



## **Platinum Salt Sensitivity (PSS): Occupational Exposure Limit (OEL) and Voluntary Guideline Value (VGv)**

The first widely recognised evaluations of what acceptable occupational exposure limits for platinum should be were conducted by the American Conference of Governmental Industrial Hygienists (ACGIH) in the 1960s and 1970s. ACGIH derived a Threshold Limit Value (TLV) of 1 mg/m<sup>3</sup> for platinum metal and 0.002 mg Pt/m<sup>3</sup> for soluble platinum salts, both as 8-hour time-weighted averages (TWA). The ACGIH values were subsequently adopted as regulatory occupational exposure limits (OELs) in a number of countries and remain the most common legally enforceable limits for these substances to this day.

Most recently, the EU Scientific Committee on Occupational Exposure Limits (SCOEL) evaluated platinum in 2011 but concluded that the available data were insufficient to derive an OEL (SCOEL, 2011).

IPA subsequently sponsored the conduct of a retrospective occupational epidemiology study of platinum salt sensitivity (PSS) at five platinum group metals (PGM) refineries spanning South Africa, Europe, and the USA. The study, which covered the period 2000-2010, was conducted by the Institute for Risk Assessment Science (IRAS) at the University of Utrecht and was published in the scientific literature in 2016 (Heederik et al, 2016). The study was later extended, taking the study period up to 2015 (Smit et al, 2023; Smit et al, 2025). See [\*\*Epidemiology of PSS\*\*](#) for further information.

Despite the various limitations of the studies and the uncertainties that remain around the true exposure-response relationship, the IPA-sponsored studies provide the best guide upon which to base health-based decisions on what is an acceptable level of workplace exposure to chloroplatinates.

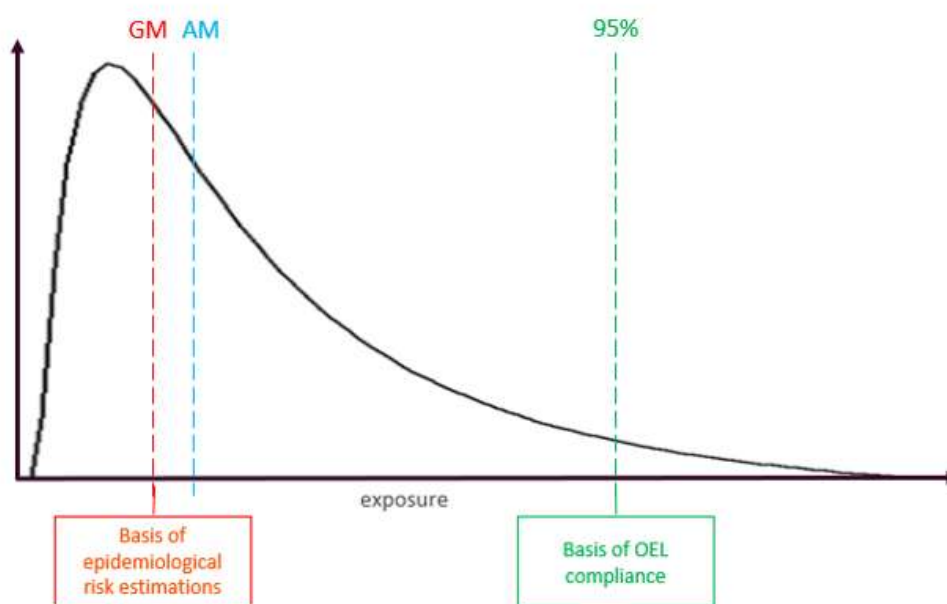
In the extension to the epidemiology study, Bayesian hierarchical modelling was used to estimate exposure levels for each worker group for each year of the study. The geometric mean (GM) exposure levels were modelled as central estimates representative for each group. Use of such a central estimate is necessary since even this is associated with uncertainty. Modelling of the 95<sup>th</sup> percentile (P95) level of exposure for each group would be associated with much greater uncertainty. In using GM values, therefore, actual exposure levels would have been higher for a substantial proportion of time or for a substantial proportion of individuals within an exposure group. How much higher depends on how broad the exposure distribution is for each defined exposure group.

Guidance on establishing similar exposure groups (SEGs) advises that if the exposure data for a group have an excessively broad distribution, which is typically defined as a geometric standard deviation greater than three (GSD > 3), it can indicate that the workers within that assigned exposure group do not in fact have the same general exposure profile and the composition of the exposure group should be reconsidered.

Across the 92 exposure groups used in the epidemiology study for which exposure measurement data were available, the vast majority (75) had a GSD above 3. Half (45) of the groups even had a GSD > 5, and 20 groups had a GSD > 10. The highest GSD was 47.

To illustrate the realities of such large exposure distributions, Exposure Group 516, for example, had a GSD of 10.3. The GM 'average' of its data was 6 ng/m<sup>3</sup>, but the measured exposure data were as high as 2000 ng/m<sup>3</sup>, i.e. over 300 times higher. Therefore, if a worker assigned to this exposure group became sensitised, it would be spurious to conclude that they had become sensitised from exposures of 6 ng/m<sup>3</sup>.

The pertinence of the extremely wide exposure distributions is critical to considerations of what is an acceptable level of workplace exposure to chloroplatinates. Compliance with OELs is judged based on the statistical analysis of limited sampling measurements. The precise statistical metric for compliance can vary between jurisdictions, but commonly it is an upper tolerance or confidence limit of the 95<sup>th</sup> percentile; for example, the 70% upper confidence limit of the 95<sup>th</sup> percentile as used in the European CEN 689. In other words, to be compliant, the exposure measurements collected for a Similar Exposure Group (SEG) must confirm with 70% confidence that exposure levels are below the OEL 95% of the time. This data point will be quite different to the geometric mean. The broader the distribution of the exposure data (i.e. the greater the GSD), the greater this difference will be.



Lognormal distribution illustrating the approximate geometric mean (GM, arithmetic mean (AM)), and 95<sup>th</sup> percentile.

P95 values are not available for each individual exposure group used in the epidemiology study, but overall GM and P95 values are available for each of the five refineries that participated. The average ratio of GM to P95 for the sites was 39 in the original study and 33 in the extended study.

Based on an evaluation of the epidemiological data on PSS, a committee of IPA member company physicians, toxicologists and industrial hygienists concluded that 100 ng/m<sup>3</sup> as an 8-hour TWA



represents a scientifically credible target for limiting workplace exposure to chloroplatinates. This is 20-fold lower than the most widely adopted regulatory OEL for chloroplatinates of 2,000 ng/m<sup>3</sup> (0.002 mg/m<sup>3</sup>) and represents an ambitious and challenging target that in most cases will require substantial capital expenditure to meet and is at the limits of technical and economic viability.

The member companies of IPA are committed to continuing the incredible progress made in reducing cases of PSS beyond the low incidence that has already been achieved. The IPA member companies therefore accepted the advice of its scientific committee and agreed to an industry Voluntary Guideline Value (VGV) for chloroplatinates of 100 ng/m<sup>3</sup> and to work towards decreasing exposures to this level.

## References

Heederik D, Jacobs J, Samadi S, van Rooy F, Portengen L, Houba R (2016) Exposure-response analyses for platinum salt-exposed workers and sensitization: A retrospective cohort study among newly exposed workers using routinely collected surveillance data. *J Allergy Clin Immunol*, **137**(3), 922-929.

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Smit LAM, Jacobs J, van Rooy F, Heederik D, Houba R, Portengen L (2025) Exposure-response relationships for platinum salt sensitization in precious metal refinery workers: a 16-year retrospective study. *Annals of Work Exposure and Health*, **69**(6), 592-601.

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