The Science Behind Sonicare
Notes from Dr. Joerg Strate
Vice President, Philips Oral Healthcare, Clinical & Scientific Affairs

**Philips Sonicare has redefined personal oral hygiene once again**

When we decide to launch a new edition of the clinical proof brochure, the document in your hands, you know we must have a significant reason to do so. Launching two new products and introducing breakthrough technology that’s likely to change our perspective on interdental cleaning are indeed significant accomplishments.

The clinical and scientific research portfolio summarized in this document provides objective and relevant information about our products, and insights into the way we work. Our clinical credibility and commitment to providing patients and dental professionals with the most advanced solutions for home oral healthcare have resulted in global recognition and professional recommendation of Philips Sonicare products. True innovation at Philips Sonicare follows a simple paradigm that integrates the latest scientific knowledge with an in-depth understanding of today’s oral healthcare needs. Adhering to these principles frequently results in solutions and technologies that are ahead of their time, and subsequently lead the industry.

The original Sonicare technology was exactly that type of industry-leading innovation — it defined a new standard for power toothbrushes. Recently, Sonicare For Kids established a unique solution for the specific oral healthcare needs of children. Now the new Sonicare DiamondClean takes our ambition to the next level with the best clinical performance of any Sonicare to date, thanks to its unique brush head and ergonomic handle design.

The requirements for our latest innovation, the entirely new Philips Sonicare AirFloss, could not be matched by existing concepts — we had to invent them. The result is a unique device that impresses equally with its convenience of use and its clinical efficacy, which could not exist without the unprecedented AirFloss microburst technology invented by Philips engineers.

When you read the following pages, I hope you will agree with me that Sonicare DiamondClean and AirFloss represent a significant next step toward even better, more intuitive solutions for daily oral hygiene — exactly what Philips Sonicare is all about.
Plaque Removal

in vivo study

Comparison of Plaque Removal by Philips Sonicare DiamondClean and Oral-B Triumph®


Objective
To compare the plaque removal efficacy and safety of two power toothbrushes: Philips Sonicare DiamondClean and Oral-B Triumph with FlossAction brush head.

Methodology
One-hundred four healthy adults, aged 18-65 were enrolled in a randomized, single-blind, cross-over design, ethics-approved clinical trial (67 females, 37 males; mean age 37 years). Eligible subjects were non-smokers who were routine manual toothbrush users with a minimum plaque score of 1.8 (Lobene and Soparker Modified Quigley and Hein) following 24hrs (+/-4) plaque accumulation. Enrolled subjects were randomized and dispensed appropriate products for a familiarization period of three days, followed by manual toothbrush use for a three-day wash-out. Subjects returned to clinic following 24hr (+/-4) plaque accumulation and received a pre-brushing plaque assessment by a blinded examiner; followed by supervised brushing with the assigned power toothbrush, and a post-brushing plaque examination. Subjects were then dispensed the alternate power toothbrush per randomization and followed the same home-use procedure of power toothbrush familiarization followed by manual toothbrush wash-out. Subjects presented to clinic for their final study visit with 24hr (+/-4) plaque accumulation and underwent ‘pre’ plaque exam followed by product use and ‘post’ plaque exam. Subjects were then dismissed from the study.

Results
Philips Sonicare DiamondClean was statistically significantly superior to Oral-B Triumph in reducing surface plaque overall, (p-value 0.0059), and in hard-to-reach posterior interproximal areas, (p-value 0.0048). Both products were safe for use.

Conclusion
Philips Sonicare DiamondClean removed significantly more plaque than Oral-B Triumph when assessed over the entire dentition, as well as in hard-to-reach areas.
% of Plaque Reduction

- Overall: Sonicare 82%, Oral-B 79.5%
- Anterior: Sonicare 88.2%, Oral-B 86.3%
- Posterior: Sonicare 77.2%, Oral-B 74.3%
- Interproximal: Sonicare 81.2%, Oral-B 78.8%
- Posterior Interproximal: Sonicare 76.5%, Oral-B 73.6%
Plaque Removal

in vivo study

Comparison of plaque removal by Philips Sonicare DiamondClean and Oral-B Pulsonic


Objective
To compare the plaque removal ability of Sonicare DiamondClean to Oral-B Pulsonic (S26.523.3) and Oral-B Pulsonic Slim (S15.513.2).

Methodology
Fifty healthy adults completed a randomized, cross-over design study to evaluate the plaque removal effects of brushing in a single-use model with Sonicare DiamondClean, Oral-B Pulsonic and Oral-B Pulsonic Slim. Eligible subjects were randomized to a sequence of product home use for familiarization followed by a manual toothbrush wash-out. Subjects were to brush for two minutes, twice daily, for each brushing encounter. Compliance was tracked by subjects in a home-use diary. For the efficacy evaluation, subjects presented to clinic with 24 hours of plaque accumulation and were dispensed a new brush head for use in a supervised brushing encounter by clinic staff per the randomization assignment. Plaque was assessed before and after the supervised brushing encounter using the Turesky-Modified Quigley-Hein Plaque Index by a blinded examiner. Safety was assessed by intra-oral examination.

Conclusion
Philips Sonicare DiamondClean removed statistically significantly more plaque than Oral-B Pulsonic and Oral-B Pulsonic Slim overall and in all sub-regions of the mouth (p<0.001). Both products were safe for use.
Plaque Removal

Plaque removal efficacy of two novel Philips Sonicare DiamondClean brush heads


Objective
To evaluate the plaque removal efficacy and safety of the Philips Sonicare DiamondClean standard and compact brush heads, the Sonicare ProResults brush head and a manual toothbrush.

Methodology
A randomized, examiner-blinded, parallel-design study was conducted in a population of 106 healthy adults (81 females, 25 males) aged 18-60 years (mean age: 37) who have been using Philips Sonicare FlexCare with ProResults brush head at home for technique familiarization. These subjects presented to the clinic with 24 (+/- 4) hours of plaque growth and were randomized to use one of the four different test devices. The test devices were ProResults standard brush head, Sonicare DiamondClean standard or compact brush head and ADA reference manual toothbrush. To assess single-use efficacy in plaque removal, plaque scores were assessed before and after brushing using the Turesky-Modified Quigley-Hein Plaque Index. Safety was assessed in an oral soft tissue examination.

Results
Sonicare DiamondClean brush head (standard and compact) removed significantly more plaque than a manual toothbrush overall and in all other regions, including hard-to-reach areas. Sonicare DiamondClean compact brush head removed 100% more plaque in hard-to-reach areas than a manual toothbrush. All products were safe for use.

Conclusion
Both Sonicare DiamondClean brush heads (standard and compact) were found to remove significantly more plaque than a manual toothbrush.
<table>
<thead>
<tr>
<th>Region</th>
<th>Device</th>
<th>Mean plaque reduction scores</th>
<th>Performance improvement vs Sonicare ProResults (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>Sonicare DiamondClean Compact</td>
<td>1.29</td>
<td>45%</td>
</tr>
<tr>
<td></td>
<td>Sonicare DiamondClean Standard</td>
<td>1.19</td>
<td>33%</td>
</tr>
<tr>
<td></td>
<td>Sonicare ProResults Standard</td>
<td>0.89</td>
<td></td>
</tr>
</tbody>
</table>

% of Plaque Reduction

- Overall: 44% Manual, 41% Sonicare Compact, 50% Sonicare Standard
- Anterior: 26% Manual, 32% Sonicare Compact, 40% Sonicare Standard
- Posterior: 23% Manual, 38% Sonicare Compact, 38% Sonicare Standard
- Interproximal: 20% Manual, 37% Sonicare Compact, 34% Sonicare Standard
- Posterior Interproximal: 18% Manual, 34% Sonicare Compact, 34% Sonicare Standard
Gingivitis Reduction and Plaque Removal

in vivo study

Effect of Philips Sonicare AirFloss on interproximal plaque and gingivitis

J Dent Res 90 (spec iss A), 2011

Objective
Philips Sonicare AirFloss is a rechargeable interproximal cleaning device that uses micro-droplets of water accelerated by pressurized air to clean between teeth. The objective of this study was to evaluate the effect of Sonicare AirFloss on interproximal plaque and gingivitis when used in addition to manual toothbrushing.

Methodology
One hundred forty-eight adults (98 females, 50 males; mean age 39.5 years) with moderate gingivitis participated in this single-blind, four-week, parallel, randomized controlled clinical trial. Ethical approval and written informed consent were obtained. Subjects were randomized either to a manual toothbrush (two minutes, twice a day) or to a manual toothbrush (two minutes, twice a day) plus Sonicare AirFloss (once daily, evening). Changes in gingival inflammation were measured using the Gingival Bleeding Index (GBI) at baseline, two weeks and four weeks. The amount of interproximal plaque was evaluated by analyzing the residual protein concentration (RPC) of six plaque samples collected from four posterior sextants (one interproximal site per sextant) and two anterior sextants (three interproximal sites per sextant). Baseline plaque samples were collected prior to any intervention. At two weeks, the plaque removal efficacy from a single use of Sonicare AirFloss was assessed by collecting interproximal plaque samples immediately after subjects used their assigned treatment regimen. Safety of the products was assessed through oral examination, prior to all other assessments.

Results
Sonicare AirFloss, when used in addition to a manual toothbrush, provided significantly greater reductions in gingivitis and bleeding sites (p<0.01) than a manual toothbrush alone. After four weeks, Sonicare AirFloss reduced gingival bleeding by 75% more and the number of bleeding sites by 86% more than a manual toothbrush alone. Interproximal plaque evaluated after a single use showed that Sonicare AirFloss removed significantly more plaque than a manual toothbrush alone (p<0.01). Both products were safe to use.
Conclusion  Sonicare AirFloss, when used in addition to manual brushing, removed significantly more interproximal plaque and resulted in significantly greater reductions of gingivitis after two weeks and four weeks of use, compared to manual brushing alone.

Gingival Bleeding Index

Bleeding Sites
Interproximal Plaque (RPC)

Sonicare AirFloss and Manual Toothbrush vs Manual Toothbrush

Mean Residual Protein Concentration (µg/ml)

- Baseline (Before Use)
- After Single Use
- Difference Before/After
Plaque Removal

*in vivo study*

Comparison of plaque removal by novel Philips Sonicare sensitive brush head and a manual toothbrush


**Objective**
To evaluate the plaque removal efficacy and safety of the Sonicare sensitive brush head and a manual toothbrush.

**Methodology**
A randomized, examiner-blinded, parallel-design study was conducted in a population of 60 healthy adults (45 females, 15 males) aged 18-63 years (mean age: 39.4) who have been using Philips Sonicare FlexCare with ProResults brush head at home for technique familiarization. These subjects presented to the clinic with 24 (+/- 4 hours of plaque growth and were randomized to use one of the two test devices. The test devices were Sonicare sensitive brush head and ADA reference manual toothbrush. To assess single-use efficacy in plaque removal, plaque scores were assessed before and after brushing using the Turesky-Modified Quigley-Hein Plaque Index. Safety was assessed in an oral soft tissue examination.

**Results**
The Sonicare sensitive brush head removed significantly more plaque than a manual toothbrush overall and in all sub regions, including hard-to-reach areas. The Sonicare sensitive brush head removed 54% more plaque overall than a manual toothbrush. Both products were safe for use.

**Conclusion**
The Sonicare sensitive brush head was found to remove significantly more plaque than a manual toothbrush when assessed over the entire dentition (overall) as well as in hard-to-reach areas.

![Plaque Reduction Chart](chart.png)
Plaque Removal

*in vivo* study

Comparison of plaque removal by Sonicare FlexCare and Sonicare Elite


Objective

To compare the plaque removal efficacy of the Sonicare FlexCare and Sonicare Elite power toothbrushes.

Methodology

Eighty-nine healthy adults aged 19-64 years, participated in a single-blind, randomized, crossover-design study assessing the plaque removal efficacy and safety of the Sonicare FlexCare and Sonicare Elite power toothbrushes. Each toothbrush was used for one week at home for familiarization. At the end of each period, subjects presented with 24 hours of plaque accumulation and then had an assessment of plaque using the Turesky-Modified Quigley-Hein Plaque Index before and after a two-minute supervised brushing with the assigned toothbrush. Safety was assessed in oral soft tissue examinations prior to all assessments of plaque.

Results

Sonicare FlexCare removed significantly more plaque than Sonicare Elite from the dentition overall (p=0.0039) as well as in hard-to-reach areas, i.e., the posterior teeth (p=0.0182) and the interproximal spaces (p=0.0003). Both brushes were safe to use.

Conclusion

Sonicare FlexCare was found to remove significantly more plaque than Sonicare Elite when assessed over the entire dentition (overall) as well as in hard-to-reach areas.

![Graph showing plaque reduction](image-url)
Plaque Removal

*in vivo study*

Comparison of plaque removal by Sonicare FlexCare and Oral-B Triumph®

Schaeken M, Sturm D, Master A, Jenkins W, Schmitt P.A. randomized, single-use study to compare the plaque removal ability of two power toothbrushes, the Sonicare FlexCare and the Oral-B Triumph Professional Care 9000. *Compend Contin Educ Dent.* 2007;28 (suppl 1):29-34

**Objective**

To compare the plaque removal efficacy of the Sonicare FlexCare and Oral-B Triumph toothbrushes.

**Methodology**

Ninety-one healthy subjects, aged 18-53 years participated in a single-blind, randomized, crossover-design study to assess the plaque removal efficacy and safety of the Sonicare FlexCare (ProResults brush head) and Oral-B Triumph (FlossAction brush head) power toothbrushes. Each toothbrush was used for one week at home for familiarization. At the end of each period, subjects presented with 24 hours plaque using the Turesky-Modified Quigley-Hein Plaque Index before and after a two-minute supervised brushing session with the assigned toothbrush. Safety was assessed in oral soft tissue examinations prior to all assessments of plaque.

**Results**

Sonicare FlexCare removed significantly more plaque than Oral-B Triumph from the dentition overall (p<0.0001) as well as in hard-to-reach areas, i.e., the posterior teeth (p<0.0001) and the interproximal spaces (p<0.0001). Both toothbrushes were safe to use.

**Conclusion**

Sonicare FlexCare was found to remove significantly more plaque than Oral-B Triumph when assessed over the entire dentition (overall) as well as in hard-to-reach areas.

![Bar chart showing plaque reduction](image)
Plaque Removal

in vivo study

Comparison of plaque removal by Sonicare FlexCare and Oral-B Triumph®


Objective
To compare the plaque removal efficacy of the Sonicare FlexCare and Oral-B Triumph toothbrushes.

Methodology
Ninety-three healthy subjects, aged 18-60 years, participated in a single-blind, randomized, crossover-design study to assess the plaque removal efficacy and safety of the Sonicare FlexCare (ProResults brush head) and Oral-B Triumph (FlossAction brush head) power toothbrushes. Each toothbrush was used for one week at home for familiarization. At the end of each period, subjects presented with 24 hours plaque and were assessed using the Turesky-Modified Quigley-Hein Plaque Index before and after a two-minute supervised brushing session with the assigned toothbrush. Safety was assessed in oral soft tissue examinations prior to all assessments of plaque.

Results
Sonicare FlexCare removed significantly more plaque than Oral-B Triumph from the dentition overall (p<0.0001) as well as in hard-to-reach areas, i.e., the posterior teeth (p<0.0001) and the interproximal spaces (p<0.0001). Both toothbrushes were safe to use.

Conclusion
Sonicare FlexCare was found to remove significantly more plaque than Oral-B Triumph when assessed over the entire dentition (overall) as well as in hard-to-reach areas.

% of Plaque Reduction

<table>
<thead>
<tr>
<th></th>
<th>Overall (p&lt;0.0001)</th>
<th>Posterior (p&lt;0.0001)</th>
<th>Interproximal (p&lt;0.0001)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sonicare FlexCare</td>
<td>36%</td>
<td>34%</td>
<td>38%</td>
</tr>
<tr>
<td>Oral-B Triumph®</td>
<td>30%</td>
<td>29%</td>
<td>26%</td>
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</tbody>
</table>
Plaque Removal

*in vivo study*

**Comparison of plaque removal by Sonicare FlexCare and Oral-B Sonic Complete®**


**Objective**
To compare the plaque removal efficacy and safety of the Sonicare FlexCare and Oral-B Sonic Complete power toothbrushes.

**Methodology**
One hundred forty-one healthy adults aged 19-65 years, participated in a single-blind, randomized, parallel group clinical study assessing the plaque removal efficacy and safety of the Sonicare FlexCare and Oral-B Sonic Complete power toothbrushes. Each toothbrush was used for two minutes, twice daily for one week at home for familiarization. At the end of this period, subjects presented with 24 hours of plaque accumulation, then had plaque assessment using Turesky-Modified Quigley-Hein Plaque Index before and after a two-minute supervised brushing with the assigned toothbrush. Safety was assessed in oral soft tissue examinations prior to all assessments of plaque.

**Results**
Sonicare FlexCare removed significantly more plaque than Oral-B Sonic Complete from the dentition overall (p=0.0071) as well as in hard-to-reach areas, i.e., the posterior teeth (p=0.0027) and the interproximal spaces (p=0.0042). Both brushes were safe to use.

**Conclusion**
Sonicare FlexCare was found to remove significantly more plaque than Oral-B Sonic Complete when assessed over the entire dentition (overall) as well as in hard-to-reach areas.

![Graph showing plaque reduction for Sonicare FlexCare and Oral-B Sonic Complete®](image_url)
Plaque Removal

in vivo study

Comparison of plaque removal by Sonicare FlexCare and Rota-dent® One Step


Objective
To compare the plaque removal efficacy of the Sonicare FlexCare and Rota-dent One Step toothbrushes.

Methodology
Thirty-two healthy subjects, aged 21-60 years, participated in a single-blind, randomized, crossover-design study to assess the plaque removal efficacy and safety of the Sonicare FlexCare (ProResults brush head) and Rota-dent One Step (hollow brush head) power toothbrushes. Each toothbrush was used for one week at home for familiarization. At the end of each period, subjects presented with 24 hours plaque. Plaque was assessed using the Turesky-Modified Quigley-Hein Plaque Index before and after a two-minute supervised brushing session with the assigned toothbrush. Safety was assessed in oral soft tissue examinations prior to all assessments of plaque.

Results
Sonicare FlexCare removed significantly more plaque than Rota-dent One Step from the dentition overall (p<0.0001) as well as in hard-to-reach areas, i.e., the posterior teeth (p<0.0001) and the interproximal spaces (p<0.0001). Both toothbrushes were safe to use.

Conclusion
Sonicare FlexCare was found to remove significantly more plaque than Rota-dent One Step when assessed over the entire dentition (overall) as well as in hard-to-reach areas.

<table>
<thead>
<tr>
<th>% of Plaque Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall (p&lt;0.0001)</td>
</tr>
<tr>
<td>Posterior (p&lt;0.0001)</td>
</tr>
<tr>
<td>Interproximal (p&lt;0.0001)</td>
</tr>
</tbody>
</table>

45% 30% 29% 42% 24%
Plaque Removal

*in vivo study*

Comparison of plaque removal for one minute brushing by Sonicare FlexCare and a manual toothbrush


Objective
To compare the plaque removal efficacy and safety of the Sonicare FlexCare and a manual toothbrush when used for one minute of brushing.

Methodology
Thirty-five healthy adults aged 19-65 years, participated in a single-blind, randomized, crossover-design study assessing the plaque removal efficacy and safety of the Sonicare FlexCare and a manual toothbrush (Oral-B P-35). Subjects were trained on usage in a one minute session per encounter (15 seconds per quadrant, four times daily). Each toothbrush was used for one week at home for familiarization. At the end of each period, subjects presented with 24 hours of plaque accumulation and then had an assessment of plaque using the Turesky-Modified Quigley-Hein Plaque Index before and after a one minute supervised brushing with the assigned toothbrush. Safety was assessed in oral soft tissue examinations prior to all assessments of plaque.

Results
Sonicare FlexCare removed significantly more plaque than the manual toothbrush from the dentition overall (p=0.0166) as well as in hard-to-reach areas, i.e., the interproximal spaces (p=0.0014). Both toothbrushes were safe to use.

Conclusion
Sonicare FlexCare was found to remove significantly more plaque than a manual toothbrush when used for one minute brushing when assessed over the entire dentition (overall) as well as in the hard-to-reach areas.
Plaque Removal

*in vivo study*

**Comparison of plaque removal in orthodontic subjects by Sonicare FlexCare and a manual toothbrush**


**Objective**

To compare the plaque removal and gingivitis reduction ability for the Sonicare FlexCare (ProResults brush head) and Oral-B P-40® manual toothbrush in orthodontic population.

**Methodology**

Ninety-five healthy orthodontic subjects aged 12 years and older participated in a single-blind, randomized, parallel group clinical study assessing gingivitis and plaque over time for the Sonicare FlexCare and a manual toothbrush. All subjects were routine manual toothbrush users. At Visit 1, subjects were screened for eligibility (Modified Bonded Bracket Index (BBI) >2.0; Pocket depth ≤ 4mm). At Visit 2, subjects received a prophylaxis and were randomized to a treatment arm. Subjects were trained and given brushing instructions to use the assigned test device twice daily at home for two minutes. Subjects abstained from oral hygiene for 12-24 hours before each visit. At subsequent visits, safety and BBI were assessed before and after a two minute supervised brushing. Secondary efficacy measurements included Turesky-Modified Quigley-Hein Plaque Index (TPI) on tooth surfaces without brackets and a full-mouth Löe and Silness Gingival Index (LSGI). ANOVA was used for statistical analysis.

**Results**

The Sonicare FlexCare demonstrated superior plaque reduction in a single brushing on the buccal (bracketed) surfaces assessed by the Bonded Bracket Index compared to a manual toothbrush at the two-week and four-week evaluations (overall p<0.0001 at two weeks, p<0.0001 at four weeks).

The Sonicare FlexCare demonstrated significantly superior reduction in plaque over time (two and four weeks) on the lingual surfaces assessed by the Turesky-Modified Quigley-Hein Plaque Index compared to a manual toothbrush (overall p=0.0221 at two weeks and p=0.0025 at four weeks).

The Sonicare FlexCare demonstrated significantly superior plaque reduction in a single brushing on the lingual surfaces assessed by the Turesky-Modified Quigley-Hein Plaque Index compared to a manual toothbrush at the two-week and four-week evaluations (overall p=0.0001 at two weeks, overall p<0.0001 at four weeks).

The mean scoring Löe and Silness Gingival Index value was low (1.14, std 0.10) indicating that the population presented with healthy gingivae. Both groups, however, were able to demonstrate statistically significant improvement vs. baseline over time (overall p<0.0001).
Conclusion

Sonicare FlexCare removed significantly more plaque than a manual toothbrush in a single brushing at two and four weeks on teeth with and without orthodontic brackets. Both toothbrushes were safe for use on oral soft tissues and orthodontic brackets.
Sonicare FlexCare / FlexCare+

**Percent Reduction Turesky Plaque Index Single Brushing Lingual Surfaces at 2 Weeks**

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Posterior</th>
<th>Interproximal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>% of Plaque Reduction</strong></td>
<td>31%</td>
<td>23%</td>
<td>29%</td>
</tr>
</tbody>
</table>

**Percent Reduction Turesky Plaque Index Single Brushing Lingual Surfaces at 4 Weeks**

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Posterior</th>
<th>Interproximal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>% of Plaque Reduction</strong></td>
<td>32%</td>
<td>24%</td>
<td>29%</td>
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</table>

**Reduction in Mean Turesky Plaque Index Over Time**

<table>
<thead>
<tr>
<th></th>
<th>Screening</th>
<th>Week 2</th>
<th>Week 4</th>
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<tbody>
<tr>
<td><strong>Mean TPI Plaque Values</strong></td>
<td>3.41</td>
<td>2.93</td>
<td>2.96</td>
</tr>
<tr>
<td></td>
<td>3.44</td>
<td>3.22</td>
<td>3.37</td>
</tr>
</tbody>
</table>
Plaque Removal

in vivo study

Plaque removal efficacy of "new" vs. "old" Philips Sonicare ProResults brush heads


Objective
To compare the plaque removal efficacy and safety of an "old" (used for three months) Philips Sonicare ProResults brush head to a "new" ProResults brush head.

Methodology
A randomized, examiner-blinded, parallel-design study was conducted in a population of 72 healthy adults (56 females, 16 males) aged 18-60 years (mean age: 35) who were using Philips Sonicare FlexCare with ProResults brush head at home for three months, +/- 10 days. Following the three-month home-use period, subjects presented to the clinic with 24 hours of plaque growth and were randomized to utilize either a newly dispensed ProResults brush head or their home-use ProResults brush head from the preceding three-month period. Randomization was stratified by the pre-brushing plaque score (< 2.7 or ≥ 2.7) in an effort to mitigate treatment effect bias. A single-use pre and post-use plaque score was evaluated for each subject utilizing the Turesky-Modified Quigley-Hein Plaque Index. Safety was assessed in an oral soft tissue examination.

Results
A newly dispensed Philips Sonicare ProResults brush head removed more plaque than the brush head used at home for a three-month period for overall dentition and specifically in hard-to-reach areas. Both products were safe to use.

Conclusion
A new Philips Sonicare ProResults brush head is clinically proven to remove up to 28% more plaque as compared to a brush head that has been used for three months.
Plaque Removal
in vivo study

Comparison of plaque removal by Sonicare HealthyWhite, Oral-B® Pulsonic® and Crest Spinbrush® Pro Clean Sonic toothbrushes

Objective To compare the plaque removal ability of the Sonicare HealthyWhite to the Oral-B Pulsonic and Crest Spinbrush Pro Clean Sonic toothbrushes after a two-minute brushing.

Methodology Fifty-four healthy adults aged 19-55 years participated in a single-blind, randomized, crossover-design study assessing the plaque removal efficacy and safety of three power toothbrushes. Each toothbrush was used for three days for familiarization followed by four days of manual toothbrush use (for wash out) at home (twice daily for two minutes). At the end of each period, subjects presented with 24 (+/- 3) hours of plaque accumulation and then had an assessment of plaque using the Turesky-Modified Quigley-Hein Plaque Index before and after a two-minute supervised brushing with the assigned toothbrush. Safety was assessed in oral soft tissue examinations prior to all assessments of plaque.

Results Sonicare HealthyWhite removed significantly more plaque than Oral-B Pulsonic and Crest Spinbrush Pro Clean Sonic from the dentition overall (p<0.0001) as well as in all sub-regions of the mouth (p<0.0001), i.e., the posterior teeth (p<0.0001) and the interproximal spaces (p<0.0001). All brushes were safe to use.

Conclusion Sonicare HealthyWhite was found to remove significantly more plaque than Oral-B Pulsonic and Crest Spinbrush Pro Clean Sonic when assessed over the entire dentition (overall) as well as in hard-to-reach areas.
Percent Plaque Reduction, Sonicare HealthyWhite vs. Oral-B Pulsonic and Crest Spinbrush Pro Clean Sonic

<table>
<thead>
<tr>
<th>Area</th>
<th>Sonicare HealthyWhite</th>
<th>Oral-B Pulsonic</th>
<th>Crest Spinbrush Pro Clean Sonic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>63% (p&lt;0.0001)</td>
<td>50%</td>
<td>45% (p&lt;0.0001)</td>
</tr>
<tr>
<td>Anterior</td>
<td>73% (p&lt;0.0001)</td>
<td>50%</td>
<td>45% (p&lt;0.0001)</td>
</tr>
<tr>
<td>Posterior</td>
<td>61% (p&lt;0.0001)</td>
<td>50%</td>
<td>44% (p&lt;0.0001)</td>
</tr>
<tr>
<td>Interproximal</td>
<td>64% (p&lt;0.0001)</td>
<td>53%</td>
<td>44% (p&lt;0.0001)</td>
</tr>
<tr>
<td>Posterior</td>
<td>57% (p&lt;0.0001)</td>
<td>50%</td>
<td>47% (p&lt;0.0001)</td>
</tr>
</tbody>
</table>

Percent Plaque Reduction, Sonicare HealthyWhite vs. Oral-B Pulsonic and Crest Spinbrush Pro Clean Sonic.
Plaque Removal

in vivo study

Plaque removal efficacy of a Sonicare Elite in periodontal maintenance patients compared to a manual toothbrush


Objective
To compare the plaque removal efficacy of Sonicare Elite and a manual toothbrush in a periodontal maintenance population.

Methodology
Forty-two periodontal maintenance patients were enrolled in this randomized, controlled, single-blind crossover study. Participants were assigned to either a manual toothbrush or Sonicare Elite and used each product for a period of 12 weeks. Patients returned to their regular oral hygiene regimen for a period of two weeks before brushing with the second assigned product for another 12 weeks. Prior to entering each of the study periods, participants received a professional polish and brushing instructions. Full-mouth plaque scores (Silness & Löe, 1973, six surfaces per tooth) were taken at 8 and 12 weeks.

Results
The mean value for the Plaque Index (PI) after eight weeks of use was 0.93 for the manual brush and 0.19 for Sonicare Elite. The respective values after 12 weeks were 0.90 and 0.14. The differences found after 8 weeks (0.74; p<0.001) and 12 weeks (0.76; p<0.001) were statistically highly significant in favor of the Sonicare Elite.

Conclusion
Sonicare Elite was significantly more effective than a manual toothbrush at removing supragingival plaque in a periodontal maintenance population after 8 and 12 weeks.
Plaque Removal

*in vivo study*

**Comparison of plaque removal by Sonicare Xtreme e3000 Series and a manual toothbrush in preteens and teens aged 9-17 years**


**Objective**
To compare the plaque removal efficacy of the Sonicare Xtreme and manual toothbrush in subjects aged 9-17 years.

**Methodology**
Thirty-nine healthy subjects, aged 9-17 years, participated in an IRB-approved single-blind, randomized, parallel-design study assessing plaque removal ability of Sonicare Xtreme and manual toothbrush. Each toothbrush was used for one week at home for familiarization. Subjects presented with 24 hours of plaque accumulation. Before and after a two-minute supervised brushing, plaque was assessed using the Turesky-Modified Quigley-Hein Plaque Index. In addition, measurements of toothbrush safety on oral tissues were performed by documenting the presence or absence of spontaneous bleeding and by using Miller's Tooth Mobility Index to assess teeth mobility.

**Results**
Preteens and teens removed more overall plaque using Sonicare Xtreme than with manual toothbrush (*p*=0.0044). Both toothbrushes were safe and gentle on oral tissues when assessed for spontaneous bleeding and teeth mobility.

**Conclusion**
Sonicare Xtreme was found to remove significantly more plaque than manual toothbrush in preteens and teens. It is also proven safe and gentle on oral tissues.

![Graph showing plaque reduction](chart.png)
Plaque Removal

*in vivo study*

**Comparison of plaque removal by Sonicare For Kids and a manual toothbrush in children aged 7–10 years**


**Objective**

To compare the plaque removal efficacy and safety of Sonicare For Kids at “high” setting and Oral-B Stages 4® manual toothbrush (MTB) in children aged 7–10 years.

**Methodology**

Fifty-eight healthy children enrolled in and four withdrew from an IRB-approved single-blind, randomized, parallel-design study (totaling 32 females, 22 males; mean age 8.3 years). Informed consent/assent (with parent) was obtained. All subjects abstained from brushing for 26 ± 6 hours prior to examination visits. At Visit 1, subjects were screened for eligibility (Turesky-Modified Quigley-Hein Plaque Index (TPI) >1.8). Eligible subjects were enrolled and instructed on use of both devices (Sonicare For Kids and MTB) in alternating manner at home (twice daily for two minutes) for a one-week familiarization period. At Visit 2, baseline TPI was performed followed by a randomization and supervised two-minute brushing session with the assigned device. Post-brushing TPI scores were then obtained. Safety was assessed in oral soft tissue examinations at Visit 2. ANOVA was used for the primary statistical analysis.

**Results**

Sonicare For Kids removed significantly more plaque than a manual toothbrush from the dentition overall (p=0.0001) as well as in hard-to-reach areas, i.e., the posterior teeth (p=0.0005) and the interproximal spaces (p<0.0001) of children aged 7–10 years. Both toothbrushes were safe to use.

**Conclusion**

Sonicare For Kids was found to remove significantly more plaque than Oral-B Stages 4 manual toothbrush in children aged 7–10 years. It is also proven safe and gentle on oral tissues.
**Plaque Removal**

*in vivo study*

**Comparison of plaque removal by Sonicare For Kids and a Crest battery-powered Spinbrush® for Kids in children aged 7–10 years**


**Objective**

To compare the plaque removal efficacy of Sonicare For Kids at “high” setting and Crest battery-powered Spinbrush for Kids (“dolphin” and “ice cream cone” handle shapes) in children aged 7–10 years.

**Methodology**

Fifty-nine healthy children (mean age 8.5 years) participated in an IRB-approved single-blind, randomized, parallel-design study. Informed consent/assent (with parent) was obtained. Subjects abstained from brushing for 26 ± 6 hours prior to examination visits. At Visit 1, subjects were screened for eligibility (Turesky-Modified Quigley-Hein Plaque Index (TPI) >1.8). They were instructed on use of both devices (Sonicare For Kids and Crest Spinbrush for Kids) in alternating manner at home (twice daily for two minutes) for a one-week familiarization period. At Visit 2, baseline TPI was scored followed by randomization and a supervised two-minute brushing session with the assigned device. Post-brushing TPI scores were then obtained. Safety was assessed in oral soft tissue examinations at Visit 2. ANOVA was used for the primary statistical analysis.

**Results**

Sonicare For Kids removed significantly more plaque than Crest Spinbrush for Kids (“dolphin” and “ice cream cone” handle shapes) from the dentition overall (p<0.0001) as well as in hard-to-reach areas, i.e., the posterior teeth (p=0.0001) and the interproximal spaces (p<0.0001) of children aged 7–10 years. Both toothbrushes were safe to use.

**Conclusion**

Sonicare For Kids was found to remove significantly more plaque than Crest Spinbrush for Kids in children aged 7–10 years. It is also proven safe and gentle on oral tissues.
Sonicare For Kids

% of Plaque Reduction

- Overall
- Anterior
- Posterior
- Interproximal
- Posterior Interproximal

Sonicare For Kids
Crest Spinbrush® - Ice Cream
Crest Spinbrush® - Dolphin

Overall (p<0.0001)
Anterior (p<0.0001)
Posterior (p<0.0001)
Interproximal (p<0.0001)
Posterior Interproximal (p<0.0001)

- Sonicare For Kids
- Crest Spinbrush®
Plaque Removal

*in vivo study*

Comparison of plaque removal by Sonicare For Kids and a manual toothbrush in children aged 4–7 years in a professionally applied toothbrushing study


**Objective**

To compare the plaque removal efficacy of Philips Sonicare For Kids at “high” and “low” settings and Oral-B Stages 3® manual toothbrushes in a professionally applied brushing session simulating one and two minutes of brushing time in children aged 4–7 years.

**Methodology**

Sixty-eight healthy children (38 females, 30 males; mean age 5.3 years) participated in an IRB-approved single-blind, randomized, split-mouth-design study. Informed consent/assent (with parent) was obtained. Subjects were screened for eligibility (Turesky-Modified Quigley-Hein Plaque Index (TPI) >1.8). Eligible subjects were randomized to Sonicare For Kids “high,” Sonicare For Kids “low” and a manual toothbrush by quadrant and were brushed accordingly by clinical hygienists. TPI was scored at one- and two-minute interval equivalents by quadrant by a blinded examiner. Safety was assessed in oral soft tissue examinations. For statistical analysis, MANOVA for a split-mouth-design was applied and P-values were adjusted using the Dunnett-Hsu adjustment.

**Results**

Sonicare For Kids (in “high” and “low” settings) removed significantly more plaque than a manual toothbrush from the dentition overall (p<0.0001) as well as in hard-to-reach areas, i.e., the posterior teeth (p<0.0001) and the interproximal spaces (p<0.0001) at one- and two-minute brushing intervals in children aged 4–7 years with professionally applied brushing sessions. Both toothbrushes were safe to use.

**Conclusion**

Sonicare For Kids was found to remove significantly more plaque than Oral-B Stages 3 manual toothbrush in children aged 4–7 years with professionally applied brushing. It is also proven safe and gentle on oral tissues.
Adjusted Mean Percent Plaque Reduction, Squirt Prototype
7 and 9 Degrees vs. Manual Toothbrush, 1-Minute Equivalent

<table>
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<th>% of Plaque Reduction</th>
<th>Overall (p&lt;0.0001)</th>
<th>Anterior (p&lt;0.0001)</th>
<th>Posterior (p&lt;0.0001)</th>
<th>Interproximal (p&lt;0.0001)</th>
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<td>43% 42%</td>
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Adjusted Mean Percent Plaque Reduction, Squirt Prototype
7 and 9 Degrees vs. Manual Toothbrush, 2-Minute Equivalent

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<td>68% 68%</td>
<td>67% 64%</td>
<td>65% 63%</td>
<td>64% 62%</td>
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Legend:
- Sonicare For Kids - 7 Degrees
- Sonicare For Kids - 9 Degrees
- Manual Toothbrush
Plaque Removal

*in vivo study*

Comparison of plaque removal by Sonicare For Kids and a Colgate® children’s battery toothbrush in children aged 7–10 years


**Objective** To compare the plaque removal efficacy and safety of Philips Sonicare For Kids at “high” setting and Colgate children’s battery toothbrushes (“Shrek” handle design) in children aged 7–10 years.

**Methodology** Sixty-nine healthy children (mean age 8.4 years) participated in an EC-approved single-blind, randomized, parallel-design study. Informed consent/assent (with parent) was obtained. Subjects abstained from brushing for 26 ± 6 hours prior to examination visits. At Visit 2, subjects were screened for eligibility (Turesky-Modified Quigley-Hein Plaque Index (TPI) >1.8). Eligible subjects were instructed on use of both devices (Sonicare For Kids and Colgate children’s battery toothbrush) in alternating manner at home (twice daily for two minutes) for a one-week familiarization period. At Visit 3, baseline TPI was scored followed by randomization and a supervised two-minute brushing session with the assigned device. Post-brushing scores were obtained by scoring TPI. Safety was assessed in oral soft tissue examinations at Visit 3. ANOVA was used for the primary statistical analysis.

**Results** Sonicare For Kids removed significantly more plaque than a Colgate children’s battery toothbrush from the dentition overall (p=0.0003) as well as in hard-to-reach areas, i.e., the posterior teeth (p=0.0037) and the interproximal spaces (p=0.0002) of children aged 7–10 years. Both toothbrushes were safe to use.

**Conclusion** Sonicare For Kids was found to remove significantly more plaque than Colgate children’s battery toothbrush in children aged 7–10 years. It is also proven safe and gentle on oral tissues.
Sonicare For Kids

Overall (p=0.0003)

Anterior (p=0.0002)

Posterior (p=0.0037)

Interproximal (p=0.0002)

Posterior Interproximal

% of Plaque Reduction

- Overall: 66% Sonicare For Kids, 53% Colgate® Battery Toothbrush
- Anterior: 70% Sonicare For Kids, 56% Colgate® Battery Toothbrush
- Posterior: 62% Sonicare For Kids, 51% Colgate® Battery Toothbrush
- Interproximal: 65% Sonicare For Kids, 53% Colgate® Battery Toothbrush
- Posterior Interproximal: 62% Sonicare For Kids, 51% Colgate® Battery Toothbrush