Sodium Hypochlorite Pulpotomies: An alternative to formocresol
Objectives

- Discuss current literature regarding primary tooth pulpotomies
- Address the controversy surrounding formocresol
- Look at the future of pulp therapy
- Describe a simple technique for using 5% NaOCl as a pulp medicament
What are the goals of a pulpotomy?

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- No evidence of post-operative external root resorption.
- Internal root resorption can be self limiting and stable.
- There should be no harm to the succedaneous tooth.

AAPD Reference Manual 2011/12
Contraindications to pulpotomy

- Swelling
- Fistula or sinus tract
- Pathologic mobility
- Pathologic external root resorption
- Internal root resorption
- Periapical or interradicular radiolucency
- Pulp calcification
- Excessive bleeding of the radicular pulp stumps
- Signs/symptoms of irreversible pulpitis are reported
There are many approaches to primary pulp therapy, with similar success rates, but without proper diagnosis, the medicament does not matter!

Diagnosis is the key!
<table>
<thead>
<tr>
<th>Ideal dressing:</th>
<th>Possibilities:</th>
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<tbody>
<tr>
<td>☑ Bactericidal</td>
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• Postdoctoral program made the switch to sodium hypochlorite for primary vital pulp therapy in 2007
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Why not formocresol?

- Full strength FMC is the “gold standard” with success rates ranging from 62-97%
- Composed of: 19% Formeldahyde, 35% Cresol in 15% glycerin and water
- Recommended is a 1/5 dilution for 5 minutes
- Causes tissue fixation
Do We Still Need Formocresol in Pediatric Dentistry?

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Most pediatric dentists in the United Kingdom and North America[1] use formocresol pulpotomy for vital primary pulp therapy. In the United Kingdom, 54% of pediatric dentists reported concerns about possible sensitization, toxic, mutagenic or carcinogenic effects of formocresol: 42% of specialists surveyed in 2002 were considering changing their pulp technique to avoid formocresol.[1]

We performed a telephone survey of directors of Canadian pediatric dentistry programs to determine undergraduate teaching for management of vital primary pulps. The formocresol pulpotomy, one-fifth dilution or full strength, continues to be the standard for didactic and clinical training of Canadian undergraduates. Although many programs provide didactic instruction in alternative techniques, fewer than a third offer clinical exposure to nonformaldehyde methods. One program does not offer didactic or clinical training in formocresol pulpotomy.

Concerns about Formocresol

Concerns about the safety of formocresol have been appearing in the dental and medical literature for more than 20 years.[2,3] Cresol is locally destructive to vital tissue, but its potential for systemic distribution following pulpotomy treatment is negligible.[4,5] The major concern has been with the formaldehyde component of formocresol. Although a 1:5 dilution of formocresol is specified in undergraduate curricula, most (78%) American pediatric dentists who use formocresol in primary tooth pulpotomy use it at full strength (19% or 48.5% formaldehyde). Only 2% of American pediatric dentists use a predictably accurate dilution of formocresol.[10]

Formaldehyde has been shown to be distributed systemically after pulpotomy. Up to 10% of the formaldehyde from a formocresol pulpotomy was absorbed systemically in dogs.[11] In a separate study, radioactively labelled formaldehyde was distributed throughout the viscera of rats following formocresol pulpotomy in a single molar.[12]

in randomized clinical trials. With the known risks of formocresol and proven alternatives with equal efficacy, formocresol use in pediatric dentistry is unwarranted.
- “...it is highly unlikely that formocresol, judiciously used, poses a cancer risk to children who undergo one or more formocresol pulpotomy procedures.”
- Milnes does go on to recommend the 1:5 dilution of Buckley’s Original Formula
Why not Formocresol??

- AAPD news release 8/19/2011
- U.S. Department of Health and Human Services (DHHS) – 12th Report on Carcinogens (RoC)
  - June 10th, 2011
  - This report identifies agents, substances, mixtures, and exposure circumstances that are known or reasonably anticipated to cause cancer in humans.
  - 8 new additions, including formaldehyde
  - “There is now sufficient evidence from studies in humans to show that individuals with higher measures of exposure to formaldehyde are at increased risk for certain types of rare cancers, including nasopharyngeal, sinonasal, as well as specific cancer of the white blood cells known as myeloid leukemia.”
AAPD’s Current Position

- Because no data area available to guide clinicians on the relative risk of formocresol, AAPD is making no recommendations regarding the use of formaldehyde-containing dental products at this time.
- *However*, we would like to make you aware of two alternative procedures to formocresol pulp therapy for children, that have evidence of success.
  - Indirect pulp cap (IPC)
  - Mineral trioxide aggregate (MTA)
What about MTA and IPT?
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- Many hospitals no longer allow FMC
- Many Institutional Review Boards will not allow FMC to be included in studies
- Body of evidence is growing for medicaments with equivalent success
- Exposure to the dental team
Sodium Hypochlorite

**Advantages:**
- Readily available
- Affordable
- Easy to handle
- Proven track record as an antiseptic in Endodontics for decades

**Disadvantages:**
- Underwhelming body of research at this point
Technique

- Very simple
- Basically the same series of steps as FMC
- No special armamentarium
1. Properly diagnose
2. Adequate local anesthesia
3. Rubber dam isolation
4. Remove caries (pulp exposure)
5. De-roof chamber
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An example of dry, hemostatic pulp chambers that is ready for placement of pulp medicament.
9. Placed “squeezed out” 5% NaOCl pellet on pulp stumps for 30 sec
10. Fill chamber with IRM and condense
11. Restore tooth with SSC
Preliminary Evaluation of Sodium Hypochlorite for Pulpotomies in Primary Molars

Kaaren G. Vargas, DDS, PhD\textsuperscript{1} Brett Packham, BS\textsuperscript{2} David Lowman, BS\textsuperscript{3}

Abstract

**Purpose:** The purpose of this study was to compare the effectiveness of 5% sodium hypochlorite (NaOCl) to that of ferric sulfate (FeSO\textsubscript{4}) as a pulpotomy medicament in decayed primary molars.

**Methods:** Healthy subjects between 4 and 9 years with at least 2 primary molars needing pulpotomy consented to receive either NaOCl or FeSO\textsubscript{4} and restoration with IRM base/stainless steel crown in a prospective, randomized design. Clinical and radiographic signs/symptoms were recorded at 0, 6, and 12 months.

**Results:** Twenty-three subjects were recruited. Six-month results are based on the first 32 teeth in the NaOCl group and 28 teeth in the FeSO\textsubscript{4} group. Twelve-month results are based on 13 teeth in the FeSO\textsubscript{4} group and 14 in the NaOCl group. Results show 100% restoration retention in both groups and no signs/symptoms of pain at 6 and 12 months. At 6 months, 100% clinical success was found with both FeSO\textsubscript{4} and NaOCl. Radiographic success for FeSO\textsubscript{4} was 68%, with internal resorption being the most common finding. The NaOCl group showed 91% radiographic success, \( P = .050 \). At 12 months, FeSO\textsubscript{4} had 85% clinical success and 62% radiographic success, NaOCl had 100% clinical success and 79% radiographic success.

**Conclusion:** Preliminary evidence shows that NaOCl can be used successfully as a pulpotomy medicament. (Pediatr Dent 2006;28:511-517)

**Keywords:** Pulpotomy, ferric sulfate, sodium hypochlorite, primary molars

Received April 20, 2006 Revision Accepted May 24, 2006
NaOCl pulpotomies had a 95% clinical and 82% overall radiographic success rate.

Scientific Article

Sodium Hypochlorite Pulpotomies in Primary Teeth: A Retrospective Assessment

Sean F. Vostatek, DDS¹ • Michael J. Kanellis, DDS, MS² • Karin Weber-Gasparoni, DDS, MS, PhD³ • Robert L. Gregorsok, DDS⁴

Abstract: Purpose: In 2007, the University of Iowa’s advanced training program in pediatric dentistry replaced the traditional formocresol vital pulpotomy technique with a 5% sodium hypochlorite (NaOCl) technique. The purpose of this study was to evaluate the clinical/radiographic success over 21 months of 5% NaOCl as the medicament in primary molar pulpotomies compared to published data for formocresol and ferric sulfate pulpotomies. Methods: A retrospective chart audit was performed to evaluate results for all primary molar pulpotomies completed during a 12-month period using NaOCl. Dental records were reviewed for clinical and radiographic findings subsequent to pulp therapy. Clinical and radiographic criteria used to determine pulpotomy success were based on scientific literature. Results: One hundred ninety-two NaOCl primary molar pulpotomies were completed in 118 patients; 131 (68%) primary molars from 77 children were available for follow-up examination (mean time since pulpotomy=10.5 months). NaOCl pulpotomies had a 95% clinical and 82% overall radiographic success rate. External root resorption was the most common pathologic finding. Pulpotomy success diminished over time. Conclusions: Clinical and radiographic success rates in this study on NaOCl pulpotomies are comparable to formocresol and ferric sulfate pulpotomies reported in the literature. Further study with longer observation periods is warranted. (Pediatr Dent 2011;33:327-32) Received December 7, 2009 / Last Revision October 18, 2010 / Accepted November 11, 2010

KEYWORDS: SODIUM HYPOCHLORITE, PULPOTOMIES, PRIMARY MOLARS
What’s the take-home message??

- This is the only way to do a pulpotomy.
- Formocresol is horrible.
- NaOCl is a viable alternative to FMC
- The process is simple
- Safety concerns are minimized
- This is an ongoing area of research – stay attuned to this area as the science develops
Thank you!
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## Medicaments

### Ideal dressing:
- Bactericidal
- Harmless to pulp and surrounding tissues
- Promote healing of the radicular pulp
- Not interfere with physiologic process of root resorption

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- 1:5 Dilution Formocresol
- Gluteraldehyde
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