

## THE DENTIST'S HEALTH: EVALUATING OCCUPATIONAL RISKS FROM THE USE OF DENTAL AMALGAM MERCURY

By David Kennedy, DDS, and Amanda Just, MS  
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Every occupation exposes workers to chronic conditions and situations that have an impact on overall health. For example, violin players and other musicians are known to suffer high rates of carpal tunnel syndrome (a musculoskeletal injury) due to the repetitive hand movements and positioning often used when playing their instruments.<sup>1</sup> Obviously, dentistry also involves routine techniques and materials that can result in health issues. Fortunately, in the same way musicians can change their practices to protect themselves from some of the adverse effects of carpal tunnel, dentists can also change their practices to protect themselves from certain occupational health risks.

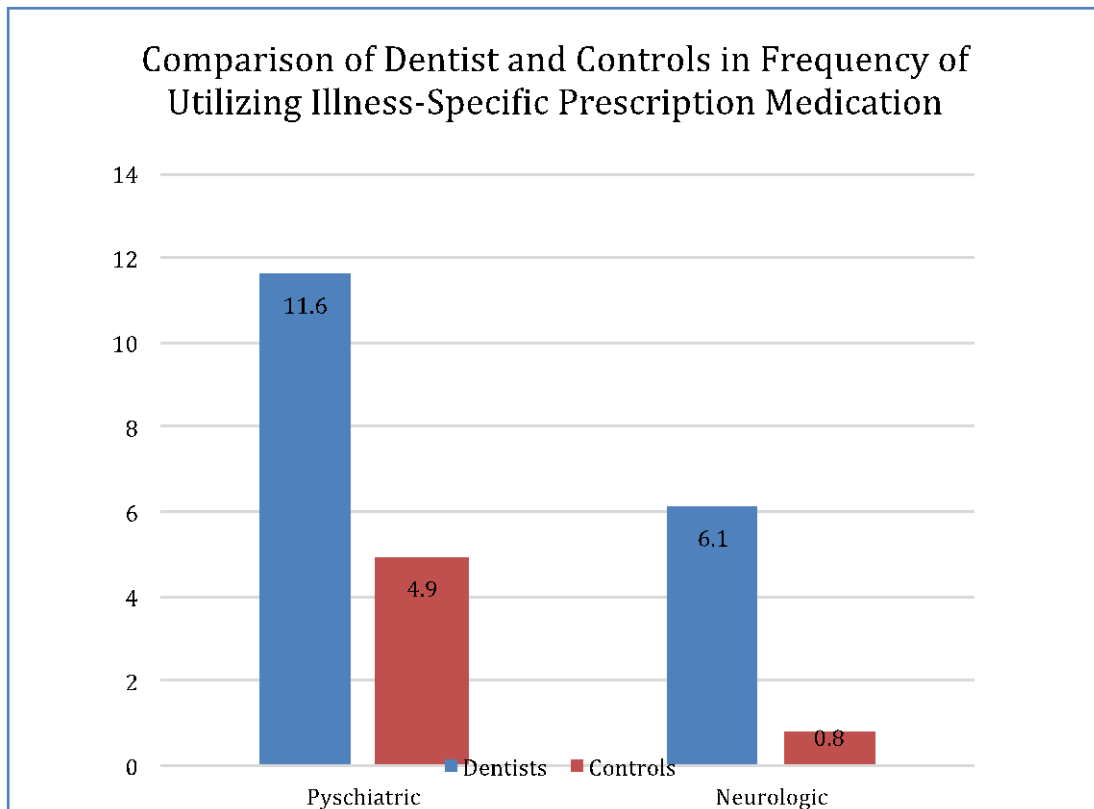
Specifically, among the materials regularly handled in dental offices, mercury stands out as a notoriously harmful substance. A report from the World Health Organization warns of mercury: "It may cause harmful effects to the nervous, digestive, respiratory, immune systems and to the kidneys, besides causing lung damage...Recent studies suggest that mercury may have no threshold below which some adverse effects do not occur."<sup>2</sup>

Some dentists, dental staff, and dental students do not realize that a variety of procedures involving manipulation of an old or new amalgam will expose them to levels of mercury that pose a threat to their health unless they take precautions such as instituting work practices and engineering controls to minimize exposure. Severe exposures from past practices include hand-squeezing of fresh amalgam, where drops of liquid mercury could run over the dentist's hands and contaminate the entire office.<sup>3</sup> Dangerous levels of mercury are still generated in the dental workplace, and research has clearly identified that exposure to these mercury levels can cause ill-health to dental workers,<sup>4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35</sup> and dental students.<sup>36 37 38</sup>

To illustrate this point, a 2012 study from Yale University School of Medicine's Dr. Thomas G. Duplinsky and Dr. Domenic V. Cicchetti reported a high rate of the use of prescription medication in male dentists and related it to occupational mercury exposure:

Dentists demonstrated significantly more prescription utilization of specific illness medications than did Controls, for the following disease categories: Neuropsychological, Neurological, Respiratory, and Cardiovascular. The greater majority of pediatric and general practice dentists still use mercury amalgam restorations. This places them at greater risk than the general population for those disorders, as well as threatening the future health of America's children and adults who continue to receive silver amalgam restorations.<sup>39</sup>

## Duplinsky/Cicchetti 2012 Study Summaries



### Dentists' Medical Conditions

Neurologic	7.6 times control
Psychiatric	2.4 times control
Cardiovascular	1.7 times control
Respiratory	1.5 times control

A series of other research articles have validated this concern, as data has shown that exposure to mercury can cause behavioral, psychological, and cognitive impacts on dental workers.<sup>40 41 42 43 44 45</sup> In particular, researchers of a 2018 review about mercury's health impacts on dental personnel, cautioned: "Recommendations for acceptable occupational limits of Hg exposure on a medical basis must be based on the most sensitive individuals. Some people may be especially sensitive to Hg toxicity due to genetic polymorphisms. Furthermore, there is no dose-response data for immunologically vulnerable persons. Therefore, no zero effect level can be established where, in individual cases, Hg-related symptoms do not occur."<sup>46</sup>

It is essential to emphasize that genetic variables have been linked to dental workers, mercury levels, and neurobehavioral factors. A common genetic trait known as the CPOX4 polymorphism has been identified as a factor in neurological damage from extremely low mercury exposure in dentists and dental personnel,<sup>47</sup> as well as in children with amalgam fillings.<sup>48</sup> Another study conducted on dental workers even explained that "[c]hronic subtoxic levels of inorganic mercury appear to produce mild changes in short-term nonverbal recall and heightened distress generally, and particularly in categories of obsessive compulsion, anxiety and psychoticism."<sup>49</sup>

Additionally, mercury is also known for being toxic to the kidney, and Austria, Canada, Finland, and Germany have worked to reduce the use of dental mercury amalgam fillings for patients with kidney problems and other populations.<sup>50</sup> To relate this issue to dental workers, consider the results of a 1988 study which evaluated kidney function in dental personnel exposed to mercury compared to workers exposed to lead, cadmium, and chromium. The authors of the study concluded that the dentists and dental assistants appeared to have a higher risk of kidney function disturbance than the other industrial workers.<sup>51</sup>

Another area that has received much attention is the possibility of reproductive hazards to female dental personnel. This is because research has repeatedly shown the potential for significant impacts to pregnant women, fetuses, and children as a result of dental mercury.<sup>52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87</sup> Thus, the dangers of exposure to mercury for pregnant dental workers have also been recognized,<sup>88 89</sup> and fertility issues<sup>90</sup> and menstrual cycle disorders<sup>91</sup> have been reported in female dental workers exposed to mercury as well.

Other research confirms reproductive dangers caused by occupational use of mercury. The Illinois Teratogen Information Service has reported that pregnant women should avoid all significant mercury exposure and has recommended greater caution for women of childbearing age.<sup>92</sup> Researchers of a 1999 study from Canada noted: “Pregnant women should not work in areas with high levels of mercury compounds in the air. The recommended TLV-TWA levels [Threshold Limit Value/Time-Weighted Average] of 0.05 mg/m<sup>3</sup> for mercury vapour might not provide sufficient protection for fetuses...Hence, women of childbearing age should not be exposed to mercury vapour concentrations greater than 0.01mg/m<sup>3</sup>.”<sup>93</sup>

Dental workers and risks of reactions to mercury or mercury allergies have also been studied. It is estimated that approximately 21 million Americans are allergic to mercury, and studies have established that exposure to dental mercury amalgam correlates with a higher prevalence of mercury allergies.<sup>94 95 96</sup> Not surprisingly, reactions to mercury have been related to dental personnel for dermatitis,<sup>97</sup> melanoma,<sup>98</sup> and skin diseases.<sup>99</sup> One study even specified hazards of mercury allergies for dental students: “The fact that the dental students who were the volunteers in this study received only a small fraction of the exposure to mercury that the practicing dentist receives does emphasize the potential of this allergen in actual dental practice.”<sup>100</sup>

In addition to these concerns, it is important to recognize that mercury is known to be released during the placement, replacement, and removal of dental mercury amalgam fillings.<sup>101 102 103 104 105 106 107 108 109</sup> A variety of studies have specifically called for protective measures to be taken in the dental office as a means of limiting mercury releases.<sup>110 111 112 113 114 115 116 117 118 119 120 121</sup>

Researchers of a 2013 study led by Robin Warwick stated: “To maximize safety, dental schools should train students to remove amalgam only while using water spray and high volume suction. Alternatively, students should use appropriate occupational hygiene personal protective equipment during amalgam removals.”<sup>122</sup> This is an important consideration because

unfortunately, dental schools oftentimes do not train dental students to comply with these work practices and engineering controls in their operative technique laboratories.

Taken together, scientific data clearly indicates that the use of mercury in dentistry can be detrimental to dentists and their staff. Perhaps a 2003 study by risk assessment expert Dr. G. Mark Richardson summarized this issue perfectly: “Various countries are moving to limit the use of amalgam as a dental restorative material in order to protect dental patients from Hg [mercury] exposure. However, dentists' occupational exposure should also be considered as a justification for reduced amalgam use.”<sup>123</sup>

Many factors contribute to increased incidences of disease and health conditions among dentists, but mercury poisoning is a threat that can be decreased by the use of current alternatives to amalgam filling materials. Additionally, safety measures should be taken to mitigate mercury exposures to dentists, dental professionals, dental students, and other staff members, as well as patients, during removal of amalgam fillings. Based on up-to-date science, the IAOMT has developed rigorous recommendations for amalgam removal known as [the Safe Mercury Amalgam Removal Technique \(SMART\)](#). The recommendations build upon traditional safe amalgam removal techniques such as the use of masks, water irrigation, and high volume suction by supplementing these conventional strategies with a number of additional protective measures.

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[davidkennedydds@gmail.com](mailto:davidkennedydds@gmail.com)

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