A pilot study on the effect of the ROCS Bionica Sensitive® toothpaste on reducing dentine hypersensitivity

Consumers are increasingly interested in finding more ecological alternatives to various products. This trend is becoming more common in the market for toothpaste as well. The ROCS Bionica Sensitive® toothpaste is a fluoride-free product containing natural ingredients, which reduces dentine hypersensitivity and offers an ecological alternative in oral health promotion. The purpose of the study was to increase knowledge of the effects of the Bionica toothpaste for sensitive teeth on reducing dentine hypersensitivity and to collect user experiences.

Introduction
Short, sharp pain due to dentine hypersensitivity is the most common type of pain in the facial area. Approximately 8 to 50 per cent of the population suffer from dentine hypersensitivity, and 30 to 50 per cent of the adult population suffer from it at some point during their lives. Dentine hypersensitivity is particularly common among adults 20 to 30 and 50 years of age. The areas which are most affected are the facial surfaces of the premolars and canine teeth. (Kontturi-Närhi & Närhi 2007, Walters, P.A. 2005.) Sensitivity to pain varies depending on an individual’s age, gender, overall situation, and earlier experiences. It also depends on each individual’s own psychological and physiological factors and characteristics. Individual characteristics and emotions, such as the degree of fear or anxiety, cultural factors, as well as social effects play a major role in how an individual reacts to pain. (Ricarte et al. 2008.) Pain associated with dentine hypersensitivity is caused in nerve endings inside the tooth and in the fluid circulation of the dentine tubules (Berman, LH. 1985). The generation of the sensation is influenced by temperature changes between cold and hot as well as other reactions (osmosis, electrical current, drying, and chemical reactions). Hypersensitivity is felt as short, sharp pain, which is the response of dentine to a stimulus not caused by other dental damage or illness, such as caries, microleakage, cusp fractures, or pulpitis. For the dentine to start eliciting a pain response, the dentine surface and adjacent dentine tubules should be exposed. The information about pain is transmitted from tissue receptors to the brain through neural pathways, resulting in a sensation of sharp pain in the individual. (Walters, P.A. 2005.)

Factors predisposing an individual to dentine hypersensitivity
Dentine hypersensitivity may be caused by a number of factors, including a toothbrush that is too hard, and forceful or excessive brushing. In particular, the teeth at which brushing is usually begun are subjected to damage caused by brushing. According to studies, a dentine surface which has worn slowly, over the years and layer by layer, is rarely sensitive. Causes of gingival recession also include a thin crown of the tooth at the alveolus, an oral trauma, orthodontics and oral piercings. (West et al. 2012.) Insufficient oral hygiene, periodontal diseases, and osteoporosis have also been associated with dentine hypersensitivity. Erosion caused by external and internal factors also results in wearing of the enamel and dentine. Abrasion, or mechanical wear of the surface of teeth, may be caused by brushing, and attrition is considered to be caused by bruxism, for example. (Gillam 2013, Ricarte et al. 2008.) Procedures performed at the dentist’s office, such as periodontal procedures and dental bleaching may expose the teeth to dentine hypersensitivity (Rösing et al. 2009). The
quality and buffering capability of saliva play an important role in neutralising the environment in the mouth. Enamel wear is considerably less pronounced if saliva contains minerals and if salivation and the buffering capability of saliva are effective. Approximately 10 per cent of the population experience chronic and prolonged dentine hypersensitivity when, for example, the temperature of the environment changes. In cases like this, the treatment response is usually poorer. (West et al. 2012.)

In-home oral care products for sensitive teeth have been found to be the most cost-effective and the easiest way to reduce dentine hypersensitivity. (Walters, 2005.) According to studies, effective compounds reducing dentine hypersensitivity include arginine and calcium carbonate, which together form a desensitising paste called the Pro-Argin technology. Toothpastes containing the Pro-Argin technology have 1,450 ppm of fluoride, which also contributes to reducing sensitivity. (Cummins 2010.) Toothpastes containing strontium are also used in treating sensitive teeth due to strontium’s dentine tubule filling effect (Karim & Gillam 2013). Potassium chloride reduces sensitivity considerably (Silverman et al. 1994; Cummins 2009; Poulsen et al. 2006). A Cochrane library search produced six studies carried out on dentine hypersensitivity using potassium chloride.

**Purpose of the study**

The purpose of the study was to determine how the ROCS Bionica Sensitive® toothpaste impacts the sensitivity of teeth, gingival bleeding (BOP) and plaque in the study subjects. In addition, the aim was to collect customers’ experiences on toothpaste properties. The objective of the study is to offer an ecological alternative in the health promotion work carried out by health care professionals.

The research problems were as follows:

1. What is the effect of the ROCS Bionica Sensitive® toothpaste on the sensitivity of teeth in the study subjects?
2. What is the effect of the ROCS Bionica Sensitive® toothpaste on the gingival bleeding index of the study subjects?
3. What is the effect of the ROCS Bionica Sensitive® toothpaste on the percentage of plaque in the study subjects?
4. What are the study subjects’ experiences of the properties of the ROCS Bionica Sensitive® toothpaste (consistency and appearance, sensations in the mouth, cleaning performance and taste)?

The research material consisted of Subjective Pain Assessment Tools, initial and final examinations to map dentine hypersensitivity, as well as a study subject journal and a completed case history form. The study subjects were recruited by means of an e-mail sent to approximately 2,000 students and faculty members of Turku University of Applied Sciences and Turku Vocational Institute in the autumn of 2013. Fifteen persons were selected in the study, one of whom had to withdraw from the study.

**Research material and methods**

The research material included both quantitative and qualitative material. In the initial examination, each study subject filled in a questionnaire which mapped the nature, duration, and degree of pain and triggers of dentine hypersensitivity. In the final examination, the client filled in the same questionnaire, so that the results of the toothpaste trial period could
be compared to the baseline situation. The qualitative material consisted of a journal kept by each study subject during the study period. The journal provided information on the study subjects’ experiences of, for example, the cleaning performance, taste, consistency and appearance of the toothpaste and its impact on dentine hypersensitivity. A delayed e-mail survey was sent to the study subjects (n=14) four weeks after the final examination. The purpose of the survey was to collect information about any changes in dentine hypersensitivity and the study subjects’ opinions on the Bionica Sensitive® toothpaste after the treatment period. After the study period, the study subjects were free to use any toothpaste they wanted. The forms used in the study were pre-tested, and the methods were calibrated with one study subject. The study was conducted without a control group.

Diagnosis of dentine hypersensitivity

Diagnosing dentine hypersensitivity was a gradual process. (See Figure 1.) A case history form was used to determine each study subject’s general state of health and treatment history (type of pain sensation, identification of the stimulus causing pain, nutrition and diet as well as client’s willingness to seek relief for their problem).

The dental examinations of clients consisted of the elimination of other causes of pain (e.g. caries, microleakage etc.) and a closer inspection of the exposed dentine, as well as the confirmation of the connection between a stimulus and pain sensation. In terms of the study, it was essential that exposed dentine was the source of pain felt by the study subjects. The inclusion criteria in the study was that a minimum of 25% of the study subject’s teeth were sensitive.

The research material was collected by means of a Subjective Pain Assessment Tool, initial and final examinations of dentine hypersensitivity, as well as a journal and a case history form. In the forms used in the clinical study, gingival recession was indicated by means of an illustration, erosion was placed on a scale of 1-3, plaque on a scale of 1-4 and gingival bleeding (BOP) was indicated with Yes/No answers. Sensitivity was registered in the Subjective Pain Assessment Tool for each surface of each tooth.

When determining dentine hypersensitivity, a verbal rating scale (VRS) depicting subjective sensations was used. The study subject evaluated the pain sensation ranging from the worst possible pain to a pain-free experience (0 = no sensation of pain but the stimulus is felt, 1= slight pain during the stimulus, 2 = considerable pain during the stimulus, 3 = considerable pain during the stimulus and 10 seconds after the removal of the stimulus; Ricarte et al. 2008; Gillam & Newman 1993.) The type and duration of pain were also registered. A sharp pain with a distinguishable location was characteristic to pain due to an exposed dentine surface (Kontturi-Närhi & Närhi 2007). Gingival bleeding (BOP, bleeding on probing) was measured on the surfaces of the teeth by means of a periodontal probe. The results received were in a dichotomic form: Yes or No. A percentage of the entire dentition was calculated based on these results. Plaque biofilm, or VPI (Visual Plaque Index), was measured using a periodontal probe and registered in a dichotomic form Yes or No, providing a plaque percentage as the end result (e.g. Nieminen 2008.)

The initial and final examinations were conducted in the same treatment units of the Ruiskatu treatment facility of Turku University of Applied Sciences. All diagnoses were made by three oral hygienist students, who were at the final stages of their studies, under the supervision of instructors and with assistants simultaneously present. The diagnostic tools included an air blast, a WHO periodontal probe, and water rinsing (5 °C). The air blast test
was a one-second air blast on each tooth at a distance of one centimetre. The periodontal probe was scraped against the surface of the tooth to test if irritation was elicited. Water rinsing was carried out with cold water. The client indicated their pain sensation verbally using the scale of 0 to 3. In addition, each client kept a journal to document their pain sensations. Each client and the dental hygienist students together and unanimously determined the presence of dentine hypersensitivity. A decision to participate in the three-week treatment period was made in the same manner.

**Study subject’s history**
- Type of pain (short, sharp, etc.)
- Pain stimulus (temperature, contact, air)
- Study subject’s willingness to participate in the treatment period
- Study subject’s diet (acidic products, fruit, wine, cider etc.)

**Diagnostics**
- Air blast
- Temperature test (ice water)
- VRS (Verbal Rating Scale)
- Journal

**Study subject examination**
- Exclusion of causes other than dentine hypersensitivity
- Examination of the exposed dentine
- Determination of the connection between the stimulus and pain

**Decision on the treatment period**
- Verification of the pain sensation and deciding on the treatment period

Figure 1 Diagnosing dentine hypersensitivity

Instructing study subjects in the care of sensitive teeth

The purpose was to try to reduce and prevent dentine hypersensitivity experienced by the study subjects in various situations. The ROCS Bionica Sensitive® toothpaste was used twice daily during the three-week treatment period in accordance with each study subject’s brushing habits. ROCS Bionica Sensitive® is a special toothpaste intended for sensitive teeth. (See Table 1.) The product does not contain fluoride. The product mainly contains natural ingredients (94.2% natural, 5.8% synthetic compounds which correspond to the compounds normally present in the human body). Liquorice and clove provide anti-inflammatory effects, reduce the activity of harmful bacteria and decrease gingival bleeding. Calcium glycerophosphate and mineral salts of Laminaria Saccharica contribute to preventing caries, activate the metabolism of the dental tissue and reduce sensitivity. Potassium chloride has been observed to reduce the symptoms of dentine hypersensitivity. Water, sorbitol, and glycerin act as moisturising agents. Eucalyptus, clove and liquorice extract give the toothpaste flavor, and sorbitol provides sweetness. (Fatkulina, E. 2014.)
Table 1 Consistency and ingredients of the ROCS Bionica Sensitive® toothpaste (Fatkulina, E. 2014).

<table>
<thead>
<tr>
<th>N O.</th>
<th>Ingredients</th>
<th>Mass fraction, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dicalcium Phosphate Dihydrate</td>
<td>24.0–28.0</td>
</tr>
<tr>
<td>2</td>
<td>Glycerin</td>
<td>10.0–14.0</td>
</tr>
<tr>
<td>3</td>
<td>Sorbitol</td>
<td>10.0–14.0</td>
</tr>
<tr>
<td>4</td>
<td>Silica</td>
<td>4.0–6.0</td>
</tr>
<tr>
<td>5</td>
<td>Potassium Chloride</td>
<td>3.0–5.0</td>
</tr>
<tr>
<td>6</td>
<td>Laminaria Saccharina Salt</td>
<td>2.5–3.5</td>
</tr>
<tr>
<td>7</td>
<td>Xanthan gum</td>
<td>0.9–1.2</td>
</tr>
<tr>
<td>8</td>
<td>Calcium Glycerophosphate</td>
<td>0.9–1.2</td>
</tr>
<tr>
<td>9</td>
<td>Glycyrrhiza Glabra Root Extract</td>
<td>2.0–3.0</td>
</tr>
<tr>
<td>10</td>
<td>Cocamidopropyl Betaine 100%</td>
<td>1.0–2.0</td>
</tr>
<tr>
<td>11</td>
<td>Sodium Benzoate</td>
<td>0.3–0.4</td>
</tr>
<tr>
<td>12</td>
<td>Magnesium Chloride</td>
<td>0.2–0.4</td>
</tr>
<tr>
<td>13</td>
<td>Dipotassium Glycyrrhizate</td>
<td>0.2–0.4</td>
</tr>
<tr>
<td>14</td>
<td>Eugenia Caryophyllus (Clove) Leaf Oil</td>
<td>0.1–0.3</td>
</tr>
<tr>
<td>15</td>
<td>Eucaliptus Globulus Leaf Oil</td>
<td>0.1–0.3</td>
</tr>
<tr>
<td>16</td>
<td>Aqua</td>
<td>Up to 100%</td>
</tr>
</tbody>
</table>

Analysis of the material
The material was analysed quantitatively and qualitatively. Both an Excel spreadsheet and
the SPSS statistics software were used in analysing the results. First, the material was
entered in Excel as a data matrix, after which the data were analysed with the SPSS
software. The t-test was used to compare the initial and final results, and the limit of
statistical significance was p<0.05. The transcribed material from the journals was
qualitatively categorised. The objective of the inductive content analysis is to find the logic
of action in the research material or a typical story guided by the research material. The
material highlighted the division of opinions into positive, negative, or neutral categories.

Results of the study
The target group consisted of 15 individuals. One study subject had to withdraw from the
study due to an allergic reaction immediately after the initial examination. Therefore, the
results were obtained with 14 individuals. The individual who withdrew from the study had
known allergies based on the preliminary information. In the final target group (n=14), one
person was male and the rest were female. The age distribution was 20 to 69 years. (See
Table 2. Description of the study group; age and gender distribution

<table>
<thead>
<tr>
<th></th>
<th>Initial examination</th>
<th>Three-week treatment period</th>
<th>Final examination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subjects</strong></td>
<td>15</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 female</td>
<td></td>
<td>13 female</td>
<td></td>
</tr>
<tr>
<td>1 male</td>
<td></td>
<td>1 male</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>20–69</td>
<td>20–69</td>
<td></td>
</tr>
</tbody>
</table>

One quarter of the study subjects (n=14) had general illnesses and allergies. Three subjects were smokers. Before the study, the majority of the study subjects (n=14) used a Finnish toothpaste, for example Pepsodent or Colgate, and approximately half of the subjects (n=14) used toothpaste intended for sensitive teeth. Nine study subjects (n=14) had gingival recession, one had dental erosion and four had both gingival recession and erosion. The majority of the study subjects (n=14) had experienced dentine hypersensitivity for a few years, one for less than a year, and one since childhood. Fifty per cent of the study subjects had noticed seasonal variations in the intensity of pain.

Dentine hypersensitivity was measured by means of clinical methods (a Subjective Pain Assessment Tool) and a questionnaire (an initial examination to determine dentine hypersensitivity before the toothpaste trial period, and a final examination after it), as well as journals. The intensity of pain associated with dentine hypersensitivity caused by the stimulus tests conducted in the clinical examination (an air blast and cold water rinsing at approximately 5°C) was assessed by the study subjects by means of a verbal rating scale (VRS) of 0–3 (0=no pain, 1=slight pain, 2=considerable pain, 3=considerable pain that lasts 10 seconds). The air blast was performed on the facial and buccal surfaces of all teeth, so the worst value for an individual tooth would be 6. The observations made with the periodontal probe have been integrated in the diagnosis. Cold water rinsing provided one value for the entire dentition.

In the initial examination, the study subjects (n=14) had an average of 11.1 (SD±7.1) sensitive teeth, which accounts for 39.4% of the dentition. In the final examination, the average number of sensitive teeth was 5.7 (SD±5.4), which accounts for 20.2% of the dentition. The reduction in the number of sensitive teeth was statistically highly significant (p=0.000). All teeth, in which the value from an air blast on either the facial or buccal surface was 1–3, were considered sensitive. The result of the air blast (n=14) provides a more precise value of the reduction in sensitivity. In the initial examination, the average of the combined VRS value (a verbal scale describing subjective sensations) for the dentition was 22.5 (SD±15.2), and in the final examination, the average was 8.9 (SD±9.3). The result is statistically highly significant (p=0.000). In the water rinsing test (n=13), the average of the initial examination was 2.4 (SD±0.8), and in the final examination, the average was 1.2 (SD±1.2). The result is statistically significant (p=0.001). (See Graph 1 and Table 3).
The average intensity of pain associated with dentine hypersensitivity (on the questionnaire scale of 1–10, where 1 is the lowest and 10 is the highest) was 6.5 (SD±1.9) before the treatment period with the toothpaste and 4.4 (SD±2.2) after the treatment period. The reduction in the intensity of dentine hypersensitivity pain was statistically highly significant (p=0.000). Among the study subjects, 13 people reported that the use of the toothpaste had reduced the intensity of pain. The duration of pain also decreased for the majority of the study subjects. Before the treatment period, the majority of the study subjects, or 10 persons (n=14), stated that the pain lasted for a while after the stimulus was removed, whereas after the treatment period, the majority, or 9 persons (n=14), stated that pain only lasted for the duration of the stimulus. The average of the degree of pain (on a scale of 1–10, where 1 was the lowest and 10 was the highest) was 5.1 (SD±1.9) before the use of the toothpaste and 3.4 (SD±1.9) after the use of the toothpaste. The reduction in the degree of pain was statistically significant (p=0.004). The nature of pain associated with dentine hypersensitivity was described as mainly sudden and sharp both before and after the use of the toothpaste. These differences may be attributable to the differences between individuals in how pain is experienced or to the pain having been caused by something else than exposed dentine. (See Table 3).
Table 3. Averages and standard deviations before and after the use of the toothpaste: Sensitive teeth, subjective sensation of pain (air blast, cold water rinsing), intensity and degree of pain on a scale of 1–10, as well as gingival bleeding (BOP) and plaque.

<table>
<thead>
<tr>
<th></th>
<th>Av</th>
<th>SD</th>
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<tbody>
<tr>
<td><strong>Sensitive teeth, number (n=14)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before the use of toothpaste</td>
<td>11.1</td>
<td>7.1</td>
</tr>
<tr>
<td>After the use of toothpaste</td>
<td>5.7</td>
<td>5.4</td>
</tr>
<tr>
<td><strong>Subjective sensation of pain, air blast, on a scale of 1-3; VRS (n=14)</strong></td>
<td></td>
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<tr>
<td>Before the use of toothpaste</td>
<td>22.5</td>
<td>15.2</td>
</tr>
<tr>
<td>After the use of toothpaste</td>
<td>8.9</td>
<td>9.3</td>
</tr>
<tr>
<td><strong>Subjective sensation of pain, cold water rinsing (n=13)</strong></td>
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<td></td>
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<tr>
<td>Before the use of toothpaste</td>
<td>2.4</td>
<td>0.8</td>
</tr>
<tr>
<td>After the use of toothpaste</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Intensity of pain on a scale of 1-10 (n=14), questionnaire</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before the use of toothpaste</td>
<td>6.5</td>
<td>1.9</td>
</tr>
<tr>
<td>After the use of toothpaste</td>
<td>4.4</td>
<td>2.2</td>
</tr>
<tr>
<td><strong>Degree of pain on a scale of 1-10 (n=14), questionnaire</strong></td>
<td></td>
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<tr>
<td>Before the use of toothpaste</td>
<td>5.1</td>
<td>1.9</td>
</tr>
<tr>
<td>After the use of toothpaste</td>
<td>3.4</td>
<td>1.9</td>
</tr>
<tr>
<td><strong>Gingival bleeding, BOP (n=5), a Subjective Pain Assessment Tool</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before the use of toothpaste</td>
<td>2.6</td>
<td>1.3</td>
</tr>
<tr>
<td>After the use of toothpaste</td>
<td>0.2</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>Biofilm plaque VPI % (n=13), a Subjective Pain Assessment Tool</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before the use of toothpaste</td>
<td>14.5</td>
<td>7.6</td>
</tr>
<tr>
<td>After the use of toothpaste</td>
<td>3.0</td>
<td>2.9</td>
</tr>
</tbody>
</table>

The Bionica Sensitive® toothpaste also had a positive effect on BOP and the plaque biofilm (see Table 3). The results only covered those study subjects who had gingival bleeding or plaque in the initial or final examination. Among the study subjects, five had gingival bleeding and 13 had plaque. In the initial examination, the average value of the gingival bleeding rate (BOP = bleeding on probing) was 2.6 (SD±1.3), and in the final examination it was 0.2 (SD±0.4). Thus the reduction of gingival bleeding was statistically almost significant (p=0.017). The average value of the visual plaque index (VPI) was 14.5 (SD±7.6) in the initial examination, and 3.0 (SD±2.9) in the final examination. The reduction in the amount of plaque was statistically highly significant (p=0.000). With all study subjects, both gingival bleeding and plaque decreased as a result of the use of the ROCS Bionica Sensitive® toothpaste.

The primary cause of dentine hypersensitivity was cold food or drink in the initial and final examinations. The use of the toothpaste reduced pain associated with dentine hypersensitivity caused by cold and hot food or drink, sweet flavor and other factors (chewing, cold outdoor air, brushing teeth). Before the use of the toothpaste, acidic flavours also caused pain in one study subject (n=14). After the use of toothpaste, two study subjects...
reported acidic substances as a cause of pain. Journal entries indicated a gradual reduction in dentine hypersensitivity week after week. During the first week, five study subjects (n=14) considered pain to have been reduced. The number was eight (n=14) in the second week and ten (n=14) in the third week. (See Graph 2).

![Graph 2](image)

Graph 2 Study subjects’ experiences of the performance of the toothpaste and the cause of the pain sensation.

The study subjects (n=14) kept a journal on the changes they observed in dentine hypersensitivity during the three weeks of treatment with the toothpaste. The majority of the study subjects felt that the pain had decreased, and some reported increase in dentine hypersensitivity during the first two weeks. The number of study subjects who did not experience any changes in dentine hypersensitivity grew smaller towards the end of the study. (See Graph 3.)

In accordance with the journal categories, positive experiences were described as follows: “I had some quark for the first time and also coffee at the same time, and there was no sharp pain in my teeth, like usual”, “Considerably less sensitivity in my teeth”. Neutral experiences were described as follows: “I haven’t noticed any difference”, “No effect.” Negative experiences were described briefly: “No effect, the teeth were maybe even more sensitive than before”, “At the beginning, sensitivity seemed to increase".

![Graph 3](image)
Graph 3. Study subjects’ experiences of changes in the dentine hypersensitivity (based on the journals).

The delayed survey conducted after the treatment period indicated that half of the study subjects (n=13) still continued to use the ROCS Bionica Sensitive® toothpaste as a complementing or only toothpaste. Twelve study subjects felt that dentine hypersensitivity pain was less intense than before the ROCS Bionica Sensitive® toothpaste treatment period. One study subject felt that dentine hypersensitivity had remained at the same level despite the three-week treatment period with the ROCS Bionica Sensitive® toothpaste.

The toothpaste user experiences focused on the consistency and appearance of the product, oral sensations, cleaning performance and taste (see Graph 4-6). During the first weeks, the opinions of the study subjects were the most negative. As the treatment period progressed, the study subjects got used to the toothpaste, and on the third week, negative opinions no longer dominated any of the areas studied. The study subjects considered the colour and taste of the toothpaste unusual. The colour was described as greyish-brown and brown, and the taste was described as having an herbal and liquorice flavour. The toothpaste was also described as soft, and as a positive aspect, it was reported that it did not cause a burning or stinging sensation in the mouth. Some felt that the cleaning performance of the toothpaste was good and the product even seemed to whiten teeth. Others felt teeth did not stay clean for long.

The study subjects’ experiences of the consistency and appearance of the toothpaste were as follows: (see Graph 4).

- **Positive evaluations:** “Interesting, the colour was truly surprising. The consistency of the toothpaste was softer and fluffier than that of your usual toothpaste.” “The consistency was soft, good... Gives a nice foam with a regular toothbrush”
- **Negative evaluations:** “Absolutely awful colour, feels oddly ‘dry’”, “looks disgusting and has repulsive consistency”
- **Neutral evaluations:** “Runny, thin, greyish-brown”, “Brown and slightly watery, does not froth”

![Texture and appearance of the toothpaste](image)

**Graph 4. Study subjects’ experiences of the consistency and appearance of the toothpaste.**
The study subjects’ experiences of the sensations caused by the toothpaste in the mouth were as follows: (see Graph 5).

- **Positive evaluations:** “The toothpaste was extremely soft”, “A plus side in the taste is that it doesn’t burn/sting”, “The strength is similar to that of most toothpastes”
- **Negative evaluations:** “At first I gagged, it was really ‘salty’”, “Unpleasant taste and sensation in the mouth”
- **Neutral evaluations:** “A sharp, spicy taste”, “Quite ok, no special sensations”

Graph 5. Study subjects’ experiences of the sensations caused by the toothpaste in the mouth.

The study subjects’ experiences of the cleaning performance of the toothpaste were as follows: (see Graph 6).

- **Positive evaluations:** “I noticed that the toothpaste cleaned my teeth well and I think it also whitened them”, “Seems to clean the teeth effectively, they feel clean, white and bright”
- **Negative evaluations:** “It feels like the toothpaste does not clean the teeth properly, I need to brush longer”, “The toothpastes I used before had a better cleaning action and left a fresher feel/taste in my mouth”
- **Neutral evaluations:** “It was ok, but did not make me feel like my teeth were somehow cleaner than usual”
Conclusions

The study subject group consisted of young and elderly persons, mainly women (n=14). One person had to withdraw from the study after the initial examination in the beginning of the treatment period. The duration of the treatment period was three weeks. The main ingredient reducing pain associated with dentine hypersensitivity in the ROCS Bionica Sensitive® toothpaste is potassium chloride. The results were obtained by dental hygienist students at the end of their studies under the supervision of instructors, by means of examinations, questionnaires, journals and case history information.

The ROCS Bionica Sensitive® toothpaste reduced dentine hypersensitivity in the study subjects, measured using objective and subjective indicators. The number of sensitive teeth decreased, the intensity, degree and duration of pain were reduced as a result of the use of the toothpaste. The results are similar to earlier studies, in which reduction of dentine hypersensitivity has been observed in connection with the use of toothpaste containing potassium chloride. (Silverman et al. 1994; Cummins 2009; Poulsen et al. 2006.) The ROCS Bionica Sensitive® toothpaste used in the test does not contain fluoride, so the study provided new information on the effect of an ecological and fluoride-free toothpaste on dentine hypersensitivity.

The results were positive also in terms of the plaque biofilm and gingival bleeding: both indicators showed clear signs of reduced dentine hypersensitivity following the use of the toothpaste. The results obtained for these two indicators are similar to those achieved in earlier studies. (Cf. Kumar et al. 2009; Sarap et al. 2012; Charantimath & Oswal 2011.) The ROCS Bionica Sensitive® toothpaste contains clove and liquorice extract, among others, and these have been shown to reduce plaque and inflammation.

The study provided new information on the user experiences and properties of the toothpaste. It can be concluded that nearly all of the study subjects, who were used to using regular “basic toothpastes”, were satisfied with the ROCS Bionica Sensitive® toothpaste used in the study. Thus, the toothpaste can be recommended for individuals suffering from dentine hypersensitivity, who want to make ecological choices. The sustainable ecological approach covers the entire product, including packaging and appearance.
The reliability of the study was increased by the researcher, method and material triangulation. Due to the small target group of the study, the study can be considered a pilot study. The treatment period of three weeks can also be considered to be too short for achieving results. The most common duration of the treatment periods of dentine hypersensitivity studies has been 4 to 8 weeks. In addition, different studies have focused on toothpastes with different ingredients and also with fluoride, and this makes comparisons between studies more difficult (Karim & Gillam 2013; Hooper S. et al 2014; Walters, PA 2005.). The results benefit both oral care professionals, who have an important role in guiding clients in various issues concerning oral health, and ecologically conscious persons who, for example, want to use a fluoride-free toothpaste.

In the future, the ROCS Bionica Sensitive® toothpaste should be studied using a comparative research frame and a larger number of study subjects.

References:


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