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TEETH: REFLECTING STRESS, AND PREDICTING MENTAL HEALTH

By Lana Heartfield

Every day, our body experiences changes and fluctuations that we are not always aware of. From the moment a fetus develops, every environmental factor affects the baby's health. This can be in the form of stress, anxiety, or depression. A recent finding that has caught the attention of the medical community is the aftermath of a baby's tooth development, specifically the width of a tooth's growing neonatal line (NNL). It was discovered that teeth carry information about the body starting from birth, similar to how trees collect aging circles like a biological marker. It is possible the width of the neonatal line can help predict psychological hardships in the future of a child.

By understanding neonatal line formation, researchers have an opportunity to navigate children's growth. For example, when the stress hormone cortisol is secreted in pregnancy, it slows tooth enamel formation.his lowers the baby's insulin-like growth factors (IGF). In this case, high cortisol further leads to a tooth development disorder, called amelogenesis, which can be seen as a wider neonatal line.

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To confirm this fascinating detail, a research group in Bristol, England collected 70 primary teeth from children of various families. Mothers were questioned on four factors during pregnancy: stressful events, history of mental illness, neighborhood disadvantages, and social support during and after pregnancy. They found that 15 out of 70 children were exposed to maternal mental health symptoms. Only 3 out of 62 mothers reported healthy levels of social support in the first trimester, and 9 out of 62 shortly after the child's birth. This number was crucial evidence that today's mothers struggle stressful pregnancies. Mothers had histories of mental illness. specifically, severe lifetime depression, lifetime psychiatric problems, and maternal depression or anxiety at 32 weeks. Children born to those mothers had wider mean NNLs in comparison to kids who were not exposed to such stress. The main finding from this study is that prenatal and early postnatal life events, both stressful or protective in nature, show clear evidence of biological embedding in the children's teeth.

This is the first study that shows a connection between maternal mental issues and children's tooth development. The fetus spends a long nine months developing in the womb so it is key to know possible influences that may interfere with this process. As we find more biological markers like the neonatal line, there will be a stronger understanding and emphasis on mental health.

Appropriate resources will become accessible so that people struggling with trauma know how to overcome it. This research has grand potential for the future of dentistry and developmental psychology because doctors will now be able to educate mothers on what factors during pregnancy may influence their child's development. One tooth at a time, we can support the trajectory of human development.



EXPLORING A CAREER IN PEDIATRIC DENTISTRY: INTERVIEW WITH DR. RIMI KOBAYASHI

By Jacqueline Ha

Pediatric dentistry is one of the various specialties recognized by the American Dental Association (ADA) that dentists can pursue post-graduation. At first glance, pediatric dentistry seems like general dentistry simply tailored towards a younger demographic. However, there are many commonly overlooked facets of pediatric dentistry that are important to understand, especially for pre-dental students who are interested in a career in pediatrics.

According to the ADA, pediatric dentistry is "an agedefined specialty that provides both primary and comprehensive preventive and therapeutic oral health care for infants and children through adolescence, including those with special health care needs". In order to become a pediatric dentist, one must graduate from an accredited dental school and then attend a post-graduate pediatric residency program that ranges from two to three years. Although the road to becoming a pediatric dentist may be long, pediatric dentists such as Dr. Rimi, owner of Pediatric Dentistry San Ramon, believe that the extra years of education to specialize is worth it.

Dr. Rimi Kobayashi graduated from the University of the Pacific and subsequently attended Northwestern University for pediatric residency. She has been practicing pediatric dentistry for 21 years and has been a practice owner for 16 of those years. She shared her personal perspective of pediatric dentistry and offered her own advice for pre-dental students interested in this specialty.

Dr. Rimi was initially drawn to pediatric dentistry due to the range of treatments that she can perform beyond the procedures limited by general dentistry. She enjoyed the fact that she can do restorative dentistry, orthodontics, and oral surgery, with the added reward of interacting with children on a daily basis and seeing them develop from newborns to adulthood.

During pediatric residency, residents are taught how to manage the behavior of the types of patients that they may face, including babies, older teenagers, and those with developmental or behavioral issues. Dr. Rimi believes that the key to treating all types of patients well is to recognize that you cannot use the same approach for all patients.

"Older kids don't want you to talk to them in a 'kiddie' voice," Dr. Rimi said. "Younger kids love the silliness and playful approach. I know pediatric dentists that interact with patients with magic tricks or balloon animals." But, no matter what style approach a pediatric dentist may choose to use, Dr. Rimi said that "patience and empathy" are the traits that she feels are of utmost importance.

Handling the wide behavioral range of patients that come into the office may seem like the most difficult task of a pediatric dentist. However, when asked about what is the most pressing challenge she faces, Dr. Rimi had something else to suggest: insurance companies.

"Insurance companies limit treatment that is necessary," Dr. Rimi said. "For instance, medical insurances [may not cover] treatment under general anesthesia when a child is medically compromised or [has] disabilities." This is frustrating for dentists because they are doing their best to provide the best care possible for their patients, yet there is an outside factor that is limiting them from doing so.

However, despite these challenges, Dr. Rimi highly encourages any pre-dental student who may be interested in pediatrics to continue their pursuit. Her greatest advice for these individuals is to "get involved with children or volunteer with services that involve children" as much as possible. An example of one organization that Dr. Rimi has enjoyed being involved in ever since college is "Give Kids A Smile", which is an organization that hosts events that provide free oral health care to children. This is a great opportunity for any student to get involved with providing pediatric oral health care before even attending dental school.

Dr. Rimi also emphasizes the importance of shadowing a pediatric dentist prior to deciding on this specialty so that one can truly understand what the profession entails. There are procedures done by pediatric dentists outside of a typical private practice that she feels many people are not aware of. "The general population do not know that we do hospital surgeries, partake on craniofacial teams, and respond to emergencies and trauma," Dr. Rimi said.

Looking back on her career, Dr. Rimi says that she has truly enjoyed her time as a pediatric dentist. Because after all, as Dr. Rimi has stated, nothing beats the reward you feel when you can help a child feel better or improve their smile.



https://www.dentistrytoday.com

THE BEST AND WORST STATES TO BE A DENTIST

By Amanda Lee

Delaware, Idaho, Ohio, and Washington are the best states to practice dentistry in, while West Virginia, Massachusetts, Hawaii, and Louisiana are among some of the worst states.

These rankings were determined and compiled from sources like the Bureau of Labor Statistics (BLS), Projections Central, and U.S. News & World Report. The data was collected from 2018 to 2021. Four factors were considered in these lists: salary, demand or job growth, affordability, and quality of life.

According to mean salary statistics from the BLS, Delaware employs dentists with an average annual wage of \$233,860 with an hourly average rate of \$112.43, as of May 2021. Meanwhile, West Virginia has an average annual wage of \$127,950. In contrast, the national average yearly salary is \$117,158 in 2022. With a more than \$100,000 difference between the nation's and Delaware's average salary, Delaware may be the best state for dentists who prioritize having high salaries above other factors.

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RANK	STATE	HEALTH CARE	EDUCATION	ECONOMY	INFRASTRUCTURE	OPPORTUNITY	FISCAL STABILITY	CRIME & CORRECTIONS	NATURAL ENVIRONMENT
1	Washington	8	4	4	3	25	6	19	15
2	Minnesota	16	17	15	9	2	21	15	10
3	(a) Utah	11	10	1	5	30	5	8	47
4	New Hampshire	13	13	11	34	3	33	1	2
5	e Idaho	24	29	3	10	24	4	10	12
6	Rebraska	28	9	20	6	10	17	31	6
7	Virginia	12	12	13	39	8	18	9	19
8	🦉 Wisconsin	15	8	26	24	9	9	25	17

Image By: USnews.com

In terms of demand or job growth, Projections Central Idaho to have the highest growth rate of 34.3% and Massachusetts to have the lowest growth rate of -8.5%, thus making Idaho relatively a much better place to consider being a future dentist in.

If considering affordability, U.S. News & World Report has ascertained that Ohio has the lowest cost of living, whereas Hawaii has the highest cost of living, according to data collected in 2021. It compares cost of living in terms of house affordability versus median incomes. Ohio's housing is 23% lower than the national average and utilities are 8% lower; its cost of living is approximately 9% lower in total. Hawaii's housing is 215% higher than the national average and utilities are 64% higher, with a cost of living approximately 93% higher than the average. Therefore, considering this factor alone, it is more favorable to be a dentist in Ohio due to the below average cost of living.

Finally, Washington has the greatest quality of life for dentists and Louisiana the worst, as according to the U.S. News & World Report in 2021. Quality of life was determined by health care, education, economy, infrastructure, public safety, government's fiscal stability, and other state-provided opportunities. was ranked first and Arkansas last. This difference in ranking is due to differences in what factors are considered most important and how recent data were collected as statistics are constantly changing. However, analyzing lists from multiple sources can help to get a better understanding of which states are best to work in and which states to avoid.

Many factors play into deciding where to establish one's (sponsored by the US Department of Labor) has projected career as a dentist. In comparison to other countries, living in the United States gives people more options to choose from because each state has different salaries, demand or job growth, affordability, and quality of life. The state that a dentist chooses to practice in ultimately will depend on which factors they value more.

SILVER DIAMINE FLUORIDE (SDF)

By Andrew Sung

The use of Silver Diamine Fluoride (SDF) in the dental field has given patients the option to choose a more costeffective treatment to treat and prevent dental cavities. This was a major advancement in the dental field because it became a great way for dentists to non-invasively manage their patients' cavities.

Dental caries may cause immense discomfort and if left untreated, may lead to unbearable pain and serious consequences. To understand how cavities are formed, it is important to know that the tooth is divided into In another ranking made by Beckers Dental, Connecticut multiple layers: the enamel, dentin, and nerves. Although the teeth are one of the toughest structures in the human body, it does not necessarily mean they are impenetrable. Bacteria, with the help of exposure to sugars and acids, can grow and perforate the enamel and dentin, possibly reaching the nerves and leading to immense pain. This causes inflammation and can ultimately lead to tooth decay or even complete loss.

While dental treatments to treat these cases such as fillings, extractions, or root canal procedures are widely available, many are expensive, especially without insurance. To give some context, a composite filling could cost a patient upwards of \$450, a simple tooth extraction may cost up to \$300, and a root canal procedure on a molar can cost up to \$1800. Although those who are insured will pay a fraction of these costs, there are many that cannot afford insurance, let alone pay for these procedures out-of-pocket. However, over recent years, Silver Diamine Fluoride has become a popular, alternative, cost-effective treatment that has allowed a wider range of patients to properly tend to their cavities without the high costs.

SDF is a liquid solution that may be applied to the affected area containing the cavity. SDF is effective at treating cavities because of its ability to hinder the growth of bacteria, as well as its regenerative properties. Specifically, the heavy metal silver in SDF has antibacterial properties that prevent bacteria from proliferating on the tooth, while the fluoride component helps to regenerate the lost enamel. SDF not only halts the progression of the cavity, but it also helps prevent further cavities by forming a fortified structure at the site of application.

The approximate cost of SDF treatment is approximately \$20 per tooth, which is vastly more affordable than alternative cavity treatment procedures. However, one major reason SDF may not be as popular as the other expensive treatments is because of its aesthetic results: a black spot at the site of SDF application. While this black spot is harmless, it may be unappealing for those considering the treatment because researchers have yet to find a way to make SDF colorless. Regardless, SDF is still a great effective treatment option, especially for people in impoverished neighborhoods. According to Desert.com, there are nearly 5.2 million Californians who cannot afford dental care. This means that many people are not financially able to pay for crucial procedures such as cavity treatments. Although SDF is not the most aesthetically pleasing, it still serves as an affordable alternative that can immediately alleviate tooth pain and prevent future dental caries, which makes it a desirable treatment option.

SDF is commonly used on children and elderly patients. An extensive procedure for children does not make financial sense considering their teeth will eventually be replaced by mature adult teeth. "Furthermore, some cavity treatments such as a root canal procedure may be too invasive for the elderly who simply want to alleviate their toothache, making SDF the more sensible option. Regardless, SDF should be considered a serious alternative for patients because it serves as a simple and affordable alternative treatment to composite fillings and crowns, especially for those looking to treat and prevent future cavities in a cheaper, noninvasive way.



Before and After SDF Application

Image By: happykidssmiles.com

WITHOUT DENTISTS, WHERE WOULD WE BE NOW?

By Tara Gharib Parsa

Sure, the assumption is that without dentists, our teeth would have probably fallen off by now. We would simply revert back to the stone ages, in which the maintenance of healthy teeth was never seen as a necessity, but rather a luxury. Since then, however, we have definitely created big strides towards making advancements in all realms of not only dentistry, but general health care as well. Although dental care is still very much a privilege and blessing for many – as there are still many communities across the world unable to have access to any sort of oral health care – we must keep reminding ourselves how lucky we are to live in a country where dentists are easily accessible. To the average person, it may not be apparent how much of an impact oral health plays in day-to-day life. However, for people who struggle with oral health diseases, they have to deal with daily severe pain just to get through each meal. For those who dislike the aesthetics of their teeth, their self-confidence chips away every time they look into the mirror or smile. According to the Global Burden of Disease Study 2019, 3.5 billion people are affected by oral disease globally. Additionally, according to the New York Post, more than half of Americans cover their mouths when they laugh because they are insecure about their teeth. This is where the endless amount of hard work from our nation's dental care providers and dental researchers comes into play so these numbers can decrease over time.

General health is affected by dental hygiene, maybe a bit too much! A National Library of Medicine study utilizing a National Health and Nutrition Examination Survey indicated that "dental caries and periodontitis are hypothesized to contribute to a pro-inflammatory state, which accelerates the atherosclerotic process and leads to coronary heart disease" (Kim et al. 2014). This statistic indicates that instead of seeing oral and overall health care as two separate systems, we should see them as two interconnected and equally important aspects of health care. For example, there is a connection between dental care and respiratory illness, oral cancer, and even sleep apnea! According to Millennium Dental, "while it may sound strange that your dentist can help improve your overall health, it's very true. Every part of your body is connected, sometimes impacting other parts in surprising ways." Thus, our dentists should not only be viewed as our dental care providers but also as our overall healthcare providers as well.

What about our favorite foods? What would life look like without our favorite hamburger from McDonald's, or our go-to candy, Sour Patch Kids? Without dentists monitoring the care of our pearly whites, we would not be able to enjoy the pleasures that life has to offer. Growing up, I had a relative that could not enjoy his favorite foods due to his teeth being too sensitive. After visiting a recommended dentist, I saw a complete change in not only his eating habits but his overall aura as well. Therefore, we unknowingly owe much of our happiness to them! Taking everything into account, we must realize that our dentists are those who we not only see once every six months, but as those who give us the much needed pride in our appearance, our activities, and most importantly, our overall health.

WHAT PROBLEMS COULD



Image By: seacliffdentalsf.com

ROBOTS IN OUR MOUTH

By Shrey Shah

On July 5, 2022, the University of Pennsylvania (UPenn) released an article about their engineered robots that would clean plaque off of teeth similar to manual brushing and flossing teeth. The intended use of these robots is for people who have trouble brushing their teeth or lack proper manual dexterity skills to properly brush their teeth.

The overall design and use of the toothbrush have not changed since the 1930s besides the addition of an electric motor to create the electric toothbrushes we commonly see on today's market. Compared to the traditional toothbrush, these minor advancements to the toothbrush, such as the addition of the electric motor, had an insignificant increase in their effectiveness.

On the other hand, the shapeshifting microrobots created by UPenn were found to be significantly more effective than traditional brushing. These shapeshifting microrobots are a true advancement in the dental field because they can complete the daily tasks of brushing and flossing simultaneously. Combining brushing and flossing is a crucial advancement because the majority of Americans do not floss on a daily basis.

The research that led to the creation of these microrobots is based on magnetic control. By controlling the "toothbrush" in a new way, they were able to combine brushing and flossing into one robot. The microrobots have bristles like a normal toothbrush, but with the new electromagnetic control, the bristles can extend, sweep, and even transfer back and forth across a space, much like flossing.

The efficacy of the microrobots was first tested using a small slab of tooth-like material and was tested on various materials until it was ready for a real tooth. The results from these experiments showed that robotic conformations that the microrobots could form would nearly eliminate the sticky biofilms that lead to cavities and gum disease. Widespread use of this technology can greatly reduce the number of people suffering from oral health diseases over time.

The technology in these robots is more than simply brushing our teeth. This technology has the ability to attack bacteria that causes tooth decay and dental plaque directly by using the catalytic properties of nanoparticles to activate hydrogen peroxide which would release free radicals.

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Together with the electromagnetic control and the technique of cleaning teeth with hydrogen peroxide, teeth will be even cleaner and can potentially last longer.

There are more benefits to this technology besides just a cleaner mouth. The average human will spend a total of 38 and a half days just brushing their teeth over a lifetime. With the introduction of this technology, it might soon be possible to get more time back into our hands when these shapeshifting microrobots can be used by everyone in their daily dental hygiene routine.

USING DENTAL EVIDENCE FOR IDENTIFICATION

By Meha Devanaboyina

Using teeth to identify an unknown person is now made possible through the field of Forensic Odontology. Forensic Odontology can determine the developmental, sex, race, and cultural patterns of a tooth sample for recognition purposes. This field of study can have a lot of practical applications in criminal justice cases by being a strong addition to traditional forensic science methods.

The analysis of DNA is a crucial first step in investigating criminal justice cases, especially when it comes to the identification of human remains.



One way it can be obtained is from the root pulp, the location of blood vessels and nerves which lies below the dentin and the enamel layers of the tooth. The mandibular bone is another good area for DNA retrieval. This bone is the largest bone in the human skull and primarily holds the bottom teeth in place. It is easily removable and preserves DNA for an accurate reading of a person's development and sex.

In Forensic Odontology, the DNA retrieved from the root pulp will then be analyzed for the amelogenin gene. This gene codes for a protein that is associated with dental enamel and it commonly causes X-linked amelogenesis imperfecta. This is a genetic disorder that shapes dental enamel formation. In an average male human genome, two copies of these genes were observed. Therefore, due to the presence of the amelogenin gene, DNA samples from teeth can be run through a polymerase chain reaction (PCR) to determine the sex.

A more recent finding is the practical uses of ammeoglyphics, the study of enamel rod patterns. Enamel rod patterns are similar to fingerprints in the way that they are unique to each person. However, a downside to using ammeoglyphics for forensic analysis is that they are sensitive to destruction. For analysis, a tooth print is made by etching the tooth in acid to make the surface of the tooth smoother. Then, an impression is created using cellulose acetate paper. After this acid dissolution step, ammeoglyphics are more prone to destruction as the acid may adversely cause permanent damage in completely changing the tooth's structure. The evaluation of this print is performed by a biometric tooth analysis software. This analysis software can then be used to trace back to a specific person that matches the enamel rod pattern data.

A more popular type of identification is utilizing bite marks for analysis. Bite marks can be used to match the marks found from a particular scene to an impression of possible suspects for those involved in a crime. Although it is a very popular form of analysis, bite marks are the most controversial form of evidence because there is less scientific support for the credibility of bite marks. There has been no strong evidence of its uniqueness from person to person. In many cases, their credibility is rejected because bite marks can be found on skin, clothing, and other sources, ultimately deforming the mark in the process. Overall, forensic odontology is a rapidly developing field due to its practical applications in determining age, race, and sex from recovered dental evidence. Much of the research is focused on analyzing a more accurate age estimation as well as strengthening the credibility and preservation of bite marks. The development of ultraviolet and infrared photographic techniques with 3-D imaging is building upon the field in an objective lens. As more research is developed to strengthen the accuracy of forensic odontology analyses, this field of study can be a great contributing factor in accurately analyzing on-site evidence for solving criminal justice cases.



Image By: dental.umaryland.edu

3D PRINTING IN DENTISTRY

By Ananya Srivatsan

Living in the 21st century, technology has increasingly been playing a large role in our daily lives over time. But how has technology advanced dentistry specifically? The answer is simple. It has helped dentists go above and beyond in providing patients with more efficient, comfortable, and quality care. The introduction of 3D printing into the dental field has broken the boundaries that once limited the various dental specialties.

3D printing is an additive manufacturing process that is different from the computer-aided design (CAD) and computer-aided manufacturing (CAM) processes which are subtractive manufacturing procedures.

The 3D printing process consists of using a powder and resin to form an image in a layer-by-layer process.

Prosthodontics is a dental specialty that replaces missing or damaged teeth often through crown and bridge procedures. The ability to print multiple crowns simultaneously using advanced dental resins while still catering to individualized treatment plans make 3D printing a great option. The introduction of 3D printing technology in prosthodontics has also maximized the precision of making dentures for patients. According to an article by Denture Centre,

"Traditional dentures take several sessions to mold, design, and fit, meaning that if you have broken dentures, you may have a long wait ahead of you. With 3D dentures, there are less invasive fitting sessions."

This allows patients to have more precise prosthodontic procedures and more comfortable dental appliances. 3D printing has allowed for a four fold increase in the production of dentures with the added bonus of reducing material waste.

Furthermore, 3D printing has also helped make major advancements in orthodontics. The traditional method in orthodontics has been to use brackets and wires to align teeth. With the introduction of 3D printing, Invisalign has now become a very popular method of teeth alignment. Impressions of patients' teeth are taken using 3D imaging and the clear aligners are then 3D printed. Thus, 3D printing has helped decrease the labor-intensive work of orthodontists. It has also given orthodontists a return on their investments and outstanding treatment outcomes.

3D printing technology also has practical applications in endodontics where it can help endodontists visualize areas of the roots and gums that cannot be seen using the naked eye. Common endodontic cases that benefit from 3D printing are pulp canal obliterations because it enables a safe method for treatment and conservation of the tooth structure.

In periodontics, 3D printing has contributed to the creation of the FDM scaffold which has been specifically designed to fit the anatomical structure of a missing tooth. This scaffold matrix has been useful in a wide range of periodontic cases. Additionally, dental implant procedures have advanced due to 3D printing.

For example, CBCT testing uses 3D printing technology to examine and create models to easily visualize areas of the gums, leading to implants that have better anchorage to the bone.

Overall, the introduction of 3D printing into the dental field has revolutionized dentistry and has allowed many dental procedures to become more efficient, accurate, and comfortable for patients. The continued development of these types of technologies over the upcoming years will allow dentistry to continue along this positive trend.



Image By: media.dentalcompare.com

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