

# Alternative foods

With growing pressure on our main food sources, the need for alternatives is increasing. Possibilities for alleviating this pressure include making more use of existing but underused foods and developing entirely new sources of food.

## Underutilized foods

A comparatively small number of plants and animals provide most of the world's food, but there are many more species that are eaten only in some areas or cultures but could be more widely used. In some cases, this may mean overcoming cultural norms about what things are considered acceptable to eat and what are viewed as disgusting – grubs, in many Western countries, for instance – or “cute”, such as pet animals.



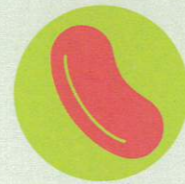
**Mammals and birds**  
Horses, kangaroos, ostriches, songbirds, guinea pigs, and dogs are eaten in some cultures, but viewed with suspicion in others. Rats and mice are staple foods in some parts of southeast Asia and Africa.



**Worms and grubs**  
Worms and grubs are highly nutritious. They are often low in fat and are valued as a protein source in some cultures, a well-known example being the Australian witchetty grub.



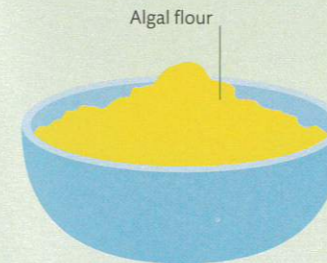
**Insects**  
Insects are already eaten by a large number of people (see pp.246–47), and their excellent efficiency in making protein makes them an attractive option for even more widespread use.



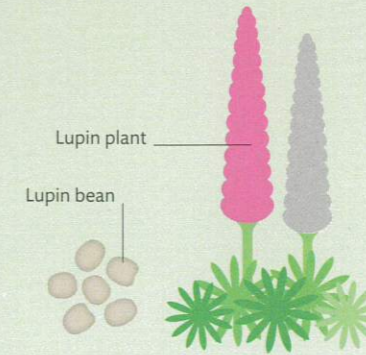
**Pulses and tubers**  
Even though pulses and tubers are already widely eaten, there are many other species that are nutrient-rich and could be valuable food sources, including African yam beans and oca tubers.

## New foods

Any new food needs certain characteristics if it is to become a practical addition to the human diet: it must be safe, a good source of nutrients, economic to produce, and, ideally, have a small ecological footprint. A good starting point is to try to adapt existing foods, such as lupin beans and algae, although scientists are also trying to grow meat from animal muscle (see below).



**Algae**  
Large algae – seaweeds – are popular food items in Asia, but some microscopic algae have also been cultivated and used to make foods such as algal flour.



**Lupin beans**  
Lupin beans are already part of some cuisines but they have also been used as the raw material to produce synthetic vegetable protein foods, such as lupin meat and flour.

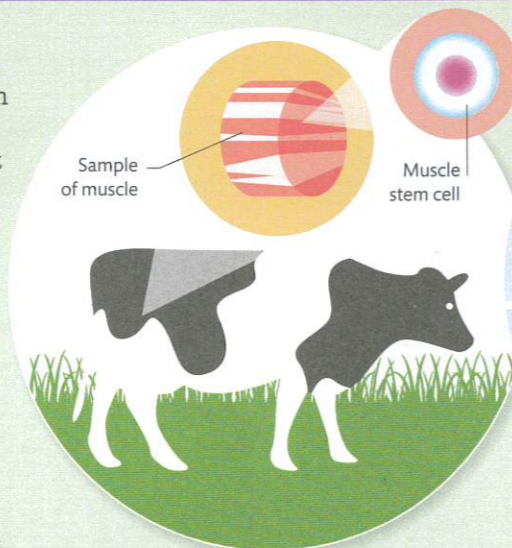
### COULD WE USE FIBRE AS FOOD?

Although we cannot digest fibre, scientists have found a way to convert cellulose (a major component of fibre) into starch that we can digest and so could potentially be used as food.

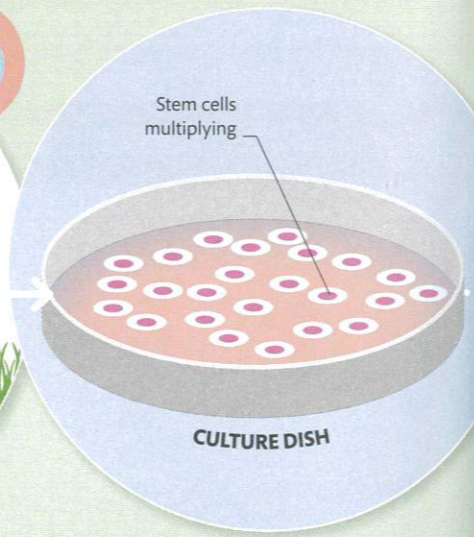
**20,000**  
THE NUMBER OF EDIBLE PLANT SPECIES WORLDWIDE

## Cultured meat

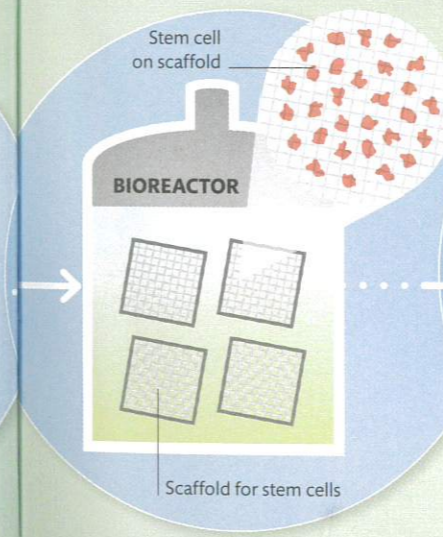
The increasing global population has created a demand for more food, including more meat. Meat from animals requires a lot of resources, such as land, feed, and water, and may not be a sustainable long-term solution (see pp.228–29). One potential answer may be to grow meat in cultures, using muscle stem cells from animals as starter cells. The first edible example of cultured meat – a laboratory-grown sample – was announced publicly in 2013. But the technical challenge of making “test-tube meat” on a large scale has not yet been overcome and so this is unlikely to solve the short-term demands for more meat.



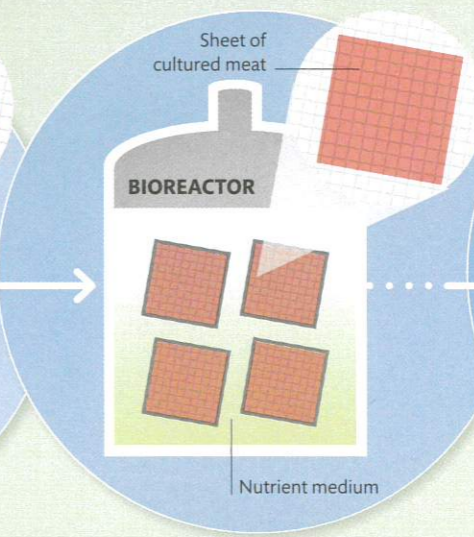
**1 Muscle sample harvested**  
A small sample of muscle is taken, typically from a cow or pig, and the stem cells in the sample are extracted. These stem cells are the ones that will be cultured and grown into meat.



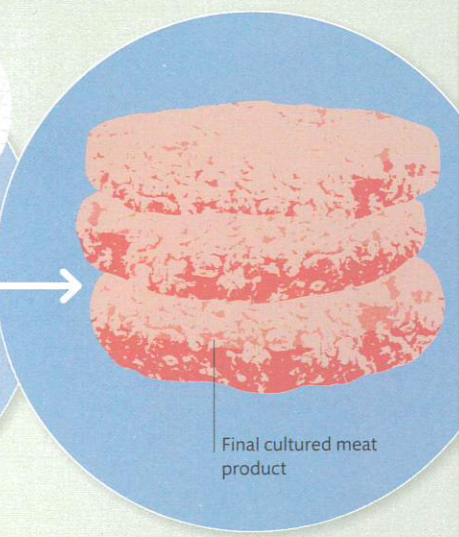
**2 Muscle stem cells cultured**  
The stem cells are placed in culture dishes and supplied with nutrients so that the cells multiply. This is in order to provide enough cells for growing into large amounts of meat in a bioreactor.



**3 Stem cells placed on scaffolds**  
The stem cells are placed on frames called scaffolds so that they have a surface on which to grow. The scaffolds, which are biodegradable and edible, are then placed in a bioreactor.



**4 Cultured meat produced**  
Bathed in a nutrient liquid in the bioreactor, the cells grow into sheets of meat. The sheets are very thin (about 1mm/0.04 inches) and need processing into larger, edible pieces.



**5 Cultured meat processed**  
The thin sheets of meat are removed from the bioreactor and processed into thicker slices. Additives, such as colourings, flavourings, and fat, are mixed in to make the meat look and taste like natural meat.

Hydons