

## HG EMISSION FROM AMALGAM ACTUALLY MEASURED!

Summary: Mercury emissions from single-spill samples of three popular precapsulated amalgams, Tytin, Dispersalloy, and Valiant, were measured in water at room temperature, 23o C. Daily emission was 4.5 to 21 micrograms per day, much higher than previously “estimated” values offered by ADA spokespeople in the past. It is now obvious why pro-amalgamists never actually measured these values.

### A STUDY ON THE RELEASE OF MERCURY FROM DENTAL AMALGAMS MADE FROM DIFFERENT MANUFACTURED MATERIALS AND PRODUCED BY NINE DIFFERENT DENTISTS.

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This study was initiated in collaboration with the IAOMT to determine the amount of mercury released into distilled water at room temperature by dental amalgams made in Plexiglas molds drilled out to hold a single spill of amalgam. Nine such molds were sent to dentists along with unopened kits from the manufacturers. The amalgams were placed in the molds by these trained dentists and then sent to the Department of Chemistry at the University of Kentucky. At this location, the amalgams were removed from the molds and allowed to set for 3 months to insure total aging and the loss of surface bound mercury.

The amalgams were weighed and measured to determine surface area. They were then placed in 15 ml tubes with 10 ml of distilled water. The water was changed daily for a week and disposed of. At day one of the study, which lasted 28 days, the water was collected and the mercury was measured using a Nippon mercury vapor analyzer. Each day a standard curve was ran to insure the instrument was working properly.

The standard curve shows that the instrument can detect mercury in the low nanogram levels and the amount found in the test solutions were 1,000 times higher.

The following graph shows the data collected from three amalgams from each of the nine sets over a 28 day period. The values are micrograms/cm<sup>2</sup> surface area.

DENTISTS	BRAND	DAY1	DAY4	DAY8	DAY11	DAY15	DAY18	DAY22	DAY25
#1	Tytin	14.207	13.175	12.244	11.835	11.639	11.568	14.147	13.24
		21.055	20.484	19.769	20.15	22.512	20.912	18.798	16.579
		9.407	8.281	8.693	9.731	9.556	11.781	9.799	9.219
#2	Tytin	9.024	8.662	8.272	7.521	8.043	11.216	9.515	8.67
		10.757	10.341	9.713	6.384	7.03	7.54	7.428	6.782
		7.539	7.108	6.656	6.508	6.899	6.508	6.959	8.2
#3	Dispersalloy	11.424	10.897	12.077	10.392	10.738	10.976	12.094	11.538
		8.242	7.675	8.123	7.425	7.499	8.872	8.588	8.463
		10.529	10.427	10.553	11.149	10.463	10.156	10.559	10.228
#4	Tytin	9.098	8.063	7.795	7.366	7.994	7.304	9.803	9.305
		10.949	10.216	10.773	10.431	12.25	11.319	12.476	11.197
		15.925	15.525	14.992	12.234	12.797	14.67	14.038	13.647

DENTISTS	BRAND	DAY1	DAY4	DAY8	DAY11	DAY15	DAY18	DAY22	DAY25
#5	Valiant	9.921	9.677	9.58	9.463	8.7	8.873	9.392	9.311
		9.751	9.262	8.886	8.202	8.074	8.014	9.563	10.322
		8.075	7.288	7.054	7.288	7.558	7.311	7.315	6.956
#6	Dispersalloy	9.966	9.62	10.851	10.59	11.26	9.07	9.28	9.014
		7.322	7.922	9.913	9.279	8.639	6.809	7.542	8.672
		9.206	8.685	8.599	8.48	7.783	8.27	7.936	8.997
#7	Valiant	5.958	5.829	4.408	4.533	4.266	4.473	5.136	4.46
		5.28	4.762	4.492	4.279	4.801	4.505	4.3	4.862
		4.596	4.704	4.929	4.867	6.147	5.798	5.936	5.468
#8	Valiant	6.841	6.904	6.788	5.782	8.158	7.74	7.893	8.026
		12.458	11.878	11.771	12.404	12.146	10.693	10.484	10.221
		13.911	13.421	12.618	11.176	11.669	13.439	13.208	13.09
#9	Dispersalloy	11.357	11.238	11.887	12.086	15.335	14.712	14.473	15.859
		17.796	17.484	16.765	19.584	19.321	20.716	20.696	19.995
		15.336	14.602	14.086	18.625	17.759	12.389	16.285	15.58

The table above is an abbreviated presentation of the results done to make the results more clear and presentable. It should also be noted that the level of mercury emission was not stimulated by any brushing or manipulation of the amalgam. Our previous studies showed that mild brushing with a standard toothbrush for just a few strokes will greatly increase the amount of mercury released, many times by over 10-fold. Also, the reported measured mercury does not contain any "amalgam particles" that would be produced by brushing or abrasion. Great care was taken not to move the amalgam during the recovery of sampled water. All 10 ml of the water were gently removed to insure proper mixing. This is because we did an experiment removing the water 1 ml at a time from the top using a microliter pipette and noticed that the closer to the amalgam the higher the mercury concentration became. Also, the surface area of all of the amalgams were very close in value with most being between 0.8 to 1.0 cm<sup>2</sup> making the amount emitted per cm<sup>2</sup> near the amount emitted per single spill filling. The weight of the amalgams varied and averaged 0.663 g/amalgam and had a radius of 0.203 cm. This would be the size of a small filling in the mouth.

While the amount of mercury released remained somewhat consistent within each amalgam it seems as if amalgam made by the same dentist on the same day could have a significant variability of mercury release even if from the same manufacturer. Additionally, amalgam from the same manufacturer could produce significantly different levels of mercury release when prepared by different dentists, and sometimes even by the same dentist. We do not know if this difference is due to the dentist's technique or to a variation in the amalgam making materials.

Finally, even with the lowest level, 4 to 5 micrograms of mercury released per cm<sup>2</sup>, the level is considerably higher than that "estimated" by pro-amalgam supporters who testified before Congressional committees that the average amalgam released 0.03 micrograms Hg per day. This is about 133 to 667 times higher than the estimated 0.03. These values were obtained with the amalgams in a sealed container under 10 ml of water at room temperature of 23°C with no agitation or abrasion. Therefore, these values must therefore be considered the minimum amount of mercury that could be emitted from these small amalgams.

Assuming the amalgams are 50% mercury and the emission of 5 micrograms Hg/day then it would take 182 years to lose all of the mercury if the rate stayed consistent. At 20 micrograms per day the time would be 45 years. Considering that 80% of inhaled mercury is retained in the human body for some extended period of time it is obvious that dental amalgams would be one of the major contributors to human mercury body burden.

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