

Saraswati Dental College, Faizabad Road, Lucknow

Science Update Notice Board

May – July 2015

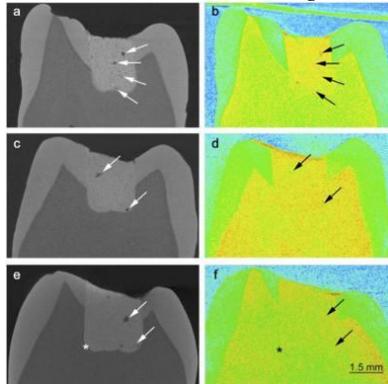
1. New research into materials for tooth fillings.
2. BPA harms dental enamel in young animals, mimicking human tooth defect.
3. The harmful effects of Monosodium Glutamate (MSG).

<http://www.medicalnewstoday.com/releases/290685.php>

New research into materials for tooth fillings

12 March 2015

Tooth decay is a serious health problem and it is often necessary to repair cavities. Today they often use a composite filling material made of acrylic compounds, as it resembles the colour of the teeth and is reasonably strong so it can handle the rigors of the powerful chewing movements. But composite filling materials have some disadvantages and now researchers are working on an interdisciplinary collaboration between physicists and dentists to develop a material comprised of **glass ionomer cement**. The results are published in the scientific journal, *Scientific Reports*.



On the left are X-rays of teeth with fillings of glass ionomer cement. The images show how porous the cement is. On the right are images of the same teeth using neutron scattering. Here you can see if pores are filled with liquid.

Amalgam, also called silver amalgam filling, is a reasonably strong material, but the disadvantage of silver amalgam is that they contain mercury, which can poison the environment. So they have mostly moved away from silver amalgam. Today, composites are usually used, but one of the drawbacks of many composites is that the fillings need to be replaced more frequently in patients that have a tendency to get many cavities. Another drawback is that composite materials require the use of an adhesive to bond the filling to the tooth and this makes the filling process more vulnerable. An interdisciplinary team of researchers decided therefore to develop a new alternative mercury-free material - glass ionomer cement.

"Glass ionomer cement has the advantage that it does not need an intermediate layer of adhesive to bond to the tooth and it also has the interesting property in that it releases fluoride, which of course helps to prevent cavities (caries). The material also has good biological properties, while it is almost as strong. Our research therefore focuses on understanding the connection between the microstructure of the material and its strength in order to improve its properties," explains Ana Benetti, dentist and researcher at the Odontological Institute at the University of Copenhagen.

Glass ionomer cement also has the property that when pulverised, it can be mixed with a liquid by hand without the use of special equipment and the material does not need to be illuminated with a lamp to harden (this is necessary for composite materials). This is a great advantage in remote areas without electricity like in Africa, China or South America.

Different mixing methods

The researchers studied two kinds of glass ionomer cement. The cement itself is the same, but a mix of acids was blended into one of them. They used two different kinds of liquids to mix the cement powder up, either ordinary water or water mixed with an acidic mixture. The question now was whether it was best to mix the acid up with the cement powder or with the water? They now carried out a series of experiments where they not only studied the cement, but also studied them as fillings inserted into teeth, i.e. teeth that had been pulled out and were no longer sitting in anyone's mouth.

"First, we took X-rays of the teeth with the cement fillings. They show the structure of the material. Glass ionomer cement is porous and you can get an accurate image in 3D, which shows the microstructure," explains Heloisa Bordallo, Associate Professor and Materials Researcher at the Niels Bohr Institute at the University of Copenhagen.

Heloisa Bordallo explains that it is ok for the material to be porous, but it is not ok for there to be liquid in the pores as it can make it easier for the fillings to break. So the next thing they did was take pictures with neutron scattering. Neutrons are good at showing where there are hydrogen atoms, which are found in all liquids. Studies complement each other

Both the X-ray and neutron experiments were carried out at the Helmholtz-Zentrum facilities in Berlin in collaboration with Markus Strobl, a materials researcher at the European Spallation Source and Affiliated Professor at the Niels Bohr Institute at the University of Copenhagen.

By comparing X-rays with neutron images, they could now see whether the pores were dry or filled with liquid. It is not just the number of pores that determine the strength of a material. The strength or weakness lies in how the liquid moves around or attaches to the material itself. So the researchers repeated the experiments at research facilities in England and France over the course of many days in order to follow the chemical reactions that took place during the hardening. "Experiments showed that the combination where the acid is mixed up in the cement, so you only have to add water to the cement powder is the weakest material. You get the strongest material by having cement powder mixed with water that has had acid added to it. So it is better to have the acid in the water - it helps to bind the liquid faster and stronger to the cement and there is less water in the pores," explains Heloisa Bordallo. There is still too much loose liquid in the pores, so now the research is continuing with new mixtures where they will try adding natural minerals to the cement.

.....

QUOTE OF THE DAY

*You can't do it unless you can imagine it.
.... George Lucas*

<http://www.medicalnewstoday.com/releases/290580.php>

BPA harms dental enamel in young animals, mimicking human tooth defect

A tooth enamel abnormality in children, Molar Incisor Hypomineralization (MIH), may result from exposure to the **industrial chemical Bisphenol A (BPA)**, authors of a new study conclude after finding similar damage to the dental enamel of rats that received BPA. The study results were presented at the Endocrine Society's 97th Annual Meeting in San Diego. "Human enamel defects may be used as an early marker of exposure to BPA and similar-acting endocrine disruptors," Babajko said.

BPA is an endocrine disruptor, or hormone-altering chemical, that has been linked to numerous adverse health effects in humans. It appears in many plastic and resin household products and food containers, including until recently baby bottles, sippy cups and infant formula packages.

Dental enamel is the hard covering protecting the teeth. MIH causes white or brown opaque spots on an affected child's permanent first molars and incisors, which become sensitive, painful and prone to cavities. Recent published data show that MIH affects up to 18% of children ages 6-9 years. Although the cause is unclear, it appears to have an environmental origin.

In first part of the study, Sylvie Babajko, PhD, a researcher at the French National Institute of Health and Medical Research (INSERM) in Paris, and her colleagues gave rats low doses of BPA, comparable to exposure in humans. The rats received BPA from fetal life to 30 days after birth. She said BPA caused enamel defects similar to MIH in humans, especially in male rats.

In part 2 of the study, the investigators cultured and looked at rat ameloblast cells, which are present only during the formation of tooth enamel, called amelogenesis. In humans, amelogenesis takes place from the third trimester of fetal development to 3 or 4 years after birth. This cell-based experiment showed that sex hormones target and influence dental epithelial cells.

"Our study shows, for the first time, that **BPA affects dental cells**, and subsequently **enamel synthesis**, using similar target molecules as those present in other organs," Babajko said. She explained that these molecules are receptors for sex steroid hormones involved in organ development, endocrine homeostasis and hormone-sensitive cancers. Babajko reported that an increase in estrogen activity had a greater effect on the tooth enamel in male rats than in female rats. This finding suggests possible sexual differences in enamel quality.

QUOTE OF THE DAY

Believe you can and you're halfway there.

Theodore Roosevelt

<http://www.rediff.com/getahead/report/health-the-harmful-effects-of-monosodium-glutamate/20150605.htm>

The harmful effects of Monosodium Glutamate (MSG)

June 08, 2015

Recently, many states in India banned *Maggi* because of high levels of lead and MSG found in some samples. But do you know how MSG affects your health?

MSG, popularly known as **Ajinomoto**, which is added to food to give it flavor, has been around for 100 years now. But only in the last few years have we woken up to its ill-effects. Yet, it has managed to stay on in the food market under different names.

Its supporters felt that this was a racist attack on an oriental food choice since it is widely used in Chinese cooking. Research studies have sometimes been against it and sometimes for it, and sometimes ambivalent. According to the latter, MSG may not affect the whole population, but only individuals who are susceptible to it, whether it's a headache, or an asthma attack. Some believe it all depends on how much you use in your cooking, others want it right off our tables. Yet, a lot of people will mourn its loss if it goes off the table because it adds a rare rounded flavor to food that would otherwise be bland.

From stomach upsets to poor circulation, many illnesses have been laid at the door of MSG:

Headaches

The first adverse reaction to MSG was from those who believed that eating oriental food flavored lavishly with MSG was possibly triggering headaches within an hour of consumption. This was dubbed the '**Chinese restaurant syndrome**'. It could include other distressing symptoms such as light-headedness, constriction in the chest, stomach pain, and a burning sensation. Though there have been research studies that insist that MSG is being unfairly targeted, the conclusion was that even if it was not MSG-induced, these symptoms were caused by MSG's reaction with other food products in the dish. Since research has been inconclusive, food producers across the globe have tried to contain the damage by limiting the amount of MSG they added to foods, mostly packaged foods.

Obesity

Research on mice has conclusively proved that there is a connection between MSG consumption and obesity. This was true of both genders, but especially evident in male mice. Obesity was not controlled even with exercise, indicating that MSG was affecting fat storage in the body. It also seemed to interfere with fat loss in cells, as if it was trapping fat in the body. **There is a tendency to overeat when MSG is added**, even in groups with less calorie intake. This could **be due to effect of MSG on the hormone leptin**, which is involved with fat release and satiation and hunger signals. However, again, there are studies that do not attribute weight gain to MSG.

Cancer

Alarm bells over the MSG-cancer link first went off in India because of the high incidence of stomach cancer among heavy MSG consumers. Even worse, it was found that MSG interfered with the work of certain anti-oxidants needed to fight cancer. This is a very disturbing connection because the presence of MSG in the food of cancer patients would severely limit their treatment and recovery. The opinion on this is divided, like all things that have to do with MSG. While international anti-cancer organisations have given MSG consumption the green signal, hotels in India reportedly limit the use of MSG because of its possible link to stomach cancers.

Asthma attacks

Here, too, research is not conclusive. But MSG is indicated as a trigger in those prone to asthma attacks. The attack may not happen immediately after consumption and may take up to six hours or more, which could explain why many people don't make the connection between the food and the attack. Also, even though other nations use MSG in their cooking, there seems to be more of a reaction when the recipe is Asian. This gives rise to the possibility that other ingredients in the food interacting with MSG may be triggering the asthma attack.

Fertility

In research done on rats it was found that MSG affected male fertility. In female rats also it seemed to interfere with ova and follicle releases, and fertility was disrupted. Even as early as the 1970s, research indicated MSG was involved in pregnancy failures in those with high MSG consumption.

QUOTE OF THE DAY

What is right is not always popular,
and what is popular is not always right.

Albert Einstein