

# The Ugly Facts

# on DENTAL AMALGAM\*

by Michael J. Wahl, DDS

*"The great tragedy of science:  
the slaying of a beautiful hypothesis by an ugly fact."*

– Thomas Henry Huxley

Dental amalgam has been maligned as a filling material, both because of its clinical properties and its alleged effects on systemic health, but reports of its demise have been premature. As of 2008, 57 percent of dentists were placing amalgam (March 2008 Dental Products Report Survey). A large 2011 survey showed that dentists in the United States place more dental amalgam than composite for first-time restorations in posterior teeth.<sup>1</sup>

Still, amalgam use has certainly declined over the last two decades, in part because of improved alternative filling materials and techniques in addition to declining rates of caries in children and young adults. When the automobile replaced the horse and buggy as the primary mode of transportation, there were few, if any, emotional attacks on horses, and no one called for a ban on horse and buggies – they were simply replaced with automobiles. Similarly, when composite resins were commercially introduced, they fairly quickly replaced silicate cements as the material of choice for anterior fillings. As was the case with automobiles replacing horses, there were few, if

any, emotional attacks on silicate cements, and no one called for a ban on silicate cements – they were simply replaced with better materials.

Compare this to dental amalgam. Never has a material been so vituperatively savaged as dental amalgam. And it's not just the dental amalgam itself, but also the dentists who place amalgam. Maroon described anyone still using amalgam as "a fool... *amalgam sucks!*"<sup>2</sup>

Harper stated that amalgam is "...an inferior restoration that I would not place in the mouths of my family or friends, much less into patients' mouths."<sup>3</sup>

Dickerson referred to the fact that dental amalgam is the most common restoration as not just unfortunate, but even *criminal*: "What is even more of a crime is that the most common restoration today is the same as it was 100 years ago. Where is the

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2. Maroon M. The fab five. *Dental Leader*, March, 1998:2-3.
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\*This article is edited to fit the magazine's space constraints. To read the full article, please visit [www.dentaltown.com](http://www.dentaltown.com).

progress in our profession? What other industry has not had a significant advancement in materials used in the last 100 years?”<sup>4</sup>

Many dentists proudly assert that they practice “mercury-free” dentistry – they place no amalgam restorations. To dentists who do place amalgam, it would seem ludicrous to assert that there have not been significant advances in dental amalgam materials and techniques in the last 100 years, but “mercury-free” dentists who have not placed any amalgams in many years might be unaware of them. A few of these advances include amalgam bonding, new preparation techniques including slot preparations and the elimination of sharp line and point angles, pre-weighed dosages, encapsulated and self-activating dispensing techniques and more. I remember using hatchets, hoes and chisels to help create sharp line and point angles when I went to dental school in the 1980s, but I have never used them since! Regardless, the fact that a material or technique is more than 100 years old does not make it a “crime.” Airplanes, aspirin, automatic dishwashers, automobiles, contact lenses, electric light, telephones, toilet paper, trains, mechanical dental chairs and postage stamps are all more than 100 years old and in common use today.

## Cusp Fracture

Amalgam restorations are often criticized because they allegedly contribute to cusp fractures. Erickson has stated, “[T]he cuspal fracture characteristic of amalgam is well-known and observed almost daily in every general dental practice.”<sup>5</sup>

DiTolla asked, “[W]hy would I plant this amalgam ‘crown seed’ and then wait for the tooth to break[?]”<sup>6</sup>

Dickerson asserted, “Many studies have shown that, after seven years, 50 percent of the teeth filled with amalgam have fractured.”<sup>7</sup> Although no studies were cited in the article, Dickerson later cited just two (personal communication, February 3, 2000), both of which were on endodontically-treated teeth with large MOD restorations. In one of the studies Dickerson cited, there were only 181 MOD (probably unbonded) amalgam restorations and 40 resins.<sup>8</sup> The teeth with resin had a much lower incidence of cusp fractures, but the author stated that the results of the study “should be cautiously interpreted, especially since the number of resin-restored teeth was rather small.” In two similar but much larger studies published by the same author two years later, there were much different results: In 1,584 endodontically-treated teeth with MOD

amalgam restorations, 34 percent (532) had cusp fractures after 20 years<sup>9</sup> and in 190 endodontically-treated teeth with MOD composite, 28 percent had cusp fracture after 10 years.<sup>10</sup> The incidence of cusp fracture after 20 years in (presumably unbonded) amalgam-restored teeth was thus about the same as the incidence of cusp fracture in composite resin-restored teeth after only 10 years. From these studies, it is clear that the cusp fracture incidence in endodontically-treated teeth restored with MOD amalgam restorations is more favorable than that of endodontically-treated teeth with resin composite restorations.

But enough about cusp fractures in endodontically-treated teeth – those teeth should be restored with crowns or some other type of cuspal coverage anyway.<sup>11-12</sup> When evaluating cuspal fractures, it is more appropriate to examine amalgam-restored vital teeth under more common clinical conditions. In a long-term 1989 study of about 600 amalgam-restored teeth, there was less than a 1.5 percent cusp fracture rate after five years.<sup>13</sup> In a 1993 study of 1,415 Class II amalgam-restored teeth, only 1.8 percent had a fractured cusp after 10 years.<sup>14</sup> After 15 years, a 1996 study of 1,214 Class II amalgam-restored teeth showed only 3.8 percent failed because of enamel fracture and only five percent failed solely because of enamel fracture or a combination of enamel fracture, isthmus fracture and/or caries.<sup>15</sup>

Amalgam bonding increases fracture resistance and decreases cuspal deflection<sup>16-19</sup> at least as much as composite bonding does<sup>20</sup> and can allow for smaller preparations and restorations, which last longer and are less likely to be associated with cusp fracture.<sup>21-26</sup> Consider that these studies were before amalgam bonding and conservative preparation techniques were in common use, but the amalgam restorations still had a low incidence of cusp fracture.

Many studies on cusp fracture in amalgam- and composite-restored teeth are also inherently biased against amalgam-restored teeth because they don’t take restoration size into account.<sup>27</sup> Dentists have long been advised to use composite only for smaller restorations but amalgam for larger ones.<sup>28</sup> Larger restorations generally do not last as long as smaller restorations, and larger restorations are more likely to be associated with cusp fractures.<sup>23,24</sup>

In assailing the cusp fractures associated with amalgam-restored teeth, DiTolla stated, “I thought back over my first six years in practice and realized that 99 percent of the teeth that

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required crowns all had silver fillings.”<sup>26</sup> DiTolla’s assertion is a classic case of the logical fallacy of “base rate neglect,” in which he focuses only on the *irrelevant* base rate (the *number* of teeth requiring crowns) and ignores the *relevant* base rate (the *incidence* of amalgam-restored teeth requiring crowns including both those that required crowns and those that did not).<sup>29</sup>

In a 2004 study we published in *JADA*, we examined every posterior tooth with an amalgam or composite resin restoration in 1,902 consecutive patients. There were a total of 10,869 posterior teeth with amalgam or composite resin, 10,082 with amalgam and 787 with composite resin. Of these, there was a 1.88 percent cusp fracture rate in amalgam-filled teeth and 2.29 percent cusp fractures in composite-filled teeth.<sup>30</sup> The cusp fracture rate was actually slightly higher in composite-filled teeth than in amalgam-filled teeth, although the difference was not statistically significant. So why does it seem like amalgam is more likely to be associated with cusp fracture than composite resin? Our study is probably typical of many dental practices – there were *13 times* more amalgam-restored teeth than composite-restored teeth in our “snapshot” of patients’ posterior dentition. One factor might be that dentists spend very little time examining successful restorations, and tend to focus on examining and restoring failed restorations.<sup>31</sup>

We are told that the amalgam “filling expands and contracts at a rate greater than that of the tooth and that’s why the

patient’s MB cusp broke off or there is a marginal fracture, etc.”<sup>36</sup> It is thus alleged that dental amalgam expands and contracts to temperature changes more than composite resin does, and that’s what contributes to tooth fractures in amalgam-restored teeth. Actually, the opposite is true: The expansion and contraction to temperature changes are greater with resin composite than with amalgam. The coefficient of thermal expansion of composite is greater than that of amalgam.<sup>32-36</sup>

Fortunately, expansion and contraction of restorative materials is not an important clinical issue. Extreme temperature changes occur only fleetingly *in vivo*.<sup>37</sup> When cold soda or hot coffee contacts teeth, it is usually only fleetingly. Unlike in the mouth, thermal expansion and contraction is an important issue in a concrete sidewalk or the steel of an automobile, where there might be intense heat and cold for hours and days at a time. When it comes to likelihood of cusp fractures, far more important than thermal expansion and contraction are issues like tooth preparation size, diet and masticatory habits.

As mentioned above, teeth filled with composite resin suffer cusp fractures also: In a 1995 study of 1,360 composite resin restorations, almost nine percent were replaced due to cusp fracture.<sup>38</sup> Many dentists consider gold restorations to be the “holy grail” of dentistry, but in a 1993 study of 745 gold restorations, 36 percent of 139 cast gold restorations that were replaced were replaced due to tooth fracture.<sup>39</sup> There is very little evidence that amalgam restorations are associated with high rates of cusp fracture.

## Amalgam and Recurrent Caries

Recurrent caries have been studied extensively in clinical restorations in thousands and thousands of teeth, and it is true that recurrent caries is the most common cause of amalgam failure.<sup>40-46</sup> However, recurrent caries is also the most common cause of resin failure<sup>38,41,42,44-46,47-53</sup> and even cast gold restoration



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failure.<sup>39</sup> In fact, recurrent caries is the most common cause of restoration failure in every kind of restoration.<sup>40,54</sup>

A 1993 study of 1,415 Class II amalgams showed only 16 (~1.1 percent) had recurrent caries after 10 years.<sup>14</sup> At 10 years, none of 35 Class II amalgams had recurrent decay.<sup>55</sup> After 14 years, less than five percent had recurrent decay.<sup>56</sup> In a 2000 randomized, prospective study of 1,748 restorations in children over seven years, the composite restorations had an incidence of recurrent caries 3.5 times greater than that of the amalgam restorations.<sup>57</sup> In a 2007 cross-sectional radiographic study of 557 amalgam and 93 resin composite inter-proximal restorations, there was an eight percent rate of secondary caries in the amalgam restorations versus a 43 percent rate in the resin composite restorations.<sup>49</sup> In a 1993 five-year prospective study of small Class II restorations of primary caries, composite restorations had a higher incidence of recurrent caries than amalgam.<sup>58</sup> Composites have higher levels of cariogenic bacteria at margins than amalgam restorations.<sup>59,60</sup> It is clear that there are holes in the argument that amalgam restorations are associated with high levels of recurrent caries.

## Amalgam Bonding

Many dentists assert that amalgam cannot be bonded to dentin. Freedman has stated, “Composites are bonded to dentin and enamel, recreating the monobloc of the original undecayed tooth. Amalgam simply fills a cavity, and may act as a wedge during mastication...Teeth are prepared more conservatively for composite restorations...The preparation for amalgams requires extensions for retention and prevention, implying the loss of healthy tooth structure.”<sup>61</sup>

Vasserman stated that amalgam “has forced us to extend cavity preparations to accommodate the material rather than have the materials accommodate the preparation.”<sup>62</sup>

Although some assert that amalgam cannot be bonded to teeth, scientific evidence belies such assertions. There have even been successful amalgam pit and fissure sealants! (Please note that this author does not advocate *using* amalgam pit and fissure sealants.) In a pit and fissure sealant study comparing bonded amalgam sealants and resin sealants, there was no difference

between the two types of sealants at six months, one year, two years and five years.<sup>63</sup> Some amalgam sealants lasted five years. If that doesn't prove to even the most fervent anti-amalgamist that amalgam can be bonded to teeth, then nothing will. The potential benefits of amalgam bonding are similar to the potential benefits of resin composite bonding and include decreased micro-leakage, decreased incidence of recurrent caries, decreased post-operative sensitivity, increased fracture resistance of the tooth, decreased cuspal deflection, conservation of tooth structure and increased retention.<sup>64</sup> As a result of amalgam bonding, *tooth preparation for amalgam restorations can be done exactly the same as for composite resin restorations.*

Many comparative studies have shown better bonding and less leakage in amalgam restorations than in composite resin restorations.<sup>65</sup> Amalgam bonding is effective and can help ensure minimal cavity preparation techniques.<sup>21,66</sup> One study has questioned the efficacy of amalgam bonding,<sup>67-69</sup> but this study included amalgam bonding agents other than 4-META HPA. Amalgam restorations bonded with 4-META HPA (Amalgambond) powder adhesive are generally superior to those bonded with other types of bonding materials.<sup>70</sup> Amalgam bonding with 4-META HPA has been shown to be equal to pin retention in large complex restorations.<sup>71</sup> All this goes to show that there is an obvious gap in the argument that amalgam cannot be bonded to dentin.

## Amalgam Longevity

Dickerson stated, “We can all find amalgam that has lasted a long time, but statistically, that is the exception, not the rule.”<sup>72</sup> This assertion is not backed up by scientific studies. In the 1960s, “extension for prevention” was state of the art. Sharp line and point angles were created using hoes and hatchets. There was no amalgam bonding. Large-scale studies (published in the 1970s) on amalgams probably placed in the 1950s or 1960s (before amalgam bonding) showed the median life of an amalgam filling to be about 10 years.<sup>73,74</sup> Since then, virtually every large study has shown that amalgam longevity is significantly greater than composite resin longevity.<sup>41,44,49,57,75-83</sup> It should be noted that as early as 1995<sup>84</sup>

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and 1998,<sup>85</sup> some authors had advised dentists to stop using amalgam, yet virtually every large study since then has shown greater longevity for amalgam restorations than for composite restorations.

There are very few studies in which resin composite restorations have shown better longevity than dental amalgam restorations. In two studies by the same authors,<sup>47,86</sup> amalgam and composite restorations were placed by the same operator and followed over many years of private practice. The resin composite restorations had a better survival rate than the amalgam restorations. This operator placed virtually all amalgams for posterior teeth in the first decade of his practice from 1983 to 1993. After a two-year transition period, he switched to virtually all posterior composite restorations thereafter. Any restorations placed during the transition period were not included in the study. In other words, virtually all the amalgams were placed by an inexperienced operator (0 to 10 years of private practice) whereas virtually all the composites were placed by the same much more experienced operator (13 to 20 years of private practice). These studies do not provide evidence that composite resin restorations last longer than amalgam restorations. Restoration longevity is directly related to operator experience,<sup>82</sup> which was significantly greater with the composite resin restorations. In addition, since they were placed between 1983 and 1993, the amalgam restorations were probably unbonded, but

the composite resin restorations (which were placed between 1996 and 2003) were bonded. Amalgam bonding has been shown to decrease micro-leakage, cuspal deflection, cuspal fracture, recurrent caries, increase retention and allow for smaller restorations. These could have yielded even greater longevity for the amalgam restorations. There are still those who argue that amalgam does not have greater longevity than composite restorations, but this argument is getting old. There is overwhelming evidence that amalgam restorations typically have greater longevity than composite restorations.

## Amalgam and Systemic Effects

Mercury occurs in the air, food and water,<sup>87,88</sup> and it is the main ingredient of dental amalgam restorations – about 50 percent Hg before mixing,<sup>89</sup> but less after condensation. Although mercury is tightly bound in set amalgam restorations, tiny amounts of mercury are released. Halbach has calculated an integrated daily dose of 3µg Hg for an average number of fillings and only 7.4µg for a patient with a high amalgam load.<sup>90</sup> These levels are well below the World Health Organization's tolerable level for daily mercury intake of 2.0µg/kg body weight or about 68µg Hg for a 150lb adult.<sup>91</sup>

Vim and Lorscheider have estimated that as much as 15µg Hg per day can be released from a single occlusal amalgam filling.<sup>85</sup> The average weight of a one-surface amalgam is estimated at 310mg,<sup>92</sup> so the mercury content would be about 155mg. If this restoration actually releases 15µg Hg per day, then the entire mercury content would be depleted in 28 years. Having lost 27mg of mercury, or nearly 20 percent of its main component, the restoration would probably implode within five years if 15µg Hg were lost daily. Even the most rabid anti-amalgamists would admit that amalgam restorations do not typically implode within five years, or even within 20 years, so it is highly unlikely that 15µg Hg per day could be released from an occlusal amalgam restoration.

In a 1998 study of 1,127 healthy males, Kingman et al. estimated there was only a 1µg Hg/L increase in urinary Hg for every 10-surface increase in amalgam fillings.<sup>93</sup> In a similar 2005 study of 1,626 women, Dye et al. estimated a 1.8µg Hg/L increase in urinary Hg for every 10-surface increase in amalgam fillings.<sup>94</sup> A 1995 study determined that a single amalgam filling releases only 0.03µg/day of mercury, so a patient would

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require 2,740 amalgam fillings in order to reach the mercury exposure threshold limit value of 83.30µg/day considered dangerous for occupational exposure in the United States.<sup>95</sup> The World Health Organization has stated that urine mercury levels are raised more from eating seafood once a week than from dental amalgam exposure.<sup>96</sup>

Mercury from dental amalgam accumulates in body tissues, especially the kidneys and brain,<sup>97,98</sup> and there is a correlation between the number of amalgam surfaces and the amount of mercury accumulation in tissues.<sup>99</sup> There have been numerous studies attempting to show that dental amalgam causes systemic health problems, but there has never been a credible scientific study showing that mercury from dental amalgam causes systemic health problems in humans, other than occasional reports of allergic reactions.

A 2001 University of Calgary study showed disruption of “the membrane structural integrity of neurites and the growth cones of identified neurons” after exposure to mercury.<sup>100</sup> Anti-amalgamists asserted that this study “should remove all doubt regarding the role that dental mercury from amalgam fillings plays in the development of Alzheimer’s disease.”<sup>101</sup> It’s curious that this study would be the one to remove all doubt since it was done on the tissue of dead snails. In fact, partly because there has never been a snail (either dead or alive) diagnosed with Alzheimer’s disease, it is questionable whether this study has any relevance at all to the issue of amalgam restorations and Alzheimer’s disease – let alone whether it should “remove all doubt” about the relationship. Another piece of evidence cited by anti-amalgamists is a 1997 study from the Universities of Calgary and Kentucky purportedly showing that some rats exposed to high levels of mercury showed brain lesions similar to those in patients with Alzheimer’s Disease.<sup>102</sup> But the rats were exposed to 100 times the level of mercury that patients with 25 surfaces of amalgam restorations would typically inhale, even under stimulated conditions, so its relevance is also questionable at best.

Well-controlled human studies have failed to show any relation between mercury exposure from dental amalgam restorations and Alzheimer’s disease. A relatively homogenous group of Roman Catholic nuns was studied for the performance on a battery of neuropsychological tests, including one from the Consortium to Establish a Registry for Alzheimer’s Disease. There was no correlation with the presence, absence or number of surfaces of amalgam.<sup>103</sup> It is a result of studies like these that the Alzheimer’s Association has concluded, “According to the

best available scientific evidence, there is no relationship between silver dental fillings and Alzheimer’s.”<sup>104</sup>

In a 2006 randomized study of more than 500 patients in the *Journal of the American Medical Association*, there were no differences in neuropsychological or renal effects in children with amalgam versus composite restorations.<sup>105</sup> In another 2006 randomized study of more than 500 patients, also published in the *Journal of the American Medical Association*, there was no difference in neurobehavioral effects in children with amalgam versus composite restorations.<sup>106</sup> Clarkson et al., writing in the *New England Journal of Medicine*, concluded, “Patients who have questions about the potential relation between mercury and degenerative diseases can be assured that the available evidence shows no connection... There is no clear evidence supporting the removal of amalgams [for health reasons].”<sup>107</sup>

A 2011 study compared subjective health complaints in patients who had all their amalgam restorations replaced with composite versus patients who had no amalgam restorations replaced.<sup>108</sup> After three years, those who had their amalgam restorations replaced had significant reductions in self-reported health complaints. This study does not provide scientific evidence that amalgam restorations cause health problems or that their removal improves health, although it may show a beneficial psychological effect to amalgam removal. The health complaints were subjective and self-reported by the patients without any preoperative medical examination (other than preoperative and postoperative mercury levels in the treatment group), and there was no information on the number of surfaces of amalgam restorations and whether there was any matching of the number of surfaces with the control group.

The National Multiple Sclerosis Society states, “There is no scientific evidence to connect the development or worsening of MS with dental fillings containing mercury, and therefore no reason to have those fillings removed.”<sup>109</sup>

The Food and Drug Administration (FDA) “considers dental amalgam fillings safe for adults and children ages six and above... the existing data support a finding that infants are not at risk for adverse health effects from the breast milk of women exposed to mercury vapor from dental amalgam. The estimated daily dose of mercury vapor in children under age six with dental amalgams is also expected to be at or below levels that the EPA and the Centers for Disease Control and Prevention (CDC) consider safe.”<sup>110</sup>

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Extensive reviews on dental amalgam restorations have failed to show any credible evidence of systemic health effects (other than rare cases of allergy) from dental amalgam.<sup>96,111,112</sup> The Life Sciences Research Office (LSRO), composed of representatives from the National Institutes of Dental and Craniofacial Research (NIDCR) of the National Institutes of Health, the Centers for Devices and Radiological Health of the U.S. Food and Drug Administration, the Centers for Disease Control and Prevention and the Office of the Chief Dental Officer of the Public Health Service, conducted an extensive review of the literature on dental amalgam's health effects in 2004 and concluded, "The current data are insufficient to support an association between mercury release from dental amalgam and the various complaints that have been attributed to this restoration material."<sup>113,114</sup> The American Dental Association (ADA) has concluded that amalgam remains a safe and effective filling material.<sup>115</sup>

### Composite Resin and Toxicity

Many dentists advertise themselves as "mercury-free," implying that while mercury is toxic, other dental materials like composite resins are non-toxic. It is true that mercury is toxic – it can impair health depending on its dose. But the same is true with any material, including composite resin.<sup>116</sup> There are between 14 and 22 potentially hazardous compounds released from composite resin restorations, including DL-camphorquinone; 4-dimethylaminobenzoic acid ethyl ester (DMABEE), drometrizole; 1,7,7-trimethylbicyclo[2,2,1]heptane, 2,2-dimethoxy[1,2] diphenyletane (DMBZ); ethylenglycol dimethacrylate (EGDMA); and triethyleneglycol dimethacrylate (TEGDMA).<sup>117</sup> Geurtsen et al. identified 35 dental resin composite monomers/additives of commercial composite resins, of which nine were shown to be severely- or moderately-cytotoxic components.<sup>118</sup> Various composite restorative materials implanted into animals have been shown

to cause inflammatory responses, including an increase in lymphocytic infiltration as well as fibroblasts and epithelioid cells.<sup>119</sup> Some composite resin components are cytotoxic (causing damage or destruction of cells).<sup>120-123</sup>

Dentin bonding agents and their components are mutagenic (causing mutations in new generations).<sup>124-128</sup> Resin composite components "are hazardous in that they all cause significant toxicity in direct contact with fibroblasts."<sup>129</sup> They have been shown to cause immunosuppression or immunostimulation,<sup>130</sup> to inhibit DNA<sup>131</sup> or RNA<sup>132</sup> synthesis and to suppress the mitochondrial activity of macrophages.<sup>133</sup> Composite resin restorative material has been shown to be more cytotoxic than amalgam in a comparative in vitro study.<sup>134</sup> Additionally, the blue light used to cure composite resin restorations may cause retinal damage.<sup>135-137</sup>

There is no "non-toxic" material for filling teeth. Mackert stated, "A frequent claim by the anti-amalgamists is that 'no research has shown that dental amalgam is safe,' yet the same charge can be leveled against composites and other dental materials. No material can ever be judged 'safe' with any kind of finality, because new biological evaluation techniques are always being developed, and previously unanticipated adverse effects are continually being discovered for all materials."<sup>138</sup> Even water can be fatal in certain doses. According to the Centers for Disease Control, there were nearly 4,000 fatal drownings in the United States in 2007.<sup>139</sup> There have been many cases of fatal water intoxication reported in the medical literature.<sup>140,141</sup> It is doubtful that any "mercury-free" dentists eschew water in their practices, even though water is toxic. Those who describe composite resins, glass ionomers, and sealants to patients as "mercury-free" would be intellectually honest if at the same time, they described amalgam restorations as "triethyleneglycol dimethacrylate-free" or "formaldehyde-free" since composite resins, glass ionomers, and sealants have been shown to release formaldehyde, a possible carcinogen.<sup>142-146</sup> Water is toxic in high

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doses, but necessary for life in lower doses. Similarly, warfarin sodium, fluoride, and indeed, mercury in dental amalgam, are among substances that are toxic in high doses but necessary for health in lower doses in some patients. The argument that mercury from dental amalgam causes systemic health effects is downright poisonous!

### Conclusion

Dentists sometimes look for solutions to problems without realizing that the problems weren't what they seemed or that the solution was right in front of them the whole time. Such is the case with dental amalgam. Thomas Henry Huxley could have been speaking about the "crucifixion" of dental amalgam when he said, "The great tragedy of science: the slaying of a beautiful hypothesis by an ugly fact."

Dental amalgam certainly has a big drawback – it's ugly, but according to exhaustive research published in the medical and dental literature, the other "problems" with amalgam are not what they seem. Dental amalgam restorations are associated with excellent longevity and low rates of cusp fractures and recurrent caries, and dental amalgam restorations have not been linked to systemic health problems other than rare reports of allergic reac-

tions. While composite resin restorations are more aesthetic and are certainly an acceptable alternative, they generally do not compare favorably in other respects. The "solution" might not necessarily be to switch to composite resins but rather to continue using dental amalgam, not composite resin. It is a wonderful time to practice dentistry and to have so many choices for restorations, including both amalgam and composites. Pardon the pun, but for clinical efficacy and safety, dental amalgam is still the "gold standard" – or the "silver/mercury standard" – to which other direct filling materials including composite resin should be compared. ■

### Author's Bio

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