



Center of Dental Medicine

Clinic for Preventive Dentistry, Periodontology and Cariology

PD. Dr. F.J. Wegehaupt

**In vitro study of the tooth-to-tooth contact of three powered
toothbrushes provided by Toothfriendly International, CH-4054
Basel**

BAIR X1 PLUS

BAIR X6

BAIR K5

For intramural use only

Confidential



Introduction

The present in-vitro-study of the tooth surface contact of the filaments of three powered toothbrushes was performed in the laboratories of the Clinic for Preventive Dentistry, Periodontology and Cariology of the University of Zurich Center of Dental Medicine under the supervision of PD Dr. F.J. Wegehaupt (Head Division of Preventive Dentistry and Oral Epidemiology). The study was commissioned by Albert Bär, Toothfriendly International, CH-4054 Basel in February 2017.

The assessment of the tooth surface contact of the toothbrush filaments on an automated brushing machine simulating horizontal brushing movements on model teeth is an established method of the laboratories of the Clinic for Preventive Dentistry, Periodontology and Cariology to assess the potential cleaning effect of marketed power toothbrushes. The method is also used when developing new toothbrush designs.

The objective of the study was to measure the contact between the toothbrush bristles and the tooth surface – referred to as “toothbrush-to-tooth contact, (TTC)” – during horizontal movements of four different powered toothbrushes and compare these results with results of different other marketed powered toothbrushes (data from the dissertation: In-vitro-Vergleich von in der Schweiz handelsüblichen elektrischen Zahnbürsten bezüglich Zahnflächenkontaktvermögen, Mathias Allemann, Zürich, 2007).



Material and methods

Powered toothbrushes tested:

BAIR X1 PLUS

BAIR X6

BAIR K5

A photographic documentation of the tested toothbrushes is attached.

Investigation of the contact between the toothbrushes and the tooth surface:

The toothbrushheads were guided over special tooth models with horizontal motions. The tooth surfaces brushed by the toothbrush bristles were measured using planimetric methods.

Test machine: Single-specimen brushing machine

Test parameters: Brushing load: 100 gram
Movement: Horizontal: 30 mm / 2 cycles per min
Brushing time: 30 s (= 1 cycle)

Test models: The model represent a maxillary sextant containing three molars, two premolars and one canine, with the buccal surfaces in one plane and slightly open interdental spaces.

Analysis of results: Before each trial the black model teeth were given a white coating. Tooth areas which were black again after the brushing test were considered to have been touched by the toothbrush bristles and thus potentially cleaned. The buccal were treated with bristles placed on tooth level and perpendicular to the tooth surface. The teeth at the end of the row (i.e. canines and



wisdom teeth) were excluded from the evaluation. A total of 16 teeth (4 teeth on 4 different models) were evaluated for each toothbrush. For the powered toothbrush BAIR K5, intended to be used by children, models simulating the situation in transitional dentition and a periodontitis affected dentition were used.

The cleaning potential of the tested toothbrushes was quantitatively assessed on the scanned-in tooth surfaces with the aid of a computer program using grey scale method.

This test is used to evaluate the cleaning potential of the tested toothbrushes on distinct tooth surfaces i.e. mesial, distal and buccal for horizontal brushing movements.



Results

The results of the quantitative assessment of the respective tooth surface contacts of the four tested brushheads expressed in percent of area of the single tooth surface and listed separately for mesial, buccal and distal surfaces as well as for the total tooth surfaces are given on the respective data sheets of the tested toothbrushes.

The toothbrush BAIR X6 showed very well rounded bristles, while the rounding of the bristles of BAIR X1 PLUS was less perfect. The rounding of the toothbrush bristles of toothbrush BAIR K5 was insufficient.

BAIR K5 showed good results for both approximal (mesial&distal surfaces together) and total cleaning (ranking 3rd in ranking of the marketed powered toothbrushes).

A handwritten signature in blue ink that reads 'F. Wegehaupt'.

PD Dr. F.J. Wegehaupt

Zurich, February 2017

Attached:

Photo documentation of tested toothbrushes

Raw data tables for the tested toothbrushes

Ranking of tested toothbrushes in comparison with other marketed toothbrushes



Photo documentation BAIR X1 PLUS

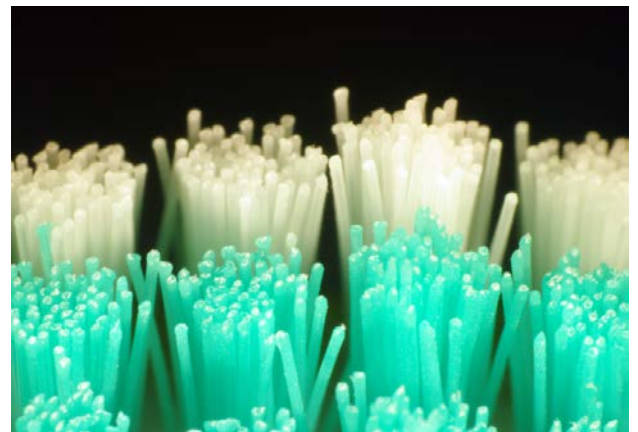
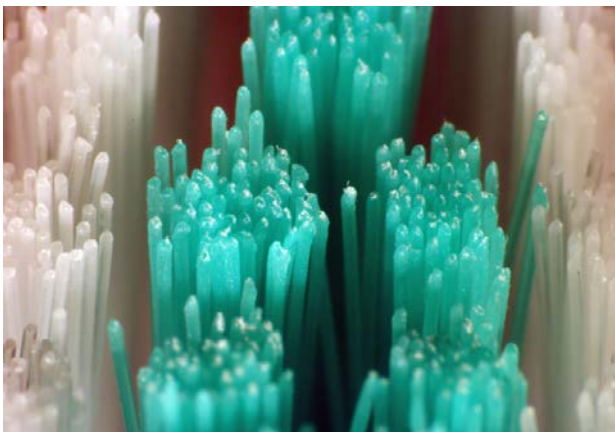




Photo documentation BAIR X6

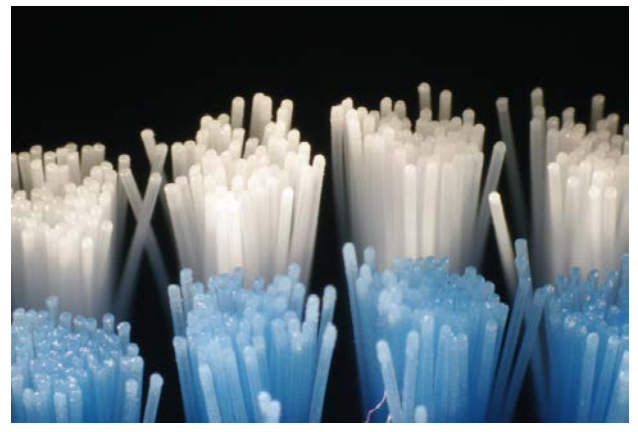
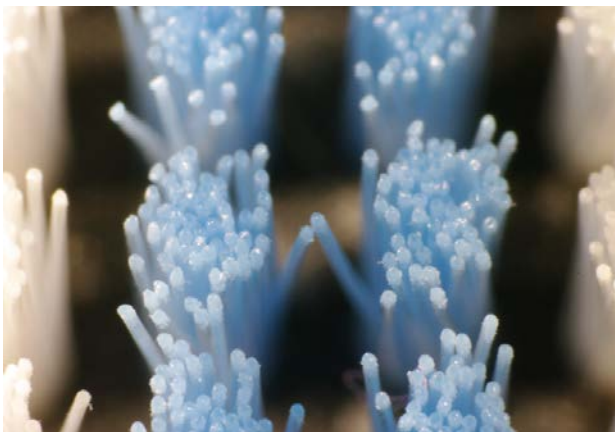
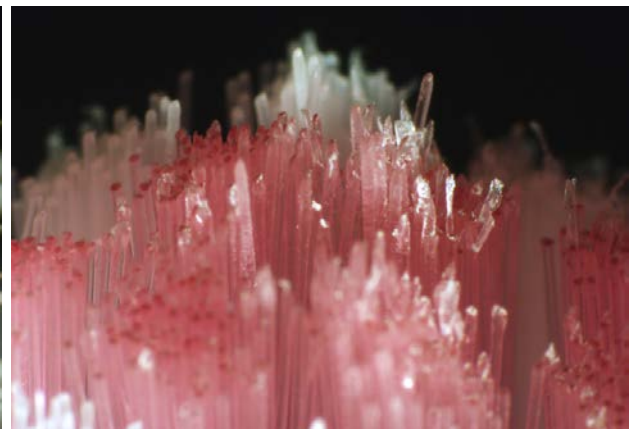





Photo documentation BAIR K5





Raw data table for BAIR X1 Plus:

| | | | |
|--|---|------------------------------|------------|
|  University of Zurich ^{UZH} | Center of Dental Medicine Clinic of Preventive Dentistry, Periodontology and Cariology | Tooth surface contact | |
| | | Brush # | 1486 |
| | | Startdate | 02/03/2017 |
| Confidential! | | | |


| | | | |
|--------------------|--------------|----------------------|----------|
| Pow. handle | BAIR X1 PLUS | | |
| Brush head | BAIR X1 PLUS | | |
| Producer | BAIR_China | Product state | Released |
| Retailer | BAIR_China | User group | Adults |

Test date 02/01/2017 **Load** 100g
Date of validation April 2005
Method Bürstzeit: 30 sek.; Bürstzyklen: 2U/Min.; Zahnbürstenposition: x: 12 mm, y: 58.5 mm
 Planimetr.Auswertung mit Graugrenze, Grenzwert: 107
 Angabe in %

| Modell | | Horizontal movement | | | | Vertical movement | | | | Circular movement | | | |
|----------------------------------|--------|---------------------|--------|--------|--------|-------------------|--------|--------|--------|-------------------|--------|--------|--------|
| | | Zahn 4 | Zahn 5 | Zahn 6 | Zahn 7 | Zahn 4 | Zahn 5 | Zahn 6 | Zahn 7 | Zahn 4 | Zahn 5 | Zahn 6 | Zahn 7 |
| Buccal | 1 | 94.68 | 80.20 | 93.77 | 96.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 66.92 | 92.06 | 88.44 | 92.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 55.75 | 91.66 | 88.47 | 97.55 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 92.72 | 90.31 | 94.45 | 96.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Distal | 1 | 12.22 | 0.00 | 6.88 | 4.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 8.49 | 18.49 | 0.25 | 7.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 0.17 | 6.55 | 3.87 | 10.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 62.61 | 5.52 | 0.51 | 18.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mesial | 1 | 17.75 | 1.16 | 25.62 | 3.55 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 3.98 | 10.17 | 1.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 13.81 | 12.60 | 10.37 | 29.63 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 38.68 | 61.27 | 37.43 | 10.26 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total | 1 | 61.29 | 44.93 | 56.43 | 52.94 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 40.78 | 53.85 | 57.69 | 51.74 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 31.47 | 49.36 | 55.61 | 57.76 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 70.88 | 61.01 | 62.42 | 56.27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mean of 4 models each | Buccal | 77.52 | 88.56 | 91.29 | 95.47 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Distal | 20.88 | 7.64 | 2.88 | 9.96 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Mesial | 18.56 | 21.30 | 18.75 | 10.86 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | M + D | 19.72 | 14.47 | 10.81 | 10.41 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Total | 51.11 | 52.29 | 58.04 | 54.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mean of 4 teeth in 4 models each | Buccal | 88.21 | | | | 0.00 | | | | 0.00 | | | |
| | Distal | 10.34 | | | | 0.00 | | | | 0.00 | | | |
| | Mesial | 17.37 | | | | 0.00 | | | | 0.00 | | | |
| | M + D | 13.86 | | | | 0.00 | | | | 0.00 | | | |
| | Total | 54.03 | | | | 0.00 | | | | 0.00 | | | |



Raw data table for BAIR X6:

| | | |
|--|------------------------------|------------|
|  University of Zurich ^{UZH} Center of Dental Medicine Clinic of Preventive Dentistry, Periodontology and Cariology | Tooth surface contact | |
| | Brush # | 1488 |
| | Startdate | 02/15/2017 |
| | Confidential! | |

| | | | |
|--------------------|------------|----------------------|----------|
| Pow. handle | BAIR X6 | Product state | Released |
| Brush head | BAIR X6 | User group | Adults |
| Producer | BAIR_China | | |
| Retailer | BAIR_China | | |


Test date 02/15/2017 **Load** g
Date of validation
Method Bürstzeit: 30 Sek.; Bürstzyklen: 2U/Min.; Zahnbürstenposition: x: 12 mm, y: 67.0mm
 Planimetr.Auswertung mit Graugrenze, Grenzwert: 107
 Angabe in %

| Modell | Horizontal movement | | | | Vertical movement | | | | Circular movement | | | | |
|----------------------------------|---------------------|--------------|--------|--------|-------------------|-------------|--------|--------|-------------------|-------------|--------|--------|------|
| | Zahn 4 | Zahn 5 | Zahn 6 | Zahn 7 | Zahn 4 | Zahn 5 | Zahn 6 | Zahn 7 | Zahn 4 | Zahn 5 | Zahn 6 | Zahn 7 | |
| Buccal | 1 | 92.37 | 93.79 | 81.08 | 81.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 82.17 | 79.34 | 72.98 | 78.30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 76.81 | 87.96 | 73.70 | 84.54 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 81.13 | 73.52 | 86.63 | 87.57 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Distal | 1 | 5.12 | 15.35 | 0.48 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 7.78 | 13.65 | 0.00 | 0.52 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 0.69 | 11.97 | 0.00 | 0.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 0.45 | 9.50 | 0.00 | 0.69 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mesial | 1 | 25.56 | 32.57 | 45.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 4.66 | 6.93 | 5.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 12.70 | 6.43 | 6.63 | 16.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 16.03 | 6.25 | 20.88 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total | 1 | 60.01 | 62.54 | 54.09 | 43.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 49.46 | 45.39 | 48.15 | 42.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 42.11 | 47.10 | 45.26 | 45.32 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 43.47 | 40.02 | 53.85 | 45.31 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mean of 4 models each | Buccal | 83.13 | 83.66 | 78.61 | 82.88 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Distal | 3.52 | 12.62 | 0.12 | 0.34 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Mesial | 14.74 | 13.05 | 19.58 | 4.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | M + D | 9.13 | 12.84 | 9.85 | 2.25 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Total | 48.77 | 48.77 | 50.34 | 44.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mean of 4 teeth in 4 models each | Buccal | 82.07 | | | | 0.00 | | | | 0.00 | | | |
| | Distal | 4.15 | | | | 0.00 | | | | 0.00 | | | |
| | Mesial | 12.89 | | | | 0.00 | | | | 0.00 | | | |
| | M + D | 8.52 | | | | 0.00 | | | | 0.00 | | | |
| | Total | 48.01 | | | | 0.00 | | | | 0.00 | | | |





Raw data table for BAIR K5 (transitional dentition):

| | | | |
|---|---|------------------------------|------------|
|  University of Zurich^{UZH} | Center of Dental Medicine Clinic of Preventive Dentistry, Periodontology and Cariology | Tooth surface contact | |
| | | Brush # | 1485 |
| | | Startdate | 02/03/2017 |
| Confidential! | | | |

| | | | |
|--------------------|----------------------------------|----------------------|----------|
| Pow. handle | BAIR K5 Children (Wechselgebiss) | | |
| Brush head | BAIR K5 Children (Wechselgebiss) | | |
| Producer | BAIR_China | Product state | Released |
| Retailer | BAIR_China | User group | Children |


Test date 02/02/2017 **Load** 100g
Date of validation April 2005
Method Bürstzeit: 30 Sek.; Bürstzyklen: 2U/Min.; Zahnbürstenposition: x: 12 mm, y: 58.5 mm
 Planimetr.Auswertung mit Graugrenze, Grenzwert: 107
 Angabe in %

| Modell | Horizontal movement | | | | Vertical movement | | | | Circular movement | | | | |
|----------------------------------|---------------------|--------------|--------|--------|-------------------|-------------|--------|--------|-------------------|-------------|--------|--------|------|
| | Zahn 3 | Zahn 4 | Zahn 5 | Zahn 6 | Zahn 3 | Zahn 4 | Zahn 5 | Zahn 6 | Zahn 3 | Zahn 4 | Zahn 5 | Zahn 6 | |
| Buccal | 1 | 98.89 | 96.37 | 99.86 | 98.89 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 99.20 | 99.71 | 93.39 | 97.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 96.16 | 99.06 | 94.00 | 94.71 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 99.64 | 99.27 | 96.84 | 92.25 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Distal | 1 | 53.28 | 6.60 | 28.31 | 13.58 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 49.73 | 59.75 | 4.34 | 0.32 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 59.78 | 61.52 | 1.46 | 74.64 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 18.16 | 39.58 | 13.72 | 75.94 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mesial | 1 | 62.62 | 62.69 | 19.61 | 41.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 87.26 | 56.98 | 24.17 | 88.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 24.12 | 29.31 | 48.99 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 74.53 | 44.19 | 43.71 | 0.73 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total | 1 | 88.76 | 78.84 | 74.09 | 73.65 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 91.66 | 82.67 | 68.45 | 79.91 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 83.38 | 77.61 | 68.83 | 76.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 85.96 | 76.99 | 74.64 | 75.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mean of 4 models each | Buccal | 98.48 | 98.61 | 96.02 | 95.74 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Distal | 45.24 | 41.87 | 11.96 | 41.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Mesial | 62.14 | 48.30 | 34.12 | 32.71 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | M + D | 53.69 | 45.08 | 23.04 | 36.92 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Total | 87.44 | 79.03 | 71.51 | 76.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mean of 4 teeth in 4 models each | Buccal | 97.21 | | | | 0.00 | | | | 0.00 | | | |
| | Distal | 35.05 | | | | 0.00 | | | | 0.00 | | | |
| | Mesial | 44.32 | | | | 0.00 | | | | 0.00 | | | |
| | M + D | 39.68 | | | | 0.00 | | | | 0.00 | | | |
| | Total | 78.56 | | | | 0.00 | | | | 0.00 | | | |





Raw data table for BAIR K5 (periodontitis affected dentition):

| | | | |
|---|---|------------------------------|------------|
|  University of Zurich^{UZH} | Center of Dental Medicine Clinic of Preventive Dentistry, Periodontology and Cariology | Tooth surface contact | |
| | | Brush # | 1484 |
| | | Startdate | 02/03/2017 |
| Confidential! | | | |

| | | | |
|--------------------|--------------------------------|----------------------|----------|
| Pow. handle | BAIR K5 children (Paro-Gebiss) | | |
| Brush head | BAIR K5 children (Paro-Gebiss) | | |
| Producer | BAIR_China | Product state | Released |
| Retailer | BAIR_China | User group | Children |

Test date 02/02/2017 **Load** g
Date of validation April 2005
Method Bürstzeit: 30 Sek.; Bürstzyklen: 2U/Min.; Zahnbürstenposition: x: 12 mm, y: 58.5 mm
 Planimetr.Auswertung mit Graugrenze, Grenzwert: 107
 Angabe in %

| Modell | Horizontal movement | | | | Vertical movement | | | | Circular movement | | | | |
|----------------------------------|---------------------|--------------|--------|--------|-------------------|-------------|--------|--------|-------------------|-------------|--------|--------|------|
| | Zahn 3 | Zahn 4 | Zahn 5 | Zahn 6 | Zahn 3 | Zahn 4 | Zahn 5 | Zahn 6 | Zahn 3 | Zahn 4 | Zahn 5 | Zahn 6 | |
| Buccal | 1 | 97.35 | 95.57 | 97.47 | 86.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 98.58 | 98.35 | 96.86 | 95.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 98.38 | 100.00 | 97.79 | 96.46 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 99.56 | 99.97 | 95.57 | 98.23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Distal | 1 | 26.81 | 27.29 | 14.19 | 1.23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 40.57 | 42.42 | 2.62 | 18.93 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 38.12 | 61.54 | 15.49 | 14.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 36.61 | 26.46 | 11.49 | 22.64 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mesial | 1 | 54.63 | 75.24 | 59.78 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 56.10 | 58.73 | 42.96 | 4.48 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 60.44 | 27.48 | 50.84 | 24.34 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 60.30 | 71.78 | 60.61 | 16.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total | 1 | 73.47 | 75.03 | 69.36 | 46.57 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | 77.03 | 74.71 | 69.52 | 57.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3 | 73.68 | 70.50 | 71.30 | 56.78 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4 | 73.20 | 73.82 | 70.85 | 59.97 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mean of 4 models each | Buccal | 98.47 | 98.48 | 96.93 | 94.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Distal | 35.53 | 39.43 | 10.95 | 14.30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Mesial | 57.87 | 58.31 | 53.55 | 11.61 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | M + D | 46.70 | 48.87 | 32.25 | 12.95 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Total | 74.35 | 73.52 | 70.26 | 55.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mean of 4 teeth in 4 models each | Buccal | 97.02 | | | | 0.00 | | | | 0.00 | | | |
| | Distal | 25.05 | | | | 0.00 | | | | 0.00 | | | |
| | Mesial | 45.34 | | | | 0.00 | | | | 0.00 | | | |
| | M + D | 35.19 | | | | 0.00 | | | | 0.00 | | | |
| | Total | 68.31 | | | | 0.00 | | | | 0.00 | | | |





Ranking of tested toothbrushes:

Ranked by total-values

ADULT

| Power handle | Brush head | Performance level | mesial (%) | bukkal (%) | distal (%) | m & d (%) | total (%) |
|---|-----------------------------|-------------------|--------------|--------------|--------------|--------------|--------------|
| Broxodent Power+ | BROXO Original-Universell | step 3 (max) | 64.44 | 90.01 | 67.42 | 65.93 | 78.82 |
| Sonicare Advance 4002 | HX4002/20 Medium | only one | 44.39 | 92.86 | 43.90 | 44.14 | 70.57 |
| BAIR X5 Children | | step 1 | 45.34 | 97.02 | 25.05 | 35.19 | 68.31 |
| Broxodent 2000 | BROXO Original-Universell | step 3 (max) | 33.07 | 88.99 | 22.60 | 27.84 | 61.00 |
| Oral-B Professional Care 9500 DLX | Pro Bright EB 18 | clean | 21.05 | 85.74 | 12.58 | 16.81 | 54.17 |
| BAIR X1 PLUS | | clean | 17.37 | 88.21 | 10.34 | 13.86 | 54.03 |
| Sonicare Elite e9000 Serie | Mini-Bürstenkopf | maximum | 14.66 | 87.50 | 6.67 | 10.67 | 52.22 |
| Sonicare Elite 7000 | HX7002/20 | maximum | 20.93 | 82.89 | 10.29 | 15.61 | 51.89 |
| BAIR X6 | | Clean | 12.89 | 82.07 | 4.15 | 8.52 | 48.01 |
| Oral-B Professional Care 9500 (Triumph) | MicroPulse EB 25 | clean | 5.10 | 74.55 | 1.43 | 3.26 | 41.60 |
| Oral-B Sonic complete | CrissCross/Power Tip | clean | 3.88 | 70.57 | 0.36 | 2.12 | 38.75 |
| Oral-B Vitality Sonic | Flexi Soft EB 17-2 | only one | 4.33 | 68.41 | 2.48 | 3.41 | 38.40 |
| Nais DentaCare Sonodent | Float-Brush EW0920 | maximum | 10.54 | 61.71 | 6.65 | 8.60 | 37.14 |
| Waterpik SenSonic SR-801 | Model SRBL-21 (klein) | maximum | 8.90 | 62.82 | 4.95 | 6.92 | 36.91 |
| Oral-B Professional Care 8500 | Flexi Soft EB 17-2 | maximum | 3.36 | 64.48 | 1.27 | 2.32 | 35.64 |
| Candida Expert Flexible | FLEXIBLE-Bürstenkopf | Active setting | 12.82 | 53.86 | 8.76 | 10.79 | 34.04 |
| Trisa Sonicpower | Klickbürste | only one | 13.23 | 49.01 | 8.73 | 10.98 | 31.44 |
| Waterpik SenSonic SR-800 | Model SRBL-21 (gross) | maximum | 0.36 | 56.43 | 0.31 | 0.34 | 30.26 |
| Philips Sensiflex 2000series | oszillierend mit Active Tip | maximum | 0.78 | 50.35 | 1.28 | 1.03 | 27.42 |
| Blend-a-dent Medic Control | blend-a-dent MEDIC soft | only one | 1.86 | 37.18 | 0.89 | 1.37 | 20.40 |
| Waterpik Synchro Sonic | Model SRBL-21 (gross) | maximum | 1.42 | 33.93 | 0.50 | 0.96 | 18.64 |
| Oral-B Vitality Precision Clean | CrissCross/Power Tip | only one | 0.63 | 26.43 | 0.06 | 0.35 | 14.35 |
| Intronic Sonic | Intronic-Aufsteckbürste | only one | 0.03 | 4.92 | 0.19 | 0.11 | 2.67 |



CHILDREN

| Power handle | Brush head | Performance level | mesial (%) | bukkal (%) | distal (%) | m & d (%) | total (%) |
|---------------------------|---------------------------|--------------------------|-------------------|-------------------|-------------------|----------------------|------------------|
| Sonicare Advance 4002 | 5-row small US commercial | only one | 50.42 | 98.86 | 39.89 | 45.16 | 73.99 |
| BAIR K5 Children | | step 1 | 44.32 | 97.21 | 35.05 | 39.68 | 78.56 |
| Trisa Sonic power KID | Trisa Sonic power KID | only one | 28.34 | 95.39 | 29.71 | 29.03 | 74.09 |
| Philips Sonicare For Kids | Philips Sonicare For Kids | only one | 23.14 | 83.72 | 12.15 | 17.65 | 63.05 |

Ranking of the three tested powered toothbrushes and other marketed powered toothbrushes according to their cleaning potential (%) of the total tooth surfaces (last column). The tested toothbrushes are marked in red. Higher values indicates a better cleaning potential.



Ranking of tested toothbrushes:

Ranked by m&d-values

ADULT

| Power handle | Brush head | Performance level | mesial (%) | bukkal (%) | distal (%) | m & d (%) | total (%) |
|---|-----------------------------|--------------------|--------------|--------------|--------------|--------------|--------------|
| Broxodent Power+ | BROXO Original-Universell | Stufe 3 (max) | 64.44 | 90.01 | 67.42 | 65.93 | 78.82 |
| Sonicare Advance 4002 | HX4002/20 Medium | einzig | 44.39 | 92.86 | 43.90 | 44.14 | 70.57 |
| BAIR X5 Children | | Stufe 1 | 45.34 | 97.02 | 25.05 | 35.19 | 68.31 |
| Broxodent 2000 | BROXO Original-Universell | Stufe 3 (max) | 33.07 | 88.99 | 22.60 | 27.84 | 61.00 |
| Oral-B Professional Care 9500 DLX | Pro Bright EB 18 | Clean | 21.05 | 85.74 | 12.58 | 16.81 | 54.17 |
| Sonicare Elite 7000 | HX7002/20 | maximal | 20.93 | 82.89 | 10.29 | 15.61 | 51.89 |
| BAIR X1 PLUS | | Clean | 17.37 | 88.21 | 10.34 | 13.86 | 54.03 |
| Trisa Sonicpower | Klickbürste | einzig | 13.23 | 49.01 | 8.73 | 10.98 | 31.44 |
| Candida Expert Flexible | FLEXIBLE-Bürstenkopf | Active-Einstellung | 12.82 | 53.86 | 8.76 | 10.79 | 34.04 |
| Sonicare Elite e9000 Serie | Mini-Bürstenkopf | maximal | 14.66 | 87.50 | 6.67 | 10.67 | 52.22 |
| Nais DentaCare Sonodent | Float-Brush EW0920 | maximal | 10.54 | 61.71 | 6.65 | 8.60 | 37.14 |
| BAIR X6 | | Clean | 12.89 | 82.07 | 4.15 | 8.52 | 48.01 |
| Waterpik SenSonic SR-801 | Model SRBL-21 (klein) | maximal | 8.90 | 62.82 | 4.95 | 6.92 | 36.91 |
| Oral-B Vitality Sonic | Flexi Soft EB 17-2 | einzig | 4.33 | 68.41 | 2.48 | 3.41 | 38.40 |
| Oral-B Professional Care 9500 (Triumph) | MicroPulse EB 25 | Clean | 5.10 | 74.55 | 1.43 | 3.26 | 41.60 |
| Oral-B Professional Care 8500 | Flexi Soft EB 17-2 | maximal | 3.36 | 64.48 | 1.27 | 2.32 | 35.64 |
| Oral-B Sonic complete | CrissCross/Power Tip | Clean | 3.88 | 70.57 | 0.36 | 2.12 | 38.75 |
| Blend-a-dent Medic Control | blend-a-dent MEDIC soft | einzig | 1.86 | 37.18 | 0.89 | 1.37 | 20.40 |
| Philips Sensiflex 2000series | oszillierend mit Active Tip | maximal | 0.78 | 50.35 | 1.28 | 1.03 | 27.42 |
| Waterpik Synchro Sonic | Model SRBL-21 (gross) | maximal | 1.42 | 33.93 | 0.50 | 0.96 | 18.64 |
| Oral-B Vitality Precision Clean | CrissCross/Power Tip | einzig | 0.63 | 26.43 | 0.06 | 0.35 | 14.35 |
| Waterpik SenSonic SR-800 | Model SRBL-21 (gross) | maximal | 0.36 | 56.43 | 0.31 | 0.34 | 30.26 |
| Intronic Sonic | Intronic-Aufsteckbürste | einzig | 0.03 | 4.92 | 0.19 | 0.11 | 2.67 |



CHILDREN

| Power handle | Brush head | Performance level | mesial (%) | bukkal (%) | distal (%) | m & d (%) | total (%) |
|---------------------------|---------------------------|-------------------|--------------|--------------|--------------|--------------|--------------|
| Sonicare Advance 4002 | 5-row small US commercial | einzig | 50.42 | 98.86 | 39.89 | 45.16 | 73.99 |
| BAIR K5 Children | | Stufe 1 | 44.32 | 97.21 | 35.05 | 39.68 | 78.56 |
| Trisa Sonic power KID | Trisa Sonic power KID | einzig | 28.34 | 95.39 | 29.71 | 29.03 | 74.09 |
| Philips Sonicare For Kids | Philips Sonicare For Kids | einzig | 23.14 | 83.72 | 12.15 | 17.65 | 63.05 |

Ranking of the three tested powered toothbrushes and other marketed powered toothbrushes according to their cleaning potential (%) of the mesial and distal tooth surfaces (second last column). The tested toothbrushes are marked in red. Higher values indicates a better cleaning potential.

