claire first learnt about supertaster genes in her 8th Grade biology class. "I was curious whether perceptions of taste might connect with memory, since I had heard that taste and smell are often connected with cognitive abilities," she says. "I wanted to study if there was a connection between TAS2R38 and Alzheimer's disease." And so, in 9th Grade, Claire joined a science fair club where she was mentored by scientists from Arizona State University who supported her as she conducted her own scientific research project.

How did Claire investigate links between taste genes and Alzheimer's?

Claire analysed data from over 2,000 people who had taken part in the Alzheimer's Disease Neuroimaging Initiative (ADNI). First, she examined their genetic data to determine their taster genotype (whether they were a supertaster, nontaster or heterozygote) by examining the alleles in three locations on the TAS2R38 gene. Supertasters have two copies of the alternative allele in the first and third location, while nontasters have two copies of the alternative allele in the second location, and heterozygotes have one alternative allele and one reference allele.

Claire then compared these people's taster genotypes with their Alzheimer's biomarkers. This included numerical scale ratings, such as their Clinical Dementia Rating, as well as imaging data collected from brain scans, such as the presence of amyloid and tau proteins that build up in the brain during cognitive decline.

"I found that alternative first and second TAS2R38 alleles are positively correlated with biomarkers for cognitive decline, while an alternative third allele is negatively correlated with cognitive decline," Claire says. "As supertasters have alternative first and third alleles, the positive and negative effects counteract each other, resulting in a slower rate of cognitive decline compared to nontasters, who only have alternative second alleles. Thus, my results showed that TAS2R38 supertasters displayed a lower risk of Alzheimer's."

Next, Claire analysed genotype data from over 900 people who had taken part in the Religious Orders Study and Memory and Aging Project (ROSMAP). "I connected genotype data to the expression of nearby genes in the genome to find a potential molecular mechanism behind the association," she explains. She discovered that the TAS2R38 gene variants themselves do not directly impact the risk of Alzheimer's. Instead, Claire found that they act as expression quantitative trait loci, meaning they mediate the expression of nearby genes, and she identified the MGAM gene (which produces an enzyme to digest starch) as being affected. "I found that the supertaster variants are associated with a lower expression of MGAM in the Alzheimer's-affected brain regions, and vice versa," she says, indicating that a higher expression of MGAM is linked to cognitive decline.

Claire presents her research to scientists at an academic conference.

> **"My results showed that TAS2R38 supertasters displayed a lower risk of Alzheimer's."**

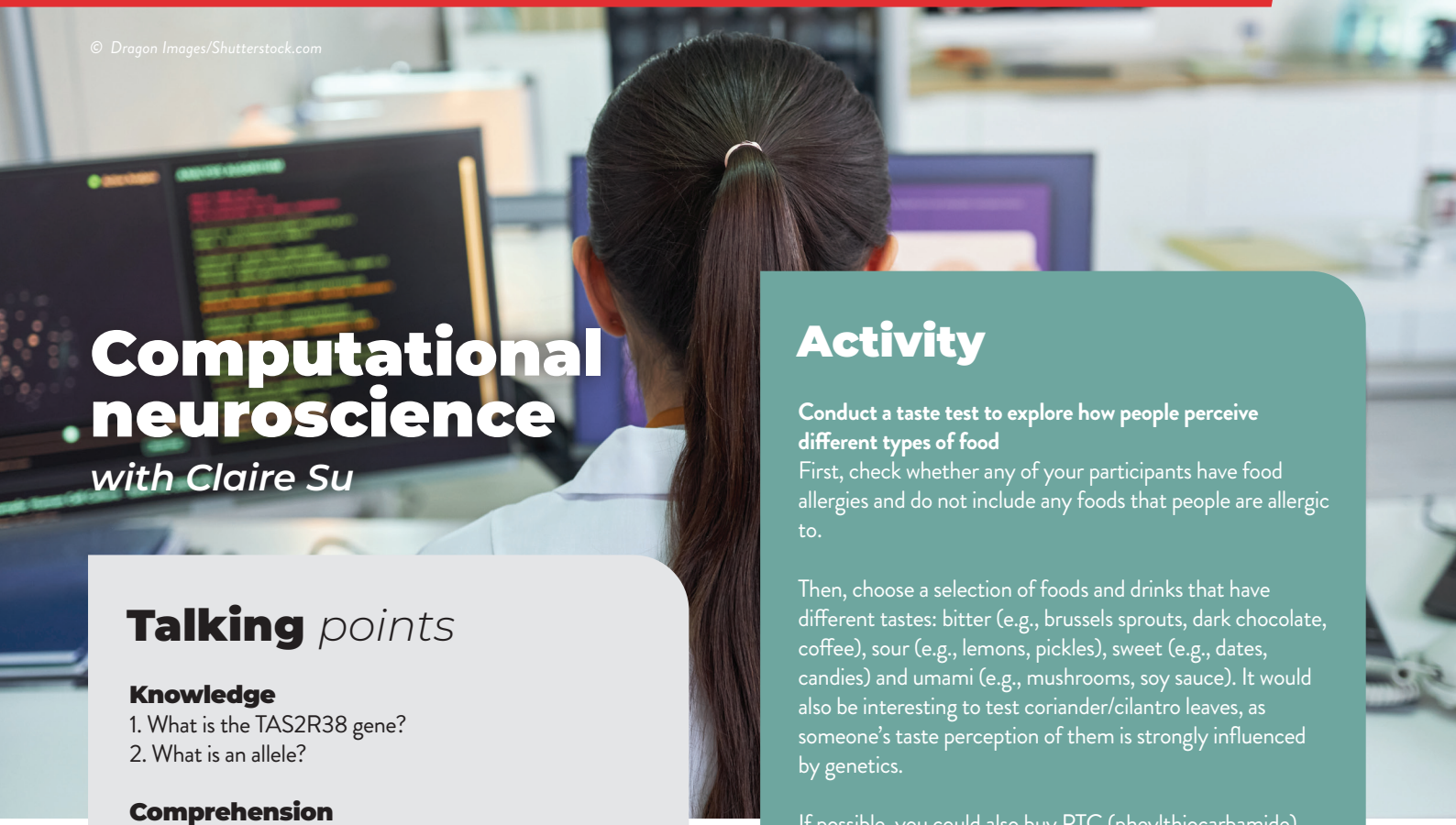
Finally, Claire analysed data from the National Alzheimer's Coordinating Center (NACC) to investigate whether MGAM-inhibiting drugs could reduce the risk of Alzheimer's. "MGAM is a target for diabetes treatment and drugs inhibiting its expression have already been developed, which allowed me to investigate how the drug could affect the susceptibility to Alzheimer's," she explains. Claire found that people taking MGAM-inhibiting drugs do indeed have slower rates of cognitive decline, suggesting that these diabetes drugs could be repurposed for treating Alzheimer's. Claire's mentors are now exploring her findings further through animal model testing, with the aim of evaluating their potential for translation into clinical practice.

What next for Claire?

Since completing her science fair project, Claire has written up her findings and, with the support of her mentors, published them in an academic journal so that scientists and doctors around the world can learn from her work. But this wasn't always an easy journey. "The research experience was hard at first because I knew very little about coding and data analysis when I began, but I have now become fluent in these skills," Claire says. "There were always setbacks, such as when results weren't statistically significant or when my code disappeared and I had to redo whole portions of the project." However, the joys have greatly outweighed the challenges. "The moments when I got significant results really excited me!" says Claire. "During the gene expression analysis, it was fascinating to learn about lots of genes that I'd never heard of before."

Now in 12th Grade, Claire is looking forward to going to college to study cognitive science. "I'm drawn to understanding human thought and how people see the world differently," she says. "I want to continue doing research as I'm constantly reminded about what a big and unexplored world the human body really is and how research can help improve diagnosis and treatment of diseases."

Claire's story highlights how curiosity born from a science lesson can lead to remarkable new scientific discoveries, as what began as a high school science project has resulted in a potential new treatment for a devastating disease.



Computational neuroscience

with Claire Su

Talking *points*

Knowledge

1. What is the TAS2R38 gene?
2. What is an allele?

Comprehension

3. How do different combinations of TAS2R38 alleles influence a person's perception of the taste of brussels sprouts?
4. Why did Claire suspect there might be a connection between TAS2R38 and Alzheimer's disease?

Application

5. How could scientists and doctors use the results of Claire's research to develop new treatments for Alzheimer's?

Analysis

6. How and why does the TAS2R38 gene influence someone's risk of developing Alzheimer's?

Evaluation

7. What do you think you would most enjoy about conducting a scientific research project and sharing your results with the world, and what do you think you would find most challenging? Why?

Creativity

8. What science topics most interest you? What further aspects of these topics do you want to investigate? Write a list of scientific research questions that you have about your chosen topics. How could you design a science fair project to answer some of these questions? What data would you need, how could you collect the data, and what do you expect to find from your results?

Activity

Conduct a taste test to explore how people perceive different types of food

First, check whether any of your participants have food allergies and do not include any foods that people are allergic to.

Then, choose a selection of foods and drinks that have different tastes: bitter (e.g., brussels sprouts, dark chocolate, coffee), sour (e.g., lemons, pickles), sweet (e.g., dates, candies) and umami (e.g., mushrooms, soy sauce). It would also be interesting to test coriander/cilantro leaves, as someone's taste perception of them is strongly influenced by genetics.

If possible, you could also buy PTC (pheylthiocarbamide) paper strips to test whether your classmates are TAS2R38 supertasters, nontasters or heterozygotes. When placed on the tongue, these paper strips will taste very bitter to supertasters, slightly bitter to heterozygotes and tasteless to nontasters.

Ask your participants to taste the different foods (and PTC strips) and record how they experience them. For example, how bitter/sour/sweet do they find each food, and do they enjoy tasting it or find it unpleasant? Do they think coriander/cilantro leaves taste fragrant or soapy?

Analyse your data to look for any trends and correlations. For example, do people who dislike brussels sprouts also dislike dark chocolate and coffee? Do people who like sour foods also like umami foods?

Summarise your results. Can you draw any conclusions about how people perceive different tastes? What other factors might influence people's perceptions of different foods, and how could you account for these variables in your experiment?

More *resources*

- Discover how a chemist accidentally discovered that bitter taste perception is genetic: learn.genetics.utah.edu/content/basics/ptc

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