Scientists unlock secrets of enamel formation

From news reports

PITTSBURGH/ANN HARBOR/CAMBRIDGE, USA: Enamel is known to be one of the hardest tissues in the human body. Researchers from the Forsyth Institute, as well as the universities of Pittsburgh and Michigan in the US have reported that they have documented the process through which the highly resistant dental tissue is created. According to the scientists, their observations could help in the development of new materials for medical and dental applications.

Using a cryoelectron microscope, they found that amelogenin, a regulatory extracellular matrix protein that makes up between 20 and 30 per cent of early enamel, is able to arrange itself stepwise in higher clusters. These clusters then stabilise and organise calcium phosphate crystals in parallel arrays and fuse them together. The result is an arrangement of needle-shaped mineral particles that resembles a complex ceramic microfabric, the researchers said.

They added that more research is needed to fully understand how the process works but the findings could make it possible to arrange molecules in a similar fashion in laboratories to build novel biomaterials for restorative dentistry, amongst other applications.

The special properties of macromolecules like biopolymers are already used by other industries for producing biodegradable packaging and new kinds of building materials.

US debt deal spares Medicaid

Daniel Zimmermann

NEW YORK, USA: Health and dental care benefits for the poor will not see a reduction, as US President Obama and members of Congress agreed to keep their hands off Medicaid in a deal agreed to by both parties to raise the country’s increasing debt limit. The agreement, which also includes the formation of a bipartisan congressional committee to recommend further cuts in federal spending, however, could target social benefit programmes later this year.

The last minute deal, ending six months of negotiations, aims to cut more than US$2 trillion from federal spending to raise the current US debt limit from US$14.5 trillion. While Democrats pushed for tax hikes and defense cuts, Republicans proposed rolling back spending on a number of social security programmes, including Medicaid.

“We will need to review the details of the debt agreement, but are encouraged by initial reports that Medicaid is not one of the major targets of spending cuts,” a speaker of the American Academy of Pediatric Dentistry told Dental Tribune Asia Pacific.

Currently, over 50 million people or one sixth of the total US population is enrolled in some form of Medicaid, the latest figures from the Kaiser Family Foundation’s Commission suggest. Twenty-five million children are receiving healthcare through the Early Periodic Screening, Diagnosis, and Treatment Program that also includes preventative and restorative dental treatment. Demand for the scheme has increased significantly since 2007 owing to the recession and rise in unemployment.

Experts said that more cuts in the joint federal-state systems could mean another setback for the programme that has seen a lack of investment and interest from healthcare providers for years. Eligibility levels could also be tightened, as less government funding over the next few years would place greater financial burden on the US states.
Bioengineers ‘floss’ bad gas from animal waste

From news reports

COLLEGE STATION, USA: A material used in the production of dental floss has shown the potential to capture a large amount of hazardous gases before they are released into the environment. In an experiment conducted on liquid animal manure, engineers from Texas A&M University’s Department of Biological and Agricultural Engineering in the US were able to extract 90 per cent of ammonia emissions with the help of tubes based on expanded polytetrafluoroethylene (ePTFE), a highly versatile polymer used to manufacture filters for cleaning teeth.

In recent years, ammonia emissions from the raising of cattle and other livestock have been recognized by scientists as contributing significantly to environmental problems such as the contamination of groundwater and acidification of soil and vegetation. The largest two producers, the US and China, currently release over 15 million tons of the gas into the environment, according to US Environmental Protection Agency figures.

After nitrogen oxide and sulfur dioxide, the gas accounts for the third largest air pollutant emissions worldwide. The new technology, developed by Drs. Saqib Mukhtar and M.D. Burhan, uses diffusion, the process through which gases move from regions of higher to lower concentration, such as in the ePTFE tubes. There they can be concentrated to form ammonium sulfate, a chemical compound used as a soil fertiliser, among other things. Although still in testing stage, the scientists have announced that the technology will be applied on a larger scale soon.

Common methods to reduce ammonia emissions include the use of other biofilters and chemicals, as well as acidification-solution spray scrubbers.

Bacteria attack children early

NEW YORK, USA: US researchers have found evidence of bacteria associated with early childhood caries in the saliva of infants with no teeth. Their findings suggest that infection with bacteria like Streptococcus mutans in the oral cavity occurs earlier in the development of children than previously thought.

Dr Eduardo Mahn, DDS, DMD, graduated from the University of Chile School of Dentistry and pursued further studies in Germany and the US. He worked at Ivoclar Vivadent’s International Center for Dental Education for several years and is now a guest lecturer at the University Andres Bello, Santiago, Chile.

Dr Mahn is currently working with the Samaya Group in Saudi Arabia, where he is specializing in implantology, restorative and esthetic dentistry. He also worked at Ivoclar Vivadent’s International Center for Dental Education in testing stage, the scientists have announced that the technology will be applied on a larger scale soon.

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**Lead researcher Kelly Swanson (left) observes a DNA extraction of saliva microbiota. DTI (Photo courtesy of CIIC-IES-ITS-C/David Riecks, USA).**

In a comparative analysis using DNA sequencing methods, scientists from the University of Illinois at Urbana-Champaign and two research institutes in Luleå in Sweden identified hundreds of bacteria species in saliva taken from infants whose teeth were still erupting, including those that are involved in the formation of biofilm and ECC. The disease, which usually occurs in primary teeth between birth and six years of age, has turned out to be one of the most prevalent infectious diseases in US children in recent years. According to National Institutes of Health figures, 42 per cent of children between the ages of 2 and 11 have had decay in their primary teeth.

The results from the study, proving that infants are infected with oral pathogens even before they develop primary teeth, could mean new strategies for preventing caries in children, the researchers said.

“We want to characterize the microbiological evolution that occurs in the oral cavity between birth and tooth eruption, as teeth erupt, and as dietary changes in nutrient profile,” said Kelly Swanson, lead researcher and Associate Professor of Animal and Nutritional Sciences.

Pediatric dentistry experts currently recommend stopping bottle-feeding infants at 14 months and regularly cleaning gums with a cloth or special toothbrush.