

Who Knew Humans Have a Third Set of Teeth?

Analysis by [Dr. Joseph Mercola](#)

March 16, 2024

STORY AT-A-GLANCE

- › Dental experts are exploring a medication to regenerate teeth, initially targeting anodontia, which could revolutionize dental care
- › Wisdom teeth, often called "third molars," aren't a separate set, but the final teeth to emerge in adulthood, evolving from ancestral needs
- › Gingivitis, if left untreated, can progress to periodontitis, highlighting the importance of proactive oral hygiene to prevent tooth loss
- › Gum disease not only affects oral health, but it also correlates with brain health, indicating a broader impact on overall wellness
- › Simple practices like oil pulling with coconut oil and maintaining a diet rich in whole foods complement oral hygiene routines, promoting healthier teeth and gums

Most people are born with 20 baby teeth and 32 permanent teeth. But around 1% of people have a condition called hyperdontia, which means they have extra teeth, known as supernumerary teeth.¹

These extra teeth can be either baby or permanent, and there might be one or several of them. However, according to Katsu Takahashi, who heads the dentistry and oral surgery department at the Medical Research Institute Kitano Hospital in Osaka, Japan, about 1 in 3 cases of hyperdontia lead to the growth of a third set of teeth.

What's interesting is that Takahashi and his colleagues believe that all humans might have once had the ability to grow a third set of teeth, but over time, this ability was lost.² There's even evidence suggesting that the "buds" for a third set of teeth may still exist.

Pioneering a Tooth Regenerative Drug

Sharks and certain reptiles have a unique ability: Their teeth continuously regenerate throughout their lives, sometimes as frequently as every two weeks.³ Could humans also tap into this regenerative power to grow new teeth once they're lost? Takahashi and his team firmly believe so, and they're actively developing a medication to try to make this a reality.

Their groundbreaking work, published in 2021, unveiled a protein produced by the uterine sensitization-associated gene-1 (USAG-1 gene)⁴ that hampers tooth growth in mice. By using a neutralizing antibody medicine to block USAG-1,⁵ the mice successfully grew new teeth.⁶ Now, the team is focused on translating these findings into a medication for humans, aimed at addressing anodontia – the complete absence of teeth – in children aged 2 to 6.

The clinical trials are slated to commence in July 2024, with the potential for the product to reach dentists' offices by 2030.⁷ Takahashi told The Mainichi:⁸

"The idea of growing new teeth is every dentist's dream. I've been working on this since I was a graduate student. I was confident I'd be able to make it happen ... In any case, we're hoping to see a time when tooth-regrowth medicine is a third choice alongside dentures and implants."

Does a Third Set of Teeth Naturally Exist in Humans?

In a 2023 review published in *Regenerative Therapy*, Takahashi and colleagues detailed the progress made in tooth regeneration. They wrote, "Anti-USAG-1 antibody treatment in mice is effective in tooth regeneration and can be a breakthrough in treating tooth anomalies in humans."⁹ They continued:

"With approximately 0.1% of the population suffering from congenital tooth agenesis and 10% of children worldwide suffering from partial tooth loss, early diagnosis will improve outcomes and the quality of life of patients.

Understanding the role of pathogenic USAG-1 variants, their interacting gene partners, and their protein functions will help develop critical biomarkers.

Advances in next-generation sequencing, mass spectrometry, and imaging technologies will assist in developing companion and predictive biomarkers to help identify patients who will benefit from tooth regeneration."

In humans, the potential for tooth regeneration hinges on what experts like Takahashi refer to as a "third dentition," an additional set of teeth believed to naturally occur in humans.

"In addition to the permanent dentition in humans, a 'third dentition' with one or more teeth can occur. In some cases, this third dentition is thought to develop as a partial dentition following permanent dentition," they explain. "In humans, a rudimentary epithelial form of the third dentition has been identified ... Detection of the third dentition during early childhood facilitates the visualization and characterization of hyperdontia in the mouth of infant and some fetuses."¹⁰

Apart from studies on mice, researchers also experimented on ferrets and found that using antibodies targeting USAG-1 resulted in tooth regeneration, akin to the concept of a third dentition. "This result is encouraging given that ferrets share dental patterns similar to those of humans," they noted in *Regenerative Therapy*.¹¹

While further testing for safety and effectiveness is crucial, the team remains optimistic about the potential of this treatment to stimulate tooth growth in humans.¹²

"Compared to dental implants and dentures, antibody-based treatment is more cost-effective and uses a naturally existing third dentition in humans at certain ages. Anti-USAG-1 antibody treatment in mice is effective for tooth regeneration and can be a breakthrough in treating tooth anomalies in humans."

Understanding Wisdom Teeth: Decoding the Role of 'Third Molars'

Wisdom teeth, often known as "third molars," are not a separate set of teeth; rather, they are the final set of teeth to emerge in adulthood.¹³ It's believed that these molars, which typically appear between the ages of 18 to 24, might have served a purpose for our ancestors, who had larger jaws and more teeth.¹⁴

However, as human jaws have evolved to be smaller, wisdom teeth sometimes fail to erupt fully through the gums. When they do, they can pose issues if there isn't adequate space. Oral health specialists commonly advise removing wisdom teeth if they're growing in at odd angles, causing discomfort, experiencing tooth decay or impacting adjacent teeth, leading to inflammation.

Despite these recommendations, many parents choose to have their teenagers' wisdom teeth extracted preventatively, even in the absence of apparent issues. Statistics suggest that around 5 million individuals undergo wisdom teeth removal annually, with many of these procedures potentially being unnecessary.¹⁵ A 2005 Cochrane Review also indicated that a significant number of wisdom teeth extractions could be avoided.¹⁶

The review highlighted the importance of judicious decision-making based on specific indicators for extraction, which could potentially reduce the need for surgical procedures by 60% or more. Furthermore, the authors suggested that closely monitoring asymptomatic wisdom teeth might be a reasonable approach. A subsequent 2020 Cochrane Review reiterated the ongoing debate surrounding the removal of asymptomatic and disease-free wisdom teeth:¹⁷

"Impacted wisdom teeth can cause swelling and ulceration of the gums around the wisdom teeth, damage to the roots of second molars, decay in second molars, gum and bone disease around second molars and development of cysts or tumors.

It is generally agreed that removing wisdom teeth is appropriate if signs or symptoms of disease related to the wisdom teeth are present, but there is less

agreement about how asymptomatic disease-free impacted wisdom teeth should be managed."

The Link Between Oral Health and Your Body's Health

The medication researchers are testing will initially be designed to promote tooth regrowth in those with anodontia, but its success could pave the way for broader applications, including addressing tooth loss. However, it's crucial to recognize that declining oral health not only affects your teeth but also impacts your overall well-being.

Without preventive oral hygiene, you can develop gingivitis, an inflammatory condition triggered by the buildup of plaque or bacteria on teeth. One of the symptoms of gingivitis is red, bleeding gums. Left untreated, gingivitis can progress to periodontitis, a severe infection that may lead to tooth loss.

Furthermore, dental health significantly influences brain health, as evidenced by studies linking gum disease to hippocampal atrophy, the shrinking of a brain region associated with Alzheimer's disease. In one study¹⁸ involving 172 individuals aged 55 and older,¹⁹ both gum disease and tooth count were associated with changes in brain structure. Participants with mild gum disease and fewer teeth exhibited accelerated shrinkage in the left hippocampus.

In this cohort, the researchers found that people with one less tooth experienced more brain shrinkage at a rate that was equivalent to nearly one year of brain aging.

A systematic review and meta-analysis of 13 studies revealed a marked increase in the risk of Alzheimer's disease and mild cognitive impairment among individuals with periodontal disease compared to those without.²⁰ This risk was particularly pronounced in individuals with severe periodontal disease. Moreover, beyond cognitive decline, periodontitis has been linked to various systemic diseases, including:²¹

Diabetes

Heart disease

Respiratory disease

Recognizing Warning Signs of Oral Health Issues

Nearly half of adults aged 30 or older – about 46% – exhibit signs of gum disease, while approximately 9% have severe gum disease.²² However, the tricky part is that many individuals are unaware of their condition because gum disease often remains "silent," showing no signs or symptoms until it reaches more advanced stages.²³

In the early phase of gingivitis, you might notice that your gums bleed during brushing, flossing or when eating hard foods. Additionally, your gums may appear red or swollen. As the disease progresses, your gums might recede, making your teeth look longer. You may also experience loose teeth, mouth sores, bad breath and pus between your gums and teeth.²⁴

Unlike anodontia, a rare genetic disorder resulting in tooth loss, the loss of teeth later in life can often be prevented by taking proactive oral health measures. Consistent oral hygiene practices, such as regular brushing, flossing and tongue scraping, coupled with routine cleanings by a mercury-free biological dentist, play a crucial role in maintaining healthy teeth and gums.

Adopting a lifestyle that prioritizes a diet rich in fresh, whole foods is also vital for promoting a naturally clean mouth and good oral health. Another beneficial practice is oil pulling, which involves swishing a small amount of oil, like coconut oil, around your mouth for approximately 20 minutes before spitting it out into the garbage.

Oil pulling, when combined with regular brushing and flossing, can help reduce gingivitis and plaque, as well as bacterial colony counts in saliva.²⁵ Only a small amount of oil is needed to achieve good results – 1 tablespoon for adults and 1 teaspoon for a child.

Coconut oil, known for its antibacterial and antiviral properties, is particularly suitable for oil pulling. Research has shown that coconut oil pulling is as effective as chemical

mouthwash (chlorhexidine) in reducing plaque, gingival index score, bleeding-on-probing and gingivitis,²⁶ highlighting its potential benefits for oral health.

While the concept of growing a third set of teeth holds promise, the potential side effects of using medication to achieve this result are uncertain. For now, staying vigilant about your oral health can help ensure that your teeth remain firmly in place – where they belong – at any stage of life.

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