

# Scientific Article



## A Survey of Primary Tooth Pulp Therapy as Taught in US Dental Schools and Practiced by Diplomates of the American Board of Pediatric Dentistry

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**Abstract:** **Purpose:** The purpose of this study was to repeat a 1997 survey of current pulp therapy practice. **Methods:** The directors of dental school predoctoral pediatric dentistry programs (N=56) and board certified pediatric dentists (N=1200) were surveyed in 2005. **Results:** More dental schools (83%) taught indirect pulp therapy (IPT) compared to 1997. Significantly more used glass ionomer for IPT with most dental schools and diplomates not re-entering a tooth after IPT. Over 30% of schools and diplomates do direct pulp caps using glass ionomer. For pulpotomy, diluted formocresol usage decreased in dental schools (54%) while ferric sulfate significantly increased (24%) and full strength remained at 22%. Shorter placement of pulpotomy medication was noted and ZOE alone the preferred base. Pulpotomy was advocated by 85% of 2005 schools and diplomates with ZOE filler use decreasing while iodoform/calcium hydroxide filler use increasing. **Conclusions:** More pediatric dentists are using glass ionomer for IPT and direct pulp capping, and there was a trend away from the use of 1:5 diluted formocresol with more using ferric sulfate for pulpotomy. For pulpectomy, most use ZOE but iodoform pastes and calcium hydroxide have increased in usage since 1997. Disagreements continue concerning when to use certain pulp therapies and some directors and diplomates did not follow the AAPD guidelines. (*Pediatr Dent* 2008;30:42-8) Received December 16, 2006 / Last Revision March 15, 2007 / Revision Accepted March 16, 2007.

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The American Academy of Pediatric Dentistry (AAPD) guidelines for primary tooth pulp therapy<sup>1</sup> outlines the indications and objectives for indirect pulp treatment (IPT), direct pulp capping (DPC), pulpotomy, and pulpectomy. Although these guidelines exist, there is a lack of consensus in the literature whether DPC is appropriate.<sup>2,3</sup> Also, there are differing opinions on the correct pulpotomy procedure and pulpotomy medication that should be used.<sup>4,6</sup> A data-based review concluded that there is no evidence supporting the superiority of one type of pulpotomy medicament or treatment over another.<sup>5</sup> The research on IPT shows a higher success than formocresol pulpotomy.<sup>7-9</sup> IPT has the same indications as pulpotomy for caries near the pulp in the AAPD guidelines,<sup>1</sup> but is not taught in 30% of the dental schools according to a 1997 survey on pulp therapy.<sup>10</sup> Pulpectomy techniques and the type of root canal filler also differ widely in the literature.<sup>11-14</sup>

Primosch et al<sup>10</sup> pointed out in 1997 the lack of uniformity in pulp therapy being taught to predoctoral dental students. His group surveyed all predoctoral pediatric dental programs in the United States to determine what pulp therapy was taught for certain hypothetical scenarios. Disagreements were common among dental educators concerning the best treatment option for primary pulp therapy.

Since 1997, new primary tooth pulp therapy medications and techniques have been published concerning: (1) DPC; (2) IPT; (3) caries control; (4) pulpotomy; and (5) pulpectomy.<sup>15-21</sup> These newer studies may have altered the way dental educators teach primary tooth pulp therapy. In addition, the Diplomates of the American Board of Pediatric Dentistry (ABPD) have never been surveyed to determine how they practice primary tooth pulp therapy.

The purposes of this study were to:

1. replicate the Primosch et al survey of predoctoral pediatric dental program directors;
2. survey diplomates of ABPD; and
3. determine whether philosophies and techniques for primary tooth pulp therapy teaching have changed since 1997 and compare these findings to the diplomates' practice methods.

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## Methods

Permission was first obtained from Primosch to use his exact survey as published in 1997.<sup>10</sup> Approval to survey undergraduate pediatric dental program directors and diplomates of the ABPD in 2005 was obtained from the Institutional Review Board of the University of Maryland. The survey was sent to all 56 US dental school pediatric dentistry departments and to ABPD diplomates. A different cover letter was sent to each group explaining the survey's purpose. The predoctoral program director letter requested that the director or person most responsible for pulp therapy teaching to dental students complete the survey according to the department's philosophy on primary tooth pulp therapy. The diplomate letter requested that the pediatric dentists answer the questions according to their philosophy for pulp therapy in primary teeth. A self-addressed stamped return envelope was included. There was no specific instruction to limit responses to one answer, which was identical to Primosch et al. Therefore, some questions had multiple answers from that respondent or in some cases, no response.

The survey contained 27 multiple-choice questions and responses identical to those in the 1997 Primosch et al survey and was divided into 2 sections. Part I was designed to ascertain which primary tooth pulp therapies were taught in predoctoral pediatric dental programs or used in practice by the diplomates. Part II presented various clinical scenarios for pulp therapy in primary teeth. The survey contained the definitions of IPT, DPC, pulpotomy, and pulpectomy from the AAPD Reference Manual.<sup>1</sup>

Once the surveys were returned, summary tabulations were calculated to create a percent distribution of responses for each question. For those respondents choosing multiple answers, all answers were included in that question's percent distribution. If the question was not answered, that respondent was not included in that question's percent distribution since it was assumed that that particular pulp therapy was neither taught nor practiced. All results were analyzed using a chi-square test for significance with a *P*-value equal to or less than .05 considered significant.

## Results

A total of 48 of 56 (86%) predoctoral pediatric dental program directors that returned surveys. Of the diplomates, 689 out of 1,200 (57% of all board certified pediatric dentists) returned a survey. This allowed samples large enough to make comparisons between the 1997 directors and the 2005 directors and diplomates. For some questions, the data needed to be collapsed to satisfy cell size requirements for valid chi-square analysis. In Tables 1 to 4, the question number from the survey is represented by Q1, Q2, etc.

Indirect pulp treatment survey results are found in Table 1. In 2005, there were more predoctoral pediatric dentistry programs that taught indirect pulp therapy (83%) compared to

1997 pediatric programs (70%). This change in pulp therapy teaching philosophy for indirect pulp therapy was not statistically significant. Conversely, compared to directors in 1997, significantly fewer 2005 predoctoral directors taught and diplomates practiced, the use of calcium hydroxide base and zinc oxide eugenol base for indirect pulp therapy.

In Table 1, significantly more 2005 predoctoral directors taught, and diplomates practiced the use of glass ionomer cement for indirect pulp therapy. Also, significantly more 2005 predoctoral directors (89%) taught and diplomates (84%) practiced not re-entering a tooth after placing an indirect pulp cap, compared to 1997 directors.

Direct pulp cap survey results are shown in Table 2. In 2005, there were more predoctoral pediatric dentistry programs that taught students direct pulp cap therapy (58%)

Table 1. SURVEY RESULTS REGARDING TEACHING AND USE OF INDIRECT PULP THERAPY (IPT) IN PRIMARY TEETH

Question no.	Directors * 1997 N (%)	Directors 2005 N (%)	ABPD † Diplomates 2005 N (%)	<i>P</i> -value
1. Teach or use IPT	37/53 (70)	40/48 (83)	486/689 (71)	.161 ‡
5. IPT liner:				
Calcium hydroxide	33/37 (89)	26/56 (47)	323/644 (50)	<.001
ZOE §	8/37 (22)	4/56 (7)	50/644 (8)	.01
Glass ionomer	6/47 (13)	26/56 (47)	271/644 (42)	.005
6. Don't re-enter ITP; restore and observe	21/37 (57)	40/45 (89)	472/559 (84)	<.001

\* Directors of predoctoral pediatric dental school programs.

† Diplomates of the American Board of Pediatric Dentistry.

‡ *P*-values derived from chi-square statistical analysis.

§ Zinc oxide eugenol.

Table 2. SURVEY RESULTS REGARDING TEACHING AND USE OF DIRECT PULP CAPS IN PRIMARY TEETH

Question no.	Directors * 1997 N (%)	Directors 2005 N (%)	Diplomates † 2005 N (%)	<i>P</i> -value
2. Teach or use direct pulp cap	23/53 (43)	28/48 (58)	357/689 (52)	.32 ‡
7. Direct pulp cap base:				
Calcium hydroxide	21/23 (91)	22/37 (60)	329/480 (69)	.03
Glass ionomer or calcium hydroxide	2/23 (9)	15/37 (40)	151/480 (31)	

\* Directors of predoctoral pediatric dental school programs.

† Diplomates of the American Board of Pediatric Dentistry.

‡ *P*-values derived from chi-square statistical analysis.

compared to 1997 pediatric programs (43%). This change in pulp therapy teaching philosophy for direct pulp cap therapy was not statistically significant. Calcium hydroxide remained the base of choice for direct pulp caps for both 2005 dental schools (60%) and diplomates (69%). Significantly more 2005 predoctoral pediatric dental programs, however, gave student the choice of calcium hydroxide or glass ionomer cement as a base for direct pulp caps in primary teeth, compared to 1997 dental programs.

Pulpotomy survey results are shown in Table 3. Pulpotomy treatment was still taught by every predoctoral pediatric dental program with no change from 1997 (100%) to 2005 (100%). Although formocresol (full strength and 1:5 dilution) remained the medicament of choice for pulpotomy procedures, in 2005 significantly more dental schools taught (24%) and diplomates used (18%) ferric sulfate compared to 1997. Diluted formocresol was taught by fewer predoctoral programs (54%) and was used less by diplomates (49%) in 2005 than was reported in 1997 by program directors (72%). Use of undiluted formocresol showed a slight upward trend by the diplomate compared to the 1997 and 2005 directors. In addition, Table 3

shows that significantly more diplomates (22%) used a medicated pellet in the pulp chamber for 1 minute (prior to removing it for an initial evaluation) compared to 2005 directors (8%) and 1997 directors (0%). Bases used for pulpotomies did not change from 1997-2005. Zinc oxide eugenol (ZOE) was the base of choice for pulpotomy procedures by: (1) 1997 dental schools (92%); (2) 2005 dental schools (94%); and (3) diplomates (83%). This difference was not statistically significant (Table 3).

Pulpectomy survey results are shown in Tables 4. As shown in Table 4, pulpectomy treatments were taught and used less by 2005 directors and diplomates, but the reduction in the use of these procedures was not statistically significantly different from the 1997 results. There was no change from 1997 to 2005 in the canal debridement method taught by directors or used by diplomates. Hand instruments were still the preferred debridement method for root canals by both 1997 and 2005 directors (98% and 96%, respectively) and diplomates (88%). In addition, there were more diplomates (11%) that preferred rotary instrumentation for root canal enlargement than advocated by the 1997 or 2005 directors (2%). This difference was not statistically significant. In performing pulpectomies, for both 2005 diplomates (63%) and dental schools (58%) there was a trend toward not enlarging the root canal that was not statistically significantly greater than the 1997 dental schools (52%). Responses to the types of solutions used for root canal irrigation showed that sodium hypochlorite (full strength or diluted) was preferred by 40% of the 1997 directors, and there was little change in 2005 since both diplomates (41%) and directors (58%) also chose some form of sodium hypochlorite. These choices of root canal irrigant used were not statistically significantly different.

As shown in Table 4, zinc-oxide eugenol paste remained the material of choice for obturation of root canals in 2005 by over 60% of directors and diplomates. In addition to ZOE, however, significantly more diplomates (32%) and 2005 directors (34%) advocated other filler pastes (such as iodoform and calcium hydroxide) than did the 1997 directors (8%). When respondents were asked what technique was used to place filling material into the root canal, the 2005 directors and diplomates tended to use one technique or a combination of techniques (lentulo spiral, hand condenser, or syringe). The choice of technique used, however, was not statistically significantly different. As for the number of scheduled pulpectomy appointments, significantly fewer diplomates (12%) and 2005 directors (7%) used or taught 2-appointment pulpectomies compared to 1997 directors (26%). When surveyed regarding the frequency of exposure of radiographs following a pulpectomy procedure, significantly more 2005 directors (74%) taught radiograph exposures immediately after obturation and then periodically than did 1997 directors (44%) and diplomates (41%).

Table 3. SURVEY RESULTS REGARDING TEACHING AND USE OF PULPOTOMY IN PRIMARY TEETH

Question no.	Directors * 1997 N (%)	Directors 2005 N (%)	Diplomates † 2005 N (%)	P-value
3. Teach or use pulpotomy	53/53 (100)	48/48 (100)	681/689 (99)	.44 ‡
8. Pulpotomy medicaments:				.02
1:5 formocresol	38/53 (72)	29/54 (54)	345/702 (49)	
100% formocresol	12/53 (22)	12/54 (22)	223/702 (32)	
Ferric sulfate	2/53 (4)	13/54 (24)	125/702 (18)	
Other	1/53 (2)	0	9/702 (1)	
9. Time of medicament (mins):				<.001
2-5	53/53 (100)	44/48 (92)	508/669 (76)	
1	0	4/48 (8)	148/669 (22)	
>5	0	0	13/669 (2)	
10. Pulpotomy base:				.15
ZOE§	49/53 (92)	46/49 (94)	572/685 (83)	
ZOE and formocresol	3/53 (6)	2/49 (4)	94/685 (14)	
Glass ionomer	1/53 (2)	1/49 (2)	19/685 (3)	

\* Directors of predoctoral pediatric dental school programs.  
 † Diplomates of the American Board of Pediatric Dentistry.  
 ‡ P-values derived from chi-square statistical analysis.  
 § Zinc oxide eugenol.

**Table 4. SURVEY RESULTS REGARDING TEACHING AND USE OF PULPOTOMY IN PRIMARY TEETH**

Question no.	Directors *	Directors	Diplomates †	P-value
	1997 N (%)	2005 N (%)	2005 N (%)	
4. Teach or use pulpotomy	50/53 (94)	41/48 (85)	583/689 (85)	.16 ‡
14. Root canal Filler:				<.001
ZOE § paste with or without formocresol	46/50 (92)	29/44 (66)	397/581 (68)	
Other (zinc oxide or iodoform and calcium hydroxide pastes)	4/50 (8)	15/44 (34)	184/581 (32)	
16. Pulpotomy appointments:				.006
1	30/50 (60)	26/43 (60)	405/585 (69)	
2	13/50 (26)	3/43 (7)	67/585 (12)	
1 or 2	7/50 (14)	14/43 (33)	113/585 (19)	
17. Root canal radiographs:				.002
Immediate and then periodically	22/50 (44)	32/43 (74)	239/574 (41)	
Periodic only	15/50 (30)	6/43 (14)	223/574 (39)	
If adverse signs or symptoms develop	8/50 (16)	2/43 (5)	61/574 (11)	
Immediate and if adverse signs noted	5/50 (10)	3/43 (7)	51/574 (9)	

\* Directors of predoctoral pediatric dental school programs.

† Diplomates of the American Board of Pediatric Dentistry.

‡ P-values derived from chi-square statistical analysis.

§ Zinc oxide eugenol.

## Discussion

According to the 2004 AAPD pulp therapy guidelines, an indirect pulp treatment is indicated in a tooth that has a carious lesion near the dental pulp.<sup>1</sup> The increase in the teaching of IPT in 2005 may reflect the mounting evidence showing IPT success rates of greater than 90%.<sup>7-9,18</sup> Another reason for the shift in IPT teaching could be the concern over systemic absorption of the formocresol after a pulpotomy. A 5-minute exposure of pulp tissue to 14C-formocresol resulted in systemic absorption of approximately 1% of the dose.<sup>22</sup> It was interesting that, in 2005, only 71% of diplomates used IPT—which nearly matched the 1997 directors response of 70%. This may be reflected by the response of one diplomate who stated, “There is no reimbursable code” for IPT, although there is an insurance code for the procedure. If most United States insurance companies do not pay a dentist for IPT, its lower use by diplomates may be a reflection of this fact. In one of the clinical scenarios, only 30% of 2005 directors and

19% of the diplomates performed IPT for a tooth that had the indications for IPT, according to the AAPD guidelines on pulp therapy. This may also be a reflection of the insurance reimbursement problem or an indication that most predoctoral pediatric program directors and diplomates chose not to perform IPT for deep caries near the pulp—although it is indicated in the AAPD pulp therapy guidelines.

Other evolving issues for IPT concerned whether to re-enter a tooth following IPT and the base used for IPT. This survey showed a significant shift away from re-entering the tooth after an IPT by both the 2005 directors and diplomates, compared to 1997 directors. This may reflect the mounting evidence showing that a 1-appointment IPT is highly successful.<sup>7-9</sup> In 2005, there was a shift from ZOE and calcium hydroxide to glass ionomer as a base for IPT, compared to the 1997 directors. The diplomates responses also showed that a high percentage, though not a majority, used glass ionomer. The AAPD guidelines endorse all 3 bases, but the shift to glass ionomer may reflect using the glass ionomer cement for steel crowns as a 1-step cement and IPT liner.

The 2004 AAPD pulp therapy guidelines for primary teeth state that direct pulp capping (DPC) is indicated only for small mechanical or traumatic exposures.<sup>1</sup> The present study’s results showed that there was an increasing trend among 2005 directors to teach DPC (58%) and among diplomates to use DPC (52%), compared to 1997 (43%). This may reflect parents’ desires after trauma to save a pulpally exposed incisor. Another factor is that DPC is less invasive and time consuming than pulpotomy in an uncooperative child. Fuks reported that DPC success rates for small mechanical or traumatic exposures are not particularly high.<sup>23</sup> This may be why over 65% of 2005 directors and diplomates preferred some type of pulpotomy rather than DPC in one of the clinical scenarios in which a 5-year-old child could be treated with a DPC, according to the AAPD guidelines. This was not significantly different from the 1997 directors. Calcium hydroxide was the preferred base for DPC in 60% or more of the 2005 responses by predoctoral directors and diplomates, but this was a significant drop from the 91% taught by predoctoral directors in 1997. In 2005, significantly more schools (40%) and diplomates (31%) advocated either calcium hydroxide or glass ionomer for DPC, even though there is no published research to support the use of glass ionomer for DPC.

All dental schools continued to teach pulpotomy in 2005, and nearly all diplomates practiced pulpotomy. Either 1:5 or full-strength formocresol was the material of choice for pulpotomy, with over 75% of 2005 directors and diplomates using it. Nevertheless, in 2005 there was a large decrease in the teaching of formocresol for pulpotomy. Instead, there was a trend toward ferric sulfate being taught (24%) and used by diplomates (18%) for a pulpotomy compared to the 1997 directors (4%). Research<sup>4,5</sup> has shown no significant difference in



ferric sulfate and formocresol pulpotomy success. Therefore, many 2005 directors and diplomates may have switched to ferric sulfate to avoid any systemic distribution of formocresol.

Another trend in pulpotomy was away from using 1:5 diluted formocresol, with 52% of the 2005 predoctoral directors teaching 1:5 diluted formocresol pulpotomy and only 49% of the diplomates using it vs 72% of the directors in 1997. This may reflect the switch to ferric sulfate. King et al<sup>24</sup> found in a survey that, of 422 pediatric dentists using formocresol, 34% thought they could buy 1:5 diluted formocresol, even though it can not be purchased and must be compounded by the dentist. Therefore, some of the responding directors and diplomates may have thought they used diluted formocresol, when in fact they did not.

More 2005 predoctoral directors (24%) advocated ferric sulfate than diplomates (18%) for pulpotomy. The survey also found that only 8% of the 2005 directors vs 18% of diplomates advocated a medicated pellet for 1 minute. These results suggested that directors are leaving the ferric sulfate pellet in the pulp chamber longer than necessary to achieve hemostasis, since ferric sulfate has been shown to be effective in as little as 15 seconds.<sup>14,25</sup>

Compared to the Primosch 1997 data,<sup>10</sup> there was no significant change in the 2005 predoctoral directors' or diplomates' use of ZOE as the base of choice for a pulpotomy. It should be noted that more of the diplomates added formocresol to the ZOE, even when a smaller percentage of directors have been teaching that method since 1997.

In the clinical scenarios involving pulpotomy, there seemed to be a disagreement as to when a pulpotomy was indicated. The AAPD guidelines<sup>1</sup> clearly state that, when homeostasis can not be achieved while doing a pulpotomy, the tooth is not a candidate for pulpotomy. Only pulpectomy or extraction would be indicated for such a situation. In a scenario on pulpal bleeding assessment, there were 43% of the 2005 directors and 45% of the diplomates who advocated a 2-stage pulpotomy or deep pulpotomy for uncontrolled pulpal bleeding when doing a pulpotomy. There is no published prospective or retrospective data for support of either treatment in primary molars. The AAPD guidelines<sup>1</sup> clearly indicate that a tooth with a draining sinus tract is a candidate for a pulpectomy or extraction. In another scenario concerning treatment of a primary molar with a sinus tract, there were 4% of the diplomates who advocated pulpotomy. It appeared that some directors and diplomates are not applying the AAPD pulp therapy guidelines or pulpotomy research to the clinical situation.

In 2005, diplomates used and dental schools taught comparable levels of pulpectomy therapy (85%), which is slightly lower than the 1997 directors (94%). Many dentists may have felt that extraction and any space maintenance of irreversibly involved teeth are less technique sensitive and more predictable than pulpectomy, especially in an uncooperative child. Canal

debridement primarily with hand instruments by directors was unchanged from 1997 to 2005. There was a slight trend for diplomates (11%) to prefer rotary instrumentation than the 2% of the 2005 directors but the difference was not significant. There were fewer 2005 directors (42%) and diplomates (37%) enlarging root canals for a pulpectomy compared to 1997 directors (48%). Enlarging root canals is advocated for nonvital teeth, per the 2004 AAPD guidelines.<sup>1</sup> Casas et al,<sup>13,14</sup> however, do not advocate enlarging root canals when doing pulpectomy in vital teeth. Possibly, there is confusion in directors and diplomates minds as to when to enlarge root canals for pulpectomies in nonvital teeth.

Significantly fewer diplomates (68%) and 2,995 directors (66%) advocate ZOE paste for root canal obturation than the 1997 directors (92%). Over 30% of 2005 directors and diplomates advocated the use of iodoform or calcium hydroxide pastes, in addition to ZOE, vs 8% of the 1997 directors. This may reflect the concern that ZOE may be retained after a pulpectomy when the tooth is exfoliated.<sup>26</sup> Regarding root canal filling instruments, there was no significant change in how root canals were filled from 1997 to 2005. Significantly fewer diplomates (12%) and 2005 directors (7%) advocated 2-appointment pulpectomy technique than the 1997 directors (26%). Many studies have shown that 1-appointment pulpectomies have high clinical success rates.<sup>11,15,16</sup> These studies may have been the rationale why the directors in 2005 and diplomates chose a 1-visit pulpectomy.

The data showed that significantly more 2005 directors (74%) taught radiographic exposures immediately after obturation and then periodically than 1997 directors (44%) and diplomates (41%). The AAPD pulp therapy guidelines<sup>1</sup> recommend periodic radiographs for all pulpal therapies. The survey results showed that 20% of diplomates take radiographs immediately after pulpectomy and then only if adverse signs/symptoms develop. One wonders how the 2005 directors and diplomates discover pathologic root resorption postoperatively if no signs or symptoms are present except on a radiograph. As was observed in a clinical scenario involving an 8-year-old with pathologic root resorption 3 years after a pulpotomy, over 60% of 2005 directors and diplomates "observe only" rather than extract or do pulpectomy. One can only infer that they are observing for more specific pathology, even though the AAPD guidelines<sup>1</sup> define pathologic root resorption after a pulpotomy as a failure.

In the other clinical scenarios related to pulpectomy, significantly more diplomates (51%) and 2005 directors (47%) extract a mandibular second primary molar with a draining fistula but no root resorption than the 1997 directors (28%). With fewer 2005 dental schools and diplomates (85%) teaching or using pulpectomy, it is not surprising that a tooth indicated for pulpectomy or extraction in the AAPD pulp therapy guidelines is extracted.

There were several limitations to this study. The Primosch et al study<sup>10</sup> had a 100% response from 53 dental school pediatric program directors, while the present study had 86% (48/56). A strong effort was made to achieve a 100% response rate, with repeated mailings, e-mails, and personal phone calls to the 8 programs that did not return the surveys without success. Secondly, since there were no specific instructions to limit question responses to one answer, some wrote in their own answer to a question that was not one of the answers. Each response was carefully evaluated to respect the spirit of the respondent's answer.

## Conclusions

Based on this study's results, the following conclusions can be made:

1. Indirect pulp therapy, as taught in US dental schools in 2005 and practiced by diplomates of the American Board of Pediatric Dentistry, has changed since 1997—with significantly more using glass ionomer and less zinc oxide eugenol (ZOE) or calcium hydroxide liners and most not re-entering a tooth following indirect pulp therapy (IPT).
2. For pulpotomy, dental schools and diplomates in 2005 still preferred formocresol but fewer used the diluted form compared to 1997. Ferric sulfate usage has increased since 1997, and shorter times were noted for a medication to be placed in the pulp chamber. ZOE remains the base of choice after a pulpotomy.
3. Slightly less pulpectomy therapy was advocated by dental schools and diplomates in 2005 for abscessed teeth. Diplomates showed a trend to use more rotary instruments for pulpectomy debridement, and more were advocating iodoform and calcium hydroxide paste fillers. Few advocated a 2-appointment pulpectomy procedure.
4. Disagreements continue concerning what primary tooth pulp therapy to use for a clinical scenario among dental educators and between diplomates. The AAPD pulp therapy guidelines and pulpal research was not always applied by some directors and diplomates in the clinical scenarios presented.
5. The pediatric diplomates tended to practice pulpal therapy similar to the way the 2005 pediatric program directors teach.

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## Abstract of the Scientific Literature

### Association between body mass index and dental health in children

*The objective of this study was to examine a possible relationship between caries frequency and body mass index (BMI) in German elementary school children. A total of 1,290 elementary school children (648 boys, 642 girls) were examined. The dental examination included the determination of caries frequency (DFT/dft values). The medical evaluation assessed the pupils' general health and BMI. The study showed that 4% of the children were underweight, 75% had a normal weight, 12% were overweight, and 10% were obese. Forty-five percent of underweight and 41% of normal weight children had healthy teeth. However, only 31% of overweight and 32% of obese children, respectively, had healthy teeth. Significant associations between overweight and caries frequency were found in the primary ( $p = .007$ ) and permanent ( $p < .001$ ) dentitions, even when adjusted for age. The number of natural healthy teeth decreased with age ( $p = .001$ ) and BMI ( $p = .006$ ) and was different between girls and boys ( $p = .03$ ). This study demonstrated a significant association between caries frequency and weight in school children. In future preventive programs, the importance of nutrition should not only be emphasized with respect to general health but also with regard to caries.*

**Comments:** Children are among the fastest growing group of the overweight and obese population. Future strategies to address this issue should emphasize diet control not only for avoiding overweight but also preventing caries. **YHW**

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**Willerhausen B, Blettner M, Kasaj A, Hohenfellner K. Association between body mass index and dental health in 1,290 children of elementary schools in a German city. *Clin Oral Invest* 2007;11:195-200.**

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