- Human anatomy

SCIENCE

ALL ABOUT YOUR ORGANS

From the heart to the brain, our vital organs work hard to help us survive

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The human body is a busy factory, and organs are the workers keeping it thriving. Like factory workers, each organ serves a function and belongs to a department. Seven in total, these departments can cover everything from digesting lunch to breathing air. There are at least 78 organs in the body, and each contains a collection of tissues. The tissues work like factory machines to help the organ do its job properly,but some organs work harder than others. Only five organs are actually essential for survival: the brain, heart, liver, kidneys and lungs. These are called vital organs as we can't live without them. However, it's possible to live with just one lung or one kidney, despite these coming in pairs. Other organs, meanwhile, can be replaced with a medical device that performs the same function. There are even vestigial organs that can be removed without any need for replacement, including the gallbladder and appendix.

But how do we know the difference between vital and vestigial organs? It's through visceral anatomy, the study of our insides. You can find some organs, such as skin, on the outside. However, most organs are located internally, so visceral anatomy explores the body's internal systems through methods such as dissection, ultrasounds and 3D models. We didn't always have these advanced methods though. In fact, anatomy originates in Babylonia, where ancient Mesopotamians would dissect animals to find omens. The ancient Greeks used anatomy to seek the location of the soul, and physician Herophilus, the father of anatomy, became the first scientist to perform systematic dissection of a human body.

Centuries later, physician Galen became the most influential doctor in the Roman Empire by dissecting apes, as human dissection was forbidden. The European Renaissance saw further strides in the field, with physician Andreas Vesalius leading the way by dissecting executed criminals.

Did you know?

The heart pumps about five litres of blood per minute

It wasn't until the 19th century, however, when anatomy's value was fully realised. England's 1832 Anatomy Act increased the number of corpses sent to anatomy schools, and the discovery of chloroform revolutionised surgeons' anatomical knowledge and saw the publication of *Gray's Anatomy*, the most famous medical textbooks on earth. Today the textbook is on its 42nd edition, as our anatomical knowledge is still expanding. Many researchers even dispute that there are 78 organs, with the most recent *Gray's Anatomy* edition recognising the mesentery as an organ that, before 2016, we had yet to discover.

DID YOU KNOW? Skin is the largest organ of the human body – on average, it takes up two square metres of an adult

ALL SYSTEMS GO

All organs belong to a system, and these are the seven most vital

1 ENDOCRINE

This system releases hormones into the blood to regulate health aspects such as metabolism, mood, blood sugar and pressure, and sleep. Organs found here include the pancreas, ovaries and testes.

2 NERVOUS

This system regulates thoughts, feelings, senses and movements – including unconscious actions such as breathing – by sending signals to the brain. Its two main organs are the brain and spinal cord.

3 RESPIRATORY

This system's main function is to inhale oxygen and exhale carbon dioxide, but it's also responsible for speech and smell. Its main organs are the lungs, nose, trachea and diaphragm.

4 CARDIOVASCULAR

This system keeps us alive by removing waste products such as carbon dioxide and delivering oxygen and nutrients to the body. The main organ of this system is the heart.

5 DIGESTIVE AND URINARY

This system is made up of many organs, including the stomach and colon, which allow the body to break down food, absorb its nutrients and remove any leftover food waste.

6 REPRODUCTIVE

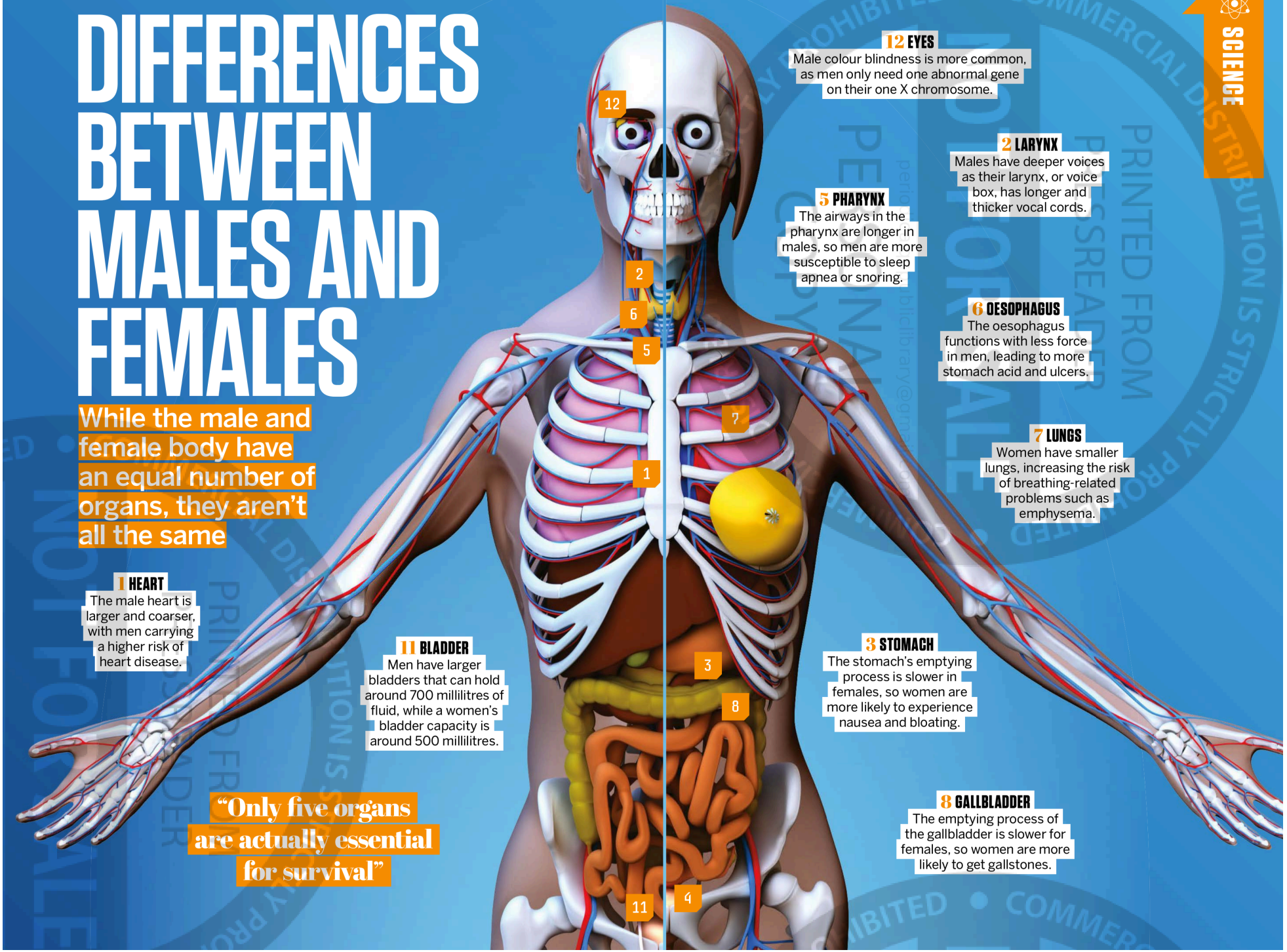
This system produces offspring, and differs between male and female bodies. The female reproductive organs include ovaries and the uterus, while the male reproductive system includes the testes and prostate.

7 INTEGUMENTARY

This system is made up of skin, plus glands, hair and nails. It protects our internal organs against pathogens such as bacteria, regulates core temperature and eliminates waste through perspiration.

DIFFERENCES BETWEEN MALES AND FEMALES

While the male and female body have an equal number of organs, they aren't all the same



1 HEART
The male heart is larger and coarser, with men carrying a higher risk of heart disease.

11 BLADDER
Men have larger bladders that can hold around 700 millilitres of fluid, while a women's bladder capacity is around 500 millilitres.

"Only five organs are actually essential for survival"

12 EYES
Male colour blindness is more common, as men only need one abnormal gene on their one X chromosome.

2 LARYNX
Males have deeper voices as their larynx, or voice box, has longer and thicker vocal cords.

5 PHARYNX
The airways in the pharynx are longer in males, so men are more susceptible to sleep apnea or snoring.

6 OESOPHAGUS
The oesophagus functions with less force in men, leading to more stomach acid and ulcers.

7 LUNGS
Women have smaller lungs, increasing the risk of breathing-related problems such as emphysema.

3 STOMACH
The stomach's emptying process is slower in females, so women are more likely to experience nausea and bloating.

8 GALLBLADDER
The emptying process of the gallbladder is slower for females, so women are more likely to get gallstones.

HOW TRANSPLANTS SAVE LIVES

When a vital organ fails, an organ transplant replaces it with a healthy one. This surgery is often the only way a patient can stay alive without life support, with organ donations saving thousands of lives in the UK every year. However, complications can ensue, such as the recipient's immune system rejecting the donation. Most donations come from deceased donors, as you can only donate certain organs – such as one kidney or a piece of your liver – when you're alive.

To decrease the risk of an organ spreading diseases to the recipient, the donor goes through a vigorous screening process that explores their medical history and profile. Once a donor is found, clinicians remove their organ and prep it for transportation – most organs are placed in cold storage, like drinks stored in an ice cooler. Donated organs can last for around 4 to 36 hours outside the body, but organs in cold storage can lose viability and doctors struggle to assess their quality. There's an alternate preservation method called perfusion that hooks the organ up to a nutrient-pumping machine. While perfusion isn't as common due to high costs, doctors hope it will become the standard for maintaining organs for weeks on end.

Hearts last around six hours in transport, but kidneys can last up to three days

10 MUSCLES
Men have more muscle mass, so they need to drink more water than women to stay hydrated.

4 COLON
Irritable bowel syndrome (IBS) is higher in women as they have shorter colons.

9 URETHRA
Women have a shorter urethra, so they're more prone to developing urinary tract infections (UTIs).

Did you know?
The brain shrinks during pregnancy

Every day, there are over 100,000 people on active waiting lists for organs

5 FACTS ABOUT VITAL ORGANS

1 BRAIN JUICE
The brain is made up of about 75 per cent water, which is why it's important to stay hydrated to keep your memory and attention span in good condition.

2 BIGHEARTED
While a child's heart is the size of a fist, an adult heart is the size of two clasped hands and can weigh up to 425 grams.

3 KIDNEYS WANTED
The most in-demand organ for transplant is the kidney. Last year, over 89,000 patients were onthe waiting list for the organ. The second most in demand is the liver.

4 TAKE A DEEP BREATH
The lungs take around 22,000 breaths and breathe in approximately 11,000 litres of air every day. They also release up to 17.5 millilitres of water every hour.

5 LIVE AND LET LIVER
The liver is excellent at regenerating itself. This extraordinary ability means that even if you were to donate 70 per cent of your liver, the leftover liver tissue can restore its function.

DID YOU KNOW? The gastrointestinal system, or gut, has its own 'brain', called the enteric nervous system