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## Heavy metal and tattoo: an allergy and legislative problem

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### KEY WORDS

tattoo; heavy metal; copper; allergy

### Summary

*We presented an interesting clinical case of a 23 years old man presented with a 2-week history of pruritus, erythema and papules on legs, arms and trunk. These lesions developed 2 months after tattooing. It showed positive patch test reaction to Copper and Disperse Blu.*

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It is estimated that more than 24% of American adults have one or more tattoos, and the practice is gaining social acceptability and is becoming more popular also in Italy, especially among adolescents (1).

In the last few years, the demand for new colors has increased. People demand for brighter colors and different shades. Pigments have been enriched with components to increase the brightness, like azopigment and heavy metal for new shades.

Heavy metal toxicity has proven to be a major threat, and there are several health risks associated with it. The toxic effects of these metals, even though they do not have any biological role, remain present in some or the other form harmful for the human body and its proper functioning. They sometimes act as a pseudo element of the body, while at certain times they may even interfere with metabolic processes. Some metals get accumulated in the body and food chain, exhibiting a chronic nature. Various public health measures have been undertaken to

control, prevent and treat metal toxicity occurring at various levels, such as occupational exposure, accidents and environmental factors. Metal toxicity depends upon the absorbed dose, the route of exposure and duration of exposure, i.e. acute or chronic. This can lead to various disorders and can also result in excessive damage due to oxidative stress induced by free radical formation (2).

As regards tattoo pigment, the legislation is not clear. In Italy there are different regional legislations.

Copper (Cu) is a vital mineral essential for many biological processes. The vast majority of all Cu in healthy humans is associated with enzyme prosthetic groups or bound to proteins. Cu homeostasis is tightly regulated through a complex system of Cu transporters and chaperone proteins. Excess or toxicity of Cu, which is associated with the pathogenesis of hepatic disorder, neurodegenerative changes and other disease conditions, can occur when Cu homeostasis is disrupted. The capacity to initiate

oxidative damage is most commonly attributed to Cu-induced cellular toxicity. Recently, altered cellular events, including lipid metabolism, gene expression, alpha-synuclein aggregation, activation of acidic sphingomyelinase and release of ceramide, and temporal and spatial distribution of Cu in hepatocytes, as well as Cu-protein interaction in the nerve system, have been suggested to play a role in Cu toxicity (3).

Cu occurring also in cosmetics may undergo retention, and act directly in the skin or be absorbed through the skin into the blood, accumulate in the body and exert toxic effects in various organs. Some cases of topical (mainly allergic contact dermatitis) and systemic effects owing to exposure to metals present in cosmetics have been reported.

We presented a clinical case of a 23 years old man presented to our department with a 2-week history of pruritus, erythema and papules on legs, arms and trunk. These lesions developed 2 months after tattooing (**figure 1**). General physical examination was normal.

The patch test was performed using the standard series SIDA-PA. It resulted negative. So, we decided to execute the special series F.I.R.M.A. for tattoo (copper sulphate 1% water, dimethylaminoazobenzene-p 1%, aminoazotoluene-o 1%, blue scattered 3 1%, blue scattered 124 1%, yellow scattered 3 1%, orange scattered 3 1%, red scattered 1 1%, gentian violet 2%, cadmi-

um chloride 1% in water, nickel sulphate 5%, iron chloride 2% in water, potassium dichromate 0.5%, chromium trichloride 2%, aminoazobenzene-p 0.25%, cobalt chloride 1%, aluminum chloride 2%, titanium dioxide 0.1%, zinc 2.5%, mercury chloride 0.05% in water, kathon cg 0.01% in water, phenol 0.5%, ethylenediamine hydrochloride 1%, phenylenediamine base-p 1%, formaldehyde 1% in water, phthalic anhydride 1%, rosin 20%, dibutyl phthalate 5%, hexamethylenetetramine 1%, benzophenone 5%).

Our patient showed positive patch test reaction to Copper (++) positive) and Disperse Blu (+ positive) (**figure 2**).

We proposed to our patient to remove the tattoo with laser therapy, but he refused it. So, we performed local infiltration of cortisone for four weeks, with temporary resolution of clinical manifestation.

The tattoo phenomenon is expanding rapidly, and involves mainly young people between 16 and 25 years. Great attention must be put to the pigments used. There are new substances, often little known, and allergic reactions to these pigments are increasing rapidly. Deciding to inject a pigment on your skin deserves great attention, even more so choosing the pigments to be used. We recommend that you always perform a patch test before getting a tattoo. (4,5).

**Figure 1**



**Figure 2**



**References**

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