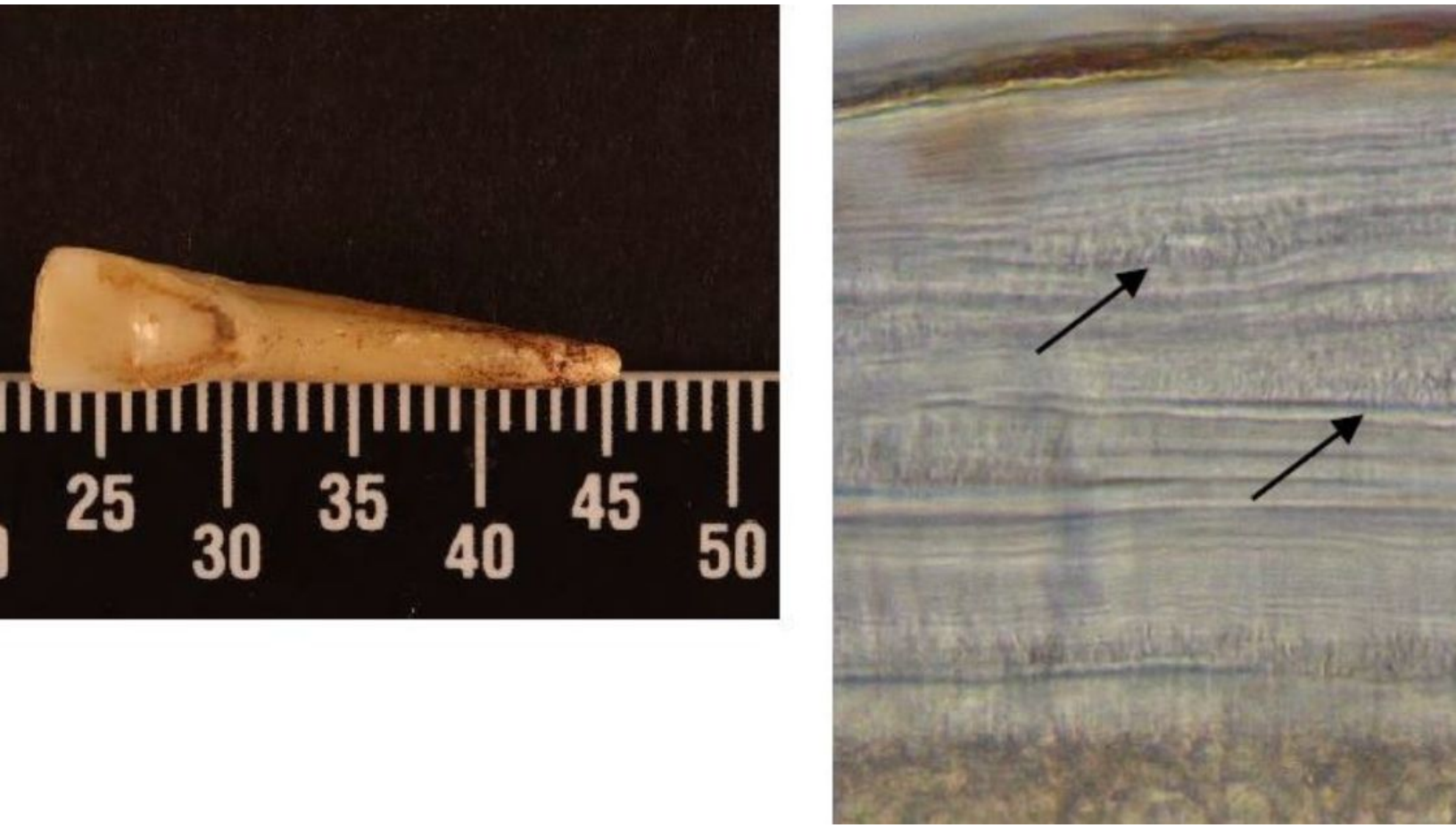
Northumbria University NEWCASTLE



Example of smoking damage in an archaeological tooth. The magnified image shows variations in the tooth's cementum rings from smoking

Jun 18, 2025 16:40 BST

Smoking leaves lasting mark on teeth, research reveals

Evidence of the permanent impact of smoking on people's teeth has been uncovered by researchers for the first time.

Researchers from Northumbria University have discovered that smokers have tell-tale signs of their smoking habits ingrained deep within their teeth, which remain even after a person has quit.

Their findings, which are now published in the scientific journal PLOS One, could help to shine new insights on forensic and historical investigations.

Teeth consist of three main hard tissues: enamel, dentine and cementum. Cementum, which covers the tooth root, develops characteristic "rings" that grow each year as we age – much like tree rings.

The research team had initially set out to see if these rings could be used to predict the age of an individual in a forensic setting, such as identifying disaster victims or for situations when an individual's DNA is not on a DNA database.

After examining a total of 88 teeth provided by both living dental patients and from archaeological remains, they were surprised to find signs of disruption in the cementum rings of some teeth, but not in others.

The disruption appeared as variations in the thickness and regularity of the rings within the teeth.

The researchers realised that these disruptions were associated with those who had identified as current or ex-smokers.

Their study revealed evidence of smoking damage in the teeth of 70% of ex-smokers and 33% of current smokers, compared to just 3% of non-smokers.

They also found that the cementum is thicker in ex-smokers. They believe this is a result of the cementum returning to its normal levels when smoking ceases, leaving 'stronger' deposits on top of the damaged rings which makes them thicker, whereas current smokers continue to have disruption to their cementum levels.

"Our research shows that it's possible to tell if someone was a smoker just by examining their teeth," said Dr Ed Schwalbe, Associate Professor in Northumbria University's Department of Applied Sciences.

"We found that the regular annual deposition of rings was disrupted for some individuals and realised that these disruptions were associated with current or ex-smokers, but were very rare in non-smokers."

Forty-six individuals who were undergoing dental treatment requiring tooth extraction consented to take part in the study, providing 70 teeth between them along with their medical and smoking histories.

Notably, the researchers found smoking damage in one of the teeth provided by a living donor which they estimated to have occurred between the ages of 22 and 41.

On checking the information provided, they found that the donor, who was aged 58 at the time of tooth extraction, was a smoker during that period. They had begun smoking when they were 28 years old and stopped at the age of 38.

Dr Schwalbe and Dr Valentina Perrone worked with Dr Sarah Inskip, UKRI Fellow at the University of Leicester's School of Archaeology and Ancient History, to sample a further 18 teeth from archaeological remains dating from 1776-1890.

Evidence of the age, biological sex and date of death was available for 13 of the 18 teeth provided.

Some of the archaeological teeth bore clear evidence of smoking activity, displaying staining and even notches from pipe smoking.

Archaeological samples of teeth showing evidence of staining and notches from pipe smoking*

Remarkably, cementum analysis of the archaeological samples revealed that the rings within the teeth of smokers who died in the 18th and 19th centuries displayed the same signs of disruption as those from living donors who were current or ex-smokers.
The findings could prove to be especially important for forensic science and historical studies in future, added Dr Schwalbe.

“This could help us learn more about people’s lifestyles in the past, especially in archaeological studies where patterns of tobacco use can reveal important cultural insights,” he said.

“The identification of 'smoking damage' in archaeological teeth opens up further avenues to understand how the long-term consumption of tobacco in populations has affected our health through time,” added Dr Inskip, who leads the Tobacco, Health and History Project which looks at the long-term consequences of tobacco use on health between 1600-1900.

“By looking at growth rings in the teeth, we can also estimate a person’s age when the tooth was removed, or when they died,” said Dr Schwalbe.
“Together, this information could help identify unknown individuals – such as disaster victims or those buried in mass graves – and offer new tools for forensic and historical investigations.”

Cementochronology – the study of what is more formally known as acellular extrinsic fibre cementum (AEFC) – has been widely used to estimate age at death and conditions such as pregnancy or disease, but this is believed to be the first time it has been used to predict tobacco use.

Dr Valentina Perrone, who is now working as a Research Assistant at Leicester University, added: “We compared the cemental deposition of smokers, ex-smokers and non-smokers visually and statistically to identify irregularities that were potentially connected to smoking activity. We found that individuals with a history of smoking – whether as a current or former smoker – were significantly more likely to have disruption to their cementum than those who did not.

“Smoking is known to have a systemic impact on the body and numerous studies have highlighted the correlation between smoking, peridontitis and tooth loss. This study shows, for the first time, the biological record of smoking-related oral health damage within the dental structure.”

The paper, Reconstructing smoking history through dental cementum analysis – a preliminary investigation on modern and archaeological teeth is now published in PLOS One.

Image caption:
Top: Example of pipe notch (arrowed) [SK134130, St James' Gardens Burial Ground, Euston, London (image reprinted from [33] under a CC BY license, with permission from Manchester University Press, original copyright 2024].

Bottom: Example of staining due to smoking [SK417, Holy Trinity Church, Coventry (image reprinted from [33], under a CC BY license, with permission from Manchester University Press, original copyright 2024)].

UNIVERSITY OF THE YEAR 2022 (Times Higher Education Awards)

Northumbria is a research-intensive university that unlocks potential for all, changing lives regionally, nationally and internationally.

Two thirds of Northumbria's undergraduate students come from the North East region and go into employment in the region when they graduate, demonstrating Northumbria's significant contribution to social mobility and levelling up in the North East of England.

Find out more about us at www.northumbria.ac.uk

--- Please contact media.communications@northumbria.ac.uk with any media enquiries or interview requests ---

Contacts

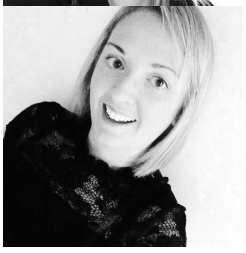
Rik Kendall
Press Contact
PR and Media Manager
Business and Law / Arts, Design & Social Sciences
rik.kendall@northumbria.ac.uk
07923 382339

Andrea Slowey
Press Contact
PR and Media Manager
Engineering and Environment / Health and Life Sciences
andrea.slowey@northumbria.ac.uk
07708 509436

Rachael Barwick
Press Contact
PR and Media Manager
rachael.barwick@northumbria.ac.uk
07377422415

James Fox
Press Contact
Student Communications Manager
james2.fox@northumbria.ac.uk

Kelly Elliott
Press Contact
PR and Media Officer
kelly2.elliott@northumbria.ac.uk



Gemma Brown
Press Contact
PR and Media Officer
gemma6.brown@northumbria.ac.uk