

► participants there received stem cells from parthenogenetic embryos — unfertilized eggs that are triggered in the lab to start embryonic development.

In the other Zhengzhou trial, surgeons will take retinal cells derived from ES cells and transplant them into the eyes of people with age-related macular degeneration. The team will follow a similar procedure to that of previous ES-cell trials carried out by researchers in the United States and South Korea.

Qi Zhou, a stem-cell specialist at the Chinese Academy of Sciences Institute of Zoology in Beijing, is leading both efforts. For the Parkinson's trial, his team assessed hundreds of candidates and have so far have picked ten who best match the ES cells in the cell bank, to reduce the risk of the patients' bodies rejecting the cells.

The 2015 regulations state that hospitals planning to carry out stem-cell clinical work must use government-certified ES-cell lines and pass hospital-review procedures. Zhou's team completed four years of work with a monkey model of Parkinson's, and has met the government requirements, he says.

Parkinson's disease is caused by a deficit in dopamine produced by brain cells. Zhou's team will coax ES cells to develop into precursors

to neurons, and will then inject them into the striatum, a central region of the brain implicated in the disease.

In their unpublished study of 15 monkeys, the researchers did not observe any improvements in movement at first, says Zhou. But at the end of the first year, the team examined the brains of half the monkeys and found that the stem cells had turned into dopamine-releasing cells. He says that they saw 50% improvement in the remaining monkeys over the next several years. "We have all the imaging data, behavioural data and molecular data to support efficacy," he says. They are preparing a publication, but Zhou says that they wanted to collect a full five years' worth of animal data.

MATURITY CONCERN

Jeanne Loring, a stem-cell biologist at the Scripps Research Institute in La Jolla, California, who is also planning stem-cell trials for Parkinson's, is concerned that the Australian and Chinese trials use neural precursors and not ES-cell-derived cells that have fully committed to becoming dopamine-producing cells. Precursor cells can turn into other kinds of neurons, and could accumulate dangerous mutations during their many divisions, says Loring. "Not knowing

what the cells will become is troubling."

But Zhou and the Australian team defend their choices. Russell Kern, chief scientific officer of the International Stem Cell Corporation in Carlsbad, California, which is providing the cells for and managing the Australian trial, says that in preclinical work, 97% of them became dopamine-releasing cells.

Lorenz Studer, a stem-cell biologist at the Memorial Sloan Kettering Cancer Center in New York City who has spent years characterizing such neurons ahead of his own planned clinical trials, says that "support is not very strong" for the use of precursor cells. "I am somewhat surprised and concerned, as I have not seen any peer-reviewed preclinical data on this approach," he says.

Studer's and Loring's teams are part of an international consortium that coordinates stem-cell treatments for Parkinson's. In the next two years, five groups in the consortium plan to run trials using cells fully committed to becoming dopamine-producing cells.

Regenerative neurobiologist Malin Parmar, who heads one of the teams at Lund University in Sweden, says that the groups "are all rapidly moving towards clinical trials, and this field will be very exciting in the coming years". ■

POLITICS

UK scientists cautious over election pledges

Parties promise more money for research, but scientists fear impact of split with EU.

BY DANIEL CRESSEY

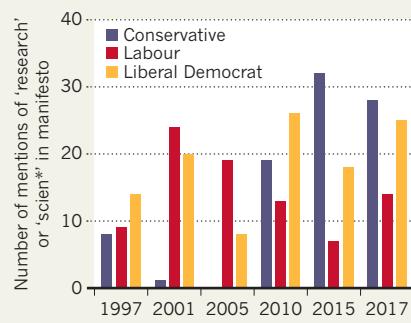
Before a UK election that will decide who leads the country's exit negotiations with the European Union, a remarkable consensus has emerged among the main national parties. All three have pledged in their manifestos to spend more money on science. Each is "putting science at the heart of their programme for the future of Britain", says Sarah Main, director of the London-based Campaign for Science and Engineering.

Yet with the uncertainty of Brexit hanging over research, these promises may seem like consolation prizes. Almost a year after the country voted to leave the EU, scientists still don't know what the split will mean for funding and collaborations — and non-British EU scientists are unclear about their future residency status.

Britain spends little on research and development (R&D) compared to other major science nations: just 1.7% of its gross domestic product

POLITICAL PATTER

UK party manifestos mention science more now than in previous decades.



(GDP). By contrast, Germany spends 2.9%. But the governing Conservative Party, which polls suggest will win the 8 June election, has said it wants to raise UK spending to 2.4% within 10 years, with a longer-term goal of 3%. Labour,

its main rival, has promised 3% by 2030 and the Liberal Democrats, third in national polls, have a "long-term goal" to double science spending. In theory, these targets would mean billions more for research. But the proportion of GDP spent isn't necessarily an indicator of a nation's research health, says Kieron Flanagan, a science-policy researcher at the Alliance Manchester Business School. Much R&D spending comes through the private sector, over which the government has no direct control, he adds.

RESEARCH RHETORIC

In recent decades, Labour has been a champion of research and innovation, and academia has been seen as a bastion of its support. But the Conservatives have increased their focus on science. The words 'science' and 'research' (or variants of these) didn't appear in their manifesto in 2005, but garnered 28 mentions this year (see 'Political patter'). And in the past year, the party — led by Prime Minister

Theresa May, who took over after the Brexit vote — has announced an extra £2 billion (US\$2.6 billion) per year in government research spending by 2020. “The Conservative Party put its money where its mouth is. There is clearly an upwards trajectory of support for science and research,” says David Willetts, who was UK science minister from 2010 to 2014.

Yet May also wants to slash immigration, raising concern about the country’s attractiveness to overseas researchers. And the Conservatives are taking a hard line on Brexit negotiations. Whereas Labour has promised to guarantee

residency and other rights for EU citizens, and that it will seek to stay part of EU research programmes, the Conservatives have made no such promises beyond saying that they want to maintain collaborations with European partners.

The Liberal Democrats oppose leaving the EU — a stance that is bringing them scientists’ support, says Julian Huppert, a former biochemist who was Liberal Democrat Member of Parliament for Cambridge until he lost his seat in 2015, but who is now campaigning for re-election. With the Conservatives seemingly set for victory, some scientists say that concerns

over Brexit trump any other promises. “I would not consider voting for any party hell-bent on pursuing Brexit whatever the cost, and without providing any analysis on the possible scenarios that we have for a Brexit future,” says Anne Glover, a prominent biologist at the University of Aberdeen who was formerly the European Commission’s chief science adviser. “It seems to me we had an evidence-free EU referendum and we are heading towards an evidence-free Brexit,” she says. ■

Additional reporting by Elizabeth Gibney.

ARCHAEOLOGY

Mummy DNA unravels ancestry of ancient Egyptians

Genetic analysis reveals a close relationship with Middle Easterners, not central Africans.

BY TRACI WATSON

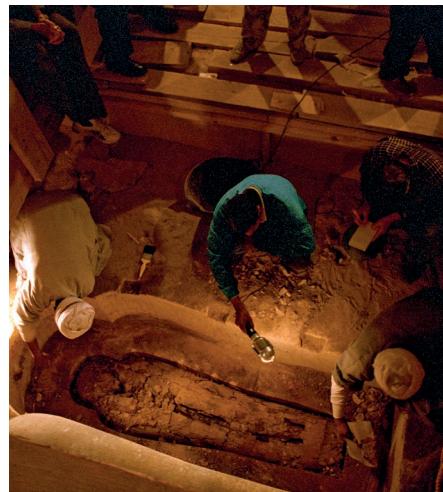
The tombs of ancient Egypt have yielded golden collars and ivory bracelets, but another treasure — human DNA — has proved elusive. Now, scientists have captured sweeping genomic information from Egyptian mummies. It reveals that mummies were closely related to ancient Middle Easterners, hinting that northern Africans might have different genetic roots from people south of the Sahara desert.

The study, published on 30 May in *Nature Communications*¹, includes data from 90 mummies buried between 1380 BC, during Egypt’s New Kingdom, and AD 425, in the Roman era. The findings show that the mummies’ closest kin were ancient farmers from a region that includes present-day Israel and Jordan. Modern Egyptians, by contrast, have inherited more of their DNA from central Africans.

Archaeological discoveries and historical documents suggest close ties between Egypt and the Middle East, but “it is very nice that this study has now provided empirical evidence for this at the genetic level”, says evolutionary anthropologist Omer Gokcumen of the State University of New York at Buffalo.

Egypt’s searing climate and the ancient practice of embalming bodies has made the recovery of intact genetic material daunting. The first DNA sequences thought to be from a mummy² were probably the result of modern contamination, and many scientists are sceptical³ of purported genetic information acquired from the mummy of King Tutankhamun⁴.

The latest analysis succeeded by bypassing soft tissue — often abundant in Egyptian



Excavations in the ancient city of Abusir el-Meleq.

mummies — to seek DNA from bone and teeth. Researchers carefully screened the DNA to rule out contamination from anyone who had handled the mummies since their excavation a century ago in the ancient town of Abusir el-Meleq.

“More than half of the mummies we studied had pretty decent DNA preservation,” says co-author Johannes Krause, a palaeogeneticist at the Max Planck Institute for the Science of Human History in Jena, Germany.

The team “succeeds where previous studies on Egyptian mummies have failed or fallen short”, says Hannes Schroeder, a palaeogeneticist at the University of Copenhagen. Now, researchers can hope to answer questions such as whether immigration drove ancient-Egyptian population growth, adds Sonia Zakrzewski, a bioarchaeologist at the

University of Southampton, UK.

The scientists obtained information about variations in mitochondrial DNA, which is passed from mother to child, from 90 mummies. Because of contamination, the team was able to acquire detailed nuclear DNA, which is inherited from both parents, from only three mummies.

Both types of genomic material showed that ancient Egyptians shared little DNA with modern sub-Saharan Africans. Instead, their closest relatives were people living during the Neolithic and Bronze ages in an area known as the Levant. Strikingly, the mummies were more closely related to ancient Europeans and Anatolians than to modern Egyptians.

The researchers say that there was probably a pulse of sub-Saharan African DNA into Egypt roughly 700 years ago. The mixing of ancient Egyptians and Africans from further south means that modern Egyptians can trace 8% more of their ancestry to sub-Saharan Africans than can the mummies from Abusir el-Meleq.

The new data can’t explain why the ancient Egyptians were so tightly aligned with people from the Middle East. Was it the result of migration, or were the Stone Age hunter-gatherers of northern Africa genetically similar to those of the Levant? It’s too early to tell, Krause says, but there’s a better chance now of getting answers. “This is the first glimpse of the genetic history of Egypt,” he says. “But it’s really just the start.” ■

- Schuenemann, V. J. et al. *Nature Commun.* **8**, 15694 (2017).
- Pääbo, S. *Nature* **314**, 644–645 (1985).
- Lorenzen, E. D. & Willerslev, E. J. *Am. Med. Assoc.* **303**, 2471–2475 (2010).
- Hawass, Z. et al. *J. Am. Med. Assoc.* **303**, 638–647 (2010).