

METHYL ALCOHOL POISONING : INVESTIGATION OF METHYL ALCOHOL LEVELS
IN COLOGNE SAMPLES

METİL ALKOL ZEHİRLENMELERİ : KOLONYA NUMUNELERİNDE METİL ALKOL
DÜZEYLERİNİN ARAŞTIRILMASI

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In their original packages, 27 cologne samples belonging to 24 producers were purchased from different parts of Ankara. According to The Turkish Cosmetic Regulation (TCR), cologne samples should not contain methyl alcohol in their formulations. Unfortunately, methyl alcohol was determined as ranging from 20.0 to 88.2% in 9 out of 27 samples. Ethyl alcohol contents of the methyl alcohol positive colonge samples were also measured and their agreements with TCR were criticized.

Ankara şehir merkezinin çeşitli semtlerinden 24 üreticiye ait 27 kolonya numunesi satın alındı. Türk Kozmetik Yönetmeliği'ne göre kolonya formülasyonlarında metil alkol bulunmamalıdır. Ancak, 27 kolonya numunesinin dokuzunda %20.0 ile 88.2 arasında değişen metil alkol saptandı. Ayrıca, metil alkol içeren numunelerin etil alkol düzeyleri de ölçüldü ve bu ürünlerin Türk Kozmetik Yönetmeliğine uygunluğu irdelendi.

Keywords : *Colonge; Methyl alcohol; Intoxication; Ethyl alcohol*

Anahtar kelimeler: *Kolonya; Metil alkol; Zehirlenme; Etil alkol*

Introduction

Methanol (methyl alcohol, wood spirit) is a widely used commercial, industrial or laboratory solvent and paint remover, as well as a solvent in paints, waxes and shellacs. It may be used alone as an antifreeze fluid and is commonly used in windshield washing fluids(1,2). It is also used as a denaturant in denaturated alcohol(3).

Its widespread industrial use in laboratories, schools, and industrial processes accounts for the fact that large volumes may be obtained, which commonly results in epidemic outbreaks of methanol poisoning. Since methanol is considerably less expensive than normal alcoholic beverages, it is not surprising that the alcoholic derelict may consume such compounds(2). Alcoholics may also drink less expensive denaturated alcohol "ispirto" and colonge.

For the toxicologic considerations, inappropriate use of methyl alcohol is hazardous for human health. Methanol poisoning may follow intentional sniffing (4,5), accidental ingesting(6) or transcutaneous exposure (5,7), which represents a classic example of "lethal synthesis". Methanol is oxidized mainly in the liver to formaldehyde, then to formic acid, which contributes to the profound metabolic acidosis occurring in acute methanol poisoning. The metabolic products of methanol can produce a syndrome of delayed-onset acidosis, obtundation, visual disturbance and death (7).

In adults, death may follow the ingestion of 20-250 ml and acute methanol toxicity is presented some 8-24 hours after exposure (3,8). Four mls have been reported to cause blindness

(3,9). The local production of formaldehyde in the retina and optic disc is one of the important reasons that causes blindness, enhanced by the production of formic acid and lactic acidosis(2). Recently, optic atrophy and cerebral infarcts caused by methanol intoxication have been demonstrated with computed tomography and magnetic resonance imaging techniques(10).

Administration of ethanol blocks the formation of formaldehyde and formic acid because of the preferential affinity of ethanol for alcohol dehydrogenase(4). Symptoms and history determine whether iv ethanol therapy and hemodialysis should be instituted (7,11). Depending on the severity of intoxication and the applicability of the treatment facilities, 90-120 ml of whiskey, vodka or Turkish Raki may be given perorally at 4 hour intervals for a period of 1 to 3 days. Ethanol levels should be maintained between 100 and 150 mg/dL to inhibit toxic metabolic formation completely (4). Hemodialysis should be performed in any patient who is symptomatic or has a blood level of methanol higher than 25 to 50 mg/dL(12). The methanol concentration remains almost steady as long as ethanol levels are relatively high (6). In contrast to previous reports, the elimination of methanol in a five week old infant, having an initial serum methanol level of 1148 mg/dL, appeared to obey the first order kinetics. This situation can be explained as that hepatic alcohol dehydrogenase activity is low in neonates and young infants and another enzyme system such as catalase may be involved (13).

4-Methyl pyrazole (4-MP) is a competitive inhibitor of alcohol

dehydrogenase (9,14). The advantage of 4-MP over ethanol is the lack of CNS depression effect. More recently several patients with toxic methanol ingestions have successfully been treated with 4-MP (15,16) which is now available in the USA as Fomepizole, and is administered as an infusion of 10-15 mg/Kg (9).

Poisoning with industrial grades of ethanol containing 5 to 10% methyl alcohol as a denaturant is less serious than with methanol alone (1). Cologne is widely used as a refreshing agent in our society. According to The Ministry of Health, approximately 850 colonge production permissions have been given to several firms. Cologne products have to contain at least 60 to 70% ethyl alcohol (17) which should not contain methanol and other impurities (18). In fact, significant amounts of methyl alcohol intoxications originating from colonge consumption by the alcoholics have been observed in emergency departments(19).

In this research, 27 colonge samples from 24 different brands were purchased and methyl alcohol contents were analyzed. Their agreements with TCR were also criticized.

Materials and Methods

Cologne samples

In their original packages, 27 colonge samples belonging to 24 producers were purchased from different parts of Ankara. Among them, 24 samples were lemon-odorated colonge, and the others were colonge for babies, lavender and mixture perfumed samples. Colorless or light colored samples were preferred for this research, since alcoholics prefer these types.

Table 1. Alcohol % of methyl alcohol positive cologne samples

Sample Code No	Alcohol%		≈Total alcohol
	Methanol*	Ethanol*	
6	56.13±4.49	13.83±0.97	69.96
17	77.07±6.71	4.32±0.25	81.39
20	75.45±2.54	5.64±0.36	81.09
21	63.66±1.12	4.19±0.27	67.85
22	26.44±0.93	24.68±1.86	51.12
23	87.89±6.03	6.59±0.73	94.48
24	88.36±4.26	5.25±0.66	93.61
25	20.83±3.86	35.13±2.18	55.96
27	62.49±2.73	6.71±1.22	69.20

*: Mean of 3 samples ± SD

Methyl alcohol analysis of the samples

Methyl alcohol contents of the cologne samples were analysed as described previously (20,21). For this purpose, 1 ml distilled water, 0,05 ml methanol (Merck) standard samples (50, 100,150 and 200 mg/dL) or cologne samples were added into glass tubes and vortexed. Then, 0,2 ml of phosphoric acid (BDH Chemicals) (20%) and potassium permanganate solutions (5%) were added, rewortexed and kept for 5 minutes at room temperature. Excessive potassium permanganate was eliminated by adding 0,2 ml of sodium bisulfite (Mallinckrodt) solution (10%). Finally, 0,5 ml of chromotropic acid (Sigma) solution (1%) and 8 ml of sulfuric acid (Merck) (81%) were added, mixed and kept in a 60°C water bath for 10 minutes. Absorbances were measured at 578 nm against a blank using a double-beam spectrophotometer (UV-2100S UV-VIS, Shimadzu).

Ethyl alcohol analysis of the samples

Ethyl alcohol contents of the samples were measured according to the Fluorescein Polarization Immunoassay (FPIA) method by using Abbott's TDx Assay System (22).

Results and Discussion

Main approach of this study was to assay the methyl alcohol contents of the cologne samples and it was found to be present in 9 out of 27 samples. The percentages of coded samples were given in Table 1. In addition to this, percentages

of the methyl and ethyl alcohol in the cologne samples were also evaluated. Thus, only methyl alcohol positive samples were subjected to ethyl alcohol determination. Ethyl alcohol levels of the nine cologne samples were also given in Table 1.

TCR Supplement I states that lemon and other colognes have to contain at least 70% (v/v) and 60% (v/v) ethyl alcohol respectively (17). Specifications of ethyl alcohol for the cologne preparations have been cited in the TCR Suppl. X. Moreover, ethyl alcohol has to meet the specifications demonstrated in the monograph of The Turkish Pharmacopeia 1974 (17,18) and according to this, cologne products should not contain methyl alcohol. All the cosmetic products' (including cologne) labels must have the detailed specific informations on the internal and external package and the printings must be unerasable, easily seen and legible. Additionally, their alcohol contents must be written on both the internal and external packages (TCR Article 18).

Apropriateness of the cologne samples to the "TCR Article 18" were observed in methyl alcohol negative samples. On the other hand, 6 out of 9

had labels indicating any adequate information about the producer firms and the alcohol percentages (Table 2).

Table 2. Appropriateness of the methyl alcohol positive cologne sample labels to The Turkish Cosmetic Regulation Article 18.

Sample Code No	Production center	Label informations*
6	Ankara	+
17	Istanbul	-
20	Unkown	-
21	Unkown	-
22	Ankara	+
23	Bursa	+
24	Unkown	-
25	Ankara	-
27	Istanbul	-

*: Appropriate(+) and inappropriate(-)

Methyl alcohol intoxications have been of importance in emergency departments of hospitals since only immediate therapy may result with satisfactory recovery of the patient. Thus, any suspected methyl alcohol intoxication needs rational diagnosis and treatment because some cologne samples have the potential danger for those who ingest them as an alcoholic beverage. Methyl alcohol positive cologne samples might have been prepared by producers lacking knowledge about alcohol and the TCR requirements. As a consequence of this 3 out of 9 methyl alcohol positive cologne producer firms gave the clear informations on the product labels (Table 2). The other 6 cologne samples might have been produced illegally, since they had no satisfactory label informations. Nine methyl alcohol positive cologne producers might have used methanol or methanol adulterated ethanol.

Unfortunately alcoholics tend to consume cologne products as an alcoholic beverage. Methyl alcohol free colognes had no apparent toxicity except for those who ingest considerably large volume of cologne. But illegally produced cologne products are definitely dangerous because of their high methyl alcohol contents. It is anticipated that the authorities take necessary actions against illegal cologne producers, and control the products more routinely and effectively. Otherwise, methyl alcohol originating intoxications will be a misery in the society for many years (19).

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