PHYTOTOXICITY OF DAILY BABY WET WIPES PHYTOTOXICITY OF DAILY BABY WET WIPES PHYTOTOXICITY OF DAILY BABY WET WIPES PHYTOTOXICITY OF DAILY BABY WET WIPESPHYTOTOXICITY OF DAILY BABY WET WIPES

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Wet wipes are a widely used cosmetic and hygienic product, the production and consumption of which is increasing annually [1]. Although consumers appreciate the simplicity, convenience, and accessibility of wet wipes [2], the production, consumption, and use of wet wipes are associated with a number of environmental and biomedical problems [1]. The toxicity of these agents can be studied using test plants [3]. The aim of this study was to evaluate the toxicity of daily wet wipes recommended for children using phytotesting.

Wet wipes for children with aloe vera extract produced in Ukraine were studied. The composition of the moisturizing solution (according to the manufacturer) is as follows: deionized water, vegetable oil (Olus oil), glycerin, lauryl glucoside, polyglyceryl-2-dipolyhydroxystearate, glyceryl oleate, dicaprylyl carbonate, aloe vera leaf extract, chamomile flower extract, chamomile flower extract (Matricaria), aloe vera seed oil, sodium ascorbyl phosphate (vitamin C), retinyl palmitate (vitamin A), tocopheryl acetate (vitamin E), panthenol, propylene glycol, benzalkonium chloride, methylchloroisothiazolinone, methylisothiazolinone, benzyl alcohol, citric acid, perfume composition, amyl cinnamal, butylphenyl methylpropional, linalool. Material - non-woven fabric.

To assess the phytotoxicity of the above-mentioned wet wipes, a growth test with watercress seeds of Svityaz LLC was used, the methodology of which was described earlier [3-4]. The following phytotoxic indices were calculated [5-7]: seed germination index (SGI), root length index (RLI), phytotoxic effect of solutions (PhE), toxicity index of solutions for each test function (ITF), average toxicity index of the tested solutions (ITF_{avr}). The obtained data were processed statistically. A 95% probability of differences ($p \leq 0.05$) was considered statistically significant.

When germinating seeds on the tested wet wipes, a slight significant increase in seed germination (1.2 times) was found compared to the control. The length of the roots and the above-ground part of the watercress seedlings was statistically significantly less than in the control, by 9.2 times and 2.8 times, respectively. The calculated phytotoxic indices are given in Table 1. According to the obtained indices, the tested wet wipes are extremely toxic. The compounds contained in the tested wet wipes for children, which are of concern for safety for the environment and biota, are benzalkonium chloride, methylchloroisothiazolinone and methylisothiazolinone, benzyl alcohol, amylcinnamal, butylphenylmethylpropional (Lilial), retinyl palmitate (vitamin A).

Some features of the sanitary and hygienic characteristics of these compounds are as follows:

1. Benzalkonium chloride. This compound is known to be irritating to the skin, eyes, and respiratory tract. It is also toxic to aquatic and soil organisms. It is a quaternary ammonium salt, preservative, disinfectant, and sanitizer [8-9].

Table 1 – Phytotoxic indices calculated for watercress when germinated on the tested wet wipes

Experiment option	Test indicator and corresponding phytotoxic indices						Toxicity index of the tested wet wipes	Phytotoxic effect
	Germi-nation energy	Seed germination		Root length		Length of the above-ground part		
	ITF_1	SGI	ITF_2	RLI	ITF_3	ITF_4	ITF_{avr}	PhE, %
Control	1.0	0	1.0	0	1.0	1.0	1.0	0
Wet wipes	1.3	0.2	1.2	-0.9	0.1	0.4	0.8	90

2. Methylchloroisothiazolinone and methylisothiazolinone. These compounds are preservatives, contact allergens, strong sensitizers that can cause contact dermatitis. It is proposed to limit their use in the European Union (EU) for leave-on cosmetics (including wet wipes). However, for leave-on cosmetic products (including «wet wipes»), safe concentrations of methylisothiazolinone to cause contact allergy or its occurrence have not been adequately demonstrated. These compounds are recommended for use only in rinse-off products [10-13].

3. Benzyl alcohol. It is a solvent and preservative that can cause contact dermatitis, and in infants at high doses can cause «gasping syndrome». Although it is used in cosmetics in small concentrations [14-15].

4. Amylcinnamal. It is a perfume allergen, a skin sensitizer [16]. Amylcinnamal is included in the list of 26 EU fragrance allergens. The above List is a list of 26 allergens that the European Commission has identified as the most common causes of contact dermatitis from fragrances [17]. The use of this compound is regulated by Regulation (EC) No 1223/2009 on cosmetic products, in particular in Annex III (List of substances that cosmetic products must not contain, except in cases where they comply with the established restrictions), which obliges manufacturers to label the ingredients on the packaging if they exceed the threshold concentrations: 0.001% in leave-on products and 0.01% in rinse-off products [12]. The purpose of this List is to enable consumers to identify potential fragrance allergens on labels.

5. Butylphenylmethylpropional (Lilial). This compound is a perfume allergen, a possible sensitizer, classified as reprotoxic (Repr. 1B) in the EU [17-18]. It is noted that in the EU, hygiene and cosmetic products containing this compound are prohibited from March 1, 2022 [19].

6. Retinyl palmitate (vitamin A). This is an antioxidant that is safe in small doses, but in excess may exhibit teratogenic properties [20].

Thus, the studied daily wet wipes for children with aloe vera extract are toxic according to the results of the growth test with watercress and contain compounds hazardous to the health of the environment and biota. It is necessary to optimize the formulations of cosmetic and hygienic products by replacing toxic components with biosafe analogues.

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