

Risk Assessment of Zinc Plated Cymbal

"This report is to assess the health risks of a zinc plated disc used as a toy for children aged 2-5 years. The referenced stainless steel disc (cymbal) is coated with zinc plating measuring approximately 6 cm in diameter and is coated on both sides with electroplated zinc.

The tests conducted by Intertek showed evidence that 'available chromium' was present in the zinc plating and further testing demonstrated that 'available chromium VI' was also present in the sample. To reflect the worse case scenario it is assumed that all of the available chromium is chromium VI and therefore the maximum content of chromium VI in the zinc plating on the disc is calculated as 0.04 mg. The maximum permissible level of detection of available chromium in toys according to BS EN71-3:1995 is 60ppm and this level of restriction has been exceeded approximately 32-fold.

Scientific information has shown that chromium VI is a significant health hazard and it cannot be excluded that this heavy metal poses a potential risk if used in toys and childcare articles, which are by definition produced for children. The uncertainties in the evaluation of exposure to this heavy metal, such as mouthing times and exposure to emissions from other sources require that precautionary considerations be taken into account.

The test used to determine the level of available chromium was one normally used to model the level of available chromium that would be present in the stomach should the product be ingested and has not determined the level of available chromium as part of the plating.

In terms of human factors, a child would play with the toy mainly by holding it. The time period of play with this toy is likely to be limited but typically would be for less than 2 hours per day. Skin contact will be limited to the hands. Any material deposited on the hands could have potential to be licked off the skin and possibly ingested. The toy is too large to be placed in the mouth by a 2 – 5 year old child but parts of it could be licked or sucked. Zinc/Chromium plating may be stripped anodically in an aqueous solution of sodium hydroxide or inhibited hydrochloric acid and these conditions are far too harsh to replicate with saliva in the mouth.

There appears to be no risk of inhalation of the zinc plating from the toys. The type of exposure from using this product will be by skin contact and transfer from the skin to mouth.

It is known that chromium is a skin sensitizer; however, this is more prevalent in cleaning services workers, builders from using cement, painters and hairdressing industries. There is little or no evidence available to suggest that chromium allergy is prevalent from exposure to articles such as jewellery. There is a risk that if used in jewellery items or items where exposure to the skin is prolonged, the release of sweat from the body will aid solubility of the chromium salts from the item on to the skin. However it was concluded that sweat and saline is an insufficient oxidizing agent to permit formation of hexavalent chromium in the reaction products from corrosion of chromium-containing alloys and any allergic contact dermatitis arising from prolonged contact with chromium-and-nickel-containing alloys would not be due to the presence of hexavalent chromium. Based on the evidence above, there is a minimal risk that the zinc plated Cymbal will give rise to skin sensitization given the mode of use.

In carrying out risk assessments it is usual to look first at the worst case scenario to see whether under such conditions any risk is minimal.

As calculated above and based on the assumption that all of the chromium identified in the sample supplied is available chromium VI, the level of available chromium VI is 0.04mg/metal disc. The toy also only allows one side of the disc to be exposed to possible skin contact effectively halving the available chromium content to approximately 0.02mg/disc. The best way to assess potential transfer to the skin is to assume that the child's hands are in contact with the surface for 2 hours a day.

It is likely that a child will ingest through the course of the day 1 litre of drinking water thus accepting 0.05mg of chromium in the body and additionally add to this a further 0.052 – 0.943 mg from the intake of chromium in food. Based on these values reported by the WHO, the typical daily exposure to chromium is higher than the amount present on the steel disc and should 100% of the zinc plating be ingested, the amount available is within the margin of environmental and normal human intake. This scenario is highly improbable as physical force and specific intended abuse would be required for the zinc plating to be removed.

Based on the information available the risk of carcinogenicity from chromium VI which is used for zinc plating is low for an end user product. The margin of safety from this worst case intake of chromium VI from handling the toy is within the limits and normal daily intakes from food and drinking water as referenced by the WHO.

The presence of available chromium VI in zinc plating on the surface of the steel disc (cymbal) represents a negligible risk to children who may play with the toy. However, the limits of available chromium found in this toy exceed the relevant European Standard BS EN 71-3:1995.