INTRODUCTION: Tattooing is defined by the introduction of exogenous pigments and dyes in the dermis to obtain permanent design. Nowadays, it is a normal practice being very important to understand the biochemical reactivity of the ink particles in the skin, tissues, and cells with regards to the toxicological risks of the ingredients used. Especially knowing all the risks in the regulation of tattoo inks.

OBJECTIVES:
• Which are the general problems associated with tattooing?
• What are the components of tattoo inks?
• Which biocompatibility/toxicity problems are related to the component of tattoo inks?

RESULTS:

General problems:
It is estimated that about 68% of tattooed people report complications, being the coloured tattoos the most concern. There is also a higher incidence of adverse reactions on the extremities.

Principal adverse reactions:
• Risk of infection (bacterial, fungi or viruses)
• Granulomatous reactions
• Lichenoid reactions
• Hypersensitivity allergic reactions
• Tumours → Related as coincidences

Caused by the Immune System
All studies indicate that allergens are formed inside the skin.

TATTOO INKS

BINDERS AND SOLVENTS
ADDITIVES
PIGMENTS

Inorganic
Organic
Carbon Black
Azo compounds
Heavy metals
Polycyclic compounds

Characteristics of the inks:
Chemically inert, high light fastness, water stability, and low migration.

It is also known that pigments can be found as nanoparticles changing some characteristics such as their biokinetic.

The principal impurities/contaminants are: heavy metals, polycyclic aromatic hydrocarbons (PAHs) and aromatic amines.

Bioavailability:
A part from the contaminants that can be toxic de per se, different processes can transform tattoo inks or generate cleavage compounds that can be potentially carcinogenic, genotoxic or citotoxic agents.

Toxicity:
Heavy metals such as nickel and chromium are found in higher concentrations and might cause allergic reactions or can be potentially genotoxic.

Tattoo ink particles can be phototoxic due to the creation of ROS. Also PAHs generate oxygen radicals when exposed to sunlight.

Photodecomposition:
The exposure to natural sunlight (UVA, UVB) can due to the formation of reactive species, toxic components or bioactive fragments by photocleavage of the pigments; mostly organic.

Metabolism:
Slow rate metabolism lifelong is important. This process can make potential systemically available components.
- PAHs by CYP450 (1A1, 1B1) can due to dialdehyde.
- Azo compounds → aromatic amines.

Biodistribution:
In general all the assays in vitro (MTT) cause a decrease in the cell cultures viability. For example, in fibroblasts can also decrease the formation of procollagen type I.

In addition, pigments can activate adaptive stress responses.

Conclusions:
• Pigments through metabolism or photodecomposition can form a lot of problematic components like dialdehyde or aromatic amines.
• Inks can due to bioavailable substances that can distribute systemically through the body, although the total distribution is not known yet.

Principal references: