

## DEVELOPMENT OF FLATTENED RICE FLAKES AS VALUE ADDED SNACKS USING DEHYDRATED SPICES POWDER AS NATURAL PRESERVATIVES

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**Abstract:** Flattened rice defines as dehusked boiled rice which flattened into flat form flakes. Thicknesses of these flakes varied almost translucently thin near to four times thicker than normal rice kernel. The sample developed by dusting of dehydrated refined spice mixes of bay leaf, zinger, and garlic powder. Phytochemical component of spices having anti-oxidative properties works as natural preservative for cereal products. Proximate values of zinger, garlic, bay leaves and flattened rice were moisture, fat, protein, carbohydrate, energy and fiber contents (%) ranged from 5-8g, 2-8g, 7-16.5g, 54-81g, 316-356 Kcal and 3- 26.3g, respectively. 1 % (w/w) spices powder mix were incorporated as natural preservative into flattened rice designed as one control ( $S_0$ ) and four treatments  $S_1$ ,  $S_2$ ,  $S_3$  and  $S_4$  samples. Physical properties of the samples were water activity ( $a_w$ ) and texture, resulted as  $S_4$  of 0.201 to 0.223 & 5.342 to 5.122 and  $S_0$  of 0.298 to 0.342 & 4.196 to 3.853. Moisture content and microbiological count for  $S_4$  and  $S_0$  were 8 to 8.2% & 13 to 15%; 40 to 42 & 40 to 80 cfu/g. The results are the indicator for crispiness and prolonged shelf life of developed snacks ( $S_4$ ). Sensory evaluation ( $N=30$ ) judged natural spices powder mixed flattened rice snacks ( $S_4$ ) as significantly ( $P<0.01$ ) superior for appearance, flavor, taste and overall acceptability than other treatment group.

**Keywords:** Flattened rice, Shelf life, Natural preservatives, Sensory, Anti-oxidant

### Introduction

Rice (*Oryza sativa*) is a semi-aquatic, annual grass which can be grown under tropical or subtropical condition. It is one of the leading food crop and the major staple food for 60% of the world's population<sup>1</sup>. Rice is a rich source of bioactive compounds, which include – oryzanol (steryl ferulates) and Aminobutyric acid (GABA). Oryzanol esterifies tranferulic acid and sterols or triterpenols is well known as the main bioactive compound in rice<sup>2</sup>. Flattened rice is dehusked rice which is flattened into flat light dry flakes. These flakes of rice swell when added to liquid, whether hot or cold, as they absorb water, milk or any other liquids. The thicknesses of these flakes vary between almost translucently thin to nearly four times thicker than a normal rice grain. This is most popular snacks item among Asian region as every days menu if they intake. Flattened rice can be eaten raw by immersing it in plain water or milk with salt and sugar to taste, or lightly fried in oil with nuts, raisins, cardamoms, and other spices. The lightly fried variety is a standard breakfast in every corner of Bangladesh. It can be reconstituted with hot water to make a porridge or paste, depending on the

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proportion of water added. In villages, particularly in urban area in Bangladesh, flattened rice is also eaten raw by mixing with Molasses.

Snacks foods have been known in the world from time immemorial. Essential vitamins, minerals and other nutrients can only be gained from food<sup>3</sup>. All over the world cereals are used as staple food for energy sources<sup>4</sup>. Snacks cereals are defined as “processed grain formulations suitable for human consumption without further cooking” or ready to eating. Flattened Rice is the most available cereal snacks used all over the country round the year<sup>5</sup>. It is locally known by many names viz. Chira or rice flakes. This is prepared from soaked paddy and has been claimed as a good source of fiber, carbohydrate, minerals and protein. Using some selected dehydrated spices such as zinger, garlic, bay leaves and calcium carbonate as binder in the preparation of ready-to-eat snacks a way of value addition to this cereal grain. Availability of these spices, cheap and can be mixed with any other food items without any side effects<sup>4</sup>. Newly, developed spices as preservatives not only enhance the taste and flavor of foods, but also increase the shelf life by being antimicrobial and antifungal effect with crispiness<sup>6-9</sup>.

Zinger has a higher antioxidant activity which is similar to tertiary butyl hydroquinone (TBHQ), butylated hydroxyanisole (BHA), and butylated hydroxytoluene (BHT)<sup>10</sup>. The phytochemical constituents of spices plants such as garlic, ginger, bay leaf, onion etc have longed been known and their antimicrobial properties have been widely studied<sup>11</sup>. Spices extract exhibited high but varied antifungal activity and can be used in controlling infection, preventing cold meat spoilage and preserve meat for longer periods against fungal contamination. Different extractive techniques correspond to different antimicrobial (antifungal) effectiveness<sup>9</sup>. Bay leaves possess anti-spasmodic, antifungal, antibacterial and carminative agents. It is useful in treating gastroenteritis, chronic fatigue, poor circulation, rheumatism, diarrhea, menstrual problems, and leucorrhea<sup>12</sup>. Different spices are effective for preservation of cereal or grain and beneficial for human health as it contains significant amount of phytonutrients, vitamins, and fiber that may protect degenerative diseases and also malnutrition deficiency diseases. Many valuable medicinal herbs or spices are becoming rare and precious information regarding their health benefits is lost due to lack of knowledge among consumers. Therefore, substitution of herbs in the preparation of flattened rice snakes will increase the nutrition value and also provide health benefits to consumers with low cost ready to eat snacks. Several spices, herbs and fruits contain volatile anti-microbial compounds<sup>16</sup>. The objectives of this study was to develop ready-to-eat low cost, tasty and nutritious snacks of flattened Rice by incorporating edible spices powder mix as natural preservatives for long shelf life, along with a view to determine the product acceptability.

## Materials and methods

Raw rice flakes were collected from Tongi bazaar, bay leaf, Zinger and CaCO<sub>3</sub> powder etc were arranged and procured from Dhaka, Bangladesh.

### Processing of fattened rice snacks

Flattened rice snakes were prepared by mixing dehydrated spices powder 1% ratio then dried at 78°C for 20 min using rotary drum drier. Moisture content of the end product was 8% and then it was cooled and stored in an air tight pouch.

#### i. Collection of spices as natural preservatives

Zinger, garlic, and bay leaves powder was collected from local market of Bangladesh. The selected dehydrated spices were cleaned, shortened, pulverized and deodorized (tray drier) for chemical analysis. Stabilizer (CaCO<sub>3</sub>) was used with spices powder mix as natural preservative.

## ii. Chemical analysis

Moisture, protein, fat, and crude fiber content of selected dehydrated spices and flattened rice were analyzed in central lab of Prome Agro Foods Ltd, Dhaka and Dept of Nutrition and Food Engineering, Daffodil International University. Total carbohydrate content was determined by difference method, protein by Micro-kjeldhal method, fat by Soxhlet extraction method using petroleum ether (B.P. 60-70°C), and crude fiber according to AOAC<sup>17</sup>.

## iii. Design of formulated snacks

1% dehydrated spices viz. zinger (*Zingiber officinale*), garlic (*Ocimum basilicum*), and bay leaves (*Laurus nobilis*), were dusted (or grinded) in four treatments S<sub>1</sub>, S<sub>2</sub>, S<sub>3</sub> and S<sub>4</sub>, respectively along with CaCO<sub>3</sub> powder and control (S<sub>0</sub>). The four treatments were tried several times and evaluated by the sensory methods. All treatments were then used for shelf life study.

## Determination of Physical characteristics

### i. Bulk density

The bulk density ( $P_b$ ) was determined using the diameter and thickness with a digital micrometer. True density ( $P_t$ ) was determined using an AccPyc II 1340 gas pycnometer (Micromeritics Instrument Co., Norcross, GA) at 20°C. Samples of each snack were dried at room temperature for 15 hr at 0% relative humidity in vacuum desiccators with anhydrous calcium sulfate (W. A. Hammond Drierite, Xenia, OH). After drying, samples were compressed into a measuring cylinder for true density measurements. Where,  $P_t$  = true density;  $P_b$  = bulk density.

### ii. Water Activity

Water activity ( $a_w$ ) was measured at 30 °C using an Aqua Lab dew point water activity meter 4TE (Decagon Devices, Inc., Pullman, WA).

### iii. Texture

Compression tests were done on 5.5 mm diameter flat snacks mounted between two 1.5×1.5 mm square, ¼ in thick, iron plates with 1 mm diameter centered holes and puncturing over smooth and sound snack surfaces with 1.14 ± 0.17 mm thickness with a flat 1 mm diameter cylindrical probe attached to a TA-XT2i Texture Analyzer (Texture Technologies Corp., Scarsdale, NY) set at 0.1 mm/s test speed and 0.2 mm rupture test distance. Analysis was done at 25°C and plastic bags were used after opening of vacuum sealed for packaging the snacks. Number of cracks, force needed for first crack, first crack area, maximum force and maximum force area were obtained by 5 replicates for each snacks sample. Gram force (gf) values were converted into Newton's (N); (1 Newton [N] = 101.971621297793 gf)

### iv. Statistical Analysis

Data were analyzed with Minitab statistical software (version-5, *Vassar Stats*) by One-way analysis of variance and multiple comparison tests with ( $P < 0.01$ ) as criteria of significance.

**Table 1: Recipe for formulated flattened rice snacks**

Sl. No.	Ingredients /recipe	Flattened Rice snakes sample				
		1.S <sub>0</sub>	2.S <sub>1</sub>	3.S <sub>2</sub>	4.S <sub>3</sub>	5.S <sub>4</sub>
1	Bay Leaves powder +CaCO <sub>3</sub> +Flattened Rice	0	1%+7%+92%=100%	0	0	1%+0+0=1%
2	Garlic powder+CaCO <sub>3</sub> +Flattened Rice	0	0	1%+7%+92%=100%	0	1%+0+0=1%
3	Zinger powder+CaCO <sub>3</sub> +Flattened Rice	0	0	0	1%+7%+92%=100%	1%+7%+0=8%
4	Spices mix (10%)+Flattened Rice	0	0	0	0	1%+99%=100%

(In the spices, CaCO<sub>3</sub> has used as free flow agent and stabilizer of natural spices mix preservative)

In table 1, the formulated ingredients are shown as per designed. 1. Control (S<sub>0</sub>): Control S<sub>0</sub> was prepared without incorporating spices mix (100% flattened rice), 2. Treatment S<sub>1</sub>: It consists of 1% Bay leaves, and 99% flattened rice, 3. Treatment S<sub>2</sub>: It consists of 1% Zinger and 99% flattened rice, 4. Treatment S<sub>3</sub>: It consists of 1% Garlic and 99% flattened rice, and 5. Treatment S<sub>4</sub>: It consists of 1% selected spices mix (1% bay leaves, 1% zinger, 1% garlic and 7% CaCO<sub>3</sub>) and 99% flattened rice.

### Results and Discussions

Table 2 showed the nutritional composition of the three selected dehydrated spices namely bay leaves (*Laurus nobilis*), zinger (*Zingiber officinale*), and Garlic (*Allium longicuspis*) and rice ingredient. Results showed that moisture, fat, protein, carbohydrate, energy and fiber contents (%) ranged from 5 to 8g, 2 to 8g, 7 to 16.5g, 54 to 81, 316 to 356 Kcal and 1.8 to 26.3g respectively.

**Table 2: Proximate values of ingredients rice dehydrated spices and flattened rice snacks of all**

Sl No	Local Name	Botanical Name	Moisture (%±SD)	Fat (%±SD)	Protein (%±SD)	Fiber (%±SD)	Carbohydrate (%±SD)	Energy, Kcal /100 g
1	Rice	<i>Oryza sativa</i>	13±1.2	2±0.34	7±1.75	1.8±0.38	76±3.76	350±10.49
2	Bay leaves powder	<i>Laurus nobilis</i>	5±0.76	8±1.13	7±1.81	26.3±4.59	54±5.89	316±15.98
3	Zinger powder	<i>Zingiber officinale</i>	8±0.92	5.7±0.77	9±2.09	13±2.99	64.3±7.71	345±17.78
4	Garlic powder	<i>Allium longicuspis</i>	5±0.54	8±1.09	16.5±2.34	9.9±3.47	60.6±8.37	456±19.39
5	Flattened rice Snacks	-	8±0.74	2±0.55	9±1.91	3±0.89	81±10.50	342±12.31

The maximum energy content was 342 Kcal/100g in treatment S<sub>4</sub> (developed). S<sub>4</sub> contained highest amount of protein (16.5%) and fiber (9.9%) than others. Carbohydrate content of treatment S<sub>0</sub> (control) (76 g/100 g) was maximum and minimum for treatment S<sub>4</sub> (81 g). S<sub>0</sub> (control) had low fiber content whereas it was increased due to incorporation of dehydrated spices as a result, the developed flattened rice could be recommended to person requiring high fiber diets. The selected spices mixed flattened rice can therefore be recommended for peoples as ready to eat snacks as well as among others for improving nutritional status of the population due to fiber content. The standard flattened rice available in the market has low nutritional value in comparison to the developed flattened rice incorporated with dehydrated spices.

**Table 3: Physical characteristics of Prepared Flattened Rice Snacks**

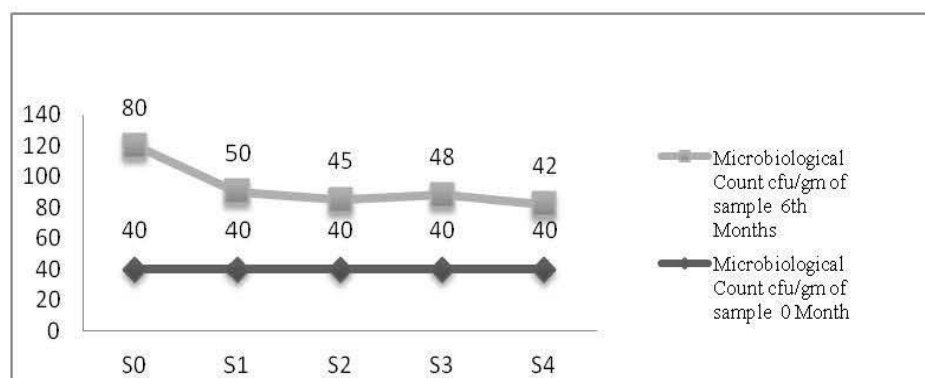
Treatments	Shelf period 0 Month				Shelf period 06 Months			
	Water Activity ( $a_w$ )	Texture, (N)	Bulk Density ( $P_t$ )	Moisture (%)	Water Activity ( $a_w$ )	Texture (N)	Bulk Density ( $P_t$ )	Moisture (%)
S <sub>0</sub>	0.298	4.196	1.385	13	0.342	3.853	1.395	15
S <sub>1</sub>	0.232	2.851	1.386	8	0.258	2.795	1.398	9.2
S <sub>2</sub>	0.245	4.100	1.393	8	0.270	3.991	1.399	8.9
S <sub>3</sub>	0.258	3.582	1.387	8	0.265	3.255	1.392	8.8
S <sub>4</sub>	0.201	5.342	1.375	8	0.223	5.122	1.338	8.2

Values are mean; Values are mean of triplicate analysis for water activity (n=50), texture (n=50) and density (n=20)

Water activity ( $a_w$ ) of selected spices mixed flattened rice snacks (S<sub>4</sub>) was significantly higher than that for different treatments in the Table 3. Data suggest that S<sub>4</sub> snacks would have higher shelf period. Water activity ( $a_w$ ) of the S<sub>4</sub> tested varied from 0.201 to 0.223. These  $a_w$  values are typical of very crispy snacks. Previously  $a_w$  of 0.298 for control sample have been reported with undesired microbiological stability in Table 3.

Texture of different treatments (S<sub>0</sub>, S<sub>1</sub>, S<sub>2</sub>, & S<sub>3</sub>) was significantly higher than S<sub>4</sub> snacks (Table 3). Data suggest that S<sub>4</sub> was crispier than other treatments as less force (N) was required to break other treatments.

True density ( $P_t$ ) of control flattened rice snacks was significantly higher than that for selected spices mixed flattened rice snacks (Table 3). However, the bulk density difference between control and developed snacks S<sub>4</sub> was very small (1.385 to 1.375).



**Figure 1: Microbiological count of different samples**



Microbiological load of different flattened rice are shown in figure 1. The microbiological load of Sample  $S_4$  is 40-42 *cfu/g* whereas other treatments are 40-80 *cfu/g*. It indicates the selected spices mixed flattened rice snacks are comparatively save for health.

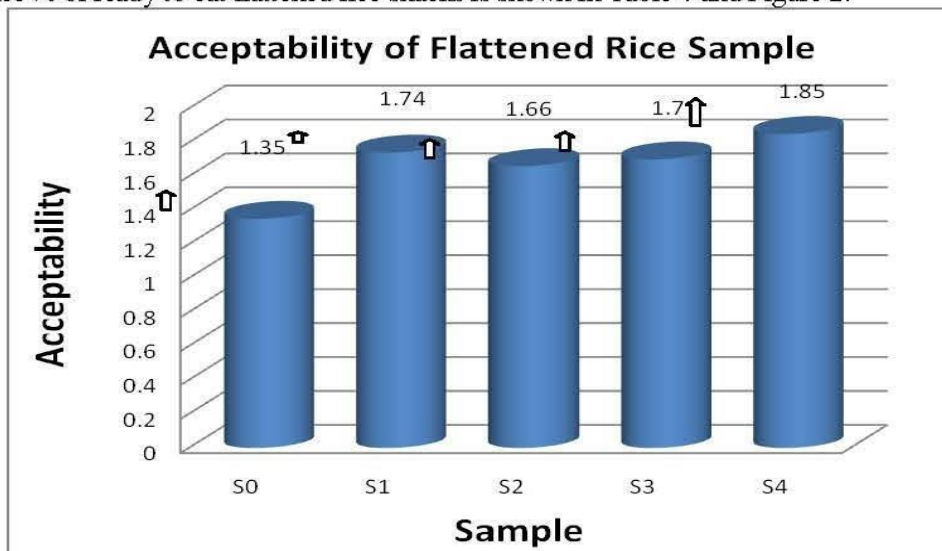
**Table 4: Data of sensory scores of different parameters in control and treated flattened rice sample using Hedonic rating Scale**

Sensory Score / Treatments	Appearance	Odor	Flavor	Mouth feel	Acceptance
$S_0$	3.21±0.12	3.53±0.09	3.48±0.12	3.90±0.10	1.35±0.14
$S_1$	4.21±0.10	3.31±0.29	3.45±0.24	3.87±0.27	1.74±0.26
$S_2$	3.86±0.14	3.31±0.19	3.44±0.35	3.89±0.60	1.66±0.06
$S_3$	3.90±0.12	3.92±0.39	3.47±0.31	3.82±0.45	1.63±0.06
$S_4$	5.12±0.11	4.10±0.26	3.95±0.12	5.34±0.41	1.85±0.05

Values are mean±SEM; n = 30. Appearance, Odor, Flavor and Mouth feel were on a scale of 1-5 (Like very much= 5, like slightly = 4, neither like nor dislike= 3, dislike slightly = 2 and dislike very much = 1); Acceptance was on scale of 1-2 (Acceptable= 1).

In house trained panelist for sensory evaluation (N=30) judged natural spices mixed flattened rice snacks ( $S_4$ ) as significantly ( $P < 0.01$ ) superior for appearance, flavor, taste and overall acceptability than other treatments (Table 4).

Appearance of the Sample  $S_4$  was significantly higher to that of other treatments i.e. 5.12±0.11 for  $S_4$ , 4.21±0.10 for  $S_1$ , 3.86±0.14 for  $S_2$ , 3.90±0.12 for  $S_3$ . Odor of sample  $S_4$  was judged to be significantly preferred to that of other four snacks tested. The scores are 4.10±0.26 for  $S_4$ , 3.31±0.29 for  $S_1$ , 3.31±0.19 for  $S_2$ , 3.92±0.39 for  $S_3$ , and 3.53±0.09 for  $S_0$  respectively. Flavor was judged to be similar for all the four kinds of snacks tested except sample  $S_4$  (3.95±0.12). Mouth feel of four flattened rice samples were almost similar to each one and significantly higher score of  $S_4$  is 5.34±0.41. Panelist acceptance % of ready to eat flattened rice snacks is shown in Table 4 and Figure 2.



**Figure 2: Acceptability rating score of flattened rice snacks**

Acceptance of sample  $S_4$  was significantly higher than other samples. Acceptance of four samples (4) was similar to each other in test. Acceptance score for various sample tested was  $s_4$  1.85,  $s_1$  1.74,  $S_2$

1.66,  $S_3$  1.70, and  $S_0$  1.35, respectively. Data suggest that 1.85 score of  $S_4$  would be considered encouraging. However no sensory evaluation data was shown to have valid comparison with liking snacks reported herein.

The results of statistical analysis of sensory evaluation of developed flattened rice snacks using different ratio of selected spices mix and stored for 06 months are presented in Table 5. Scores of flavor, taste, texture and overall acceptability of control and other treatments were not significantly ( $P > 0.05$ ) affected by spices mix added at zero time. Taste, flavor, mouth feel, and overall acceptability score values showed a preference of panelists to samples prepared with 1% of bay leaves powder, 1.0% of zinger powder, 1% garlic powder and 1% of selected spices powder mix compared to the control sample with significant differences ( $P < 0.01$ ). Storing the developed samples for 06 months not significantly ( $P < 0.01$ ) affected the appearance or color of all studied samples.

At the same time, no significant differences in taste, flavor, mouth feel, and overall acceptability were observed between the samples prepared using 1.0% selected spices mix powder after storage period samples at zero time, while samples prepared with spices ratios about 1.0% and stored for 06 months showed a significant differences ( $P < 0.01$ ) in the aforementioned quality attributes compared to those at zero time. Generally, flattened rice snake sample prepared using 1.0% selected spices powder gave significantly ( $P < 0.01$ ) the highest overall acceptability scores at zero time and after 06 months compared to those of the control and treatment  $S_4$ .

**Table 5: Summary of ANOVA on Data for Sensory evaluation**

Sources	SS	Df	MS	F	P
Treatment between group	20.8738	4	5.2185	23.1	0.01
Error	4.518	20	0.2259		
Total	25.3919	24			

Analysis of variance (ANOVA) reveals that the calculated value of F (23.1) is greater than table value (3.84) on 4, 20 (d. f.) at 1% probability level. Therefore, it can be concluded that there was a significant difference ( $p < 0.01$ ) between treatments regarding the overall acceptability of the product. Spices have antimicrobial property and it act as traditional food preservative, which increases the shelf life of the product (Table 5).

## Conclusion

At present, most of the flattened rice snacks are used as ready to eat forms in different delicious condiments and spices.

Due to moisture activity, the samples show less crispiness and a little bit bitter taste. So, natural spice powder preservative will create new taste and increase shelf life.

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- The first paragraph following a heading or subheading should be flush left and all paragraphs that follow should be indented 0.25 inch. Be sure that your text is fully justified. Please do not place any additional blank lines between paragraphs. However, any necessary spacing (e.g. spacing between Title and Author's name(s), between consecutive Sections, etc.) should be a single blank line of 10-point Times New Roman font.
- Avoid placing 'Figures' and 'Tables' in the middle of columns. Large Figures and Tables may span across both columns. Figure and Table captions should be 10-point Times New Roman font. Initially capitalize only the first word of each Figure caption.

and Table title. Each Figure must have a glossy finish. Figures and Tables must be numbered separately. For example: “Figure 1. Database contexts”, “Table 1. Input data”. Figure captions are to be flushed left *below* the figures. Table titles are to be centered *above* the tables.

- Equations should be numbered (1), (2), etc. When referring to an equation in the body of the text, only the number enclosed in round brackets should be used. A colon should be inserted before an equation, but there should be no punctuation following the equation.
- Use footnotes sparingly (or not at all) and place them at the bottom of the column on the page on which they are referenced. Use Times 8-point type, single-spaced.
- British/Canadian spelling should be adopted. Acronyms should be spelled out at first mention, but not thereafter unless there will be any good reason to do so.
- List and number all references in 9 point Times New Roman, Italic, single-spaced, at the end of your paper. When referenced in the text, enclose the citation number(s) in superscript, for example <sup>1, 5</sup>. Only those references actually cited in the paper should be listed. References should be numbered according to when they are first mentioned in the paper. All authors of a paper must be listed in the references. We do not support the use of et al. in the reference list.
- References are to be presented in the following style:

## REFERENCE LIST

Provide full citations in your Reference List, included starting as a **new page** at the end of your document. Follow the Vancouver reference style as stated following examples for different types of resources:

- Books
- Articles in Journals
- Websites
- Other Resources
- Personal Communication

## BOOKS

### Standard Format for Books:

Author Surname Initials. Title: subtitle. Edition (if not the first). Place of publication: Publisher; Year.

### Book with One Author or Editor

1. Mason J. Concepts in dental public health. Philadelphia: Lippincott Williams & Wilkins; 2005.
2. Ireland R, editor. Clinical textbook of dental hygiene and therapy. Oxford: Blackwell Munksgaard; 2006.

### Two-Six Authors/Editors

3. Miles DA, Van Dis ML, Williamson GF, Jensen CW. Radiographic imaging for the dental team. 4<sup>th</sup> ed. St. Louis: Saunders Elsevier; 2009.
4. Dionne RA, Phero JC, Becker DE, editors. Management of pain and anxiety in the dental office. Philadelphia: WB Saunders; 2002.

### Multiple Authors

Cite authors in the same way for all types of resources: articles, websites, videos, etc. List up to the first 6 authors/ editors, and use "et al." for any additional authors

### More than Six Authors/Editors

5. Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson JL, et al., editors. Harrison's principles of internal medicine. 17<sup>th</sup> ed. New York: McGraw Hill; 2008.

### Organization as Author

6. Canadian Dental Hygienists Association. Dental hygiene: definition and scope. Ottawa: Canadian Dental Hygienists Association; 1995.

### No Author/Editor

7. Scott's Canadian dental directory 2008. 9<sup>th</sup> ed. Toronto: Scott's Directories; 2007.

### Government Document

8. Canada. Environmental Health Directorate. Radiation protection in dentistry: recommended safety procedures for the use of dental x-ray equipment. Safety Code 30. Ottawa: Ministry of Health; 2000.

### Chapter in a book

9. Alexander RG. Considerations in creating a beautiful smile. In: Romano R, editor. The art of the smile. London: Quintessence Publishing; 2005. p. 187-210.

### E-book

10. Irfan A. Protocols for predictable aesthetic dental restorations [Internet]. Oxford: Blackwell Munksgaard; 2006 [cited 2009 May 21]. Available from Netlibrary: <http://ccsw2.vcc.ca:2048/login?url=http://www.netLibrary.com/urlapi.asp?action=summary&v=1&bookid=181691>

## ARTICLES IN JOURNALS

Journal articles can be accessed in three different ways: (1) from the print (paper) copy; (2) from the journal's website; or (3) from an online article database like Medline. You will cite the article differently depending on how you accessed it.

### Standard Format for Journal Articles:

Author Surname Initials. Title of article. Title of journal, abbreviated. Date of Publication:  
Volume Number(Issue Number): Page Numbers.

#### Finding the Journal Abbreviation

Vancouver Style does not use the full journal name, only the commonly-used abbreviation: "New England Journal of Medicine" is cited as "N Engl J Med".

If the abbreviation is not stated, use the **PubMed Journals Database** to find your journal: <http://www.ncbi.nlm.nih.gov/sites/entrez?db=journals>. The correct abbreviation will be listed.

### Journal Article in Print

11. Haas AN, de Castro GD, Moreno T, Susin C, Albandar JM, Oppermann RV, et al. Azithromycin as a adjunctive treatment of aggressive periodontitis: 12-months randomized clinical trial. *J Clin Periodontol*. 2008 Aug; 35(8):696-704.

### Journal Article from a Website

12. Tasdemir T, Yesilyurt C, Ceyhanli KT, Celik D, Er K. Evaluation of apical filling after root canal filling by 2 different techniques. *J Can Dent Assoc [Internet]*. 2009 Apr [cited 2009 Jun 14];75(3):[about 5pp.]. Available from: <http://www.cda-adc.ca/jcda/vol-75/issue-3/201.html>

#### Creating Small URLs

If the URL of an article is long, go to: [www.tinyurl.com](http://www.tinyurl.com)

Create a working link to a website that is shorter.

### Journal Article from an Online Database

13. Erasmus S, Luiters S, Brijlal P. Oral hygiene and dental student's knowledge, attitude and behaviour in managing HIV/AIDS patients. *Int J Dent Hyg [Internet]*. 2005 Nov [cited 2009 Jun 16];3(4):213-7. Available from Medline: <http://cclsw2.vcc.ca:2048/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cmedm&AN=16451310&site=ehost-live>
14. Monajem S. Integration of oral health into primary health care: the role of dental hygienists and the WHO stewardship. *Int J Dent Hyg [Internet]*. 2006 Feb [cited 2009 Jun 21];4(1): 47-52. Available from CINAHL with Full Text: <http://tinyurl.com/kudbxw>



## WEBSITES

### Standard Format for Websites:

Author Surname Initials (if available). Title of Website [Internet]. Place of publication:  
Publisher; Date of First Publication [Date of last update; cited date]. Available  
from: URL

#### Publication Information Online

Publication information is often unavailable on websites and is not standardized like books or journals.

Vancouver Style requires the “Place of Publication”, the “Publisher” and the “Original Publication Date” as part of the citation. If these pieces of information are not given, use: [place unknown], [publisher unknown] or [date unknown].

### Website with Author

15. Fehrenbach MJ. Dental hygiene education [Internet]. [Place unknown]: Fehrenbach and Associates; 2000 [updated 2009 May 2; cited 2009 Jun 15]. Available from: <http://www.dhed.net/Main.html>

### Website without Author

16. American Dental Hygienists’ Association [Internet]. Chicago: American Dental Hygienists’ Association; 2009 [cited 2009 May 30]. Available from: <http://www.adha.org/>

### Part / Article within a Website

17. Medline Plus [Internet]. Bethesda (MD): U.S. National Library of Medicine; c2009. Dental health; 2009 May 06 [cited 2009 Jun 16]; [about 7 screens]. Available from: <http://www.nlm.nih.gov/medlineplus/dentalhealth.html>

### Blog

18. Skariah H. The tooth booth dental blog [Internet]. Mississauga (ON): Hans Skariah; 2004 - [cited 2009 Jun 20]. Available from: <http://dentaldude.blogspot.com/>

### An Entry / Article within a Blog

19. Skariah H. The tooth booth dental blog [Internet]. Mississauga (ON): Hans Skariah; 2004 - . Dental did you know: breastfeeding duration and non-nutritive sucking habits; 2009 May 18 [cited 2009 Jun 20]; [about 1 screen]. Available from: <http://dentaldude.blogspot.com/2009/05/dental-did-you-know-breastfeeding.html>

### Image on the Internet

20. McCourtie SD, World Bank. SDM-LK-179 [image on the Internet]. 2009 Apr 29 [cited 2009 Jun 14]. Available from: <http://www.flickr.com/photos/worldbank/3486672699/>

## OTHER RESOURCES

### Newspaper Articles

Like journals, newspapers are cited differently depending on how the article was accessed. Include a working “permanent link” to any article accessed online.

21. Fayerman P. Women must now wait to 40 for publicly paid amnio test. Vancouver Sun. 2009 Jun 9; Sect. A:5.
22. Health Canada issues warning over fake toothbrushes. The Globe and Mail [Internet]. 2009 April 10 [cited 2009 Jun 23]. Available from:  
<http://www.theglobeandmail.com/news/national/health-canada-issues-warning-over-fake-toothbrushes/article973190/>
23. Waldman D. Mouth is ‘window on the rest of the body’: oral health, dental hygiene is linked to more than teeth, gums. The National Post [Internet]. 2009 Apr 14 [cited 2009 Jun 22]. Available from Canadian Newsstand:  
<http://celsw2.vcc.ca:2048/login?url=http://proquest.umi.com/pqdweb?did=1680306071&sid=1&Fmt=3&clientId=6965&RQT=309&VName=PQD>

### Video recordings

24. Dental dam: still the best dry-field technique [DVD]. Provo (UT): Practical Clinical Courses; 2007.
25. Cuaron A, director; Abraham M, producer. Children of men [DVD]. Universal City (CA): Universal; 2006.

### Dictionary, Encyclopedia or Similar Reference Book

Entries in reference books are either signed or unsigned. The author will be listed at the start or end of the individual entry. An editor(s) will usually be listed at the front of the book but the editor is not included in the citation for reference works.

#### Unsigned

26. Mosby’s dental dictionary. 2<sup>nd</sup> ed. St. Louis: Mosby Elsevier; 2008. Frenotomy; p. 273.

#### Signed (and Online)

27. Murchison DF. Dental emergencies. In: Merck Manual of Diagnosis and Therapy [Internet]. 18<sup>th</sup> ed. Whitehouse Station (NJ): Merck; 2009 [last modified 2009 Mar; cited 2009 Jun 23]. Available from:  
<http://www.merck.com/mmpe/sec08/ch096/ch096a.html?qt=dental&alt=sh>

## PERSONAL COMMUNICATIONS

### PERSONAL LETTERS AND CONVERSATIONS

Personal communication (with the exception of email) should not be included in the Reference List, as they are unpublished and cannot be easily traced by the reader. Instead, acknowledge personal conversations and letters within the text in parentheses.

#### Conversation

“...in conversation with a fellow student from the Dental Hygiene program (Affleck, Ben. Conversation with: Matt Damon. 2008 Sep 07.)”

#### Personal Letter

“...this information was later confirmed in a letter (Hepburn, Katherine. Letter to: Spencer Tracy. 2005 Mar 03. 4 pages.)”

#### Email

Email correspondence is included in the Reference List as emails are easily traceable and dated.

28. Bloom, Orlando. Searching Medline for dental hygiene articles [Internet]. Message to: Johnny Depp. 2008 Nov 11 [cited 2009 Jun 22]. [3 paragraphs].

#### SHORT COMMUNICATION:

Should not be more than 4 pages. It should include title, authors' name(s), affiliation(s) and e-mail address(es), keywords, figures (if any), tables (if any), acknowledgement (if any) and references, but must not contain abstract, introduction, any other sub-sections, discussions, conclusions etc, and should also maintain all other formatting requirements of full papers for short communication.

#### REVIEW POLICY:

The objective is to provide detailed, constructive feedback on submitted papers and to publish high quality papers within a very short period of time. However, the length of the review process to be completed varies among papers, as many factors affect the time it takes to review a paper. The time it takes to locate qualified referees who are available to review a paper depends on the complexity and the type of material submitted for review. This journal makes a rigorous effort to keep the review time to a minimum that is consistent with keeping reputation for its quality and integrity. Each submission placed into review is sent to at least two independent reviewers, making one submission correspond to roughly two review requests. Based on this information, a first reply may take approximately three months. After review, you may be requested to submit a corrected version as per comments of reviewers. Please assist us in achieving our ambitious goals for short publication time by submitting the camera-ready paper at the earliest.

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