Testing toothpastes, toothbrushes

Improving dental hygiene products through virtual brushing

Designing toothpastes and toothbrushes is a time-consuming process involving the production and testing of numerous samples. Using a new type of simulation, various parameters such as bristle shape and abrasive particle size can be modified with just a click. This enables manufacturers to improve the quality of new dental care products and bring them to market more quickly.

When we wake up in the morning, there is a fur-like coating on our teeth. This is a biological film that forms overnight. Over time, this can lead to the development of caries—which is why it is critical that we remove this “rug” using a toothbrush.

There is a large selection of dental hygiene products on the market, including brushes whose bristles are rounded, pointed, hard, and soft. There are also brushes with bristles of varying lengths. Until now, to determine which ones clean the most thoroughly while doing as little damage to the tooth enamel as possible, manufacturers have had to conduct experiments. This was also the case when selecting the right abrasive particles to be used in toothpastes.

Various toothpaste formulations had to be mixed and then tested on artificial tooth enamel models—a laborious task. Another drawback to this approach is that the brush, paste and enamel can be analyzed only as a complete system, which means that manufacturers have a difficult time determining which effects observed in these experiments are derived from which of the various parameters.

Help has arrived in the form of a new type of simulation developed by researchers at the Fraunhofer Institute for Mechanics of Materials IWM in Freiburg, Germany. “With our procedure, manufacturers of dental hygiene products can determine the cleaning effectiveness of each individual parameter in a fast, economical and reliable manner,” says IWM scientist Dr. Christian Nutto. “Unlike in real-world experiments, the individual parameters in the simulation can be easily modified—be it the size, shape and quantity of abrasive particles in a toothpaste, or the material from which they are made, or the shape and elasticity of the bristles.”

Simulated tooth brushing

Researchers can increase the scope of the experiments far beyond what is possible in real-world testing, and that makes a noticeable difference in the quality of the products. What effects do the shape and stiffness of the bristles have when brushing? How do the different abrasives or toothpaste viscosity affect the enamel, and how do they affect their intended target, the biofilm on the teeth? Simulation testing can deliver reliable answers to questions such as these, and it does so long before the manufacturer ever mixes the toothpaste.

Nutto relies on SimPARTIX® simulation software developed at the IWM, which uses the Smoothed Particle Hydrodynamics (SPHD) particle simulation method. “We specify characteristics for the abrasive particles such as density, shape and fill factor,” he says. Even parameters for the tooth enamel are included. The virtual toothbrush bristle is then rubbed over the tooth enamel, with the simulation providing data on how the scrubbing particles interact with the elastic bristle. It also calculates cleaning effectiveness, as well as the aggressiveness of the abrasives against the tooth enamel. Here, the team from the Powder Technology, Fluid Dynamics group can vary the speed at which the bristles pass as the enamel as well as their pressing force. The SimPARTIX team, together with the Fraunhofer Institute for Algorithms and Scientific Computing SCAI, designed an additional software tool to integrate the particle simulation into standardized simulation programs.

But do the findings correspond to reality? The comparative experiments were conducted by Dr. Andreas Kiesow and his staff at the Fraunhofer Institute for Microstructure of Materials and Systems IMWS in Halle as well as at the MikroTribologie Centrum µTC in Karlsruhe. In the tests, a brush bristle was placed in a fastener and brushed at a constant speed across an artificial tooth enamel model onto which toothpaste 1. The toothpaste was stirred and then applied to the specimen. The simulation results were compared to real-world experiments.

“SimPARTIX has already been successfully used in more than 100 toothpaste products,” reported Dr. Ralf Dittrich, a scientist at the Fraunhofer IWM. “We plan to continue developing this technology.”

Downtown Pittsburgh to host ADHA Center for Lifelong Learning

Some 2,000-plus attendees are expect to ADHA CEO Ann Battrell, MSDH. “All of our attendees benefit from not just the education but the experience, the networking, the engagement. They have the opportunity to interact with their peers, corporate sponsors and mentors in the field to build their knowledge in oral health and create new career opportunities.”

To learn more about the ADHA’s CLL at the j3rd Annual Session, you can visit www.adha.org/annual-session.
Barrier protection critical with any dental-care glove

While caring for their patients, dental and health care professionals are constantly exposed to bodily fluids that may carry viruses and other infectious agents. It is therefore critical that the gloves these professionals use provide the best possible barrier protection.

Natural rubber latex is effective
Many types of gloves are available today, but it is important to know that not all gloves have the same barrier capability, depending on the type of material used.

For example, natural rubber latex gloves have long been acknowledged for their very effective barrier properties, while non-latex gloves, such as vinyl (polyvinyl chloride), have inferior barrier capability as has been shown by numerous studies.

Other synthetic gloves, such as nitrile and polyisoprene, perform much better than vinyl but are more costly, especially polysynthetic gloves. Using gloves with inferior barrier capability could expose both the patient and user to harmful infections.

Quality, safety top priorities
Malaysia is the world’s largest medical gloves exporter (latex and nitrile). Both quality and users’ safety are of top priority to the nation’s glove industry. To this end, a quality certification program (the Standard Malaysian Gloves, or the SMG) has currently been formulated for latex examination gloves.

All SMG-certified gloves must comply with stringent technical specifications to ensure the gloves are high in barrier effectiveness, low in protein and low in allergy risks, in addition to having excellent comfort, fit and durability — qualities that manufacturers of many synthetic gloves are trying to replicate.

Natural, sustainable resource
Latex gloves are green products, derived from a natural and sustainable resource, and are environmentally friendly. (You can learn more online by visiting www.smg-gloves.com or www.latexglove.info).

The use of low-protein, powder-free gloves has been demonstrated by many independent hospital studies to markedly reduce the incidence of latex sensitization and allergic reactions in workplaces. Moreover, latex allergic individuals donning non-latex gloves can now work alongside their coworkers wearing the improved low-protein gloves without any heightened allergy concern. However, for latex-allergic individuals, it is still important they use appropriate non-latex gloves, such as quality nitrile and polyisoprene gloves, that provide them with effective barrier protection.

Extensive array of brand, prices
Selecting the right gloves should be an educated consideration to enhance safety of both patients and users.

For decades, gloves made in Malaysia have been synonymous with quality and excellence, and they are widely available in an extensive array of brands, features and prices.

They can be sourced either factory direct (www.mrepr.com/trade and click “medical devices”) or from established dental product distributors in the United States.

(Source: Malaysian Rubber Export Promotion Council)
Protect your game face: A mouthguard PSA

For this year’s National Facial Protection Month (April), five of the nation’s top dental associations joined forces to remind athletes and recreational sports players to wear mouthguards to protect their teeth. Mouthguards are an essential piece of athletic gear and can help prevent serious, painful facial injuries that affect the mouth and teeth.

The dental experts at the Academy for Sports Dentistry (ASD), American Academy of Pediatric Dentistry (AAPD), American Association of Oral and Maxillofacial Surgeons (AAOMS), American Association of Orthodontists (AAO), and the American Dental Association (ADA) urge parents, caregivers, athletes and coaches to be proactive about staying safe by using a mouthguard.

The five associations pooled together the following mouthguard-related statistics to keep in mind as spring sports season begins:

3 – Types of mouthguards: Custom-fitted mouthguards are made by your dentist for you personally. Stock mouthguards come pre-formed and may offer a bulky fit. Boil and bite mouthguards are softened in boiling water and then inserted and allowed to adapt to the shape of your mouth.

5 – The number of top dental associations that encourage athletes and recreational sports players to wear mouthguards to keep their teeth and smiles intact.

7 to 11 – The ages during which children are most vulnerable to sports-related mouth injuries.

60 – The number of times that athletes are more likely to suffer harm to the teeth if they’re not wearing a mouthguard.

All – How many sports during which you should wear a mouthguard. Collision and contact sports may be high-risk for the mouth, but you can still experience a dental injury from other sports such as gymnastics or skating.

New mouthguard has athletes smiling

Keystone Industries, the U.S.-based company that manufacturers some of the world’s top mouthguard products, has launched the latest product in its Pro-Form Mouthguard line — the PF2 mouthguard.

Unlike laminated mouthguard products that require a dentist to custom fit to the patient, the PF2 mouthguard is a do-it-yourself guard that provides an accurate custom fit without any need to take impressions of the teeth.

With the elimination of dentist appointments and impressions, the price of this guard is significantly lower than custom-fit mouthguards while still providing high-impact protection, according to the company. The PF2’s unique design also enables it to be re-fit by the user multiple times.

“Being a leader in this field means we need to set the bar high for new products and innovation,” said Michael Prozzillo, vice president of sales for Keystone. “The PF2 will change the way athletes buy mouthguards, but also how the dentist sells them.” The PF2 mouthguard is available in either black or white. The company reports that there will be bulk purchasing available in the near future, which will include a display piece and literature on the product suited for dental offices.

Multiple color options will also be available soon, similar to the Pro-Form line of color options, according to the company.

Custom fit in less than a minute

“You won’t be able to get ahold of another mouthguard that can be custom fit in under a minute and provide the same beneficial features,” said Derek Keene, Keystone’s vice president of marketing and product development. “We’re excited to watch PF2 take off and provide significant value to our customers and athletes across the country.”

To keep up to date on the PF2 and Keystone, go to www.keystoneindustries.com. You also can follow the company on all the major social media platforms.

(Source: American Association of Oral and Maxillofacial Surgeons)
HUGE SPRING SAVINGS!

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