



Science Debate Kit:

Do we have free choice over what we eat?



“Keep these kits coming please!”



For in-depth resources on this debate go to: food-dk.imascientist.org.uk

Debate Kit: Food

Do we have free choice over what we eat?

Food and our food environment has never before changed so rapidly as it has in the last 50 years. A huge range of foods are accessible in the UK – widening our choices and protecting us against food shortages. But with the industrialisation of food has come a separation between producer and consumer – does that mean we are no longer in control of what we choose to eat?

You can use all eight characters, or fewer, as you wish.

The minimum is the four essential characters (**in bold**), this gives two for and two against.

Characters

Yes

Sara Orin – Supermarket manager

Pat Connor – Diabetic

Mary-Anne Chapman – Food vlogger

Ben Beaton – 23-year old farmer

No

Leo Sturgeon – Full time parent

Harriet Furuta – Microbiologist

Enele Tua – Samoan Rugby player

Alex Whit – School student

Facilitation tips

- Ensure pupils know there is no right or wrong answer.
- Be observant of ones who want to speak and are not getting a chance.
- Encourage students to give a reason for their opinions.

Designed for KS4 but can be used with ages 11-18.

Learning notes

Learning objectives:

- To develop oracy skills, practice discussing issues and expressing an opinion.
- To explore the applications of science in a real-life context.

Other learning outcomes:

- Consider different points of view and develop the British Values of respect and tolerance.
- Think about different points of view.
- Learn to back up opinions with facts.

Curriculum points covered:

Thinking scientifically

- Evaluating the implications of technological applications of science
- Developing an argument
- Reflecting on modern developments in science

Teacher Notes

Note: This kits discusses food, mentions restrictive diets and calories. It has been written to avoid triggering issues relating to eating disorders, but please be alert to how it is received by your students.

Question:

Do we have free choice over what we eat?

Food and our food environment has never before changed so rapidly as it has in the last 50 years. A huge range of foods are accessible in the UK – widening our choices and protecting us against food shortages. But with the industrialisation of food has come a separation between producer and consumer – does that mean we are no longer in control of what we choose to eat?

Lesson plan

The different rounds of the debate help students think through the issues and reconsider their opinions. The structure also shows them how to build a discussion and back up their opinions with facts.

Starter: 5 minutes.

Who influences your own food choices?
How does our internal biology – our hormones, genetics – affect food choices?
What does the food environment look like around our school?

Designed for KS4. These debate kits have been used with ages 11-18.



Main Activity: 35 minutes.

- 1) Split students into as many groups as characters you want to cover.
- 2) Give them their character cards - one per group, and give them a few minutes to read them over.
- 3) Get one student in each group to read out their first section of the rest of the class.
- 4) Take it in turn to read out their fact. Does it change the way they think?
- 5) Read the issue. Any different feelings?
- 6) Each team asks their question to the character of their choice.

TIP: Visit our resources site, food-dk.imascientist.org.uk, to project the character cards on your whiteboard.

Support: To help students you can put the following prompt sentences up on the board:
"I feel has a lot of influence over what we eat"
"I think the most important consideration is....."

Plenary: 10 minutes

Vote for which position they agree with most (if there is one). Why? Which arguments were the most persuasive?
Note – Pupils can stay in roles all the way through the debate, or only for the first round if you prefer. If it's all the way through, give them a chance to express their own opinion at the end and in the plenary. For groups who are not confident at class discussion, it might help to have them start by discussing the question and/or their character's position in pairs, and then compare notes in fours. They've then had chance to rehearse some of what they want to say before having to do it in front of the whole class.



Epigenetics

Some diseases are considered epigenetic. Epigenetics describes the field of genetics where changes occur not in the genes themselves, but in which genes are expressed. Environmental factors can switch on/off particular genes or combinations of genes. They do this by influencing which chemicals are released or proteins made in the body, and where they bind to DNA, activating or silencing genes. Environmental factors include pollution, temperature, or what we eat. These factors can affect our susceptibility to various diseases, including heart disease, cancer, and neurodegenerative disorders. The good news is that epigenetic modifications are potentially reversible – which may open the door to potential treatments in the future.

Diabetes

Diabetes is a metabolic disease where the body is unable to control blood glucose levels with the hormone insulin, leading to high blood sugar. Untreated, this leads to diabetic complications almost everywhere in the body, including the brain, eyes, heart, kidneys and feet.

Type 1 diabetes tends to run in families, and occurs when the immune system attacks its own cells that produce insulin.

Type II diabetes occurs when the body doesn't produce enough insulin or doesn't respond to it. It can more often be managed by diet, and may be caused by diet and other lifestyle factors such as lack of exercise.

Diabetics may need to take insulin, and calculate exactly how much sugar or carbohydrates they have eaten in every mouthful. <https://www.diabetes.org.uk/about-diabetes>

Background notes for teachers

Processed foods
We can't divide foods into processed and unprocessed – processing can mean many things, including selective breeding, genetic modification, fermenting, pasteurising, crushing, and, yes, cooking. Many of these processes predate writing and so record-keeping. The result? Pretty much everything we eat now is a bit processed. But we do know that the more processed food is – the more it is chemically altered – and the more processed food we eat – the greater the risk of illnesses. This is true even when other factors are corrected for, like weight. Even vitamins may not help: vitamin C cures scurvy, fish oil cures rickets, but if you're not ill, taking a multivitamin might increase risk of heart disease or cancer. We don't know why. <https://www.theguardian.com/society/2015/apr/27/vitamin-supplements-increase-risk-cancer-heart-disease-research>

Golden Rice

Genetic modification of rice produced "golden rice", which produces its own beta-carotene, a precursor for vitamin A. The aim is to grow this rice in rice-eating populations where vitamin A deficiencies are common. The Philippines became the first country to approve Golden Rice for the public in 2021, but in 2024 it was banned after a court ruled there was no scientific consensus on its safety.

Food Production

Bees pollinate 88% of nutritionally important crops: if we don't protect bees, some food items such as chocolate and coffee could become rare. This would drive up the market price, making them luxuries that only the privileged few could afford. D. A. Stanley et al., *Nature* 528, 548(2015) <https://www.envchemgroup.com/neonicotinoids-updated.html>

Energy and food

There are two commonly quoted units of calorie, and it's important not to be confused between them:
1 Calorie (cal) is the energy required to increase the temperature of 1 g of water by 1 °C.
1 Calorie (kcal) is the energy required to increase the temperature of 1 kg of water by 1 °C.
This means that in fact, 1000 calories = 1 Calorie (kcal).

The Microbiome

There are trillions of microorganisms – bacteria, viruses, fungi, and a few other species – that live inside us, outnumbering human cells with microbial ones, and weighing about as much as a hamster. Scientists have shown that healthier people have more different varieties of microorganisms. Allergies, bowel disease, chronic fatigue, and cancer may be linked to lack of microbial diversity.

This can happen with:

- Restrictive diet, e.g. cutting out a whole food group like in a keto diet, which cuts out carbohydrates;
 - Antibiotics;
 - Other illnesses, including stress;
 - Exposure to toxins.
- Scientists are still working out why, but it may be because of chemicals produced by microbes.

Water in your body is not under conscious control because many processes act to regulate input via thirst and output by sweating and urination, and the amount in you stays pretty constant. Some think food intake may be similar.

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Diabetics may need to take insulin, and calculate exactly how much sugar or carbohydrates they have eaten in every mouthful. [Diabetes UK]

Poverty

Growing up in a lower income family increases your chances of "commerciogenic diseases" – diseases caused by companies



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A full list of sources and additional reading material is available online at ri-uk.imascientist.org.uk

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Ben Beaton

23-year old farmer



Agriculture is transforming. Shifting from growing big fields of single crops to small amounts of many crops boosts resilience and biodiversity. Organic farming can't yield enough food for our world – but we can use pesticides less.

This means less pesticides in food, and it will protect pollinators like bees, which in turn protects the diversity of food we can grow. Soil health science can help us plant sustainably, and GM (genetic modification), in countries that allow it, can increase disease resilience or supplement diets.

Fact: GM golden rice produces its own beta-carotene, providing vital vitamin A for people who don't get enough.

Issue: The average UK farmer is 59 years old – towards the end of their career, they are less keen to take risks.

Question: Will GM golden rice reduce the diversity of rice we choose?

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Mary-Anne Chapman

Food vlogger



Industrialisation lets us mass produce food and ship it worldwide. Other people sow it, grow it, harvest it, even cook it.

It frees up so much time. Just go to the supermarket and look how much choice there is – incredible! We can even eat what we want and optimise our health. Too many carby crisps? Add a protein shake! Too much caffeine? Swap for a mushroom coffee! The power we have is immense. Calories are just Calories, afterall: a measure of the energy content of food. What can they even tell us? Current legislation allows for a 20% margin of error in the Calories reported on packages.

Fact: A Calorie is the energy it takes to make 1 kg of water 1 °C hotter.

Issue: Taking vitamins doesn't seem to work as well as eating foods containing them – scientists aren't sure why.

Question: Do you know where and how your food is produced?

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Enele Tua

Samoa Rugby player



Because I play sport, I am surrounded by people who eat healthily, so I eat healthily. I come from Samoa, where fast food arrived in 1996, displacing local food cultures.

Now when I visit, I see my family eating fast food, and getting health problems like strokes, diabetes, heart disease, cancer, dementia... These are "commerciogenic diseases": caused by companies advertising aggressively and saturating the options available with unhealthy food. If it's easy to get, cheap, and everyone eats it – why would you go anywhere else?

Fact: Scientists think some diseases are "epigenetic" – caused by interactions between our genes and environmental factors like food.

Issue: 1.2 million people in the UK lack access to affordable, healthy food.

Question: What is the food environment like around you?

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Harriet Furuta

Microbiologist



Biology subtly controls what we eat: we don't even notice! The foods we choose change the hormones we release, and these then control what we eat, how much, and when. So does the microbiome – microbes in our digestive system that help us break down food. Healthy people have diverse microbiomes, but if you eat a restrictive diet, e.g. a keto diet, raw vegan diet, or lots and lots of burgers, some kinds of microbe die off. This change to gut microbes has been linked to allergies, bowel disease, chronic fatigue... We don't know why.

Fact: Processed foods can disrupt hunger cues – for example, we can drink much more orange juice than eat whole oranges.

Issue: Avoiding processed foods may lead to more restricted diets.

Question: How do you escape a "cycle" of poor diet?

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Alex Whit School student



I wanted a plant-based diet, but my parents insist I won't get enough protein without meat. The supermarket bakery pumps fake scents out onto the street, so you can always smell warm bread and chocolate outside our house. I think my parents fall for it too much. They're always pushed for time, and it's an easy option. In school, they teach us to eat healthy, then in the canteen we choose between pizza and chips. Adults exhaust me.

Fact: The last part of our brains to develop, in our 20's, is the prefrontal cortex, which manages decision making and self-control – needed for making sensible food choices.

Issue: UK school meals are held to health standards, through which fat, salt and sugar are restricted, but many canteens still serve processed meats, pizza, and chips.

Question: Is educating people about healthy eating enough?

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Pat Connor Diabetic



I have Type I diabetes, but have free will to choose foods that don't make me sick. Every food choice matters. It's exhausting! But if I can do it, anyone can. Most people eat lazily. If they were as motivated as me, they would make better choices. We only think we're not in control because people don't want to work hard – they mix up intentions and actions and say they're healthier than they are. This reporting bias makes it really hard to study eating habits.

Fact: Type I diabetes is a metabolic disease, often inherited, where your body doesn't make the hormone insulin that helps turn sugar into energy. Eating sugar, carbs, and taking insulin is a delicate balance.

Issue: People make around 220 food-related decisions each day, leading to 'mindless autopilot' when it comes to food choices.

Question: Is resisting foods we crave long-term sustainable?

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Leo Sturgeon Full time parent



Food technologists do everything to make food ultra palatable, easily digestible, and attractive, adding fake colours to burgers to lure you, and creating packets with cartoons. My 2-year-old tantrums to get those dinosaur snacks. The pressure is immense. I don't even know how much is okay because serving sizes are for adults, not children! My 10-year-old has an "overbite" – a jaw too small for his face, caused by less fibre in the diet. He likes to drink fizzy drinks, we have tried sweeteners, but they just make him want to snack. I am not in control.

Fact: We have smaller jaws than our ancestors just 100 years ago because we do less chewing.

Issue: Sweeteners tell your body to expect sugar – so it produces insulin. When sugar doesn't come, too much insulin makes you crave sugar, making it harder to resist sweets.

Question: Is it ethical to market to children?

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Sara Orin Supermarket manager



Cost affects what we eat. As a society, we have the power to change what's affordable. So, let's tax junk, and subsidise nutritious food to make it cheaper, so those with less don't need to turn to junk. Fight temptation, and reduce social inequalities! Just look at the sugar tax! We taxed sugar, and companies put less in soft drinks. And the group who had the biggest drop in sugar consumption were from areas of high deprivation.

Fact: After 1 year, sugar tax meant children ate 5 g less per day and adults nearly 11 g on average.

Issue: Taxing sugar has increased the amounts of sweeteners added to food – is this okay?

Question: Is it ethical to tax some foods – like biscuits – but not others – like cake? What if they are essentials?

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