‘Biot teeth’ a step closer to becoming clinical reality

Scientists ‘build’ teeth that have dentine, enamel, viable roots

Researchers at the Dental Institute at King’s College London say they’re a step closer to growing human teeth in the lab using cells from the individual who would ultimately receive the tooth as a natural implant.

Led by Professor Paul Sharpe, the research team isolated adult human gingival tissue from dental patients at the institute, grew more of the tissue in the lab, and then combined the tissue with mesenchyme (tooth-forming) cells from mice. The combination of cells were transplanted into mice renal tissue, where they grew into hybrid human/mouse teeth that contained dentine and enamel — and formed viable roots.

The root formation is seen as a key breakthrough, because bioengineered teeth with natural root structure could eliminate one of the challenges sometimes seen with tooth-implant technology to date: a risk of bone loss in the area of the jaw that anchors an artificial implant. Such bone loss has been attributed to friction that occurs when eating or because of other jaw movement.

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Nonmembers can sample CDA Presents

Discounts available to access California Dental Association event

Nonmembers can experience one of the biggest benefits of California Dental Association membership by attending CDA Presents in Anaheim for $75. Nonmembers who take advantage of the offer save $815 and gain access to world-class speakers, numerous C.E. opportunities and an extensive trade show. Registration materials must be picked up on site at a membership presentation held in the registration area. Those who already took advantage of this promotion or who had a CDA membership in 2011 or 2012 are not eligible. Additionally, if a nonmember isn’t able to attend one of the membership presentations, registration cost is $890.

Details on the April 11–13 event can be found at www.cdapresents.com. Nonmembers also have the opportunity to register for a $175 one-day pass for exclusive Saturday, April 13, entry to the trade show floor featuring products and services from close to 600 companies.

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Dental clues assist in effort to identify USS Monitor remains

The remains of two sailors discovered during the 2002 recovery of the gun turret of the Civil War-era ironclad ship USS Monitor were interred at Arlington National Cemetery March 8. At the time of the interment ceremony the sailors remained unidentified, but thanks in part to dental clues, researchers are closer to possibly identifying the two men by name, and perhaps ultimately even identifying them in photographs from the era.

The remains of the two sailors are the only remains to be discovered of 16 sailors lost with the Monitor sank during a storm on Dec. 31, 1862, off Cape Hatteras, N.C. The Joint POW/MIA Accounting Command (JPAC), Joint Base Pearl Harbor-Hickam, conducted forensic analysis on the remains in an effort to identify the two sailors who lost their lives more than 150 years ago.

JPAC staff members who took part in the identification process included a dentist who analyzed the teeth from the remains, with the intent to cross reference them with any dental records that they might be able to find. To date, no such records have emerged, but the sailors’ teeth have revealed other clues that brought JPAC researchers closer to their goal of identifying the sailors by name.

Forensic anthropologist Robert Mann, director of the Forensic Science Academy for JPAC, was assigned to do the skeletal analysis. “The Monitor sailors were really very unusual for us, water recoveries first of all are not that common for us,” said Mann. “To recover remains from the bottom of the ocean that sat there for 150 years is really phenomenal.”

“There are a lot of challenges when you are trying to identify someone, especially when you are dealing with skeletal remains. If you think about how you recognize somebody, and how we identify people, they identify them by visual examinations,” said Mann. “Look at the face or finger prints, well we don’t have finger prints after 150 years. We don’t have face, we have bones and teeth.”

One of the challenges faced was the availability of data from the Civil War-era and when the Monitor sank in 1862.

“Were talking 150 years and from the Civil War. The records are not that good and we don’t have the dental x-rays. We don’t have DNA samples from everybody missing, and family members missing, we don’t have all 16 individuals who are missing, this really is a difficult job,” explained Mann.

Due to the conditions and elements the remains were exposed to during the last 150 years, Mann and other JPAC staff members were faced with more challenges in their attempts to identify the sailors.

The first major step in identifying the remains was a desalination process, which removed the salt from the bones. The remains were also covered in rust, coal and sediments from the ocean, all factors which made them impractical to use in a general recombination, such cell sources are considered a realistic source for consideration in human biotooth formation. The next major challenge is to identify a way to rise to relevant differentiated cell types, following in vitro culture. These easily accessible epithelial cells are thus considered a realistic source for consideration in human biotooth formation. The next major challenge is to identify a way to culture adult human mesenchymal cells to be tooth-inducing, as at the moment we can only make embryonic mesenchymal cells do this,” said Mann.

“The are the things that can help us identify them.”

Mann’s findings were published in the Journal of Dental Research. The team’s efforts were funded by the National Institute for Health Research (NIHR) Biomedical Research Centre at Guy’s and St. Thomas’ NHS Foundation Trust and King’s College London, United Kingdom. The research report became available online in early March at jdr.sagepub.com. Categorized under “Research Reports – Biological”, the article is titled, “Adult Human Gingival Epithelial Cells as a Source for Whole-Tooth Biogenic Engineering.”

(Source: Dental Institute at King’s College London)

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The goal is creation of a viable root that could be integrated into the jaw as if it were the patient’s natural tooth. There’s no need for the crown of the tooth to rise to relevant differentiated cell types, following in vitro culture. These easily accessible epithelial cells are thus considered a realistic source for consideration in human biotooth formation. The next major challenge is to identify a way to culture adult human mesenchymal cells to be tooth-inducing, as at the moment we can only make embryonic mesenchymal cells do this,” said Mann. “Those are the things that can help us identify them.”
The biological profiles, revealed primarily through studying the development of the teeth concluded that the sailors were both white males, one 17 to 24 years old and the other in his 30s. Both sailors stood about 5-feet-7-inches tall.

Speaking in more detail about the teeth of the older sailor, Mann said researchers found “a round spot” worn into the sailor’s bite. “It’s a little semi-circle in the top [teeth] and a semi-circle in the bottom, and you put that together and what would that be? That’s a pipe-stem groove. Back in the Civil War a lot of sailors were smoking clay pipes that were very abrasive. So they would put this clay pipe between their teeth and sit there and grind on it, and after a while it acts like sandpaper and puts a groove there in their top teeth and their bottom teeth.

We have evidence in his teeth. There’s no doubt about it, this individual smoked a pipe.”

Mann created a short list of possible identities based off of the age, race and height of the sailor’s remains, and narrowed down the identities to six possibilities by comparing them to the 14 other sailors. Because of a limited number of records and lack of dental records from the Monitor, the next step in attempting to identify the fallen sailors is DNA testing. Genealogists have been able to identify possible descendants for 10 of the 16 missing sailors.

“What we’re going to hope for is we may still find [descendants] of the other missing sailors,” said Mann. “If that happens we can get DNA samples from them, then we may be able to exclude the other 15 sailors, we may end up with a match. We may end up with one or both of these sailors [identities].”

Secretary of the Navy Ray Mabus announced Feb. 12 that the remains recovered from the Monitor were to be interred in Arlington National Cemetery on March 8. The date was chosen to honor Monitor’s role in the Battle of Hampton Roads 151 years ago. “The importance of recovering a fallen warrior is to let the nation know that the United States has made a commitment that once we’ve put someone it harm’s way, and they are either missing or killed in action, that we have a resolve to go back and return them back to their families,” said McKay.

McKay also expressed the importance of JPAC’s role to future service members, and their families and to those who are currently serving today. “It gives the family closure, and I think it gives the war fighter a sense of comfort to know that no matter what happens, the nation has not forgotten them and will return them back home with honor,” said McKay. All 16 sailors will be memorialized on a group marker in section 46 of Arlington National Cemetery, which is between the amphitheater and the USS Maine Mast memorial.

(Source: Navy Public Affairs Support Element)