pH-Telemetry testing

Measuring the cariogenic and erosive potential of foods and food ingredients
The “toothfriendly” properties of foods and other products are determined by standardized in vivo pH-telemetry tests conducted by accredited test facilities. A product is considered “toothfriendly” if it lacks a significant cariogenic and erosive potential in healthy people under usual conditions of use (in vivo).

**Evaluation of the cariogenic potential**

The cariogenic potential of a product is evaluated by measuring the plaque-pH in vivo during and for thirty minutes after consumption of the product using an in-dwelling pH-electrode. Using this method, the product is tested in at least four healthy volunteers two of which have a 3-4 day old plaque and two of which have a 5–7 day old plaque on the electrode which is mounted in a removable, restorative dental device, is surrounded by human enamel, and is facing the sound interdental surface of an adjacent, natural tooth.

The plaque pH curve of a test product is the resultant of at least two measured pH-values per minute. A product is considered to lack a significant cariogenic potential if it does not depress the pH of the interdental plaque below 5.7 by bacterial fermentation, neither during consumption nor during a period of 30 minutes following consumption. The pH curve must clearly show the time of consumption of the test product and the 30-minute period following consumption.

The proper functioning of the plaque-pH-measuring equipment and the plaque metabolism must be checked in each test by rinsing with 10 ml sucrose solution (10%) or by the consumption of a sugar-containing analogue of the test product. This positive control must depress plaque pH to values below 5.

The Toothfriendly label may only be used on products which fulfil the certification criteria. In the case of food products, pH-telemetry testing is at this time the only reliable method to measure the non-cariogenic and non-erosive quality of foods and food ingredients.
Evaluation of the erosive potential

Products suspected of having an erosive potential on dental hard tissue by virtue of their acidic components must be tested as follows. An aqueous solution of the product is made (1 g/15 ml distilled water) and its pH is measured. If the pH-value is below 5.7 or if it is impossible to make an aqueous solution of the product, the following in vivo test must be performed.

Parallel or in addition to the measurement of interdental plaque pH, the pH of oral fluid is recorded during and for at least 15 minutes after consumption of the product using a clean (i.e., plaque-free) electrode. This electrode must either be placed on the buccal surface of either the maxillary canine or first premolar, or it is facing an interproximal space (i.e., is identical with the electrode used for plaque-pH measurement).

For the in vivo test, each product must be tested in at least two volunteers. The results of the measurements must be adequately documented. A product is regarded as not presenting a significant erosive potential if the acid exposure of the plaque-free electrode does not exceed 40 µmol H⁺ x min, established by calculating the area under the curve [acid concentration (in micromols H⁺) x time (in minutes)]. (This value is equivalent to the exposure to a solution of pH 5 for 4 minutes).

Regulatory acceptance

The critical plaque pH value of 5.7 (as determined by the plaque pH-telemetry test) is cited by reference in the US Code of Federal Regulations and the EU Regulation on Nutrition and Health Claims.

Test stations

At present, three University institutes are equipped to perform such tests: the University Witten/Herdecke in Germany, the University of Zurich in Switzerland and the Peking University’s School of Stomatology (Department of Preventive Dentistry). The contact details of these test centers may be obtained from Toothfriendly International.
Toothfriendly labeling

The Toothfriendly logo is a registered trademark which may be used only on confectionery products that have been shown to be toothfriendly, i.e. non-cariogenic and non-erosive, in a standardized pH-telemetry test. The testing requirement guarantees that the Toothfriendly logo appears only on products of consistent high quality in terms of dental safety.

The Toothfriendly label is governed by Toothfriendly International, a non-profit association with seat in Basel, Switzerland.

Manufacturers who wish to use the Toothfriendly logo on the label and in the advertising of their toothfriendly products, must have:

1. Tested their product(s) for “toothfriendliness” at one of the accredited test centers, and
2. Concluded a license agreement with Toothfriendly International for use of the trademark on the label and in the advertising.

How to proceed?

As a first step, kindly submit product information and/or recipe to Toothfriendly International. A pre-screening of the recipe is done free of charge to avoid unnecessary testing cost. Depending upon the case, a full test (4-6 pH-curves) or a shorter follow-up test (2 pH-curves) may be necessary.

If a range of products with different flavors is to be evaluated, one product must be tested in at least four different volunteers and each additional flavor variety in at least two different volunteers. Exceptions to this general requirement for testing may be made for products, which are substantially equivalent, with regard to their fermentability and acidity of their ingredients, to an already tested product of the same manufacturer.

For more information, contact:

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References

- Olofsson M. and Brathall D. (2003). Diet measures for Prevention or Control of Dental Caries. Malmö University, Faculty of Odontology.