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# Forensic Examination of Alcohol Intoxication

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Forensic Examination of Alcohol Intoxication

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### Abstract

The totality of the scientific data that makes up the content of the three sections of Forensic Medicine is the theoretical basis for forensic examination. General and specific issues that determine the procedural regulation and organization of the examination, reasons, rules and methods for the practical application of forensic knowledge, form the content of this section of forensic medicine, as a forensic examination. Hence, the term 'forensics' has a double meaning: on the one hand, it represents a scientific and practical expert study conducted within the framework of a specific investigation, on the other - the section of Forensic Medicine, which develops recommendations for the practical use of forensic knowledge. Forensic medicine in its development has gone through a number of typical steps that were necessary in its formation as a special medical discipline. At first, it was a disjointed information gleaned primarily from other medical and non-medical sciences. Later, forensic doctors have begun to develop a number of independent tasks in relation to the needs of the judicial and investigative practice. It was a stage of empirical learning. A distinctive feature of the next stage was to analyze forensic knowledge, the wording of the main problems and the terms of their constituent scientific issues.

Theory and practice of forensic science are not conceived without the constant and widespread use of scientific methods of research (observations, measurements, calculations, generalization, modeling, experiment, and others.).

Along with other biological sciences forensic medicine uses a wide range of private methods of scientific knowledge: morphological, clinical, physical and optical, X-ray, photographic, physico-chemical, chromatographic, spectral, and many others. Everyday forensic scientific and practical research actively invade quantitative methods of mathematical and statistical analysis.

Forensic examination of poisoning allows investigative authorities to resolve the issue of the presence (or absence) conditions and circumstances, which occurred in a crime. Its results are important for public health, contributing to improve the diagnosis, treatment and development of preventive measures at various intoxications in the home, medical practice, drug addicts and others. In this paper, using the science of forensic toxicology presents the insight of forensic examination of alcohol intoxication and poisoning substance.

### Introduction

Forensic science has developed special techniques peculiar exactly to this science. The assessment of the results obtained by all methods of investigation are the laws of dialectical logic. Each position, each pin, each puts forward the thesis for scientific and practical forensic investigations. It must be substantiated in accordance with the following logical rules: the thesis should be stated clearly; formulation of the thesis must be constant throughout the evidence; arguments must be true, proven and do not contradict each other, and are not dependent on the thesis. The evidences must comply with the general requirements for the conclusions such as: evaluating the results of expert research, the method of analysis, synthesis, induction, deduction, formalization, abstraction and others. Houck explains that when forensic scientists step into a courtroom to testify, they are, in essence, entering a foreign realm where only some of the rules of science apply. The legal arena has its own rules and most, but not all, apply to experts and they must abide by the rules (Houck, 2007, p. 150).

Revealing the independent nature of forensic science, we must specify its close relationship with other sciences. Among them are, many medical disciplines (general and pathological anatomy, traumatology, neurosurgery, obstetrics and gynecology, pediatrics, radiology, etc.), and non-medical (criminalistics, forensic chemistry, physics, entomology, comparative anatomy, anthropology, and others.). Forensic science most closely is associated with forensics jurisprudence. This connection is so strong and organically, we can talk about their inseparability, which is defined by the following three positions: 1) the need to use forensic medical knowledge in connection with the investigation; 2) the need to regulate the fate of the stringent practical-medical activities to the standards of legislation; 3) the historical and

inalienable rights of forensic science have emergent developed to meet the needs of forensic investigative practices.

## Forensic Examination of Alcohol Intoxication

### **Forensic Toxicology**

Toxicology - branch of medicine that studies the physical and chemical properties of poisons, their mechanism of action on the human body and develops methods of diagnosis, treatment and prevention of poisoning. Forensic toxicology - field of forensic medicine, which is studying poisons and poisoning in terms of issues of interest to the investigating authorities and the courts.

Difficulties in conducting forensic examinations poisoning is that by the time of the corpse examination may occur the problems of investigative data: insufficiently complete records in the medical records, the similarity of the clinical manifestations of poisoning in the early stages of poisoning, many poisons do not cause visible changes, the absence of specific symptoms during the forensic medical examination of the corpse in case of poisoning functional poisons, incomplete proof laboratory studies. It is important that the laboratory tests use accurate information and the methods employed are reliable. Otherwise, the data obtained may be contested in court, may lead to unforeseen legal consequences for the defendant, and may affect the patient care. (Rao, 2012). To prove that a poisoning is carried out a comprehensive study, forensic experts are starting with the examination of the scene, the investigation materials, medical records, forensic examination of the corpse and data forensic chemistry and other laboratory studies. Forensic examination is a complex process as a comprehensive study on the projects and research methods. In each case it is necessary to establish or exclude the fact of poisoning, if it was possible to identify the poison that caused it.

Poison - a substance entering into the body from the outside in small quantities, is acting as chemical and physic-chemical under certain conditions causing impairment of health or death.

At present, the most common poisoning with ethyl alcohol and its surrogates, psychotropic drugs, and carbon monoxide poisoning. Poisoning often happens in everyday life, at least in the workplace, medical practice, and criminal investigation. By category the poisoning death is always violent death, by the nature of violent death: accidents, suicides, murders. In the definition of poison, it was stated that the poison acts under certain conditions. What are these conditions? Terms of the poison can be divided into two groups: conditions, which are associated with toxic substances and other external factors; the second group - the conditions that lie in the body. Conditions which are associated with poison and other external factors following: the chemical structure of the substance is often determined by its action; dose (number), poison depends on its amount injected into the body, in the same doses substance has a therapeutic effect (therapeutic dose), in others - toxic effects (toxic dose) or leads to the death (lethal or lethal dose), example for therapeutic dose of morphine 0.01-0.05 toxic, and deadly - 0.2-0.3; physical (aggregate) state of poison (gas, liquid, solid). The gaseous and vapor poison enters through the respiratory tract, quickly gets into the blood. The liquid poison enters the blood after absorption through the mucous membrane. The solid (powder and tablets) are involved in the exchange only after their dissolution, and then suction; solubility (soluble poisons well absorbed and exert their effects; insoluble poisons do not cause poisoning, fat-soluble toxins can be absorbed through intact skin); tracts of poison into the body (through the mouth (oral), through the rectum (rectal), via the respiratory tract (inhalation), dermal, intradermal, subcutaneous, intravenous, intramuscular, through the mucous membranes of eyes, mouth, nose, spinal canal, but the fastest action via the blood, respiratory). There are many classifications of poisons: the circumstances in which the poisoning is occurred, the chemical structure, toxicity and other poisons. In forensic practice, the classification of poisons is based on the clinical and

morphological classification principle (taking into account the clinical overlook of poisoning and the changes in the body that occur when poison was entered into the body). Poisons are divided into local and resorptive actions; poisons topical (inorganic and organic acids, alkalis) induce morphological changes at the contact with them; resorptive poisons exert their effect after absorption. Resorptive poisons are divided into groups: destructive poisons (metals and salts of heavy metals), causing degenerative and necrotic changes in tissues and organs; blood poisons - hemoglobiniferous which forms the stable compounds with blood hemoglobin (carbon monoxide forms the carboxyhemoglobin, nitrates and after, nitrites form the methemoglobin), and hemolytic poisons (acetic acid, snake venoms, toxic mushrooms); functional poisons leave no morphological changes in the organism, disrupt the function of the organism but up until it is terminated; overall-functional poisons (cyanides et al.); cerebrospinal poisons (ethyl alcohol and its surrogates, hypnotics, narcotics, etc.); heart-nervous (atropine, nicotine et al.); intracardiac (strophantin et al.). Stains can also be examined successfully for drugs and poisonings. For example, if the victims notices a nasty taste and spits out the drink, the allegation that someone had tried to poison him or her can be investigated if the stain is submitted for analysis. (Cooper & Negrusz, 2013, p. 5).

In case of death from acute poisoning with ethanol, changes during forensic medical examination of the corpse nonspecific. For external examination of corpses are noticeable: cyanosis and puffiness of face, bleeding of the connecting theca of eyelids, spilled blue-purple spots all-over on a corpse, involuntary urination and defecation. When an internal investigation of the corpse performs, changes are: hyperemia and edema of the brain and choroid plexus of the brain, uneven perfusion of the heart muscle, and petechial hemorrhages beneath the outer theca

of the internal organs, edema of gallbladder bed, and the overflow of the bladder, the smell of alcohol from the cavities and organs of the corpse.

### **Classification of Surrogates of Ethyl Alcohol**

Surrogates of ethanol divided into two groups: 1) specimens prepared on the basis of ethanol and containing various impurities. Among this group of drugs most widely used are as follows: methylated spirit (white spirit with a small admixture of methyl alcohol and aldehyde) - lotions and perfumes (containing up to 60% ethanol, oils and other impurities), glue (phenol-formaldehyde resin and polyvinyl acetal, dissolved in ethanol, acetone), varnish (technical ethanol content with other alcohols and acetone), stain for wood and others; 2) preparations containing no ethanol represent other monohydric or polyhydric alcohols, and chlorinated hydrocarbons. Their toxicity is significantly higher. This group includes methyl alcohol, ethylene glycol, ethylene dichloride, tetraethyl et al.

### **Forensic Examination of Alcohol Intoxication and Poisoning Substance**

#### Poisoning by Ethyl Alcohol (ethanol)

Numerous young persons, especially college students die from alcohol overdose (intoxication) every year. In addition, there are over 50,000 cases of alcohol poisoning have been reported each year, and there are fatal poisoning and substitutes of ethanol as well. It should be noted that alcohol intoxication plays a fateful role as a contributing factor in the occurrence of death from cardiovascular and other diseases. Social harm of drinking has been known in occurrence of violent death: the different types of injuries and asphyxia, the low temperatures, as well as in the development of alcoholism.

It is known that according to the laws offender who is intoxicated, not exempting from a criminal liability, and even carries a high responsibility. Therefore, in all cases, the forensic

examination of corpses, and in some cases for the examination of living persons, set the amount of alcohol in the body. Due to various factors it cannot be clearly separated from joint evaluation of functional changes in order to determine the concentration of ethyl alcohol in the blood.

**What tissues and organs should be taken for detection of ethyl alcohol?**

Ethanol refers to the fatty drugs. Poisoning occurs by ingestion: lethal dose - 250 - 300 ml of 96% ethanol or 6.8 ml of ethanol per 2.20 Lbs. (1 kg) of body weight. Diagnosis of acute ethanol poisoning is usually based on the results of forensic chemical-ray study of blood and urine. Blood is recommended only receive from peripheral veins (femoral or brachial) or from the bosom of solid cerebral theca. Distribution of alcohol in the body is unevenly and depends on the percentage of water content. To assess of alcohol intoxication, beside the blood and urine samples, it is sometimes necessary to take liquor (brain-spinal fluid-hand) of the lumbar or a large tank at the position of the corpse on its side, or vitreous body of the eye by the suction of syringe. This is especially important when blood and urine are expressed the processes of alcoholic fermentation under the influence of glucose, which in the cerebrospinal fluid and vitreous body practically have no development even in the process of decay. In the presence of hemorrhage is advisable to take the clot of blood separately, when receiving the result, keeping in mind that the alcohol therein is 1.2 times less than in the rest of the blood.

**Which way the body passes ethanol and how important is it to assess the results?**

From the stomach and intestines alcohol penetrates by diffusion into the walls, and then in unaltered blood. There are two phases of alcohol intoxication: resorption (intake) and elimination. In the phase of resorption occurs the suction and the content of alcohol in blood increases. The duration of this phase in the fasting state - 40-60 minutes, filled in the stomach - 1.5-3 hours. This phase is shorter for people who are suffering from the alcoholism and for

people during exercise, and longer for those who suffer from the neuropsychological irritation. Resorption rate decreases with head injuries as lowered metabolism. Many additional factors have influences as well. After the blood alcohol level reached the highest limit, begins the second phase - the elimination (oxidation). Initially, about 90% of alcohol is oxidized, part of the same (10%) is allocated by lungs, urine, feces and left unchanged. In this phase, the level of alcohol in blood decreases gradually. Oxidation occurs in the liver (90%) slightly - kidney and muscles. The duration of the elimination phase also varies depending on the amount of received alcohol and other reasons, but rarely exceeding 24 hours. In case of injury decreases the rate of oxidation, alcohol can be detected even on the second day. In order to establish the phase of alcohol intoxication in which death occurred, should be revealed by examination of the blood and urine. In the phase of resorption the urine alcohol level is lower than in the blood, through the period of one hour and a half it is the same (equilibrium phase diffuse), and a phase of elimination in the urine is higher than in the blood. With repeated use of alcohol or a large gap between the use of the first portion of alcohol in the blood and urine this level may be revealed in another proportion. Most postmortem cases contain a plethora of specimens available for toxicologic analysis, but it is important to know which specimens are most useful yielding drug concentrations that are practical for interpretation. Not all specimens may be available in all cases. For instance, decomposed bodies may no longer have blood, yet may have vitreous, urine, and tissue. (Molina, 2010, p. 1).

**How to establish the degree of intoxication using the quantitative results of forensic-chemical studies?**

Toxicological data center indicates that between the severity of poisoning by ethyl alcohol and its concentration in the blood clearly has no parallelism. Death may occur from being

poisoned in the presence of 4.0% or less. According to some researchers, there are approximate averages for living persons that characterize the correlation between the state of intoxication and alcohol content in the blood. The degree of intoxication and the blood alcohol content can be easily defined in the percentages: no effect: 0.3; little impact: 0.3-0.5; slight intoxication: 0.5-1.5; average intoxication: 1.5-2.5; severe intoxication: 2.5-3.0; severe poisoning (possible death): 3.0-5.0; fatal poisoning: 5.0-6.0.

**What factors affect the change in the concentration of ethyl alcohol in the body and are necessary in assessing alcohol intoxication?**

The results of forensic chemical study on the ethanol concentration are detected in blood and urine should not be mechanically transferred to assess the degree of alcohol intoxication, because, depending on a number of factors, the rate of absorption and excretion of alcohol, the degree of intoxication (and hence the effect of intoxication on behavior) may vary. These factors include the following:

- Constitutional features (weight, age, sex) in children, pregnant women (the ethanol produces and slightly increases the performance);
- The presence of pathological conditions (especially cardiovascular diseases, diseases of the gastrointestinal tract and liver) and traumatic brain injury;
- The extent and quality of filling the stomach with food. On an empty stomach absorption begins in 30 minutes to complete delayed up to 90 minutes or more. Dense, rich in protein food prevents the absorption of alcohol into the blood;
- Specialty of alcoholic beverages. Rapidly absorbed drinks fortress 10-20 degrees with impurities of carbon dioxide;

- Exposure for therapeutic purposes when receiving the corpse from the hospital which associated with the forced alcohol elimination from the body, reducing its concentration in blood transfusion, forced diuresis, spillage the stomach and intestines. On the other hand, the delivery of drugs containing ethanol or generators due to its fermentation. Synergists (enhancing the effect of alcohol) may be taking medicines such as: barbiturates, tranquilizers, and others;

- Some external factors are important, which stay at a low temperature slows down the absorption, and at high speeds significantly increase in the blood. The absorption also slows down at the stressful situation. Cautious approach should be applied in order to quantify alcohol in the analysis of corpses recovered from the water;

- Reducing the amount of alcohol depends on the time after consumption until death. On average, one hour in the blood is lowering the amount of alcohol by 0.1% (a factor in the oxidation is 0.1 to 0.13%). With an average muscle load - 0.15%, with tense - 0.2%, with cranial trauma 0, 06-0, 08%. In the weight ratios per hour oxidation occurs 6-10 grams of alcohol. Knowing the time after ingestion of alcoholic beverages to death, we can set the amount of alcohol taken;

- Postmortem changes in the investigation of the death of over two or more days. Because due to the decay constitutes the alcohol, and its amount can be increased by 2% of the true, especially in the blood withdrawn from the cavities of the heart (as compared to peripheral blood, and urine).

There are also important feature and the storage of seized material to its investigation as well.

**To what extent can change the concentration of alcohol, depending on the time and conditions of storage of tissues from living and dead?**

How much more influenced by the conditions and the time of withdrawal to the storage material can be best seen from the results of examination? The studies were conducted by a comparative evaluation of the results of urine ethanol in alive persons in different states and the bodies which were immediately after removal and after 10 days storage at room temperature. There are following indicators: a) With 75% of the alive patients with heart diseases, and 82% in corpses ethanol is formed with a maximum concentration, respectively of 8.75% and 3.2%; b) In pregnant women, especially during the second stage of pregnancy, the formation of ethanol has been detected, respectively in 60% and 78% of the maximum concentration of 2.76% and 4.74%; c) in sick children, and the bodies of children 61% and 66.7% of the ethanol is formed, respectively, with a concentration of 8.5 and 2.6%; d) After the impact of extreme factors, formation of ethanol in urine samples of living people is detected in 60% of cases with the concentrations up to 5.7%, and in the urine of human cadavers within 67% with the maximum concentration of 2.7%. It should be noted that in practice, even at shorten term we can receive inaccurate results, especially when the material of the compartments receiving area or determining the amount of alcohol results conducted in a hospital.

**What other than forensic chemical analysis is based diagnosis of acute alcohol intoxication?**

Diagnosis of death from alcohol is based on a comprehensive assessment, first of all, on the forensic chemical examination. At the same time it should be taken into account the clinic examination: increased heart rate, facial flushing, agitation, speech disorder, impaired motor coordination, decreased sensitivity, excessive salivation, increased diuresis, motor paralysis, deep sleep, slow breathing and heart rate, decrease in temperature, loss of consciousness, nausea and vomiting, which in severe poisoning can close the airway and cause the suffocation from which death occurs. On the corpse there plethora of all organs, especially in the brain, bladder

overflow, cyanosis, edema of the eyelids, may be signs of a quick death, but it is not specific of the death from poisoning with ethanol. The great importance is the smell of alcohol in the organs and cavities of the corpse, more pronounced in the thoracic cavity and brain. The smell may be presented or not with a quick death, even with large amounts of alcohol in the blood. All this allows forensic experts to conclude that alcohol was taken shortly before his/her death and suspected alcohol intoxication may be detected.

### **What substances are called psychotropic?**

The list of such substances, which are poisons, depressing the central nervous system include those drugs that are addictive and have an effect on the central nervous system, causing hallucinations, thought and mood disorders, changes of perception, motor functions. Chronic use of these medications results in a reduction of sensitivity to the drug and therefore increasing the dose, increased portability, which is called tolerance. These people just few hours with no drug in the body are experiencing a mental stress, anxiety, aggression, disruption of the central nervous system, respiratory and cardiac activity, which cause the “breaking” abstinence. These phenomena after 3-5 days can cause psychosis. Abuse of psychotropic drugs has been called - drug dependence. Psychotropic substances cause mental and physical dependence as a desire to use drugs and to achieve comfort.

### **What is a drug (drug substance)?**

Narcotic substance is called if it has a specific effect on the central nervous system, takes socially dangerous proportions, causing its non-medical use. “Narco” in Greek means dizziness, “mania” - desire, madness. In connection with the advent of new drugs of similar action, but is not included in the official list of drugs, there was a term-toxic substance that causes substance abuse (from the Greek word toxicosis - poison and mania - attraction).

**What drugs and toxic substances are most common?**

With the development of the pharmaceutical industry, the number of these substances is gradually increasing and replenishing their official list. In our country the most common substances found in India and in South Chui and South Manchurian hemp. This cannabis has many names and one popular of them is marijuana. This is pollen and resin of cannabis. They are used in different ways: smoke, chew, sublingual and inwardly in the form of tablets, powder, or a beverage. No less common other plant-based drug is opium, using a sap from unripe poppy capsules. Opioids are used in the composition of medical means in medicine: morphine, codeine, and others. The rest - are drugs as they call themselves addict. These include primarily hypnotics - barbituric acid and derivatives - barbituraty (Barbamyl, etaminal sodium and others), and hypnotics other groups. Psychotropic drugs are also commonly used, like tranquilizers (Xanax, Ambien et al.), and antihistamines substances with sedative action (diphenhydramine). The most accessible and therefore common in comparison with drug are toxic substances that cause substance abuse. Clinical pathology studies monitor many powerful drugs that the patient may be receiving to be sure that he or she is getting exactly the right dose. (Adelman, 2007, p. 4).

### Conclusion

Under the toxic substance means any exogenous chemical compound that penetrates into the body, causing structural and functional damage at various levels and are expressed in terms of clinical, pathological condition. The concept of the toxic substance includes any factor tending to disturb the balance between the individual and the environment, regardless of the nature of this factor. Toxicity expresses the response of a living organism that has been penetrated by the toxic substance. It manifests metabolic, histochemical, morpho-pathological and clinical lesions, closely related to the pathogenetic mechanism by which acted toxic substance. The toxicity of a substance is determined by a number of factors, including: physical and chemical properties of the toxic substances; dose; concentration, path and speed of penetration of toxic substances into the organism; appearance; age, sex, body weight and individual susceptibility; other factors (food regime, pathological conditions, and so on.). The action of toxic substances in the body develops at different levels - molecular, subcellular, cellular, tissue, and also on the level of major systems of organic-functional integration. The total effect is characteristic for most toxic substances, irrespective of local action develops after the toxicant has penetrated into the body cells and fluids. A large number of toxic substances is having a selective or preferential effect on certain organs, which are called "target organs". Basically, the "target organ" of certain toxic substances are central nervous system, kidneys, liver.

The mechanisms of action of toxic substances are closely linked to what is happening at the molecular level, with chemical bonds that are established between toxic substances and biological molecules. Therefore the forensic science plays a significant role to define intoxication and provide an assistance to create examination report for the criminal investigation.

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