

# Children's play paints safety – What is the reality in Portuguese schools and at retail stores?

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**ABSTRACT:** Children's play paints, an attractive tool for preschool activities, can be classified in artist paints (gouaches, acrylics, watercolors, fingerpaints) and face paints. These products composition is not always known since not all are required to bear their ingredients in the label packaging. The present study aimed to characterize the children's play paints available in schools and retail stores and also to assess the practices involved in the acquisition, handling and storage of these products by schools and that may have impact on the product quality and safety. For this purpose were studied paints from 8 schools and 7 retail stores from Porto (Portugal), in a total of 17 popular brands. The results shows that the label information differs from product type, taking into account the legal requirements applied to each one (artist paints or face paints). The main hazards stated in the products label are related with the possibility of ingestion of small pieces that are part of the product. Only brands of face paints (60%) mentioned the potential risk to develop allergic reactions or skin irritation problems arising from their application. As regards to school practices, they are aware to the importance in purchasing products suitable for children use however, some of the behaviors during storage and handling of these products may affect their quality and safety.

**Keywords:** Children, Toys, Cosmetics, Artist paints, Face paints, Safety product

## INTRODUCTION

Children's play paints are an attractive tool for preschool activities, being widely used as didactic products. These paints can be divided into two main groups "artist paints" (e.g., gouaches, watercolors, acrylic paints, fingerpaints) and "face paints".

Given its purpose, artist paints fall within the concept of a toy "a product designed or intended, whether or not exclusively, for use in play by children under 14 years of age", and therefore their safety in the European Union is regulated under the Toy Safety Directive (EU, 2009a). As regards to face paints (cosmetic toys), they have to be considered as cosmetics products, "any substance or mixture intended to be placed in contact with external parts of the human...with a view exclusively or mainly to...changing their appearance", and so they shall comply with the compositional and labelling requirements laid down, in European Union, in the Cosmetics Regulation (EU, 2009b).

The composition of these products is not always known, since only the cosmetic products must state on its label the list of its ingredients. However, the basic composition of a paint typically includes pigments or dyes, solvents, resins and additives.

The paints used for didactic purposes are mostly water-based, having a high percentage of this component, as well as pigments and dyes, essential to obtain the diversity and attractiveness of the colors. The pigments used in these paints are typically inorganic pigments (Barata, 2002; Smith, 2003), generally comprised by oxides, chromates and metal sulfates, which may contribute to the presence of potentially toxic elements in their composition, such as heavy metals [e.g., lead (Pb), cadmium (Cd) and chromium (Cr)] (Godoi et al., 2009). Furthermore, due to their ubiquitous and persistent nature, the presence of metals as impurities in all products is recognized as unavoidable (trace amounts arising from both the ingredients and manufacturing practices) (Al-Saleh et al., 2009).

The major concerns related to children's exposure to toxic elements present in paints were made clear in summer 2007 when media worldwide reported about toys being recalled from the market because of the discovery of high Pb levels in them (Baer et al., 2011) and more recently with the presence of some heavy metals in children's face paints reported in the Campaign for Safe Cosmetics (CSC) (2009).

In addition to potential toxic elements (i.e., heavy metals), the presence and growth of microorganisms is another condition susceptible to occur in these products. The effect is not only the deterioration of the product, but the presence of opportunistic microorganisms, representing a risk to children's health (Flores et al., 1997). The main microorganisms commonly isolated from cosmetics, with weak preservative capacity, include the genera *Klebsiella*, *Enterobacter*, *Staphylococcus*, *Bacillus*, *Pseudomonas*, *Penicillium* and *Candida* that are normally introduced in the product through the water used in its formulation (Perry, 2001).

Despite most of these products being specifically designed for children, there is always some concern regarding to their safety, particularly to the chemical ingredients used in its formulation, as also to their microbiological quality, since they are more susceptible to biodegradation (La Rosa et. al., 2008).

The most significantly health impacts to which children can be exposed when using these products are related with the risk of allergy due to the added of fragrances, preservatives or coloring agents (The Danish Environmental Protection Agency, 2007). Additionally, when children play with paints, skin contact and potential absorption through the skin of some ingredients are almost unavoidable. These products are also susceptible of easy ingestion in significant quantities, and they should comply with maximum acceptable levels for the migration of toxic elements (ISO, 2010).

The aim of this study was to characterize the children's play paints used in schools establishments and also available in retail stores, by analyzing the label content (e.g. ingredients, potential hazards, emergency first aid, handling and storage conditions and toxicological information). It was also aimed to know which practices are involved in the acquisition, storage and handling of these products by schools establishments in order to understand whether they can have an impact on product quality and safety.

## MATERIAL AND METHODS

### Sample selection and collection

The information about the products available in schools were obtained by contact and visit 8 preschool establishments located in Porto (Portugal). It was also purchased some products available in 7 retail stores of the same area. This study was conducted between the period of 2011 and 2014.

In total 66 products belonging to artist paints (n=54) and face paints (n=12), representing 17 popular brands were studied. The general information about the samples (brand and country of manufacture) and the local of acquisition are represented in Table 1.

Table 2 – General information about the samples

Category of Paint	Brand	Country of Manufacture	Collected/ Purchased in
Artist paints	B1 (n=11)	Italy	School/Store
	B2 (n=4)	France	School
	B3 (n=1)	Italy	School
	B4 (n=1)	Spain	School
	B5 (n=6)	Italy	School
	B6 (n=1)	Italy	Store
	B7 (n=1)	China	Store
	B8 (n=5)	France	Store
	B9 (n=3)	China	Store
	B10 (n=5)	China	Store
	B11 (n=4)	China	Store
	B12 (n=12)	China	Store
Face paints	B13 (n=1)	France	School
	B14 (n=1)	Spain	School
	B15 (n=1)	China	School
	B16 (n=2)	China	Store
	B17 (n=7)	U.K	Store

### Sample and school practices characterization

The 66 products identified were characterized according to the information available on the product label as regards to ingredients, potential hazards, emergency first aid, handling and storage conditions and toxicological information. This information was then analyzed in accordance with the legal requirements [Directive 2009/48/EC and Regulation (EC) n.º1223/2009] of each category of product (toy or cosmetic).

In order to assess the practices involved in the acquisition, storage and handling of these products by schools establishments it was applied a short questionnaire, as an interview, to kindergarten teachers or school leaders.

### RESULTS

All the studied products had a package label providing information about the product and country of manufacture. China was the predominant country of origin (42.4%), followed by Italy (28.8%), France (15.2%), UK (10.6%) and Spain (3.0%). The products purchased in retail stores were mostly from China (58.7%). Watercolors were the most available artist paint, representing the highest percentage of the samples identified (34.8%), followed by gouaches (30.3%), face paints (18.2%), fingerpaints (9.1%) and acrylics (7.6%).

The Figure 1 shows the package label information by product type (face paints and artist paints) and main practices adopted by the schools in the acquisition, storage and handling of these products.

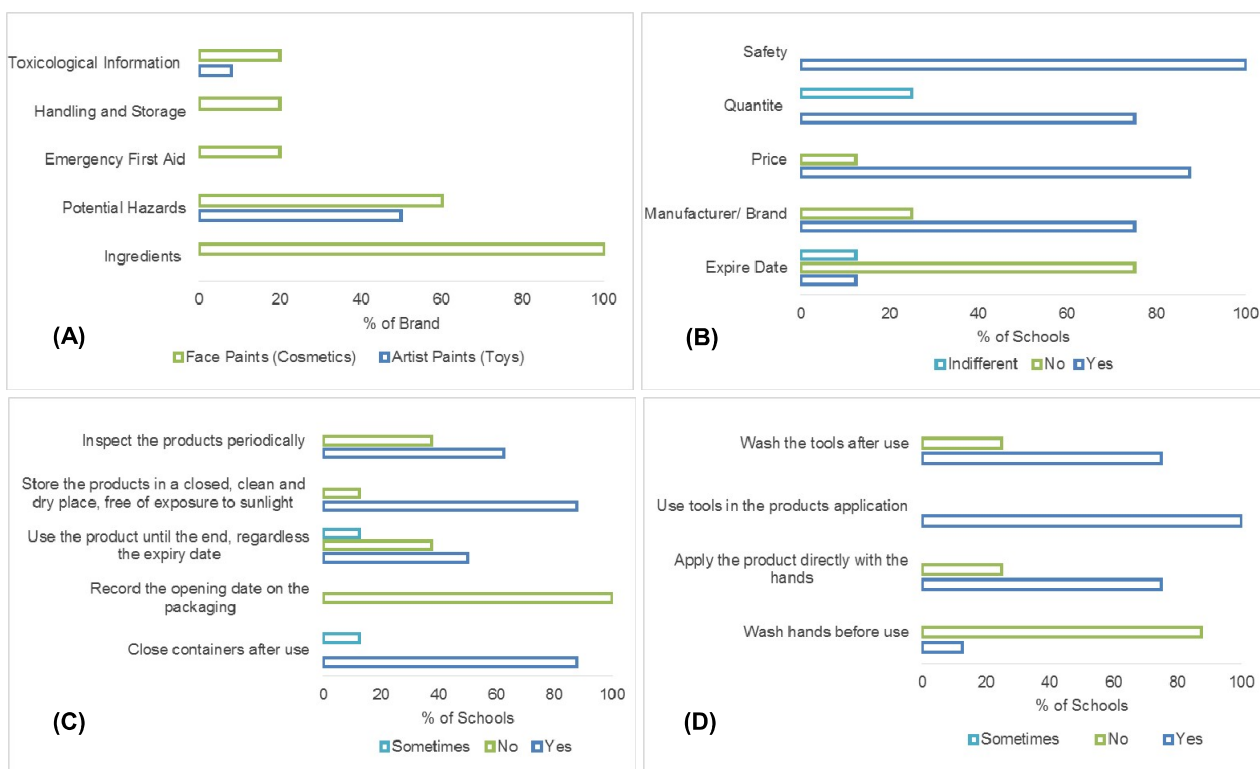


Figure 1 – Label information provided by brands of face paints (cosmetics) and artist paints (toys) (A); Schools practices involved in the acquisition (B), storage (C) and handling (D) of the products. In the acquisition process “indifferent” meant that it is an important factor but is not taking into account. In the storage and handling of the products “sometimes” meant that is not always considered by schools as an important factor to control.

### DISCUSSION

Through the analysis of Figure 1 (A) it is possible to emphasize that the label information differs in function on the product type (i.e. face paints or artist paints), a fact easily explained by the different legal requirements applied to each product. However, a similarity found in all the products was the presence of a graphic/information on the label indicating ‘the product is not suitable for children under

36 months' and the CE marking that indicates the product is in conformity with the Community harmonization legislation.

As regards particularly to face paints (cosmetics), they must specify on the label, among other information, the data of minimum durability and the list of ingredients used in its composition (EU, 2009b). All the products identified were in accordance with these requirements. Carrying out a more detailed survey of the pigments and dyes indicated in the label shows that all of them are listed as colorants allowed in cosmetic products by the European Regulation. The precautions to be observed during the use (handling and storage) were only observed in 20% of the brands and were related with the importance to handle the product with the hands washed, not ingest or apply near the eyes and mouth (mainly the colors red, yellow and green) and guarantee the storage in a cool and dry place. The potential hazards identified in these products (60%) are related with the risk to develop allergic reactions or skin irritation problems arising from their application. The CSC (2009) study concluded that more than half of Children's face paints tested contained Cr, Ni and Co, common causes of allergic contact dermatitis, at levels exceeding 1 ppm, a recommended limit value to minimize the risk for very sensitive individuals (Basketter, et. al. 1993).

Concerning to artist paints (toys), the Toy Safety Directive, states that a toy in the form of a substance or mixture containing inherently dangerous substances or mixtures must indicate, without prejudice to the application of the provisions laid down in applicable Community legislation, as regards to the classification, packaging and labelling of certain substances or mixtures, the instruction for use indicating a warning of the dangerous nature of these substances and an the precautions to be taken by the user (EU, 2009a). However, the main warnings identified in the studied products are related with physical hazards, more specifically with the possibility of ingestion of small pieces that are part of the product and the specification of the minimum and maximum ages for users. No mention to chemical hazards were identified in these paints. As respect specifically to fingerpaints, the new toy safety standard EN 71-7:2014 for fingerpaints, requires that the primary packaging indicates in the label the preservatives and embittering agent used (CEN, 2014). The only brand (B1) of finger paint identifies in this study had not this information on the label.

Analyzing the practices involved in the acquisition of children's paints in schools [Fig. 1 (B)] is possible to verify that the safety of the product is a major factor in its acquisition, looking for products suitable for the children's age, despite the price also be crucial. Although schools are aware to the importance of the expiry date, particularly in cosmetic products, this is not a determinant factor since the "product's life" is considered short at these establishments and, therefore, is not taken into account in their acquisition [Fig. 1 (B)]. For the same reason the use of the products until the end, regardless the expiry date, is not always an important factor to control [Fig. 1 (C)]. As regards the registration of the opening date on the product packaging, during the storage period, none of the inquired schools applies this practice [Fig. 1 (C)], which may contribute to the use of a product with a durability date already expired. Concerning to the handling procedures it is noted that hand washing prior to product use is not a common practice and that the product is, in most cases, applied directly with the hands [Fig. 1 (D)]. This scenario may not only contribute to the microbial contamination of the paints, and consequently to their biodegradation, but also to increase the exposure to some potential hazards substances, including the microorganisms itself and harmful microbial metabolites (US FDA, 1995). Additionally, the exposure through dermal contact or ingestion to other potential toxic elements present in these products is also greater. A study conducted recently by Rebelo, *et. al.* (2015) that analyzed the samples here characterized in this work shows the presence of some heavy metals, mainly copper (Cu) and zinc (Zn) in concentrations above the migration limits, imposed by Toys Safety Directive, in artist paints, which reinforce the need to ensure the effective monitoring of the quality and safety of these products.

## CONCLUSIONS

This study provide useful information about the children's play paints used in school establishments and available in retail stores. By analyzing the label content, was possible to characterize generically these products, especially as regards to the main hazards that may be involved in their use. As regards to the practices adopted in schools, it is perceptible that they are aware to the importance of acquire suitable products for children. However, some behaviors used in the application of these products may increase the exposure to some potential toxic elements and to their deterioration. In this sense, it is important to rethink some of these practices in order to ensure a high level of protection of children and also to guarantee the quality of these products.

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