

# PH EXTERNO DE DENTES BOVINOS COM PASTA DE HIDRÓXIDO DE CÁLCIO

*EXTERNAL PH OF BOVINE TEETH USING HYDROXIDE PASTE*

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## **ABSTRACT**

The aim of this study was to evaluate the external pH root of bovine teeth, using calcium hydroxide paste (Ultracal XS Ultradent) and (CALEN-SS WHITE) as intra canal medication. Thus ten bovine teeth (n=10/group) were used and they had their apex sealed with composite resine. These teeth had four perforations of 2 mm depth which were made with spherical tip diamond number 1014 in each of them. The chemical-mechanical preparation was made manually with limes type K up to #80. The canal system irrigation had sodium hypochlorite 4% during the instrumentation plus EDTA 17% under agitation with ultrasound (Profi II ceramic Dabi Atlante) during 20 seconds, three times, totalizing one minute. Subsequently the canals were filled with the intra canal medication (Ultracal XS Ultradent) and (CALEN-SS WHITE). The dental crowns were sealing with Bioplic. Immediately, every tooth was placed in endodontic containers containing Milli-Q water. After that, the external pH was measured with pH tape ribbon Merck trademark (pH 0-14) and it was made every 24 hours for 21 days. The results of this experiment showed that the dressing used could not alkalize the dentin in its outer surface once the modulator, Milli-Q water, had a little change. Concluding, the calcium hydroxide paste inside the root bovine tooth could promoted a small change in the external environment, which was represented by Milli-Q water.

**UNITERMS:** Calcium hydroxide, sodium hypochlorite, root canal dressing.

## **INTRODUÇÃO**

One of the main challenges of endodontic is to promote the proper cleaning of the root canal system, in order to control and prevent microorganisms responsible for pulpal and periapical pathologies. The elimination of intraradicular infection is linked to several factors such as mechanical chemical preparation, irrigation solutions used, intracanal medication and channel sealing<sup>1,2,3</sup>. The success of endodontic treatment depends in some cases on the use of intracanal medication favoring the periapical repair process<sup>1</sup>. The most commonly used intracanal medication in endodontic therapy is the calcium hydroxide paste<sup>4</sup> and its action is related to the dissociation in hydroxyl ions and calcium ions and pH change. It is necessary that diffusion of the hydroxyl ions occur through the dentinal tubules so that there is a change in the pH of the external radicular surface<sup>1,5,6</sup>. The antimicrobial effect of the calcium hydroxide slurry is maintained for a long

period of time due to its low solubility<sup>7</sup>. In addition, the choice of vehicle can determine the rate of calcium hydroxide absorption; some vehicles have the possibility of alkalizing the external radicular environment, acting on bacteria in the oral cavity<sup>8,9</sup>. The anti-inflammatory action of the calcium hydroxide paste is due to the following mechanisms: hygroscopic action, formation of calcium / protein bridges and inhibition of phospholipase<sup>10</sup>. In addition, it has some properties, such as antibacterial action, biocompatibility, anti-inflammatory action, solvent of organic matter, among others, being used as intracanal medication in endodontic practice<sup>1</sup>. Its action is related to the dissociation in hydroxyl ions and calcium ions and for the action of calcium hydroxide to be effective in endodontic therapy, the hydroxyl ion must be capable of Broadcast through Dentin<sup>11</sup>. In addition to the dentin buffer capacity, the use of vehicles may interfere with the diffusion capacity of calcium hydroxide<sup>1</sup>.

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Another important factor in sanitizing the root canal system is the use of irrigation solutions during mechanical chemical preparation. The most commonly used solution is sodium hypochlorite (NaOCl) at different concentrations. The disinfectant action of this substance is given through the release of chlorine, the hypochlorite ion is the main responsible for the antimicrobial activity of the chlorinated solution<sup>12</sup>. It is an unstable, thermosensitive product, quickly inactivated in the presence of organic matter<sup>13</sup>. Chemical disinfection and constant irrigation of the channels are necessary for the removal of channel debris, in addition to sodium hypochlorite, EDTA is also used. During endodontic there is a smear layer, which must be removed to increase dentin permeability, cleaning and disinfection of the canals. EDTA is a chelating agent, with a descaling effect, acting in the inorganic portion, being effective with neutral pH<sup>14</sup>. It is important to use a chelating agent to prepare the root surface for hypochlorite, which may exert action within the dentinal tubules<sup>15</sup>. However, these solutions must be in direct contact with the root surface so that its action is effective<sup>16</sup>. The use of ultrasound is used in endodontic, proving effective in cleaning the root canal when associated with irrigation solutions<sup>17</sup>. Studies have suggested the use of ultrasound in an attempt to potentiate the action of the irrigation solution<sup>18,17</sup> and its use is associated with a greater cleaning of the root canal system and also of areas of difficult access during instrumentation. Thus, the objective of this study was to evaluate the changes in the pH of the Milli-Q water of the external root surface of bovine roots, verifying if the intracanal medication promotes changes in the dentin that they reflect in its exterior.

## MATERIALS AND METHODS

This study was carried out in the laboratory of the dentistry faculty of the São Leopoldo Mandic University - Porto Alegre. For this test, ten roots of bovine teeth (n = 10) were used per group, sealed at the apex with a composite resin and with four perforations of 2mm depth, using a spherical diamond tip # 1014 (KG Sorensen) on each test specimen. The mechanical chemical preparation was done manually with Kerr type files (Sybron) starting with a # 45 file going up to file # 80. Channel irrigation was done with 4% sodium hypochlorite (Bulla manipulation) and at the end a toilet with and 17% EDTA (Bulla manipulation) under ultrasound shaking (Profi II ceramic- Dabi Atlanti) for 20 seconds, three times, totaling one minute. Subsequently the root canals were filled with calcium hydroxide paste as intracanal medication (Calen - SS WHITE) and (Ultracal XS Ultradent) the coronary sealing was done with Bioplic. The pH of the slurry before being placed was measured to be 12. After, each tooth was placed in eppendorf containing Milli-Q water (Sherk), whose

pH is 6.8 according to the manufacturer. Soon after the root was placed in the eppendorf, the pH of the Milli-Q water was measured with the pH strip (Merck - 0 to 14) and was subsequently checked every 24 hours for 21 days.

## RESULTS

The results are described below on tables I and II.

Table I. PH of the Milli-Q water of the bovine tooth root portion when calcium hydroxide paste (CALLEN-SS WHITE) was placed inside the root canal during the 21 day period.

Bovine roots	pH Initial	pH Final (21 days)
1	pH 7	pH 7
2	pH 7	pH 8
3	pH 7	pH 7
4	pH 7	pH 8
5	pH 7	pH 7
6	pH 7	pH 7
7	pH 7	pH 8
8	pH 7	pH 7
9	pH 7	pH 7
10	pH 7	pH 8

Table II. Milli-Q water pH of the bovine tooth root portion when calcium hydroxide paste (Ultracal XS Ultradent) was placed inside the root canal for 21 days.

Bovine roots	pH Initial	pH Final (21 days)
1	pH 7	pH 7
2	pH 7	pH 8
3	pH 7	pH 8
4	pH 7	pH 8
5	pH 7	pH 7
6	pH 7	pH 7
7	pH 7	pH 8
8	pH 7	pH 7
9	pH 7	pH 8
10	pH 7	pH 8

## DISCUSSION

Research has shown that the success of endodontic treatment depends on good instrumentation, irrigation of the root canals, intracanal medication and adequate sealing<sup>19</sup>. The difficulty in eliminating the microorganisms present in the dentinal

tubules after the mechanical chemical preparation shows the necessity of the use of an intracanal medication to maintain and sanify the dentinal mass. For this, the calcium hydroxide paste is the most used in the different clinical situations<sup>20</sup>. Its action is determined by the release of hydroxyl ions, requiring time for the destruction of microorganisms. The purpose of this study was to evaluate the change in pH of a Milli-Q water after the placement of calcium hydroxide paste in the root canal, mimicking such changes that would occur in the external root surface of the roots for a period of 21 days.

The action of this compound is due to the dissociation in hydroxyl ions and calcium ions with consequent change in the pH of the external environment<sup>8,9,1</sup> which in this study did not happen because it varied very little since the initial period, table 1. Still Nerwich et al. (1993)<sup>11</sup> emphasize the diffusion of the hydroxyl ion through the dentin that can be explained by the dentin permeability, which was sought in this experiment with the application of 17% EDTA and ultrasound. In addition, Guerisoli et al (2002)<sup>16</sup> emphasize the use of EDTA in complementation and action with sodium hypochlorite, since it facilitates the instrumentation of the channels besides permeabilizing the dentin. The authors discuss the dentin buffer capacity and the use of vehicles as well as interfere with the diffusion capacity of calcium hydroxide, so that it may be inferred that dentin has some power to maintain a pH balance, supporting the calcium hydroxide slurry at the most biological level possible. In the present study, in addition to intracanal medication, the irrigating solutions used were 4% sodium hypochlorite as an energetic cleaning agent of the root dentin<sup>15</sup>, facilitating the action of the paste used as intracanal medication. Researchers such as Huque et al., 1998; Plotinus et al., 2007<sup>18,17</sup> have suggested the use of ultrasound in endodontic therapy in order to potentiate the action of irrigation solutions and its use is associated with a greater cleaning of the canal system. In this study 17% EDTA was used under ultrasonic agitation for 20 seconds with three repetitions, totaling one minute trying to facilitate the penetration of the hydroxyl ions of the pulp, but due to the results of little alteration, this did not collaborate to alkalize the dentine mass. The pH measurements were performed for 21 days every 24 hours with pH indicator strips trying to verify if Milli-Q water would be altered and therefore it would be inferred that the external radicular surface of bovine teeth would also be alkalized. However, the pH of the water changed very little in relation to the pH of the calcium hydroxide placed inside the root canal that is<sup>12</sup>. Thus, according to the results obtained in this experiment, the intracanal medication failed to alkalize the dentinal mass on its surface. Since the modulator, Milli-Q water, has changed little.

## CONCLUSION

The results obtained with the methodology employed showed that:

- The pH of Milli-Q water changed from 7 to 8 days for 21 days;
- Calcium hydroxide (Ultracal XS Ultradent) and (Calen - SS WHITE) pastes within the bovine tooth root canal promoted a slight alteration in the external environment represented by Mili - Q water.

## RESUMO

O objetivo deste estudo foi avaliar o pH externo radicular de dentes bovinos, utilizando pasta de hidróxido de cálcio (Ultracal XS Ultradent) e (Calen - SS WHITE), como medicação intracanal. Foram utilizados 10 dentes bovinos (n=10/grupo), selados no ápice com resina composta e com quatro perfurações de 2 mm de profundidade realizadas com uma ponta diamantada esférica n° 1014 em cada corpo de prova. O preparo químico mecânico foi feito manualmente com limas tipo Kerr até a lima #80. A irrigação dos canais foi feita com hipoclorito de sódio a 4% durante a instrumentação e EDTA 17% sob agitação com ultrassom (Profi II ceramic Dabi Atlante) durante 20 segundos, três vezes, totalizando um minuto. Posteriormente os canais radiculares foram preenchidos com a medicação intracanal (Ultracal XS Ultradent) e com (Calen - SS WHITE) e o selamento coronário com bioplic. Imediatamente após, cada dente foi colocado em eppendorfs contendo água miliquezada, logo o pH externo radicular foi medido com a fita de pH da marca Merck (pH 0-14), de 24 em 24 horas durante 21 dias. Os resultados obtidos neste experimento mostraram que a medicação intracanal não conseguiu alcalinizar a massa dentinária em sua superfície externa já que o modulador, água Milli-Q, alterou-se pouco, concluindo-se que a pasta de hidróxido de cálcio no interior do canal radicular de dente bovino promoveu pequena alteração no meio externo representado pela água Mili-Q.

**UNITERMOS:** Hidróxido de cálcio, hipoclorito de sódio, medicação intracanal.



Figure 1 - Perforations in bovine roots

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