

A microscopic view of several cells, likely cancer cells, stained with a purple dye. The cells are of various sizes and shapes, with some showing prominent nuclei and others appearing more rounded or irregular. The background is a light, grainy texture.

A GOLDEN AGE FOR

CANCER RESEARCH

A century of pioneering research has given us the know-how that's saved over a million lives in the UK – where will the next decade of advances take us?*

STOPPING CANCER IN ITS TRACKS

When scientists first linked the human papillomavirus with cervical cancer they were dismissed. Now, 40 years later – thanks in part to Cancer Research UK – the HPV vaccine offers crucial life-saving protection

On June 27, 2009, the front page of *The Times* announced the news that even those working on the front lines of cancer prevention never expected to see. “A research paper” read the headline. “The power of medical research to save and improve lives is currently being demonstrated by the new documentary series *Cancer Detectives*. Finding the Causes in Chapter 4. Inaugural by you by Cancer Research UK.”

Up to **90%** The HPV vaccine can drastically reduce cervical cancer risk

that is most common in women aged 20 to 34 and kills more than two women each day. But, thanks to the tenacity of researchers funded by Cancer Research UK, life looks very different for the next generation. One of the biggest breakthroughs in the history of cancer research is the HPV vaccine, which is expected to prevent up to 90 per cent of cervical cancers in the UK, and lower the risk of other cancers caused by HPV.

FINDING A LINK
The first linking that there could be a connection between HPV and cervical cancer came in the 1970s, struck by reports of a link between genital warts and cervical cancer. Harald zur Hausen, a German virologist, had begun to question whether HPV could be the culprit. By 1984, zur Hausen and his team had narrowed down from more than 100 variations of HPV found in cervical cancer samples to two key cancer-causing strains, with a catch-up programme later made available to women up to 25 years old. Since September 2009, Professor Peter Sissler, then a young researcher, addressed a conference at the Royal College of Obstetricians and Gynaecologists.

Having worked on cervical cancer since his post-doctoral position with the Imperial Cancer Research Fund – which in 2002 merged with The Cancer Research Campaign to form Cancer Research UK – he argued for the growing body of evidence that cervical cancer was caused by HPV. After his talk was over, the audience was asked to vote on whether they agreed with this theory. “Half of the audience didn’t think that HPV caused the disease,” says Sissler. “There were gynaecologists sitting upstairs with cervical cancer regularly. And they weren’t convinced by the evidence at that point.”

RESEARCHING THE VIRUS

It can take time, a lot of research and validation for a theory to become widely accepted. This is why a dedicated organisation like Cancer Research UK, with the resources and ability to take a long view, is so important – and why your donation could make a real difference. Professor Karen Viossien was the charity’s chief scientist between 1987 and 1993. She led a group that pinpointed the molecules that HPV-16 viruses produce to replicate themselves, which can cause cancer.

Then, in 1995, a group including Cancer Research UK scientist Prof. Sir Julian佩斯 analysed almost 1,000 cervical cancer samples, finding HPV present in 99.7 per cent of them.

With the link convincingly demonstrated, *The Times* wrote in August 2002: “Exposure to the HPV virus can lead to cervical cancer.” The article mentions the likelihood of a vaccine rollout within 15 years, and “the fascinating possibility of a programme of universal inoculation” – a development that, thanks to the next scientists to take up the baton, research, would take just six years.

CREATING A VACCINE

Knowing the link between HPV and cervical cancer is one thing, tracking the subset of HPV strains that present a high risk of causing cancer is another, as in our sidebar – which was where Professor Ian Frazer and Dr Jan Zhou stopped in.

Two years had been studying the effects of HPV since 1989 and the scientists realised that the virus particles that formed the basis of the vaccine. Once they’d persuaded their colleagues that there was a market for the vaccine, a transformative breakthrough in the field of cancer was in sight. *The Times* announced the breakthrough in 2005 with the headline: “Vaccine could wipe out deadly cervical cancer.” By 1984, zur Hausen and his team had narrowed down from more than 100 variations of HPV found in cervical cancer samples to two key cancer-causing strains, with a catch-up programme later made available to women up to 25 years old. Since September 2009, UK boys aged 11 to 13 have been vaccinated.

‘I WOULD HAVE DEFINITELY HAD THE VACCINE’

Having been affected by cervical cancer, Gem Sofianos is relieved that young people like her sister have access to HPV vaccination



Learning to live with HPV: girls and boys aged 11-13 are offered the HPV vaccine in schools

who get the vaccine, protecting more people from several types of cancer in the future. “Seeing those results for the first time made my whole career seem worthwhile.”

PROOF POSITIVE

Key evidence for the effectiveness of the HPV vaccine came in 2001, when the results of a study funded by Cancer Research UK brought decades of cervical cancer research into sharp focus. At this time, there was no question that the first vaccine had been right, almost 30 years before when he’d talked about the link between the headline: “Vaccine could wipe out deadly cervical cancer.” and the first HPV vaccination programme in the UK was introduced in 2008. Girls aged 11 to 13 were offered the vaccine at school, with a catch-up programme later made available to women up to 25 years old. Since September 2009, UK boys aged 11 to 13 have been vaccinated.

Gem Sofianos, 38, from London, was diagnosed with cervical cancer after a routine screening appointment in 2015 found abnormal cells. It’s rare for the outcome of cervical screening to be a cancer diagnosis. The main advantage of cervical screening is that it can pick up abnormal changes in cells – before they become cancerous – to prevent cancer developing. The HPV vaccination programme launched after Gem had left school. Now she strongly advocates that other people should consider taking up the offer of the vaccine, as well as cervical screening. Her test on programme is perfect, but when Gem says that a favourable force against cervical cancer

“Seeing those results for the first time made my whole career seem worthwhile.”

PROFESSOR IAN FRAZER, CANCER RESEARCH UK

“I had been offered the vaccine when I was younger, I wouldn’t have bothered to take it up. My younger sister was given the HPV vaccine in the first rollout at school. It gives me comfort knowing that she and others are more protected against HPV, and therefore less likely to develop cervical cancer. I don’t want to see what I expect – to prevent cancer developing – to be the end of some research effort. This helped put my mind at ease.” she says. Gem was 28 years old when she was diagnosed. “I was young and healthy and hadn’t experienced the usual symptoms, so to have had cervical cancer took me completely by surprise. It was a lot to take in.”

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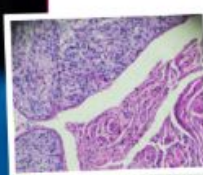
the Cancer Research UK Cancer Prevention Trials Unit at Queen Mary University of London. “Seeing those results for the first time made my whole career seem worthwhile.” It was a huge collaborative effort by scientists all over the world, and knowing that science can virtually eliminate a cancer that had once been one of the most common causes of cancer death in women worldwide was incredibly inspiring.”

THE FUTURE OF CANCER RESEARCH

As well as introducing a new vaccination programme into the UK, the breakthrough has changed the way women are screened for cervical cancer. “Testing for HPV works better than the old test, which only checked for the changes in the cells of the cervix. Because of this, women who test

Thanks to the screening, Gem’s cancer was caught early, before it had much time to grow. She had surgery a month later and the treatment was successful. Gem is now free from cancer, but still has regular screenings. “I took the advice to see a gynaecologist, and a follow-up appointment last 1085 was clear of cancer and I didn’t need further treatment. I now want to highlight the need for prevention and early detection. I got 1000 e-mails from the aftermath of my diagnosis and I hope one day we’ll live in a world where cervical cancer is the least preventable. With advances in research and more people getting the HPV vaccine, this could be a reality.”

A HISTORY OF THE HPV VACCINE



Treatment target: Cervical cancer cells under the microscope

1983 German virologist Harald zur Hausen and his team publish a study identifying two key cancer-causing strains of HPV. It was 25 years before he received a Nobel prize for his work.

1987 to 1996 Cancer Research UK’s former chief scientist, Professor Karen Viossien, leads a group that identifies the specific viral molecules that cancer-causing HPV strains produce, which can make cervical cells grow out of control and lead to cancer.

1999 Cancer Research UK scientists find genetic material from the virus in 99.7 per cent of cervical cancer samples, which helps prove the link between the two.

2005 An HPV vaccine, spearheaded by the work of Professor Ian Frazer and Dr Jan Zhou, is created. The team’s announcement: “Vaccine could wipe out deadly cervical cancer.”

2006 The first HPV vaccination programme is rolled out in schools for girls in the UK aged 11-13.

2009 Boys aged 11-13 are offered the vaccine.

2013 A monumental study funded by Cancer Research UK shows that the vaccine dramatically reduces cervical cancer rates in women aged 16 per cent in women in their twenties who were offered the vaccine when they were aged 12 to 13.

2015 to 2023 NHS expands programme to cervical screening uptake so that eligible women at lower risk are invited every five years instead of every three.

Better testing Some people are now offered cervical screening less frequently.



Learning to live with HPV: girls and boys aged 11-13 are offered the HPV vaccine in schools

negative for HPV (meaning they’re at very low risk of cervical cancer) are invited for screening less often every five years instead of three. The rest of the efforts made by researchers partly funded by Cancer Research UK, has led the World Health Organisation to predict that the 2010 century may be the last to see cervical cancer deaths associated with HPV. The big challenge now is ensuring that all countries benefit from this discovery is just one of the ways the charity has helped save over a million lives in the UK alone. Thanks to its generous donors, Cancer Research UK’s lifetime work – and that of researchers who have dedicated their lives to detecting, preventing and treating cancer – will continue long into the future.

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RESEARCH IN ACTION

Cancer Detectives: Finding the Causes continues at 10pm on Thursday 27 as new series brought to you by Cancer Research UK. Stream or watch now on

A BETTER BLO SWALLOW

Advances in cancer detection now include an ingenious 'sponge on a string' to identify a precancerous condition. Its inspiring creator, Professor Rebecca Fitzgerald, explains how funding from Cancer Research UK made it possible

re doctor. Cancer Research UK has been at the cutting edge of innovations designed to prevent, detect and treat cancer.

Every day, medical researchers strive to make breakthroughs that people in the UK can use to live longer and healthier lives. Some of this work is being showcased in a three-part documentary series, *Enter Genetics: Finding the Cure*, brought to you by Cancer Research UK, available to stream on Channel 4.

While treatment advances on other health issues, cancer research, innovations in prevention and detection can actually provide some of the most compelling narratives. For cancer types, such as oesophageal cancer (stomach cancer of the food pipe), we've seen little progress in survival rates in recent decades compared to others. Around 17 per cent of people in the UK survive five years or more after an oesophageal cancer diagnosis. But this jumps to

10x increase in detection of Barrett's oesophagus, demonstrated by the BEST3 trial

63 per cent if it's diagnosed at its earliest stage, showing the importance of early diagnosis. This is where experts like Professor Rebecca Fitzgerald come in. As director and founder of the Early Cancer Institute at the University of Cambridge, affiliated with the Cancer Research UK Cambridge Centre, Professor Fitzgerald has led the oesophageal cancer research group since 2006. "When it comes to oesophageal cancer, we haven't really moved the bar in 40 years," she explains. "Because the oesophagus is a stretchy muscle, you often won't know a tumour is there until it's started to spread."

As a young doctor, Professor Fitzgerald learnt that heartburn is a key risk for oesophageal cancer. Researching a condition called Barrett's oesophagus, which is considered a gateway to disease, she saw an opportunity to intercept Barrett's before it progresses. "But we actually achieved a twofold increase. I was overhauled by the result – it was the most exciting

30 minutes and can be done without anaesthesia, at a local GP. While honing the device's design, Professor Fitzgerald was also developing a lab test for signs of Barrett's oesophagus that they could apply to the collected cells.

"Endoscopes show doctors where to take cell biopsies from, but the sponge soaks the cruder oesophagus, collecting millions of cells," she explains. "We needed to devise a simple way of identifying the cells for more intensive testing."

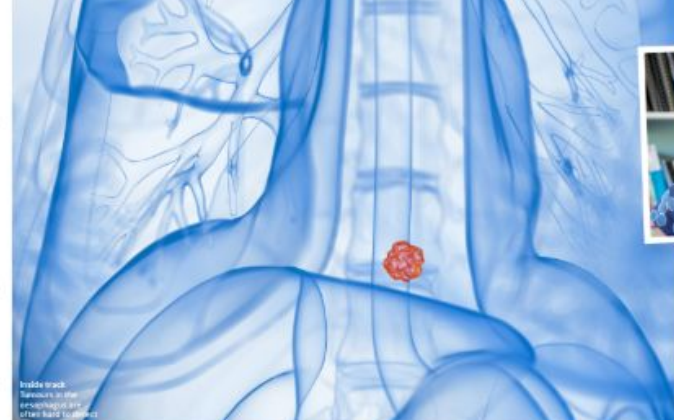
The team required a biomarker – a biological clue – that would reveal the presence of Barrett's. Using antibodies to compare proteins in Barrett's samples with healthy cells, they identified a protein called TFF3, which they could develop a lab test for.

The first use of the capsule sponge test was during BEST1, the first phase of Barrett's Oesophagus Screening Trials, which began in 2008. As GP surgeons around Cambridge, 500 people experiencing heartburn were given the test to see whether it was feasible and acceptable, followed by an endoscopy to confirm its accuracy.

"Nearly everyone (95 per cent) was able to use the capsule without side effects, and we also found that TFF3 was a suitable biomarker for testing, identifying 15 people with Barrett's," Professor Fitzgerald explains. "The BEST1 trial was followed by BEST2, then BEST3 – both supported by Cancer Research UK."

"The trial has become increasingly positive and complex – and have been made possible thanks to the support of Cancer Research UK," says Professor Fitzgerald. "It's a big credit for the charity to fund a new test that we've developed from scratch."

The results of the trial have been encouraging. BEST2 achieved 92 per cent specificity, meaning there were very few false positives from the test. BEST3 revealed that the sponge's breakthrough to date. "We'd hoped to achieve a twofold increase in the detection of Barrett's compared with normal GP care," Professor Fitzgerald says. "But we actually achieved a twofold increase. I was overhauled by the result – it was the most exciting



Inside track: Barrett's in the oesophagus can often lead to cancer

moment of this journey so far." Now, Professor Fitzgerald is looking to encourage 120,000 participants to join BEST4. Screening, the trial is designed to test whether the capsule sponge is effective when it comes to early cancer detection. If the trial works, the impact could be huge. Currently there are around 7,000 oesophageal cancer deaths in the UK every year, or almost 23 each day, making it the UK's seventh leading cause of cancer deaths.

"Our goal is that the sponge will prove to be effective enough to be offered as part of a national screening programme, so anyone getting a test will be heartburn medication would be invited for a sponge test. "The BEST4 results will be ready in around five years' time, but that doesn't mean people aren't benefiting in the meantime," Professor Fitzgerald says. "A pilot study run by NHS England for patients on an endoscopy waiting list resulted in about 70 per cent avoiding having the procedure unnecessarily as their biopsies were negative. People with a positive result had endoscopies performed. None of this would be possible without the support of Cancer Research UK, which Professor Fitzgerald says, has been crucial in enabling testing of her invention. "At the beginning of my work

'Our goal is for the test to be part of a national screening programme' Professor Rebecca Fitzgerald

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Patients progress Professor Fitzgerald has seen her work transform lives

2005-2005 Cancer Research UK funds the larger BEST2 trial, involving over 1,000 people. It reveals that 94 per cent of people can swallow the capsule without any problems, and that the TFF3 test on the retrieved cells is accurate, with a low rate of false positives.

2007-2009 The landmark BEST3 trial, again funded by Cancer Research UK, tests over 13,000 people with heartburn, resulting in a twofold increase in detection of Barrett's oesophagus when using the sponge, compared with GP tests.

2010-2010 The MRC funds the first human trial, BEST1. It shows the capsule sponge device is safe and less uncomfortable than an invasive than a traditional endoscopy.

2012 onwards BEST4 Screening launches, a nationwide trial supported by Cancer Research UK that will involve 100,000 people who regularly take heartburn medication. It's hoped this will result in the test being offered as a national screening programme for oesophageal cancer in the future. People over 55 with chronic heartburn can join Heartburn Health to be considered for the trial. www.heartburnhealth.org

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FROM IDEA TO REALITY – HOW THE REVOLUTIONARY DEVICE WAS CREATED

2006-2006 Professor Rebecca Fitzgerald develops the idea for a cell collection device to screen for Barrett's oesophagus, a precursor of oesophageal cancer. She works with the MRC at Cambridge on a prototype device.

2007 Professor Fitzgerald and her researchers discover that leaving samples taken by the sponge for TFF3 – a protein found in the abnormal cells in Barrett's oesophagus – is an accurate way of identifying the condition in patients.

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toys please bring able to detect cancer early enough ways to reach better outcomes, so assist research in this area, visit

'I BELIEVE THE CAPSULE SPONGE SAVED MY LIFE'

A recommendation from her GP to join a new clinical trial proved a 'near miraculous' stroke of luck for retired scientist Liz Chipchase

With a history of indigestion and acid reflux, retired scientist Liz Chipchase, 77 from Cambridge, was contacted by her GP about the BEST3 clinical trial, soon to people up to sign acid suppressants. Liz used National Science at Cambridge University and worked research labs throughout her career, so she was interested in the trial, which would test the capsule sponge's effectiveness in identifying Barrett's oesophagus.

"I was curious, having never heard of Barrett's oesophagus, and was interested in the technique," Liz says. "I only moved to spend a nice GP visit, so I went along and had the test. "I didn't realise I could have a capsule with a string attached. I was in for 15 minutes for it to dissolve in my stomach. The dissolved sponge was then pulled out within seconds. My reflux symptoms

had got no worse in recent years and I felt fine, so after the test I went home and got all about it."

Although Liz considered herself a good control subject, the sample taken by the sponge revealed that, in fact, Liz had Barrett's oesophagus. Further tests revealed a precancerous tumour growing in her oesophagus, which was close to reading "It was a real shock to me. If my GP hadn't been selected and got me on a good day when I was at the trial I wouldn't be here now. I don't know what would have happened. It's a shame of events that makes me feel so very lucky to be grateful to everyone involved. I believe this trial saved my life."

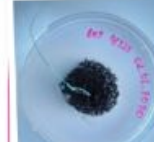
Liz went through two endoscopy procedures to remove the cancerous



Success story Liz Chipchase was curious about the technique

issue, plus follow-up treatment to remove traces of Barrett's. "I still always be immensely grateful for Cancer Research UK's involvement," Liz says. "Bodies such as theirs can provide much-needed money to support research projects but also influence the development and timing of these in areas that can lead to real advances in patient treatment."

"It didn't take the capsule sponge test, could now be walking around with cancer. Survival for oesophageal cancer isn't good, so the fact that cancer of cancer is fantastic. "The experience has changed me in a lot of ways. Since reading, I've taken up pottery fairly seriously. I don't want to get out and do long distance walking. I feel very lucky to be able to make these plans."



Wunder sponge The capsule is swallowed and dissolves in the stomach, releasing a sponge that is then pulled back out with the string

RESEARCH IN ACTION



CANCER RESEARCH UK
Cancer Detection: Finding the Cure in a new wave through to you by Cancer Research UK
Stream or watch now on

SCIENCES NEW RAYS OF HOPE

Radiotherapy has long been one of our best treatments for cancer. But thanks to innovative work funded by Cancer Research UK, it is becoming more powerful, targeted and effective than ever, improving many people's quality of life

Radiotherapy is a cornerstone of cancer care, used to treat more than 10 million people every year in the UK.

**1,000x
FASTER**

Research into FLASH has shown how to deliver radiation much faster and save healthy cells

Back in 1952, a letter to *The Times* written by JH Dunning, Director of the MRC's Institute of Radiobiology was already describing it as "the one means (other than surgery) that has stood the test of time in cancer treatment".

The power of medical research to save and improve lives – including developing treatments – is demonstrated in a new Channel 4 documentary series *Cancer Stories*. Finding the Cure, brought to you by Cancer Research UK. And while radiotherapy is a lot older than modern breakthroughs in cancer treatment, it's an increasingly exciting story in its own compelling – and improving – thanks in large part to Cancer Research UK. The rays of light that were in



Pushing studies: A new Channel 4 series shows research in action

could be made much more quickly using fewer but stronger doses of radiotherapy, improving their quality of life (see panel below).

The development of proton beam therapy during the cancer decade, which departs from traditional x-ray treatment entirely, represents another leap forward. Instead of using x-rays, this therapy attacks tumours with tiny particles pulled from atoms. While standard x-ray radiotherapy can damage healthy cells in its path, protons can be more precisely targeted.

"The main advantage of using protons as opposed to x-rays comes from the way they interact with human tissue," says Dr David Thomson, a consultant clinical oncologist and NHS Institute for Cancer Research's clinical lead for research.

"The reduction in the amount of healthy tissue that is irradiated when using proton beams reduces the risk of both short- and long-term side effects and secondary cancer risk, potentially giving patients a better quality of life during and after treatment, and potentially shorter recovery times," he says. "This is particularly important for paediatric patients, whose tissues are still developing, and who are more sensitive to radiation therapy."

The world's first hospital-based proton beam therapy machine, located at Catherine Cookson Centre in Liverpool and funded by Cancer Research UK, treated its first patient in 2015. But it wasn't until 2023 that the government, after lobbying from the charity, allocated the funds needed to build dedicated sites of the art-proton beam therapy treatment centres.

This approach is unique, and allows for the irradiation of a large number of biological samples within a short period of time," Thomson explains.

"Cancer Research UK has also helped to fund a second proton beam line, which is currently being developed and will expand our research capabilities considerably. It means we can undertake internationally leading cutting-edge proton beam therapy research that will ultimately benefit cancer patients."

Today, Cancer Research UK



Amazing: A patient undergoes radiation therapy in a clinical accelerator

team at the University of Manchester and the British NHS Foundation Trust for proton radiobiology experiments.

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Today, Cancer Research UK

The funding will expand our research capabilities considerably

to do even more research with these machines

continues to support advances in radiobiology, many of which will emerge from the FLASH radiobiology research network created by the charity in 2016.

A consortium of researchers across seven centres of excellence, FLASH tackles major challenges in radiobiology and delivers fresh insights into the crucial area of research.

The network is also researching FLASH, a new type of ultra-high intensity radiotherapy in which radiation is delivered about 1,000 times faster than in conventional radiotherapy, reducing collateral damage to healthy cells by as much as a half. This could decrease side effects and could allow researchers

to make radiotherapy more potent, increasing radiation doses to levels that were previously too damaging to healthy cells.

Conducting research like this is made possible with generous donors bearing gifts in their wills and pledging to make regular donations. Giving to Cancer Research UK today helps to ensure the remarkable progress made in developing this cornerstone of cancer treatment can continue for many years to come.

Search 'Cancer Research UK breakthroughs' to discover more
"Estimate based on Cancer Research UK analysis of England since 2022-23"

20 YEARS OF RADIOTHERAPY PROGRESS



Precise targeting: New advances have led to more effective treatment

2015 Cancer Research UK scientists show SIRT can cut side effects among people with head and neck cancer, which affects about 12,000 doctors a year

2016 The results of the CHRP trial led to fewer, shorter chemotherapy doses becoming the standard treatment for prostate cancer

2017 In a 13-year follow-up, the ACT1 trial shows that combining radiotherapy with chemotherapy reduces deaths from anal cancer by a third, leading to a new standard treatment worldwide

2018 The START trial's two-year follow-up confirms the safety of shorter high-intensity treatment plans for breast cancer, influencing worldwide practice

2019 Cancer Research UK launches RaIDER, investing more than £43 million to help speed up innovation in precision radiobiology. The network is building a community of scientists across the globe to share research centres of excellence

2023 Through RaIDER, Cancer Research UK is supporting investigators into FLASH, a new type of radiotherapy that uses ultra-high intensity doses of a second, damaging cancer cells while sparing healthy ones

2024 The charity continues a further £2.6 million to support RaIDER

2025 The charity's RAIDER trial shows it's possible to use tumour-focused radiobiology for muscle-invasive bladder cancer. Using scan images, radiobiology can be adapted to the size and location of each patient's tumour, which allows doctors to target cancer cells more precisely while sparing healthy cells

Shining light: The CHRP trial led to faster treatment of prostate cancer, above



RESEARCH IN ACTION
Cancer Defectors: Finding the Cure continues at Virgin on December 4, a new news broadcast to see the Cancer Research UK Stream of watch now on



'I'M PROUD TO PLAY A PART IN PROGRESSING TREATMENT'

How one trial almost halved Peter's radiotherapy time – and paved the way for shorter treatment for all

Peter Tomlinson, 82, from Drogheda in Westmeath, began taking money for Cancer Research UK in 1992. Each time, long before cancer touched his own life, things were less complicated for the owner of the 1970s Children's TV show *Tomax*.

"Initially, the challenge was how do we actually make money and, dare I say it, make sure we enjoy ourselves in the process," he says. "But then, at 1700 miles, something cancer loomed."

In 2003 Peter lost his mother to lung cancer. Then in 2018 he received his own diagnosis of prostate cancer. As part of his treatment, Peter was offered the chance to join Cancer Research UK's CHRP trial – a project that compared different ways of applying radiotherapy to prostate cancer cells.

The aim was to test whether doctors could effectively halve the number of radiotherapy sessions needed by delivering stronger radiation doses. The trial compared 37 days of rad therapy with either 19 or 20 days, Peter recalls.

"I was lucky I got 19," he says. "Chris [his wife] also introduced intensity-modulated radiotherapy (IMRT) to prostate cancer treatment, which Peter was and alongside hormone therapy and IMRT, says radiation beams to more closely match the shape of each patient's tumour, lowering the risk of side effects by sparing healthy cells.

"The biggest problem was that you had to have three parts of water before treatment," he says. "It was delayed, with three parts inside you, you can imagine what you would be able to resist doing. And if that happened, you



Fast in research: Peter had hoped to see more than 10 million

had to start all over again. But the interesting thing was that we laughed. It was going to work."

Although Peter's trial was successful, his wife Alison was sadly diagnosed with secondary cancer in 2015 and died in 2020. It now feels he has an extra incentive to fundraise and, to date, he's helped raise more than £1 million in support of Cancer Research UK.

It's partly thanks to fundraisers and grant trial participants like Peter that early-stage prostate cancer is now treated with 20 days of radiotherapy rather than 50. "I was very proud to have played a part in progressing that treatment," Peter says. "My wife and all the money involved gave me a huge amount of confidence. This was just something I had to go through, it was going to work, and it did."



From pioneering vaccines to precision surgery, Cancer Research UK's scientists are redefining what the next generation of medicine and therapy can achieve

On its front page in July, The Times announced an impending revolution. Beneath the striking headline, "Golden age of cancer treatment is on the way," says NHS chief¹, it reported medical breakthroughs accelerating at such a pace that more treatments will be developed, creating great advances in cancer survival.

Already, Cancer Research UK has pioneered innovations that have helped to double cancer survival in the UK over the past 50 years. As its researchers move into the age of precision development, they're working on the design, creation and trials of new drugs, which are expected to boost the number of people living longer, better lives free from the fear of cancer.

But the charity's work isn't just about treatment: prevention and detection tools are also being honed to target the causes of cancer, and to detect signs earlier in order to improve patient outcomes.

By making a regular donation to the charity's vital work, you're contributing to breakthroughs which are changing

Steps ahead: the charity is working on the design, creation and trials of new drugs



MICHELLE MITCHELL, CEO, CANCER RESEARCH UK

people's lives every single day, and could fuel more significant progress than ever before. "We're living in a golden age of research, where new technologies are unlocking discoveries that offer real hope to people affected by cancer," says Michelle Mitchell OBE, chief executive of Cancer Research UK.

Channel 4's new three-part documentary series in partnership with Cancer Research UK, *Cancer Detection: Finding the Cures*, will increase public awareness of the great strides made possible by scientific endeavour.

"The series tells the stories of advances that are already making a difference – and the people who make them possible," says Mitchell. "We're grateful to the scientists, clinicians and patients who shared their experiences and gave us a glimpse into the future of cancer research. Together we are beating cancer."

Read on to discover ten ingenious breakthroughs made possible by the charity's research and funding.

Breakthrough moments

Prevention

SAVING LIVES FROM CERVICAL CANCER

Cancer Research UK spent decades examining the link between the virus HPV and cervical cancer, leading to the introduction of the HPV vaccination in the UK in 2008. Today, it is offered to all children in the UK aged 11 to 13, which is expected to prevent up to 90 per cent of cervical cancers.

EXPOSING A KEY 'CANCER GENE'

People who inherit a fault in the 'cancer gene' BRCA2 – which was uncovered by the charity's research – have an increased risk of certain cancers, including breast, ovarian and prostate cancers. It's now possible for people to get tested for a faulty BRCA2 gene and take steps to manage their increased risk.

Detection

COLLECTING CELLS WITH A NEW DEVICE

Each year around 9,400 people in the UK are diagnosed with oesophageal cancer, which can be hard to treat. But there is now hope for future early intervention, thanks to a new 'sponge on a string' device called the capsule sponge, currently in clinical trials. The result of more than 20 years of research, which Cancer Research UK helped fund, it provides a simple way of collecting cells from the oesophagus for testing.

IMPROVING OUTCOMES FOR CHILDREN

The charity's researchers have developed a technique that

Scientists predict end of cervical cancer fight

Scientists predict the end of the cervical cancer fight is in sight, thanks to the introduction of the HPV vaccine in the UK in 2008. The charity's research has shown that the vaccine could prevent up to 90 per cent of cervical cancers.



History in the making: In June 2019, The Times reported an 86 per cent fall in HPV infection rates among young women aged 15 to 19

could give children a precise diagnosis for a medulloblastoma brain tumour in minutes rather than weeks. This would mean that doctors could start using the best treatments for each child much faster.

DISCOVERING LUNG CANCER EARLIER

Researchers are pioneering a urine test that could spot the earliest signs of lung cancer months, or even years, before symptoms manifest. Each year, around 33,000 people die from lung cancer in the UK, and this test could mean that in future people can start treatment when it's more likely to be successful.

DEVELOPING A 'LOLLIPOP' TO FIND CANCER

Diagnosing mouth cancer is invasive and uncomfortable. So researchers, partly funded by the charity, are creating a 'lollipop' made from a high-tech material called hydrogel, which could be used to check saliva for telltale signs of cancer.

SPOTTING STOMACH CANCER WITH A BREATH TEST

The charity is supporting researchers in London to develop a unique breath test that could detect early signs of stomach cancer. Over the past decade, deaths due to stomach cancer have decreased by around a third in the UK, and this new method could help save even more lives.

Treatment

MAKING RADIOTHERAPY MORE EXACT

Cancer Research UK's pioneering use of radiotherapy (pictured left) over a century ago helped establish it as one of today's main treatments for cancer. The charity continues to innovate in this field, most recently supporting investigations into a new type of radiotherapy called FLASH, which damages cancer cells but spares healthy cells.

CREATING DRUGS TO BLOCK CANCER GROWTH

Cancer Research UK's scientists discovered that a molecule called EGFR, which is on the surface of cells, can help cancers grow. This has led to the creation of drugs to block it, which are now used in more than six types of cancer.

LIGHTING UP PROSTATE CANCER CELLS

Each year around 58,900 in the UK are diagnosed with prostate cancer. Research funded by the charity has discovered that a fluorescent that sticks to prostate cancer cells could help surgeons see an much cancer as possible during surgery. In the future, it's hoped these cells could be used to develop a range of dyes for different types of cancer.

To learn more, search Cancer Research UK breakthrough

RESEARCH IN ACTION



Cancer Detectives: Finding the Cures is a new series brought to you by Cancer Research UK.

Stream or watch now on 4