



CCO Ltd

***Diving management studies
Study No 3***

***Implement a drug and
alcohol abuse policy***

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1 - Purpose

Drugs are natural or created chemical substances commonly used in the diagnosis, cure, mitigation, treatment, or prevention of diseases. However, the United Nations Convention on psychotropic substances 1971 (article 2) says that *“they have the capacity to produce a state of dependence and central nervous system stimulation or depression, resulting in hallucinations or disturbances in motor function or thinking or behavior or perception or mood.”* As a conclusion, these substances are dangerous when their dosage is not appropriately controlled. For these reasons, their use must be strictly regimented and, based on the international conventions published by United Nation Office on Drugs and Crime (UNODC), and national laws in force in the signatory countries, only medics, chemists, and laboratories agreed by the government are authorized to deliver, detain, and produce substances that are classified drugs.

What the public and the legal authorities usually call “psychotropic substances”, “psychoactive drugs”, or “recreational drugs” are the molecules described above that are used at high dosages to exploit their side effects for pleasure instead of medicinal purposes.

These substances are often obtained illegally in the countries who have signed the international conventions.

Nevertheless, they can be bought legally in some regions where medications can be delivered without a medical prescription. Also, traditional drugs such as cannabis, opium, coca, and others can be easily found in countries where they are produced, and sometimes used for religious purposes.

Note that alcohol which traditionally accompanies meals and offers a wide range of tastes and products that are appreciated by the gourmets is considered a "recreational drug" by the specialists. However, the production of beverages containing alcohol is generally regimented by the laws regarding the production of food. It is the main reason it is considered apart from the other recreational drugs.

Based on what is said in the United Nations Convention on psychotropic substances 1971 above, occasional and regular abuse of psychoactive drugs can result in the safety of the consumers and the people living and working with them being jeopardized.

For these reasons, in addition of measures to limit the possession, use, trade in, distribution, import, export, manufacture, and production of drugs exclusively for medical and scientific purposes, the international treaties have for their goal the combat of drug trafficking through international cooperation.

To comply with national and international laws, and because operations undertaken in our industry are risky activities where it is unacceptable that people not having their full capacities are authorised to work, the companies must implement an efficient drug abuse policy. It is commonly admitted that such policies are zero tolerance.

The purpose of such policies is not to substitute for the legal authorities, but implement a management system and procedures that allow the personnel at work to deal with cases that may be encountered, and organize an efficient system of prevention to be sure that such undesirable events never happen.

Note that because the laws of the country where a project is to be organized and also, the procedures of the client may be very stringent, the drug abuse policy must be reviewed appropriately.

This study lists the main effects of drug abuse on health, the means of detection, the global evolution of this phenomenon, and some procedures that can be implemented to control it within a company.

Note that coffee (caffeine) and tobacco are not part of this study. The reason is that they are not considered psychotropic substances by the legal authorities, even though their influence on health is recognized disastrous at high dosages and they can produce a state of dependence.

2 - Main substances involved in drug abuse and their effects on health

It is essential to identify precisely the substances that are commonly found in cases of drug abuse. The “list of psychotropic substances under international control” published by the International Narcotic Control Board (*United Nations*), which is regularly updated, can be used for this purpose. Names, reference codes, and alphabetic classifications are used to identify the substances and the countries where they are forbidden.

However, it is evident that new molecules are regularly created and that only officially known drugs are recorded in this list. Also, this system of identification obliges the nonmedical personnel to consult the descriptions from the manufacturers to understand the characteristics of the products listed.

For these reasons, a lot of organisations involved in the prevention and fighting of drug abuse classify the drugs according to their chemical characteristics and their effects. That reduces the lists of substances to a few families and highlight only those that are the most involved in the recorded cases of drug abuse. This system of classification is often used to create statistics, and it is the one used in this guidance.

2.1 - Acting processes of drugs and parts of the body the most affected

As all parts of the body are linked their condition depends on the status of the rest of the body. As a result, the entire body of a drug abuser will be affected by the direct and indirect effects from such substances. However, for convenience, this study focuses on the parts of the body that are the most affected.

2.1.1 - Acting process on the nervous system

The central nervous system is a primary target organ for psychotropic substances.

The majority of the visible troubles linked to drug abuse are due to actions of these substances on the neurotransmitters. Neurotransmitters are chemical agents released by neurons (nerve cells) to stimulate neighbouring neurons or muscle or gland cells, thus allowing impulses to be passed from one cell to the next throughout the nervous system. Similarly to a computer, a few disruptions in neurotransmissions, or corrupted messages can create huge problems (*even though the brain is much more complex than any machine*).

- One known process is that when absorbed, some drugs can send messages that are similar to those of certain neurotransmitters. As an example, heroin and opioids have a similar chemical composition as endorphin and enkephalin which are the neurotransmitters naturally produced by the brain for analgesia and sedation, so they can stimulate their specialized receptors. As heroin is more concentrated in opioid than endorphin and enkephalin, it can implement stronger stimulations and activate more receptors than the natural neurotransmitters, triggering a massive amplification of the activity of opioid receptors. Similarly, marijuana has a similar chemical composition as cannabinoid neurotransmitters such as anandamide and can replace them for the same reasons as opioids.
- Other drugs alter neurotransmission by interacting with molecular components of the sending and receiving process other than receptors. As an example, Cocaine attaches to the molecular conduit that draws the dopamine out of the synapse and back to the sending neuron. As long as cocaine occupies the molecular conduit, the dopamine cannot return to the emitting neuron and builds up in the synapse. As a result, there is a much more significant dopamine impact on the receiving neurons than the one that occurs naturally.
- Other drugs such as benzodiazepines, (diazepam or lorazepam), produce relaxation by enhancing receiving neurons' responses when the inhibitory neurotransmitter Gamma-aminobutyric acid (GABA) attaches to their receptors.

The disruptions in neurotransmission will have an impact on the entire body through the autonomic nervous system, which regulates the involuntary processes such as:

- Blood pressure
- Heart and breathing rates
- Body temperature
- Digestion
- Metabolism
- The balance of water and electrolytes (such as sodium and calcium)
- The production of body fluids (saliva, sweat, and tears)
- Constriction of the pupil in bright light and dilation of the pupil in dim light.
- Urination
- Defecation
- Sexual activity

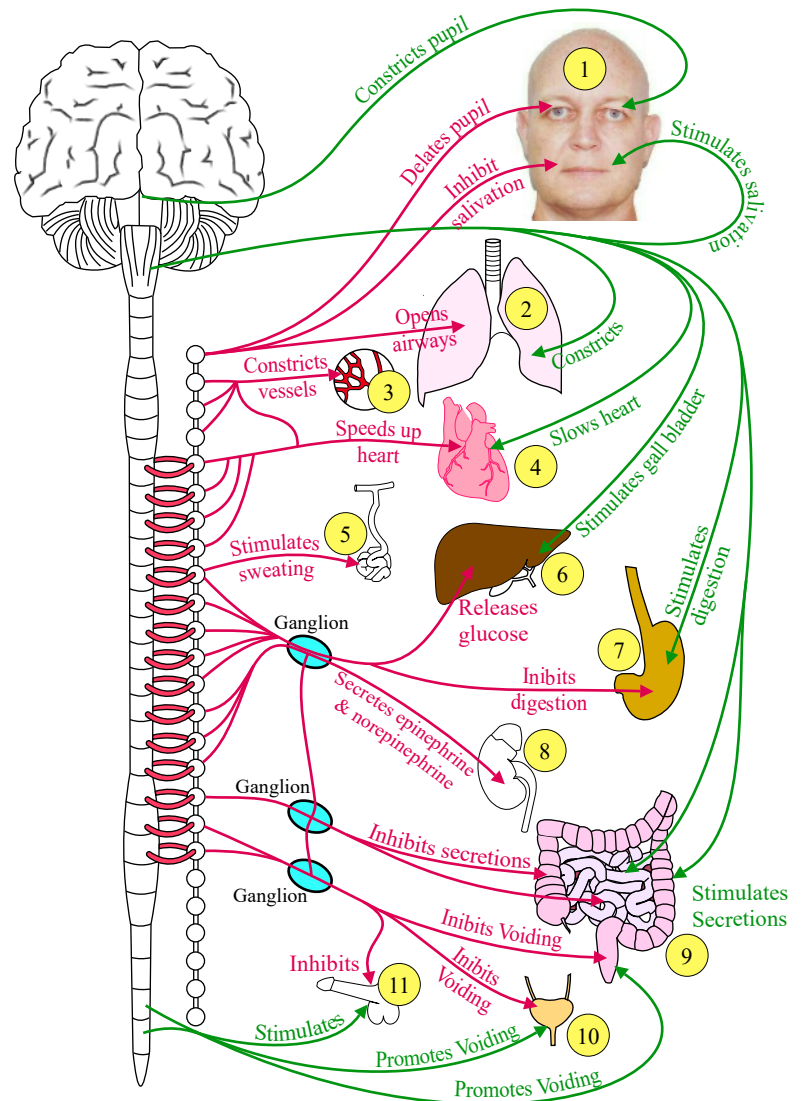
the autonomic nervous system responds to information sent by a receptor cell and processed in the brain using stimulating processes through the sympathetic division, or inhibiting process through the parasympathetic division.

- The sympathetic division prepares the body for stressful or emergency situations. As an example, it increases heart rate and the force of heart contractions and dilates the airways to make breathing easier.

- The parasympathetic division regulates body process during ordinary situations. As an example, it slows the heart rate and decreases blood pressure. It stimulates the digestive tract to process food and eliminate wastes

Actions of the sympathetic division (in red) and of the parasympathetic division (in green) on various organs:

- #1 - Head
- #2 - Lungs & airways
- #3 - Blood vessels
- #4 - Heart
- #5 - Sudoriparous glands
- #6 - Liver + pancreas
- #7 - Stomach
- #8 - Kidneys
- #9 - Intestines
- #10 - Bladder
- #11 - Sex



The adverse effects of drugs on the autonomic nervous system impact the processes and organs listed above. As a result, there are also indirect effects on the brain and other parts of the nervous system. As an example, neurovascular complications that can be classified as follows can be encountered. Note that these complications can become life-threatening if nothing is done. Nevertheless, note that these complications can be for other reasons.

- "Ischemic strokes" occur when the arteries in the brain become narrowed or blocked, causing severely reduced blood flow (ischemia). The most common ischemic strokes include a thrombotic stroke which occurs when a blood clot (thrombus) forms in one of the arteries that supply the blood to the brain. Blood clots often happen in injured blood vessels. Narrowed arteries are often the result of an unbalanced action of the sympathetic division, which results in an exaggerated vasoconstriction. However, note that the arteries may be already partially obstructed for other reasons such as fatty deposits, or vessels becoming thick and stiff (arteriosclerosis). Thrombosis can also be caused by substances insufficiently refined injected in the blood or platelet aggregation.
- Intracerebral bleeding occurs when a blood vessel within the brain bursts, allowing the blood to leak inside the brain, which increases the pressure within the brain and can cause damages to the neurons. Burst blood vessels are often the result of damaged blood vessels and of a too high intravascular tension resulting from the release of too elevated quantities of adrenaline, norepinephrine, and other components, that speed up the heart and increases its compression, and from the inhibition of the parasympathetic division.
- Bleeding into the space between the brain and the skull also called "subarachnoid hemorrhage". The subarachnoid space is normally filled with the cerebrospinal fluid that acts as a floating cushion protecting the brain. This bleeding, which causes are those explained above, results in an irritation of the lining that protects the brain in addition to an increased pressure to the brain that can damage neurons.

Stimulant drugs such as cocaine, amphetamine, methamphetamine, and 3,4-Methylenedioxymethamphetamine are the substances most involved in neurovascular complications. Among these substances, cocaine is classified the most active as its sympathomimetic effects can directly contribute to ischemia via a sudden constriction of a blood vessel (vasospasm), as well as indirectly by complex chemical and hormonal reactions increasing the level of thromboxane, which is a hormone that induces platelet aggregation and arterial constriction. However acute neurovascular complications such as ischemia and stroke are encountered with opioid, cannabinoid, and toluene abusers.

Another adverse effect of some drugs is their impact on the quantity of white and grey matters that compose the brain and also the degenerateness of some nervous cells.

The difference between grey matter and white matter is that grey matter contains numerous cell bodies and relatively few myelinated axons, while white matter contains relatively few cell bodies and is mainly composed of long axons protected by a myelin sheath.

- A lot of neurons forming the grey matter are characterised by short axons. They control senses and functions such as elocution, hearing, feeling, view, memory, and also the muscles.
- The white matter composes structures at the centre of the brain such as the thalamus and the hypothalamus. It is found between the brainstem and the cerebellum. It allows communication to and from grey matter areas, and between the grey matter and the other parts of the body. It is involved in the control of functions such as temperature, blood pressure, heart rate, control of food, as well as the intake of water and the expression of emotions.

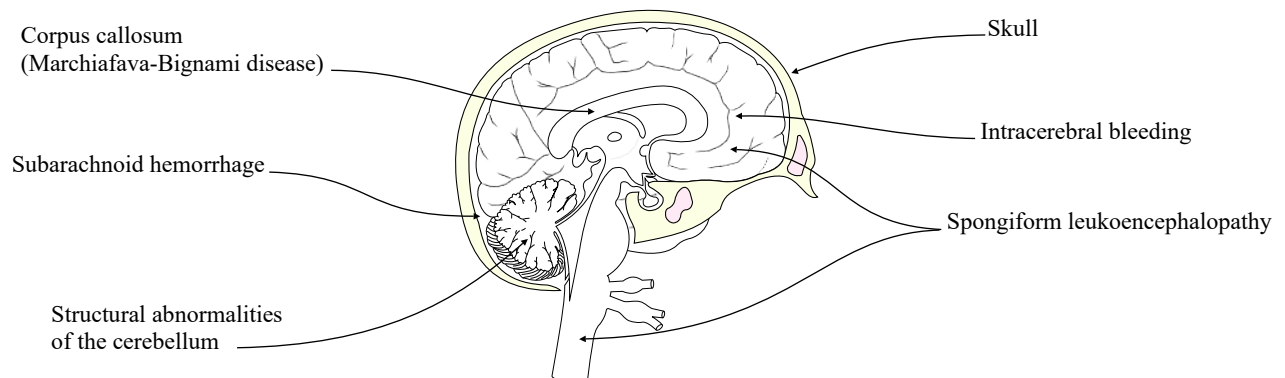
- “Spongiform leukoencephalopathy” is a progressive disorder that causes deterioration and vanishing of the white matter of the brain, the spinal cord, and the corticospinal tracts. The progression of this disease is characterized by periods of relative stability interrupted by episodes of rapid decline. It is mainly associated with inhalation of heroin and the triggering agent is believed to be an impurity that is activated by heat. However it is said that this disease can develop with other opiates and also cocaine. The symptoms of leukoencephalopathy develop as follows:

- Stage 1: Impaired muscle coordination and people particularly vulnerable to stresses such as infection, mild head trauma, or extreme fright.
- Stage 2: Continuous spasms, motor restlessness, rigidity, tremors, and irregular jerky slow movements.
- Stage 3: Loss of the normal ability to move the muscles, lack of speech caused by lesions of the cerebellum, lethargic state developing to coma and death.

- It is said that alcoholics have significantly lower intracranial volume with less grey matter and white matter than nonalcoholic people of similar ages. Note that the combination of alcohol with other drugs such as cocaine can contribute to further volume loss. In addition to generalized volume loss, structural abnormalities of the cerebellum, that are attributed to neuronal loss as well as nutritional deficiency, are often seen with chronic alcohol abuse.

- Marchiafava-Bignami disease is a rare alcohol-associated disorder characterized by demyelination and necrosis of the corpus callosum and extra-callosal lesions in the hemispheric white matter as well as cortical lesions. The corpus callosum is a flat bundle of commissural fibers, situated beneath the cerebral cortex that connects the left and right cerebral hemispheres, and enables communication between the hemispheres.

The most common symptoms include psychiatric disturbances that can lead to dementia, and psychomotor impairment such as incontinence, weakness of one side of the body (hemiparesis), gait problems, difficulties to speak and understand a conversation, and the inability to perform learned movements on command (apraxia).



Among indirect effects of drug abuse that may affect the brain, note that improperly sterilized injection devices can cause septic emboli (*emboli infected with bacteria, resulting in the formation of pus*) which consequences can be an area of necrotic tissue in the brain (*cerebral infarction*), brain abscesses, and infection of the arterial walls.

2.1.2 - Acting process on the digestive and urinary systems

2.1.2.1 - In the mouth

Alcohol, methamphetamine, heroin, cocaine, ecstasy, and marijuana, and antidepressants can induce hypo-salivation and cause teeth and gum problems:

Salivation is triggered by the autonomic nervous system (parasympathetic division stimulate salivation, and sympathetic division inhibit it) and various hormones that modulate salivary composition. Drugs and alcohol can influence the autonomic system. Sympathetic stimulation results in the release of noradrenaline, which acts upon alpha and beta adrenergic receptors which results in decreased production of saliva, increased protein secretion, decreased blood flow to the glands.

As a function of saliva is protecting teeth. As a result, without sufficient saliva the teeth are not protected from acids and other attacks:

- The enamel that protects the teeth wears off because of the frequent grinding of the teeth while under the influence of some substances such as amphetamines, cocaine, or ecstasy.

- Broken teeth occur because following repeated exposure to acids and sugars they become weak.
- Dental caries are present in the gum line or in between the teeth. The nerves of the teeth can also be affected.
- Ulcers are found in the gingival area. The gums are inflamed and are painful to touch. This is caused by a buildup of bacteria in the mouth. A foul smelling breath is noticeable.
- Aside from that, when mouth sores occurs, it is difficult to eat because pain is felt.



2.1.2.2 - Oesophagus and stomach

Drugs can change the balance of the PH inside the stomach making it more acid. In this case, the mucus that contains bicarbonate ions secreted by the specialized exocrine mucous cells is not sufficient to protect the mucosa against the acid. As a result, the acid can create inflammations and open sores that may bleed or lead to perforations. Note that the unprotected areas are favorite places for the bacterium *Helicobacter pylori* (*H. Pylori*), which is responsible for most ulcers.

In addition, some drugs may lead to vascular complications that result in dilated small blood vessels in the antrum, or the last part of the stomach which may result in bleeding. Ulcers and open sores can trigger frequent nausea, and blood can be seen in the feces. Note that it is reported that polyps and tumors, whether benign or malignant can develop.

2.1.2.3 - Intestine

In the case that over-acidity has developed in the stomach, it will continue in the intestines. Also, a lot of substances associated with drug abuse can create inflammation of the small intestine (*enteritis*) and of the colon (colitis) with possible perforations. Such problems can be indicated by the presence of rectal bleeding and abdominal pain.

Also, some drugs initiate vasoconstriction (*action on the sympathetic division*) which limits the blood flow to the intestines. As a result, injuries of the mucosa may happen in the constricted sections of the intestines which can result in perforations, as well as hemorrhages. Not vascularised areas sometimes die which then permits gangrene to develop in the small and large bowels and can result in the death of the casualty. The Ileum is the most affected part, but some reports say that gangrene has been found in almost any part of the small and large bowels.

Note that it is reported that alcohol abuse is significantly associated with colon and rectal cancer.

2.1.2.4 - Pancreas

Heavy consumption of alcohol and drugs such as heroin and cocaine can stop the pancreas secreting pancreatic juice (*Proteolytic enzymes, Lipolytic enzymes, Glycolytic enzyme*). It results in an inflammation (*pancreatitis*) that may degenerate the organ. Acute pancreatitis, that last for a short time, shows symptoms such as nausea, vomiting, diarrhea, abdominal pain, and tachycardia. Chronic pancreatitis happens after one or several acute crisis and can result in the development of diabetes.

Diabetes, is a condition in which beta cells of the pancreas are unable to properly produce insulin and then regulate blood glucose (sugar) levels that become abnormally high (*hyperglycemia*). Diabetes type 1 refers to no production of insulin, and diabetes type 2 refers to a limited production of insulin which is not sufficient to fulfill the body's needs. Also, diabetes type 2 may develop as a result of the body's inability to properly use insulin.

2.1.2.5 - Liver

The morphologic changes in the liver tissues are associated with its function disturbances.

Alcohol promotes the formation of "acetaldehyde" which is the partial oxidation of ethanol by the liver enzyme "alcohol dehydrogenase". Acetaldehyde leads to functional impairments of key proteins, including enzymes, as well as DNA damages, which promotes mutagenesis. Also, acetaldehyde is indicated a contributing factor to hangovers.

Alcohol and other drugs increase the production of urine (*diuretic*), which promotes the dehydration of the body. That has an impact on internal organs such as the liver that needs to be well hydrated and may result in the ability to burn the fats being slowed, and the other metabolic functions being impaired. It may result in accumulation of the metabolic wastes that can cause cancers, allergies, hypertension, Parkinson's, kidney stones, gall-stones, kidney failure, and more.

The alcoholic fatty liver disease is the result of regular heavy drinking that promotes the fat to build up in the liver cells and the size of the liver to increase. This state is the 1st step to cirrhosis. However, it is reversible.

The fatty liver disease may continue with the inflammation or mild scarring of liver cells, also called "alcoholic hepatitis", that mostly occurs in people who drink heavily over many years. Alcoholic hepatitis can cause liver failure or even death and may progress to cirrhosis. However, it will usually resolve with appropriate treatment. Typical symptoms are as follows:

- Nausea, loss of appetite, & pain in the liver area

- Confusion
- Yellowing of the skin and the eyes
- Blood in the feces

Cirrhosis is the last state which is characterized by the development of scar tissue that blocks the flow of blood through the organ, raising the blood pressure and disturbing normal functions. Such disturbances cause the lobules to die and their replacement by connective tissues which give the liver the aspect of a sponge. This condition is irreversible. The symptoms are similar to those of alcoholic hepatitis. Note that liver cirrhosis can be triggered by hepatitis B & C.



Normal liver



Liver with cirrhosis

Intra-venous intake of drugs leads to severe hepatic tissue infections (hepatitis, HIV/AIDS) that are mostly linked to lack of hygiene such as shared syringes.

Hepatitis is an acute or a chronic inflammation of the liver with visible symptoms such as yellow discoloration of the skin and whites of the eyes, poor appetite, vomiting, tiredness, abdominal pain, or diarrhea. There are five main types of viral hepatitis:

- Hepatitis A and E are mainly from contaminated food and water.
- Hepatitis B is sexually transmitted, but may also be passed through needle sharing by intravenous drug users. It can lead to liver cirrhosis.
- Hepatitis C can also be transmitted by needle sharing and can lead to liver cirrhosis.
- Hepatitis D can only infect people already infected with hepatitis B.

Note that immunization against hepatitis A, B, and D is possible.

2.1.2.6 - Excretory system

Dehydration of the body due to alcohol abuse or other drugs has an impact on kidneys and homeostasis cannot be performed properly as the blood and the wastes it carries cannot circulate appropriately.

Consequently, waste products accumulate in the body and the problems may progress to acute kidney failure, which is a condition where one or both kidneys stop working. It can lead to life-threatening complications such as changes in blood chemistry which can affect the brain and the function of the organs.

Note that consequences from the dehydration of the liver such as the production of kidney stones which can block the urine tracts may occur.

Acute kidney failure can also be caused by the direct action of drugs that can lead to inflammation and damages to kidney cells and then stop the function of the nephrons. Typical symptoms of acute kidney failure are a decreased urine output, swollen body, high blood pressure, nausea, vomiting, fatigue, poor appetite, and lethargy.

Chronic renal failure occurs over a long time and can be the consequence of diabetes (which can be a consequence of drug and alcohol abuse). In addition to the other symptoms, it can lead to bone damage.

Note that "Polycystic kidney disease" which cause the kidneys to enlarge and lose function over time is an inherited disorder that is not linked to drug abuse.

2.1.3 - Acting process on the circulatory and the respiratory systems

2.1.3.1 - Cardiovascular system

Most drugs have direct and indirect adverse effects on the cardiovascular system.

- Injected drugs can physically damage the circulatory system.

- Repeated injection of drugs can lead to scarred and collapsed veins (veins that have lost wall tension).
- Some low quality injected drugs, where additives and contaminants are not fully dissolved, can clog blood vessels supplying oxygen and nutrients to organs, leading to infections and tissue death in the lungs, liver, kidneys, or brain. Also, they can trigger inflammations or wounds of the inner tissues of the circulatory system (intima, tunica, and epicardium). These inflammations and wounds can lead to infections, clots, and death of the exposed tissues. In the heart, unprotected parts of the myocardium can become inflamed (Myocarditis) which affects its ability to pump and causes problems such as abnormal heartbeat and chest pain. In extreme cases, damages to the circulatory system can cause myocardial infarction (heart attack).
- Also, as indicated in point 2.1.2.5, repeated injections of drugs using improperly sterilized injection devices pose the risks of bacterial and viral infections such as HIV and hepatitis B & C.

Drugs can also damage the circulatory system by their action on the autonomic nervous system:

- Stimulants (*also called psychostimulants*) activate the sympathetic division, which controls the release of adrenaline, norepinephrine and other components, and inhibit the parasympathetic division. A too high level of adrenaline, norepinephrine, and related hormones in the blood results of the following:
 - Tachycardia (heart rhythm between 100 to 400 beats per minute).
 - Arrhythmia (Irregular heartbeat).
 - Vasoconstriction (The narrowing of the blood vessels resulting from contraction of the muscular wall of the vessels, particularly the large arteries and small arterioles).
 - Hypertension (Blood pressure above normal pressure).

These effects increase the risk of myocardial ischemia (*insufficient blood flow to a portion of the heart*), which can lead to myocardial infarction (heart attack).

Also, long-term abuse of stimulants can cause spasms which can decrease or completely prevent blood flow to the heart muscle and can lead to chest pain (angina), myocardial infarction, and tears in the arteries or even in the walls of the heart itself. Tears in arteries lead to internal bleeding. The difference between vasoconstriction and vasospasms is that vasoconstriction involves wide areas and may result in elevated regional or systemic vascular pressure. A spasm is a sudden involuntary contraction of a muscle, a group of muscles, or a hollow organ. Thus, it is generally limited to a small area. A vasospasm is the sudden constriction of one or several blood vessels but not a large area as for vasoconstriction.

Stimulants include drugs such as cocaine, amphetamine, methamphetamine, and 3,4-Methylenedioxymethamphetamine

- Depressants activate the parasympathetic division, whose main chemical mediator is acetylcholine, and has inverse effects than the sympathetic division. Also, depressants are inhibitors of the sympathetic division. A not compensated action of the parasympathetic division leads to:
 - Hypotension (Abnormally low blood pressure).
 - Bradycardia (Slowed heart rate).
 - Arrhythmia (Irregular heartbeat).

Such effects lead to “hypoxemia”, which is an abnormally low level of oxygen in the blood, and then “hypoxia”, which is a condition where the supply of oxygen is insufficient for normal life functions.

Depressant include drugs such as opioids and alcohol.

2.1.3.1 - Respiratory system

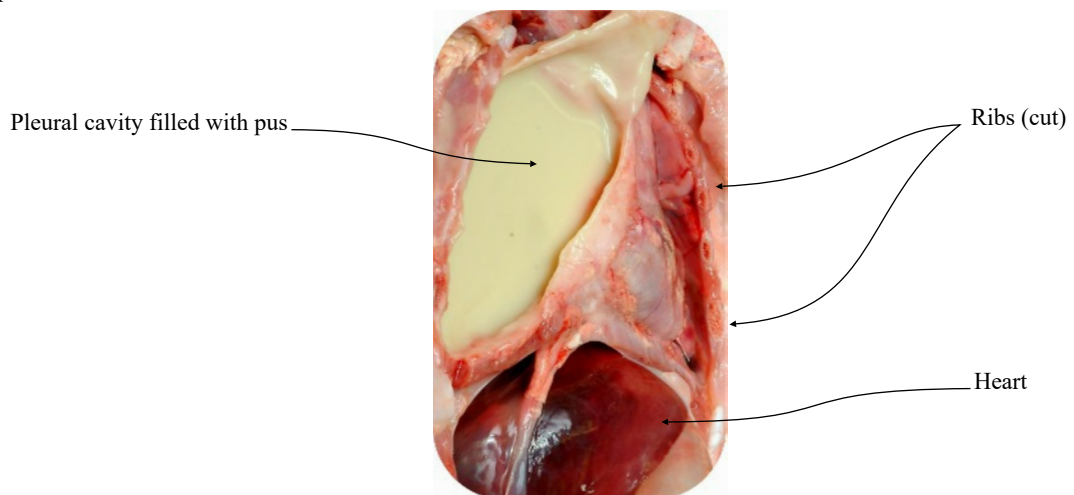
Snorted drugs such as cocaine can cause serious problems to the nasal cavity such as a lost sense of smell, inflammations, wounds, nosebleeds, or necrosis of the tissues that can result in perforation of the nasal septum and of the soft palate. Note that a pierced soft palate does not allow a person to drink and eat normally as its function is to separate the nasal cavity from the oral cavity when the food is swallowed.



Smoking any substance increases the risk of developing infections and cancers of the respiratory tracks and of the lungs. Researchers indicate that inhaled substances damage the cilia, or hair-like projections, that protect the respiratory system, resulting in a weakened immune system. Also, smoked substances, particularly cocaine and heroin injury the mucosal lining of the airways which, in addition to irritations, inhibit the activity of the pulmonary alveolar macrophages cells. That lets the respiratory tracks and the alveoli exposed to multiple infections which may result in:

- Lung abscess, which is a disease caused by a microbial infection resulting in the formation of small cavities containing necrotic debris or fluid. It is also called necrotizing pneumonia or lung gangrene. Early signs and symptoms of lung abscess include fever with shivering, cough, night sweats, dyspnea, weight loss and fatigue, chest pain, and sometimes anemia.
- Pulmonary oedema, which is a condition where the lungs are filled with fluid. It is often the result of heart problems due to a weakness of the left ventricle that cannot properly remove the blood from the pulmonary circulation. Also, it can be the result of injuries to the cytoplasmic membranes (type 1 pneumocyte) of the alveoli, or to the vasculature of the lung. Common symptoms are shortness of breath during efforts, difficulty breathing when lying down, suffocation, fatigue, wheezing, coughing up mucus that is possibly tinged with blood.

- Pleural empyema, which is a large amount of pus in the pleural cavity caused by bacteria. It often happens with drugs such as opioids that are cough suppressants and prevent foreign matters from being expelled from the lungs causing an infection. The common symptoms are chest pain, shortness of breath, dry cough, excessive sweating, weight loss and frequent malaises.



- Pneumonia, which is an infection of the lungs that can be caused by bacteria, viruses, or fungi. Bacterial pneumonia is the most common type in adults. Pneumonia causes inflammation in the alveoli that can fill with fluid or pus, resulting in difficulty breathing. Pneumonia can lead to other complications, such as empyema, lung abscess, and an elevated amount of pathogen bacteria in the bloodstream. Note that early signs of pneumonia cannot be differentiate from lung abscess.
- Bronchiectasis, which is a disease resulting in the permanent enlargement of parts of the airways and of the lungs. The symptoms are typically a chronic cough with mucus. Over time, the airways cannot properly clear themselves of mucus, allowing bacteria to flourish and another series of infections to occur. Bronchiectasis can also lead to respiratory failure if the airways are completely blocked.
- Increased incidents of cancers as a result of carcinogens and toxins

As for the circulatory system, drugs can damage the respiratory system by their action on the autonomic nervous system.

- The action of stimulants can increase the rate of breath as for an emergency situation where the lungs abruptly take in more oxygen (300 to 400 %). People suffering from a lung disease have their ability to sustain such situations compromised due to difficulty breathing and the inability to take in large amounts of oxygen, which can result in an increased likelihood for a sudden worsening of the symptoms of their disease. Also, pulmonary oedema is known to be caused by excess adrenaline: Tachycardia and increased systemic resistance cause excess load on the left ventricle, causing pulmonary congestion. This is accompanied by a mismatch in increased pulmonary artery pressure compared with pulmonary alveolar pressure, causing the hydrostatic flux of fluid. In addition, it is said in studies that excess adrenaline causes changes in endothelial cells and the cells secreting surfactant in the alveoli, leading to lung injuries that can cause pulmonary oedema. Also, stimulants can inhibit the action of the pneumotoxic centre that prevents pulmonary barotraumas.
- The action of depressants taken in large doses may result in respiratory depression (*hypoventilation*) which is a breathing disorder characterized by slow ($< 12 \text{ breath / min}$) and ineffective breathing with a reduced urge to breathe and can cause a "sighing" pattern of breathing which can be described as deep breaths separated by abnormally long pauses. Sedation increases along with drug-induced respiratory depression. Hypoventilation is life-threatening as it may develop into a situation where the casualty definitively ceases breathing.

2.2 - Main drugs encountered and their visible symptoms

2.2.1 - Alcohols

2.2.1.1 - Description

Alcohols are found under several forms such as:

- **Alcohol** (*ethanol, ethyl alcohol*)

This alcohol is naturally produced by the fermentation of sugars. It is found in various beverages such as wines, beers, whiskies, cognac, ciders, and others. It is tolerated by the body in meager quantities and is appreciated by the gourmets for the taste and smell of the beverages in which it is present. Also, it is used as an antiseptic and disinfectant.

- Methanol (Wood alcohol, Methyl alcohol)

It is produced in a catalytic process directly from carbon monoxide, carbon dioxide, and hydrogen. It is not a drinkable alcohol. It is used for industrial purposes such as antifreeze, solvents, and fuel. It is highly toxic and ingesting it may result in blindness, coma, and death.

- Isopropanol (rubbing alcohol, Isopropyl alcohol)

It is mainly produced by combining water and propene which is a substance that, in nature, is the result of fermentation of vegetation, and is produced from fossil fuels and eventually coal. It is not a drinkable alcohol and is mostly used for industrial applications such as solvents, cleaning fluids, gasoline additives, etc. It is also used for medical purposes as a disinfectant and for the prevention of external infections such as otitis. Severe isopropanol poisoning results in the central nervous system depression, and a collapse of the respiratory and circulatory functions. However, patients usually make a full recovery provided they receive prompt supportive care.

2.2.1.2 - Summary of the visible symptoms

The first noticeable effects of alcohol such as reduced anxiety and sedation occur when blood alcohol concentration is at 0.04 g per 100 ml of blood.

As the level of alcohol in the blood rises, The person may show the following signs:

- Confusion
- Problems of coordination
- Expansive mood, change of personality
- Poor judgment & Impaired memory
- Sense of well-being followed by a depressive state
- Short attention span
- Slurred speech
- Talkativeness (*A person who is inclined to talk a great deal, sometimes without significance*)
- Nausea and vomiting
- Frequent need to urinate (*Which leads to dehydration of the body*)
- Convulsions resulting in loss of consciousness and muscle contractions
- Difficulty in performing tasks involving coordination
- At very high levels alcohol can cause the person to fall unconscious or to pass out.

Chronic alcoholics are people who are alcohol dependent and are unable to reduce the amount they drink or to stop drinking, though they often try. These people can develop health problems that are not detectable at first but become detectable with time such as:

- Insomnia
- Anxiety
- Hyperactivity
- Sweating, pulse rate greater than 100
- Hallucinations
- Delirium tremens (*anxiety, increased heart rate, sweating, trembling, confusion*),
- Progressive dementia
- Permanent difficulties in performing tasks involving coordination
- Incontinence
- A weakness of one side of the body (*hemiparesis*)
- Hand tremors
- Gait problems
- Difficulties to speak and understand a conversation
- Inability to perform learned movements on command (*apraxia*)
- Dental caries, broken teeth, and ulcers in the gingival area
- Foul smelling breath
- Gastrointestinal disturbances such as ulcers, bleedings, perforation of the intestine, gangrene, cancers, etc
- Fatty liver (*1st step to cirrhosis*), liver inflammation, cirrhosis, and liver failure
- Pancreatitis, diabetes
- Particular odors
- Cardiovascular disturbances (*hypotension, bradycardia, arrhythmia, damaged blood vessels*)
- Red eyes, and red blotchy skin

Note that withdrawal medically assisted is necessary in the case of chronic alcoholism.

2.2.2 - Ethylene glycol, Acetone, and Trichloroethylene

These three products are examples of liquids designed for industrial applications that may be employed with other components to fabricate recreational drugs or can be deliberately ingested or inhaled without modification by the consumers.

Note that these substances can be absorbed accidentally during handling and normal maintenance operations. Also, note that other industrial substances can be diverted from their original application.

- **Ethylene glycol** (*antifreeze*)

It is a colourless, odourless, viscous dihydroxy alcohol (*a molecule containing two hydroxy radicals [oxidizing agents]*) produced by the reaction of ethylene with water.

Ethylene is a colorless hydrocarbon which fabrication requires a lot of complex technologies and temperatures from +1500 to -120 C°. It is at the base of the modern petrochemical industry and is massively used for the fabrication of plastics, paints, and various liquids in use in the industry.

Ethylene glycol is commonly used as a coolant or heat transfer agent, antifreeze, brake fluid, and solvent. It has a sweet taste which may tempt some people to ingest it as it is or mix it with other ingredients.

If ingested, the central nervous system, metabolic process, and kidneys can be deeply affected.

Common symptoms after ingestion are those of a depressant which are at first similar to those from ethyl alcohol abuse. More serious damages may be seen a few days after ingestion:

- Person dizzy, confused
- Lack of coordination
- Excess of saliva
- Slurred speech
- Abnormal eye movements
- Nausea, vomiting, and lost of appetite
- Elevated heart rate and respiration with elevated blood pressure
- Lower back pain, with blood in the urine
- Decreasing production of urine
- Kidney failure
- If not treated sufficiently early, the person falls unconscious and passes out.

- **Acetone**

It is a colorless liquid formerly extracted from pyroligneous acid resulting from the carbonization of wood. It is now obtained from benzene and propylene. It is one of the ketone bodies which is commonly used as a solvent and antiseptic.

The substance can be absorbed into the body by inhalation, ingestion and prolonged skin contact.

It is a depressant which affects the central nervous system and other organs.

Note that acetone is commonly used as a recreational drug by poor urban people who have not sufficient resources to buy more elaborate molecules.

The common symptoms are:

- Sore throat and coughing in the case of inhalation. Note that the lungs can be affected.
- Nausea and vomiting in the case of ingestion
- Blurred vision, and painful red eyes if exposed to vapors or projections
- Dry skin in the case of prolonged exposure
- Confusion, headache, dizziness, drowsiness.
- Unconsciousness

- **Trichloroethylene** (*Halocarbons*)

It is a volatile clear halocarbon liquid with a sweet smell and burning taste.

Halocarbons are chemicals in which one or more carbon atoms are linked with one or more halogen atoms (*fluorine, chlorine, bromine or iodine*). They are naturally produced by micro-organisms and can be found in the soil following wood fires and volcanic activity. However, halocarbons used in the industry are not from a natural process.

Trichloroethylene is mainly used as an industrial solvent and degreaser. Also, it has been used as a general anaesthetic in short surgical procedures. The reason is that, when inhaled, it triggers a central nervous system depression resulting in anaesthesia.

Note that the “European Scientific Committee on Occupational Exposures Limit values” says that the exposure limit at work should be 54.7 mg/m³ for 8 hours.

This substance can be inhaled, ingested, or absorbed through the skin. Most symptoms after over-exposure are mainly related to the central nervous system depression. However, other parts of the body can be affected.

Some of the visible symptoms can be listed as follows:

- Euphoria
- Dizziness, confusion and headache
- Drowsiness, weakness, lassitude, depression

- Note that degeneration of the cranial nerves have been found after short term exposures to high dosages
- Nausea
- Sore throat resulting in the irritation of the oral tracts following ingestion
- Irritation of the gastrointestinal tracts following ingestion
- Irritation of the eyes, and blurred vision
- Dry red skin due to irritation after prolonged contact
- Cardiac dysrhythmia, tachycardia, and respiratory arrest.
- Liver and kidneys damaged (resulting in fatality)
- Immune and endocrine systems affected and increased risks of cancer
- Stupor, coma, and death

Note that, similarly to acetone, this substance is commonly used as a recreational drug by poor urban people or kids who have not sufficient money to buy more elaborate molecules.

2.2.3 - Opiates & opioids

2.2.3.1 - General description

They are drugs that are derived from the opium poppy (*Papaver somniferum*), or synthetic substances which have similar molecular compositions and effects. They are classified in three categories:

- “Opiates”, which are the natural drugs that come from the opium poppy (*Papaver somniferum*).
- “Opioids” which are synthetic drugs that are made from an entire industrial process where each molecule is created from scratch. They act on the same areas of the brain as opiates and produce similar effects.
- Semi-synthetic drugs, that are also called “opioids”, are a mix of both synthetic and natural opium alkaloids.

Note that the term “Opioids” is sometimes used to group the three categories. However, reports from the the United Nation Office on Drugs and Crime (UNODC) clearly separate opiates and opioids.

The production and use of these substances are strictly limited to medical use by the United nations conventions against illicit traffic in narcotic drugs and psychotropic substances 1961, 1971, and 1988.

However, conventions on drug abuse are not signed by all the registered members of the United Nations, and controls are impossible in some countries where they are produced and where the states have not sufficient resources to implement these conventions.

Note that UNODC says that opioid use causes seventy percent of diseases due to drugs.

2.2.3.2 - Summary of the visible symptoms

Opioids are depressants with some symptoms that can be similar to those of alcohol. The main visible symptoms can be classified as follows:

- A feeling of euphoria (*short-term effect*) followed by agitation (*restless legs*), anxiety, sudden change of mood, lack of motivation.
- Patients using such substances for a long time may develop depressive episodes.
- Capacities of reflection impaired, confusion, psychomotor impairment with slow movements and loss of coordination
- Sedation, insomnia, and fatigue
- Pupils excessively constricted (*miosis*)
- The patient has sudden loss of consciousness and does not wake up or respond to voice or touch
- Altered perception of temperatures
- Patients who are not suffering from long addiction have a decreased perception of pain
- Opposite of above, some patients suffering from chronic abuse have a greater sensitivity to pain
- Fingernails and lips turning blue or purple
- Muscle aches
- Dehydration
- Sweating with particular odors
- Abdominal cramps (due to intoxicated liver and hepatitis), nausea and vomiting
- Slowing of the digestive system can result in constipation
- A person who is addicted to injected substances can be identified by the numerous traces of injections.
- Respiratory depression which can slow the breathing and result in death
- Slow heartbeat and/or low blood pressure

Problems not immediately detectable may be present:

- Injected substances such as heroin or crushed pills, lead to collapsed veins and infection of the heart lining which results in cardiovascular problems.
- Intercerebral bleeding and bleedings in the space between the brain and the skull which may result in:

- Headache, nausea, and vomiting
- Lethargy or confusion
- Sudden weakness or numbness of the face, arm or leg, usually on one side
- Loss of consciousness
- Temporary loss of vision
- Seizures
- Problems linked to shared needles:
 - Hepatitis with symptoms such as: Flu-like illness that includes fever, abdominal pain, fatigue, decreased appetite, nausea, and in some cases yellowing of the skin and eyes.
 - HIV with symptoms such as: Body rash, fever, sore throat, severe headaches, fatigue, swollen lymph nodes, ulcers in the mouth or on the genitals, muscle aches, joint pain, nausea and vomiting, night sweats
 - Vulnerability to these infections and others is increased due to the reduced immune response of the body.
- Clogs in the blood vessels throughout the body, causing organ damages. This is due to injuries and impurities that can be injected and are then trapped in small capillaries.
- The slowed gastrointestinal activity which results in constipation can lead to complications such as small bowel obstruction, perforation and peritonitis.
- “Spongiform leukoencephalopathy” (*Deterioration and vanishing of the white matter of the nervous system*)
- Septic emboli (*Emboli infected with bacteria, resulting in the formation of pus*)
- Lung abscess with the following symptoms: Fever with shivering, cough, night sweats, dyspnea, weight loss and fatigue, chest pain, and sometimes anemia.
- Pulmonary oedema with the following symptoms: Shortness of breath during efforts, difficulty breathing when lying down, suffocation, fatigue, wheezing, coughing up mucus that is possibly tinged with blood.
- Pleural empyema with the following symptoms: Chest pain, shortness of breath, dry cough, excessive sweating, weight loss and frequent malaises.

2.2.3.3 - Main opioids involved in drug abuse cases

- **Opium**

It is the most ancient form of opiate and has been cultivated since prehistoric times. From this period these drugs have been used for medical and recreational use. It is extracted from the latex of the opium poppy (*Papaver somniferum*) seed pod that has been dried. The traditional method of extraction consists of opening the pod and let the sap seep out on its outer surface and dry. Then, the brown substance obtained is carefully collected. Opium can be ingested or smoked using specific pipes and a precise methodology. Note that smoking opium is still a tradition of some Asian populations. However since the 20th century, Opium has been superseded by derivated substances such as heroin.

- **Morphine** (duramorph)

Morphine is a component of opium used for the relief of pain in patients who require analgesia and sedation for more than a few days. It increases the patient's tolerance for pain and decreases discomfort, although the pain may still be recognized. However, alterations in mood, euphoria or dysphoria, drowsiness, and respiratory depression commonly occur during the treatments. This product is usually taken orally, rectally (suppository), or by injection. Recreational drug users take it at high dosages or mixed with other agents such as alcohol.

- **Codeine**

It is an extract of opium related to morphine but with less potent analgesic properties and mild sedative effects. It is commonly used to treat mild pain and cough. It is commonly administrated by ingestion (liquid or pills). It is said that its efficiency may decrease after a long-term treatment. Also, it may cause withdrawal reactions (anxiety, sweating, vomiting, and diarrhea) when stopped too suddenly after long-term treatments at high dosages. As for the previous substance, it is not recommended for people suffering from severe asthma or breathing problems.

- **Hydromorphone** (*Dilaudid*)

It is a derivative of morphine which has a shorter duration of action and is eight times more potent than morphine. It is used for analgesia and sedation. It is absorbed by ingestion (capsule, liquid, solution, tablet) or injection. Its side effects that are similar to those of other opiates (nausea, vomiting, constipation, dizziness, drowsiness, sweating, flushing, dry mouth, withdrawal) may decrease with time.

- **Heroin** (*Diacetylmorphine*)

It is a strong analgesic semi-synthetic medication derivated from morphine. In the countries where its medical use is legal, it is absorbed by injection. For those who consume it for a recreational purpose its side effects, which are similar to those from smoked opium, can lead to a fatal overdose because injection allows raising the dosages beyond the limits usually accepted by the body. Note that those who consume it as a recreational drug are also targets for various infections such as HIV and the complications indicated in the paragraph about "symptoms" due to lack of hygiene and insufficiently refined products. Note that heroin is strictly forbidden in a lot of countries (even for medical support).

- Oxycodone (*Oxycontin, Oxy/r, Percocet*)

It is a semi-synthetic, moderately potent opioid that is used for the treatment of acute or chronic pain. Like most opiates, this medication may cause euphoria, anxiolysis, vision changes (miosis), sedation, physical dependence, constipation, and respiratory depression, depending on dosage and variations in individual metabolism. It is taken orally.

- Hydrocodone (*Lorcet, Vicodin, Lortab, Hycodran*)

It is a semi-synthetic opiate similar to codeine used for short term treatments to relieve a dry cough usually caused by common cold. It is also used for pain relief. It is taken orally (tablets). Its side effects are similar to those of oxycodone and propoxyphene.

- Methadone (*Dolophine Amidone*)

It is a synthetic analgesic which effects are similar to those from morphine. It is also used for the same purpose and also the treatment of narcotic addictions. It is administered orally using solutions or tablets, or by injection. This substance is indicated more toxic than morphine.

- Meperidine (*Demerol, Pethidine*)

It is a synthetic opioid that is used as a substitute for morphine. It can be administered by injection or orally. Its side effects are said to be similar, but lower than those of morphine. However, it is not recommended for people suffering from severe asthma or breathing problems.

- Propoxyphene (*Darvon, Darvocet-N*)

It is a synthetic drug structurally related to methadone which is used to relieve mild to moderate pain. It is usually given orally (tablets or capsules). As the previous drug, it may cause withdrawal reactions. Among its side effects, numerous overdoses that have led to fatalities have been reported. As a lot of casualties had previous histories of emotional disturbances or suicidal tendencies, it is recommended not to prescribe this product to patients with such disorders.

- Fentanyl (*Sublimaze, Duragesic, Actiq, Fentora*)

It is a synthetic molecule which is a potent narcotic analgesic, used alone and together with other medications for anesthesia. It has a rapid onset and its effects generally last less than an hour or two. It is absorbed by injection, skin patches, intranasally, or sublingually. Abuse of this substance quickly leads to habituation or addiction.

2.2.4 - Hallucinogens

2.2.4.1 - General description

Hallucinogens are drugs that change the perception of reality. When the substance is absorbed, the person sees, feels, and hears things that aren't real, or distorts what happens around them. People have used hallucinogens for centuries, mostly for religious rituals.

2.2.4.2 - Summary of the visible symptoms

Some symptoms commonly observed are as follows:

- Distorted sense of sight, hearing, and touch
- Dilated or floating pupils
- Anxiety, paranoia, sudden change of mood, irrational behaviour, violence (*only with certain substances*)
- The ability to make sensible judgments and see common dangers is impaired
- Problems of coordination and dizziness
- Faintness and numbness
- Increased blood pressure and heart rate developing to tachycardia
- Increased body temperature
- Sleeplessness & increased energy
- Spasms & epileptic type crisis
- Profuse sweating
- Dry mouth
- Airway irritated in the case of smoked substances. Additional damages that are the continuation of the irritation can be similar to those described with opioids
- Nausea
- Eventually death

Longer-term use of these drugs may impair thinking, memory, learning functions, and affect how the brain builds connections between the areas necessary for these functions.

Studies have been undertaken to evaluate whether these changes are permanent.

Psychological distresses are usually reported.

Note that in the case of absorption by injection the additional dangers are the same as those indicated by the absorption of

opioids by intravenous injection.

2.2.4.3 - Main hallucinogens involved in drug abuse cases

Hallucinogens can be found in many plants and mushrooms (or their extracts) or can be synthetic or semi-synthetic molecules. Also, some substances are consumed locally and by very private groups of persons. So, the list can be infinite. The drugs described below are those that are the most found in recorded cases of drug abuse.

- Lysergic acid diethylamide (LSD)

It is a clear or white odourless substance made from lysergic acid, which is found in a fungus that grows on rye and other grains. Primary route of administration is oral, but it can be inhaled, injected, and transdermally applied. It is one of the most powerful mood-changing chemicals. When taken orally, the effects become apparent within about 30 minutes and may continue for 8 to 12 hours or more. The duration and intensity of effects are dose-dependent.

- Cannabinoids

Cannabinoids are the chemical compounds of cannabis, also known as marijuana, which is a plant that grows in many parts of the world. Note that the human body has cannabinoid receptors that help the compounds to be active. For this reason, some varieties of cannabinoids are recommended by doctors to reduce nausea and vomiting during chemotherapy, improve appetite in people with HIV, and to reduce chronic pain and muscle spasms. However, most cannabinoids are psychoactive substances and, their use as a medicine has not been rigorously tested. For these reasons, their use is forbidden in most countries. The drugs below are the most encountered consumed forms:

- Marijuana (*Marie Jeanne*) refers to the dried leaves, flowers, stems, and seeds from the *Cannabis sativa* or *Cannabis indica* plant. Marijuana is smoked through hand-rolled cigarettes (joints), pipes or water pipes, cigars. It is also inhaled through vaporizers. The consumer generally feels the effects after 30 minutes to 1 hour. Note that effects of this drug can be transmitted to people not smoking it, but breathing its smoke in a room.
- Hashish is a resin made from cannabis that is usually smoked mixed with marijuana, tobacco or another type of herb using a pipe, or a hand-made cigarette. Depending on region or country, multiple synonyms and alternative names exist.

- Phencyclidine (PCP - Angel dust)

It is an anaesthetic that has been discontinued due to its extreme side effects that include delirium, confusion, visual disturbances, hallucinations, and violence. Evidence of long-term memory disorders and schizophrenia-like syndrome has been observed. Also, fatalities are reported. Phencyclidine is similar to Ketamine (see next) in structure and in many of its effects. It is also called PCP and Angel Dust by those using it for drug abuse. It can be absorbed by oral and nasal routes.

2.2.5 - Stimulants

2.2.5.1 - General description

These drugs increase the awareness, alertness, and efficiency of the body. For these reasons, they have been used by German militaries during the 2nd war (Pervitin) and a lot of athletes.

Elevated consumption of stimulants leads to addiction. Also, because they increase the blood pressure, their combination with physical exertion can lead to cardiac arrest or stroke.

2.2.5.2 - Summary of the visible symptoms

Common symptoms of stimulant abuse:

- Euphoria and hyperactivity
- Insomnia, dizziness
- Hallucinations
- Dilated pupils and blurred vision
- Increased respiration that can lead to pneumothorax
- Tachycardia (*heart rhythm between 100 to 400 beats per minute*), elevated blood pressure, arrhythmia
- Myocardial ischemia (*insufficient blood flow to a portion of the heart*)
- Ischemic strokes (*occur when the arteries in the brain become narrowed or blocked*)
- Intracerebral bleeding, subarachnoid hemorrhage.
- Problems to the nasal cavity such as a lost sense of smell, inflammations, wounds, nosebleeds, or necrosis of the tissues that can result in perforation of the nasal septum and of the soft palate (*mainly with cocaine*).
- Dental caries in the gum line or in between the teeth, ulcers are found in the gingival area, broken teeth, foul smelling breath
- Mucosal lining of the lungs damaged (Smoked substances)
- Decreased appetite
- Inflammations and possible perforation of the stomach and the intestines, gangrene of the parts of the intestine that are not vascularised.
- Inflammation of the pancreas (Cocaine)

- Sweating
- Extreme sleepiness or falling asleep suddenly (*collapsing following a period of abnormally long activity*)
- Spongiform leukoencephalopathy (*deterioration and vanishing of the white matter of the brain*)
- Septic emboli (*Emboli infected with bacteria, resulting in the formation of pus*)
- Damaged blood vessels (*resulting from intake by injection*)
- Pulmonary oedema, pleural empyema, pneumonia, bronchiectasis (*enlargement of the airways and of the lungs*)

2.2.5.3 - Main hallucinogens involved in drug abuse cases

- Cocaine

It is an alkaloid extracted from the leaves of coca.

It is used as a local anaesthetic and vasoconstrictor, particularly in the eye, ear, nose, and throat. It is no longer used because of its potent addictive qualities. When given in high doses, it has the effect indicated above associated with toxic reactions including acute liver injury which can be severe and even fatal. When used as a recreational drug, it is commonly snorted, smoked, or injected.

- Amphetamines (Benzedrine, Dexedrine)

They are central nervous system stimulants that have also been used in the treatment of narcolepsy and of attention deficit disorders and hyperactivity in children. In addition to the effects indicated above, high doses of amphetamines can be associated with liver injury.

- 3.4-Methylenedioxymethamphetamine (MDA - Ecstasy)

This drug is also commonly known as “ecstasy”. It is a synthetic substance that is primarily used as a recreational drug. Note that the exact composition of most ecstasy sold is uncertain. It is generally orally absorbed (tablets or capsules), the effects begin after 30 - 45 minutes and last 3 - 6 hours. It is not accepted for medical use.

- Methamphetamine (Desoxyn, Methedrine)

It is a form of amphetamine which facilitates the release of catecholamines (*neurotransmitters which regulate physiological functions such as heartbeat and breathing rate*). It increases the stimulation of the post-synaptic receptors (*a synapse is a structure that allows passing of an electrical or chemical signal from a neuron to another one or an efferent cell*). These drugs are absorbed orally (capsules or tablets), or by inhalation. “Pervitin” was a well-known form of methamphetamine that was promoted by the German 3rd Reich before and during the 2nd war, to increase the productivity of the people working in their factories and the efficiency of their soldiers during the “blitzkrieg”. However, a lot of consumers became addicted and cases of depression, suicide, and cases of non-stop periods of sleep from 2 - 3 days have been reported. These substances are often consumed by unscrupulous athletes, students, and a lot of workers with the aim of improving their efficiency. They are the root-causes of numerous accidents.

2.2.6 - Barbiturates

2.2.6.1 - General description

Barbiturates are a class of drugs that have been derived from barbituric acid, an odorless powder soluble in water. Its derivatives enhance the action of the GABA_A receptor, a neurotransmitter that inhibits the activity of nerve cells in the brain. Barbiturates are used in the treatment of anxiety, epilepsy, as anesthetics, and to induce sleep.

However, they have a tendency to cause psychological and physical dependence and their dosage to create a desirable effect is not far from a lethal dose. For these reasons, a lot of medics replace them with safer drugs. However, they are still available on the market.

2.2.6.2 - Summary of the visible symptoms

Common signs of barbiturate abuse are as follows:

- Slow-talking
- Lack of facial expression
- Poor coordination
- Inability to walk properly, staggering or stumbling
- Inability to think
- Decreased anxiety
- Low blood pressure and slow and shallow breathing
- Lethargy
- Extreme sleepiness or even coma

2.2.6.3 - Main barbiturates involved in drug abuse cases

- Pentobarbital (Nembutal)

It is a short-acting sedative and hypnotic agent and is usually given orally. It is prescribed more frequently for the treatment of short term insomnia. It is a central nervous system depressant that may induce drowsiness and relieve tension or nervousness.

- Secobarbital (Seconal)

Secobarbital is a synthetic substance that has anaesthetic, anticonvulsant, sedative and hypnotic properties. It is used short-term to treat insomnia, or as a sedative before surgery. It is a depressant that slows the activity of the nervous system. It is recommended to use it with caution in patients with a history of substance abuse, depression, or suicidal ideation. It is commonly taken by ingestion (capsules).

- Butabarbital (Butisol)

This synthetic molecule has a fast onset of effects and short duration of action compared to other barbiturates, which makes it useful for certain applications such as treating severe insomnia and relieving anxiety before surgical procedures. However, it is also relatively dangerous, particularly when combined with alcohol, and so is now rarely used. This substance is absorbed orally (Tablets).

- Phenobarbital

Phenobarbital is a long-acting barbituric acid derivative with antipsychotic properties. It is a medication recommended by the World Health Organization for the treatment of certain types of epilepsy. It is also used for the treatment of seizures and as a sedative. It can be injected intramuscularly or intravenously, or absorbed orally (pills).

2.2.7 - Benzodiazepines

2.2.7.1 - General description

Benzodiazepines are a class of psychoactive drugs whose core chemical structure is the fusion of a benzene ring and a diazepine ring. They are depressants that are used as tranquillisers and considered safe and effective for short-term use. They are not recommended for long-term use as they can lead to dependence (addiction) and problems of tolerance in the case of long-term treatment or abuse.

2.2.7.2 - Summary of the visible symptoms

Problems arising from these substances can be listed as follows:

- Euphoria
- Paradoxical effects such as worsened agitation, panic, aggression, or disinhibition occasionally occur.
- Increased tendency to suicide
- Amnesia and confusion (especially in high dosages)
- Drowsiness, dizziness, and decreased alertness and concentration
- Lack of coordination may result in falls and injuries
- Blurred vision or double vision
- Confusion
- Depersonalisation and nightmares
- Hypo-tension, slow heart rate, cardiac arrhythmia
- respiratory depression & apnea
- Less common side effects include nausea and changes in appetite
- Rare cases of liver toxicity have been described
- Nausea & vomiting
- Skin rash
- Injection site reactions

Withdrawal reactions can also occur if the drug is stopped suddenly which can lead to insomnia, and perpetuating continued use and higher dosages.

2.2.7.3 - Main Benzodiazepines involved in drug abuse cases

- Diazepam (Valium)

Diazepam is used to treat anxiety disorders, alcohol withdrawal symptoms, or muscle spasms. Diazepam is sometimes used with other medications to treat seizures. Diazepam is a benzodiazepine. It affects chemicals in the brain that may be unbalanced in people with anxiety. It can be taken by mouth, inserted into the rectum, injected into muscle, or injected into a vein.

- Oxazepam (Serax)

Oxazepam is used to treat anxiety and also acute alcohol withdrawal. It is approved for the short-term treatment of insomnia. In addition, it has anxiolytic (anti-anxiety), anticonvulsant, and skeletal muscle relaxant properties. It is

administered orally (Capsules).

- Alprazolam (Xanax)

Alprazolam is used to treat anxiety disorders, panic disorders, and anxiety caused by depression. It is taken orally (pills).

- Clonazepam (Klonopin)

It is an anticonvulsant used for several types of seizures, including myotonic or atonic seizures, photosensitive epilepsy, and absence seizures. It is ingested by the means of pills. (Notes: Myotonic = contracted muscle. Atonic = absence of contraction).

- Chordiazepoxide (Librium)

It is an anxiolytic with anticonvulsant, sedative, and amnesic properties. It has also been used in the symptomatic treatment of alcohol withdrawal. This drug is absorbed orally (capsules).

- Lorazepam (Ativan, Lorazepam)

It is an anti-anxiety agent with few side effects. It also has hypnotic, anticonvulsant, and considerable sedative properties and has been proposed as a preanesthetic agent (*drug that is given before the administration of an anaesthetic*). Thus drug is absorbed orally (pills). Its side effects are those described above.

- Fluritrazepam (Rohypnol)

This drug has general properties similar to those of Diazepam (*Valium*). It is used in the short-term treatment of insomnia, as a pre-medication in surgical procedures and for inducing anaesthesia. Its effects include sedation, muscle relaxation, reduction in anxiety, and prevention of convulsions. It is absorbed orally (tablets & pills) and rectally (suppository). Rohypnol's sedative effects that appear 15 to 20 minutes after administration and last approximately four to six hours are 7 to 10 times stronger than Diazepam. Some residual effects can be found 12 hours or more after administration. Also, it causes partial amnesia such as individuals are unable to remember certain events experienced while under treatment. Due to its characteristics, it has been used as a date rape drug. It is forbidden in some countries.

2.2.8 - Gamma-hydroxybutyrate

- 4-Hydroxybutanoic Acid (Somatomax)

It is commonly sold in the form of a salt administered intravenously. It is a naturally occurring short-chain fatty acid, and immediate precursor of gamma amino butyric acid (GABA) with neuromodulatory and anesthetic properties. It is a central nervous system depressor molecule that is used to treat catalepsy and daytime sleepiness in patients with narcolepsy. It is also used for the treatment of alcohol dependence and the withdrawal from heroin, opium, morphine, and other opiate drugs. Some athletes consume it (illegally) to increase their performances. As it causes sexual arousal and memory loss, it is also used as a date rape drug. Note that it is an addictive drug. Also, the use of Gamma-hydroxybutyrate has been linked to deaths and cases of serious side effects:

- Headaches, dizziness, confusion
- Agitation
- Hallucinations and mental changes
- Drowsiness and unconsciousness
- Memory loss
- Visual disturbances
- Numbing of limbs (mainly the legs)
- Nausea, vomiting, diarrhea
- Life-threatening respiratory depression
- Bradycardia and Cardiac arrest
- Coma and death.
- Long-term use may lead to withdrawal symptoms

2.2.9 - Hydrochloride (also called Chlorhydrate)

- Ketamine hydrochloride (Ketajet)

It is a synthetic derivative of cyclohexanone which is a colorless oily liquid with an odor resembling acetone and peppermint. Cyclohexanone is occasionally found as a volatile component of human urine. Hydrochloride has analgesic and anesthetic activities. It is used as an anesthetic for short diagnostic and surgical procedures that do not require skeletal muscle relaxation. It is also indicated for inducing anesthesia prior to administration of other general anesthetics. The onset of action of this drug is fast (within 30 seconds after injection), with the anesthetic effect usually lasting five to ten minutes. It can be administered intravenously or intramuscularly. When used with over-dosages or for drug abuse, it can provide the following undesirable effects:

- Psychological manifestations that may vary between pleasant dream-like states, vivid imagery, hallucinations, and emergence delirium, sometimes accompanied by confusion, excitement, and irrational behaviour.
- State of sedation, immobility, amnesia, and marked analgesia.
- Enhanced skeletal muscle tone manifested by tonic and clonic movements.
- Arrhythmia, bradycardia & hypotension. However, elevated blood pressure and heart rate are also indicated
- Severe respiratory depression
- Anorexia, nausea, vomiting.
- Periods of unusual hyperactivity or agitation
- Sudden mood changes such unusual irritability and paranoia, or at the opposite, increased sociability
- Psychotic and violent behaviour
- Sudden change in relationships, friends, favourite hangouts, and hobbies
- Lack of motivation
- Appearing fearful, withdrawn, anxious, or paranoid, with no apparent reason
- Hallucinations, delirium, panic attacks

2.3 - Effect of combined substances

Mixes of substances, also called poly-substances abuse, can be performed intentionally or by mistake. As a result of these combinations the drugs are more difficult to identify and the risks of overdose and fatalities are increased.

Mixes of depressant such as heroin combined with stimulants such as cocaine to avoid or decrease the unwanted side effects of either drug are often performed. When consumed simultaneously with heroin, the effects of cocaine can temporarily counteract the effects of heroin. However, the effects of cocaine are known to decrease faster than those of heroin, which means that users might not realize they are overdosing until it is too late and they are exposed to the increased effects of the depressant. As a result, there is a high risk of negative effects on the circulatory and respiratory systems with can result in death at extreme dosages. Also, the association of the two substances may increase their psychotic effects such as delusions and paranoia.

The effects of cocaine with alcohol will be similar as those of heroin with the effects of alcohol temporarily masked and then increased when the effects of cocaine will decrease (*Stimulant temporarily counteracting the effects of a depressant*). Regarding psychotic effects, data suggest that people using cocaine with alcohol become more violent than they would be with these substances consumed alone.

Also, the combination of cocaine with alcohol can trigger the production by the liver of a substance called “cocaethylene”. This is a psychotropic substance which has a stimulant, euphoriant, anorectic, sympathomimetic, and local anaesthetic properties. It can damage the liver, compromise the immune system functions, cause seizures, and increases the risk of death. Cocaethylene can stay in the body up to five times longer than cocaine.

Alcohol and heroin or other opioids are depressants which slow down the functions of the central nervous system that regulates the circulatory and breathing functions. Ingesting alcohol simultaneously with heroin or other opioids results in the increased effect of both depressants, which can result in permanent brain damage, physical disabilities, a coma, or a fatality.

Marijuana, which is a hallucinogen is another depressant that is often mixed with alcohol. Such mix can cause paranoia, panic, anxiety, or terror in those who consume such mixes.

Also, reports from specialized agencies suggest that dependence to mixed drugs is more profound than that of substances absorbed individually with more frequent intakes. The increased frequency of intakes will increase the complications linked to the method of absorption.

Note that as there is no quality control of illegal drugs, the consumer cannot be sure of the composition of the product he consumes. Thus, the product ingested can be made of combined substances which effects may conflict or be reinforced.

3 - Means of detection and cut-off levels

Several means of sampling which the results can be obtained onsite within a few minutes or need to be analyzed in a specialized laboratory have been developed. Depending on the procedure selected, the collection of samples are invasive methods that must be performed only by qualified medical personnel (nurse or doctor), or non-invasive methods some of which can be performed by no-medical personnel.

3.1 - Blood sampling

3.1.1 - Description

Blood tests offer the ability to accurately test the same sample several times if the sample is properly preserved. However, the procedure has some disadvantages:

- The collection process requires trained medical personnel.
- The sample collection is invasive.
- The analysis requires precise procedures by trained laboratory technicians.
- The results are not immediately available, and the process is expensive.

3.1.2 - Collection

3.1.2.1 - Collector

The sample collection must be done by a doctor or a nurse who is accompanied by another appointed person.

3.1.2.2 - Collection site

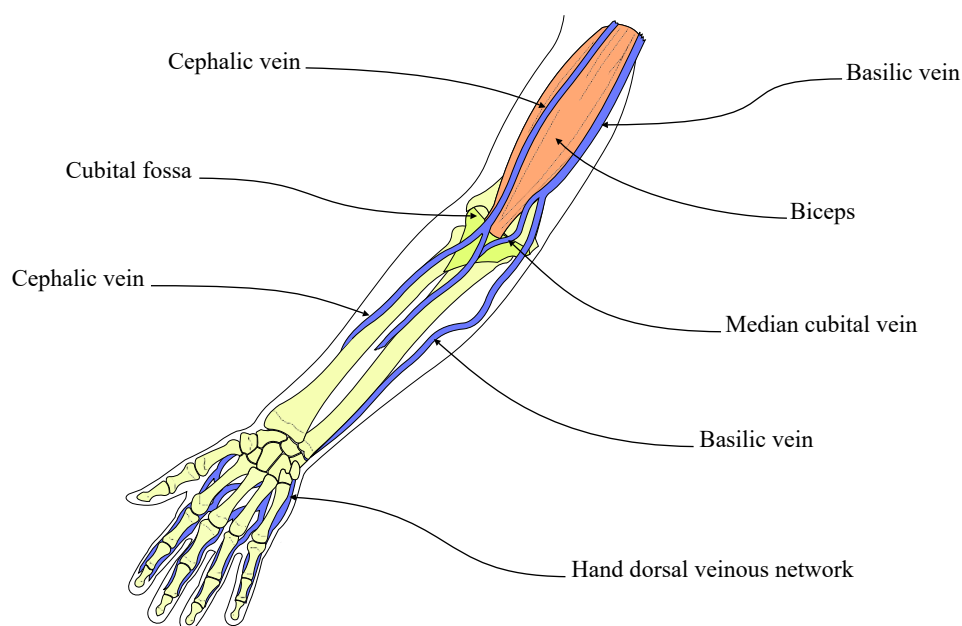
The collection site should be the onsite hospital or infirmary. Nevertheless, in the case that there is no hospital or that collection in the hospital cannot be made in the best conditions, the following points should be checked:

- The access to the room must be restricted.
- The room is clean.
- There should be a secure area where samples can be kept.
- There should be a suitable area for dealing with the completion of forms and other administrative tasks.

3.1.2.3 - Collection process

Blood is most commonly obtained from the median cubital vein, which lies within the cubital fossa anterior to the elbow. This vein lies close to the surface of the skin, and there is not a large nerve supply.

Note: The larger median cubital vein is the usual choice, but the cephalic vein or the basilic vein on the dorsum of the arm or dorsal hand veins are also acceptable. Foot veins are a last resort because of the higher probability of complications.



- The person to test is sat on a chair or laid on a bed.

- The collector has washed his hands and wears medical clothes and surgical gloves as for any medical intervention. Glasses should be worn.

- Specialised documentation says that it is not advisable to use isopropyl alcohol to cleanse the venipuncture site when obtaining a specimen for a blood alcohol test. This has been related largely to the potential legal implications associated with use of alcohol based cleaners that could theoretically impact the analysis.

Numerous police alcohol collection kits have been marketed that incorporate a sodium fluoride/potassium oxalate preservative and non-alcohol based cleansing agents to ensure proper collection. Using soap and hot water or a povidone iodine swab are advisable alternatives to isopropyl alcohol in this case.

- Two methods of sampling may be used:

- Vacuum extraction

A lot of organizations promote the use of vacuum extraction tube systems as closed systems for blood collecting reduces the risk of direct exposure to blood and has made it easier to take multiple samples from a single venipuncture. Although vacuum extraction systems are safe, training and skill is required for their use. The vacuum blood collection system consists of a double-pointed needle, a plastic holder or adapter, and a series of vacuum tubes with rubber stoppers of various colours. The evacuated tube collection system will produce the best blood samples for analysis as the blood goes directly from the patient vein into the appropriate test tube.

- The holder for vacuum blood collection is a plastic sleeve into which the phlebotomist screws the double pointed needle.
- The most current guidelines require that all holders are for single use only.
- Vacuum collection tubes are glass or plastic tubes sealed with a partial vacuum inside by rubber stoppers.
- The air pressure inside the tube is negative.
- After inserting the longer needle into the vein, the phlebotomist pushes the tube into the holder so that the shorter needle pierces the stopper. The difference in pressure between the inside of the tube and the vein causes blood to fill the tube. The tubes are available in various sizes.
- Anticoagulants are already in the tubes in the precise amount needed to mix with the amount of blood that will fill the tube.
- The colour of the stopper on each tube indicates what, if any, anticoagulant the tube contains.
- It is important to completely fill each tube so that the proportion of blood to chemical additive is correct, otherwise, the test results may not be accurate or the specimen will be rejected and will need to be recollected.
- It is also important to thoroughly mix the blood with the additive by gentle inversion

- Open extraction

Open systems include hypodermic needle and syringes, as well as winged steel needles attached to a syringe. The principle of extraction is based on aspiration by the syringe.

- Modern extraction syringes have the piston that can be locked and the plunger broken off . That allows the syringe to be used as a sample tube.
- If a classical syringe is used , the blood collected must be transferred into a collection tube that is sealed. As per the vacuum collection tube there should be an anticoagulant in the tube

- When the blood is collected, the blood collection tubes must be labelled. It should be done in the presence of the person tested. Note that in the case of an accident, the local authorities may require an officer to watch the process. When the sample is labelled, it is packed in a protected container. The World Health Organization suggests using a primary container that is protected by a secondary container that is protected by a tertiary container.

3.2 - Urine sampling

3.2.1 - Description

Urine tests are commonly used to detect alcohol and drugs. The principle is to collect a sample of urine in a container and then analyse it to find the substances the doctor in charge of the sampling is looking for.

Two types of urine samples can be used:

- Instant drug tests are designed to be read within a few minutes after collection. However, These tests are often considered screening tests, and positive results must be confirmed with another method of testing.
- laboratory drug tests are more precise but the process of analysis is more complex and longer. It is the only method of urine test approved in all countries.

3.2.2 - Instant drug testing kits

3.2.2.1 - Urine cup testing

The drug test cup is an integrated urinalysis-screening device that includes a temperature test and drug test contained in a cup. These tests are used to detect the presence of multiple drug metabolites at specific cutoff levels in urine. These tests are easy to read and interpret, and do not require a medical formation and additional instruments.

Drug test cups are available in different versions and depending on the brand and the model more than fourteen drugs can be detected simultaneously.

The method is based on a sample of urine that is collected in the cup which is then sealed where the various drugs react with chemical components that display a particular colour according to the quantity of the substance detected. The results can be read on the multi-colored panels that are on the outside of the cup where thresholds are indicated. The time for an accurate reading is indicated by the manufacturer. It is generally approximately 5 minutes.

Note that specialized brochures say that if the reading is not performed within the time frame indicated by the manufacturer, it may be inaccurate.

3.2.2.2 - Urinalysis strips

This method is also based on reactive chemical products that are included in bands of absorbing paper that produce a specific colour in the presence of the drugs they are designed for. Note that similar tests are also available on rigid cards. The number of substances detected is above fourteen.

To perform a reading, a fresh urine sample is collected in a clean, dry container. The reagent strip is removed from its container, which must be immediately closed to minimize the exposure of the remaining test strips to light and air. Then, the reagent pad of the strip is immersed in the urine sample, and when the control colour that indicates that the wick has absorbed sufficient urine appears, it is immediately removed to avoid dissolving out the reagent pads. The change of colour is then compared to the corresponding colour chart on the label that is normally displayed on the container. As with urine cup testing, the reading must be performed within the time frame indicated by the manufacturer, as when the time for the reading is passed the colour displayed is inaccurate.

3.2.3 - Laboratory urine tests

3.2.3.1 - Immunoassay technique

Laboratories use a variety of testing methodologies for screening. However, immunoassay is widely employed because the technique is cost-effective, fast, and is readily available. This method is often used for the initial tests.

It is a biochemical test that measures the presence or concentration of a macromolecule or a small molecule in a solution through the use of an antibody, which is a protein produced by the plasma cells that neutralizes pathogens (*bacteria and viruses.*), or an antigen, which is a molecule capable of inducing an immune response.

These antibodies are tagged with markers such as an enzyme, which is a protein that creates biochemical reactions, a radio-isotope, which is a chemical element that has an unstable nucleus and emits radiation during its decay to a stable form, or a fluorescence, which is the emission of radiation, especially of visible light, by a substance during the exposure to an external radiation. Reagents containing these labelled antibodies are introduced into the urine samples, and if the specific drug against which the antibody was made is present, a reaction will occur.

3.2.3.2 - Chromatography and Mass spectrometry

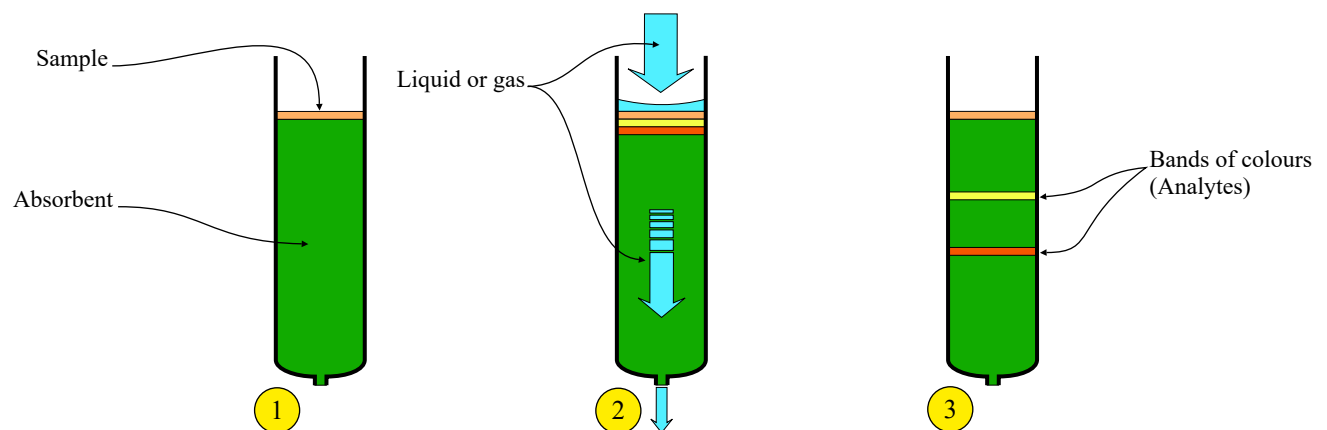
Chromatography, which means colour writing, has been discovered by a Russian botanist named Mikhail Tswett. It is an analytical technique commonly used for separating a mixture of chemical substances into its individual components that can be then thoroughly analysed.

The principle is based on the fact that when a substance is poured into a tube containing an appropriate adsorbent (in the initial experimentations, a solid) and pass through this absorbent, the components of the substance separate and move through it at different speeds according to their degree of attraction to the absorbent and produce various bands of colour. The chromatographic process is based on the following:

The "stationary phase", is the absorbent. It is usually a solid, a thick liquid, or a coating that is fixed in one place.

The "mobile phase" is usually a liquid or a gas. It is also called "eluent". It moves through the stationary phase.

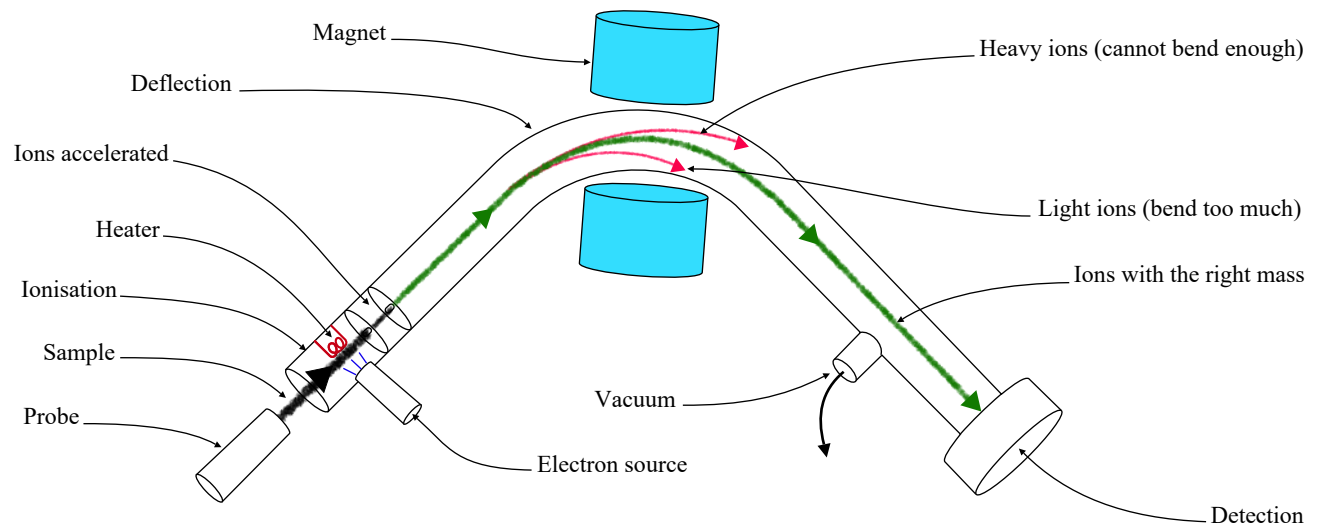
The sample to be analysed is placed on the stationary phase. It gradually moves along in the same direction as the mobile phase. As they progress through the stationary phase, the components of the sample, also called "analytes", separate from each other and can be captured or at least detected. Note that a specific detector is used to identify the chemicals that are or seem colourless. The types of chromatographic processes used in the analysis of drugs include thin-layer, gas, and liquid chromatography as well as a combination of gas or liquid chromatography with mass spectrometry (gas chromatography-mass spectrometry, or liquid chromatography-mass spectrometry/mass spectrometry).



Mass spectrometry is an analytical laboratory technique to separate the components of a sample by their mass and electrical charge. It is achieved using a specific machine (mass spectrometer) that plots the mass-to-charge ratio of compounds in a mixture. The basic process is as follows:

The sample is vaporized into a gas which passes through an electron stream that is heated by a metal coil. As a result, the high energy electrons from the electron stream hit the electrons of the sample and form ions.

Then, an ensemble of charged parallel metal plates that repel and attract the ions of the sample pushes them to the next part of the machine where they are accelerated by a potential difference (energy required to move an electric charge from one point to another) and then concentrated into a beam which passes through a magnetic field that is in a curve. The light ions and those with one positive charge are too deflected, and the heavy ions and those with a positive charge of 2 or more are not sufficiently deflected. Both categories are eliminated as only the ions with the right mass can pass the curve. Then, the detector records the induced charge or current caused by each ion striking a surface or a wire. The data is plotted as a graph or spectrum of the different masses.



3.2.4 - Collection kit

3.2.4.1 - Collection containers, specimen bottles, & specimen tubes

There are a lot of models of containers that can be used for instant tests and laboratory tests

- Most collection containers, specimen bottles, and specimen tubes are made of polyethylene. They should be packed in sealed plastic bags to preserve them from pathogen and other contaminants. Also, they are usually closed, and a seal where the mention “sterile” is written is present. The usual volumes of collection containers and specimen bottles rank from 40 to 120 ml. The selection of the size that is calculated according to the volume of urine to collect is instructed by the doctor in charge. Even though their use diminishes, glass collection containers may be used in some clinics. In this case, they should be preserved from contamination as for the plastic ones. Most containers and specimen bottles have graduations that allow checking the volume of urine they contain. Also, note that a lot of models of collection containers can be used for the shipment of samples.
- Some collection containers and specimen bottles are fitted with a temperature indicator strip to ensure that the urine submitted for drug testing is at the correct temperature. This system, that indicates the temperature of the specimen within minutes, avoids the use a thermometer, so diminishes the risks of contamination. The strip is commonly applied to the outside of the urine specimen container. The temperatures indicated in it range from 32 to 38 °C (90 to 100 °F). Colour points are fitted at each graduation. They illuminate when the temperature to the corresponding graduation is reached. Green colour means that the temperature is perfect. Note that such temperature strips can be bought separately.
- The lid provided with the collection container or the specimen bottle must be designed such that it can be sealed with an obvious tamper-evident system. However, the specimen containers that are designed to be transferred to the laboratory must be designed to reduce specimen loss and risk of healthcare worker exposure to the specimen while also protecting the specimen from contaminants. They must withstand shocks and the diminution of the atmospheric pressure if they have to be transferred by plane. For this reason, their walls must be sufficiently thick, and their caps must be leak proof.
- Urine collection containers with an integrated port can be used to transfer samples to bottles or urine specimen tubes. Urinalysis specimen tubes are available in a variety of shapes that are convenient for laboratory examination. However, this transfer must be done with precautions to avoid contaminations.
- Urine specimens can be collected from catheters using a syringe, followed by transfer to a specimen tube or bottle. Also, urine can be drawn directly from the catheter to an evacuated tube using an appropriate adaptor.

3.2.4.2 - Shipment container

The bag or the box that is used to transfer the specimen bottles or tubes to the laboratory should be robust, leak proof,

and have enough space for absorbent material in the case that the sample containers open inadvertently during the transfer. Also, it should be designed to be securely closed and have a tamper-evident seal.

3.2.5 - Collection

3.2.5.1 - Collector

It is said that the collector does not need to be medically qualified. However this person must be trained for this method of sampling. For this reason, it is highly preferable that the collector has medical qualifications such a nurse or a doctor as they are used to these procedures. Note the the collector should operate with another appointed person.

3.2.5.2 - Collection site

The offshore collection site should be the onboard hospital. Onshore collection site should be the nearest hospital or the office of the doctor of the company. In the case that there is no hospital or that collection in the hospital cannot be made in the best conditions, another room must be selected. In this case, the following points should be checked:

- The access to the room must be restricted.
- Toilets (rest room) should be at the direct proximity and controllable by the collectors. The water sources should be external to the toilet where the collection occurs. If it is not the case, the collector must secure them prior to the collection. If a water source is not available, another means (e.g., waterless cleanser, moist towelettes) outside the toilets is an acceptable alternative.
- The privacy of the person tested must be preserved.
- There should be a secured area where samples and the equipment can be kept.
- There should be a suitable area for dealing with the completion of forms and other administrative tasks.

3.2.5.3 - Collection process

Details of the medical treatment should be communicated to the doctor and recorded before the test. Nevertheless, to be 100% sure, the collector and the person in charge should ask the person to be tested whether he/she is under medication. Also, the person to be tested may have been under medical treatment that has been completed a few days before. As traces of this therapy may be detectable a few weeks after the last intake, it must be indicated as well.

- The collector should wear clean medical clothes & surgical gloves.
- The collection containers and bottles should be opened in front of the person to be tested.
- The person to test should wash his/her hands prior to giving the sample.
- The sample collected should be of the quantity required. This quantity is normally set up by the size of the container.
- The container / bottle is sealed in front of the person tested.
- Samples must be kept at the acceptable temperature range and within the dedicated time span. Operational instructions should be indicated on the container or communicated by the governmental agency.

The form is completed, signed and dated by the person tested, the collector and his appointed aid. It is placed in a plastic bag with the specimen bottle. The bag is secured with tamper proof seals.

Note that in the case of a test for reasonable cause or an accident, an officer mandated by the government may be present.

3.3 - Hair drug testing

3.3.1 - Description

Hair drug testing is a method that can detect drug use over a much longer period of time and may be used for highly safety-critical positions.

The growth of hair is usually at the rate of 1.2 cm per month. The hair sample is cut close to the scalp, and 80 to 120 strands of hair are needed for the test. In the absence of hair on the head, body hair can be used as an acceptable substitute. This includes facial hair, the underarms, arms, and legs or even pubic hair. Because body hair grows at a different rate than head hair, the timeframe changes. It is estimated that drug use can be detected in body hair for up to twelve months. However, the standard hair test is often limited to a period of 90 days.

3.3.2 - Collection

3.3.2.1 - Collector

It is preferable that the collector has a medical knowledge. He should operate with another appointed person.

3.3.2.2 - Collection and analysis

Hairs are cut and packed in sterile sample tubes that are sent to the laboratory.

Hair samples are first screened using Enzyme-Linked Immunosorbent methodology for routine drug testing. Any samples that test presumptively positive in the screening process are then subjected to gas chromatography/mass

spectrometry (GC/MS), gas chromatography/tandem mass spectrometry (GC/MS/MS), or liquid chromatography/tandem mass spectrometry (LC/MS/MS) confirmation testing.

3.4 - Saliva drug test

3.4.1 - Description

Oral fluid is a non-invasive procedure for drug testing. It provides presumptive results within minutes of a collection of specimens.

The main problem with this technique is that its collection may be thwarted by a lack of available fluid due to a range of physiological factors, including drug use itself. The food and techniques designed to stimulate the production of oral fluid can also affect the concentration of drugs.

The main application of this procedure is testing for drugs such as the amphetamines and cocaine. It can also be used to detect opioids such as morphine, methadone and heroin, and for cannabis.

Oral fluid concentrations of basic drugs such as the amphetamines, cocaine and some opioids are similar or higher than those in plasma. Tetrahydrocannabinol (THC), the major chemical present from cannabis use, displays similar concentrations in oral fluid compared to blood in the elimination phase.

3.4.2 - Collection

3.4.2.1 - Collector

It is preferable that the collector has medical knowledge. He should operate with another appointed person.

3.4.2.2 - Collection techniques

Expectoration (or spitting) provides oral fluid, but this is relatively viscous and can be difficult to work with in the laboratory. It may also be contaminated with food and other debris from the mouth and will, therefore, require centrifugation. More often than not, the volume will be less than one ml requiring the use of sensitive detection techniques.

Some collectors use some specific diluents to mix with the collected oral fluid. Following mixing, the solution is used for drug analysis.

Other devices involve squeezing absorbed oral fluid from a pad or foam onto the drug-detection device.

The collection time is typically one to three minutes. However, this can vary. Some devices have some form of indicator to show that sufficient oral fluid has been collected.

- When the saliva is collected, the sample must be labelled. It should be done in the presence of the person tested and at least the appointed witness. Notice that the local authorities may require an officer to watch it.
- When the sample is labelled, it is packed in a protected container. The World Health Organization suggests using a primary container that is protected by a secondary container that is protected by a tertiary container.

3.5 - Breath testing

3.5.1 - Description

Breath tests are currently only used for the determination of whether alcohol has been taken. They are based on the fact that alcohol found in a deep lung breath is in proportion to the alcohol found in the blood. Cheap and easy to use equipment that are designed to be operated by non-medical personnel are now available. They provide quick and reliable accuracy. Several technologies are used to test a breath sample for alcohol. They include the following

- Wet Chemistry
- Photo Spectroscopy
- Gas Chromatography
- Infra Red Spectroscopy
- Semi-Conductor Sensors (Tin Oxide Sensors)
- Electro Chemical Analysis (Fuel Cell)

3.5.2 - Sampling

3.5.2.1 - Collector

Breath testing kits are designed to be used by everybody. Nevertheless, a lot of national regulations request that the tester has received adequate training. He should operate with another appointed person.

3.5.2.2 - Collection site

Most devices are the size of a cellular phone and can be operated directly on the work site. Nevertheless, for privacy reasons, it is recommended not to perform the sampling in front of the other workers and to organise it in the worksite hospital or infirmary. In the case that these facilities are not available, the test should be undertaken in a room that is far from the eyes of others.

- The access to the room must be restricted
- The room is clean
- There should be a suitable area for dealing with the completion of forms and other administrative tasks.

3.5.2.3 - Collection process

- The equipment must be calibrated by the manufacturer or a recognised organization.
- Manufacturer’s instructions must be clear and followed.
- Breath testing instruments are fitted with interchangeable mouthpieces and it is necessary to ensure that a new sterile unused mouthpiece is provided for each person to be tested. Also, the instrument must be clean.
- The person to test takes a deep breath and exhales into the mouthpiece, such that he completely empties his lungs. The result of the analysis is read on a small screen.

The units used might slightly vary the results, but all give a reading which can be defined as within or outside the prescribed limit. Note that most companies and states require zero alcohol when working offshore.

3.6 - Spray (sweat) drug testing

3.6.1 - Description

Spray (sweat) drug tests are non-invasive techniques to detect drugs. they are based on chemicals that react with the drugs that are eliminated in the sweat. It is a simple process to collect a specimen. No specific room is needed for collection and no laboratory is required for analysis. Nevertheless, for the reasons explained before, it is better to do it in the hospital or a dedicated room. Also, these procedures have some disadvantages:

- There is not much variety in these drug tests, only a limited number of drugs can be detected.
- Inconclusive results can be produced by variations in sweat production rates in donors.
- They are more vulnerable to contamination than other common forms of tests.

3.6.2 - Collection

3.6.2.1 - Collector

This system is simple to use and does not require particular medical knowledge. Nevertheless, a lot of national regulations request that the tester has received adequate training.

3.6.2.2 - Collection process

Using a special paper, the collector wipes or simply touches the surface to be tested, then sprays the test on a special paper. If there is a presence of a drug a colour (for example blue) is visible on the special paper.

3.7 - Approximate detection periods

It is essential to have an idea how long drugs and alcohol continue to affect the people who have absorbed them. Such information allows deciding which test can be applied and whether the person can be transferred to a specialized establishment.

The table below, which is based on publications from test manufacturers and official competent bodies such as “National Institute on drug abuse (USA)” suggests the detectable durations of known substances using a urine test, a blood test, a hair test, or a saliva test. Note that precise information should be provided by the manufacturer of the test.

Classification	Substance	Test used			
		Urine	Hair	Blood	Saliva
<i>Alcohols, diols, & ketones</i>	<i>Alcohol (ethanol, ethyl alcohol)</i>	6–24 hours	90 days	12 to 24 hours	1 to 5 days
	<i>Methanol (Wood Alcohol)</i>	< 24 hours	90 days	12 to 24 hours	1 to 5 days
	<i>Isopropanol (rubbing alcohol, Isopropyl alcohol)</i>	< 24 hours	90 days	12 to 24 hours	No info
	<i>Acetone</i>	< 24 hours	90 days	12 to 24 hours	No info

Classification	Substance	Test used			
		Urine	Hair	Blood	Saliva
Alcohols, diols, ketones	<i>Ethylene glycol (Antifreeze)</i>	< 24 hours	90 days	12 to 24 hours	No info
Opiates & opioids	Opium	2 to 4 days	90 days	24 hours	1 to 4 days
	<i>Heroin (Diacetylmorphine)</i>	1 to 2 days	90 days	6 to 12 hours	1 to 4 days
	<i>Morphine (duramorph)</i>	2 days	90 days	6 to 8 hours	1 to 4 days
	<i>Methadone (Dolophine Amidone)</i>	3 days	90 days	24 hours	1 to 10 days
	<i>Meperidine (Demerol, Pethidine)</i>	2 to 3 days	90 days	24 to 48 hours	1 to 2 days
	Codeine	2 days	90 days	1 to 4 days	1 to 4 days
	<i>Propoxyphene (Darvon, Darvocet-N)</i>	6 hours to 2 days	90 days	1 to 2 days	1 to 2 days
	<i>Oxycodone (Oxycontin, Oxy/r, Percocet)</i>	1 to 3 days	90 days	24 hrs	3 to 4 days
	<i>Hydrocodone (Lorcet, Vicodin, Lortab, Hycodran)</i>	1 to 2 days	90 days	No info	1 to 10 days
	<i>Hydromorphone (Dilaudid)</i>	1 to 2 days	90 days	6 hours	1 to 4 days
	<i>Fentanyl (Sublimaze, duragesic, actiq, Fentora)</i>	1 to 2 days	90 days	12 hrs	1 to 2 days
Hallucinogens	<i>Lysergic acid diethylamide (LSD)</i>	1 - 5 days	90 days	3 days to 4 days	1 to 2 days
	<i>Marijuana and cannabinoids (hashish)</i>	Single use: 2 to 7 days Frequent use: 1 to 22 months	90 days	Single use: 2 to 3 days frequent use: 2 weeks	1 to 10 days
	<i>Phencyclidine (PCP)</i>	Single use: 1 week Frequent use: 2 to 4 weeks	90 days	24 hrs	1 to 10 days
Stimulants	Cocaine	Single use: 2 to 5 days Frequent use: 7-10 days	90 days	2 to 4 days	1 to 10 days
	<i>Amphetamines (Benzedrine, Dexedrine)</i>	Single use: 48 hours Frequent use: 7 to 10 days	90 days	12 hours	1 to 2 days
	<i>3,4-Methylene-dioxymethamphetamine (MDA - Ecstasy)</i>	24 hours	90 days	1 to 2 days	1 to 5 days
	<i>Methamphetamine (Desoxyn, Methedrine)</i>	Single use: 48 hours Frequent use: 7 to 10 days	90 days	1 to 3 days	1 to 4 days
Barbiturates	<i>Pentobarbital (Nembutal)</i>	48 hours	90 days	1 to 2 days	1 to 10 days
	<i>Secobarbital (Seconal)</i>	48 hours	90 days	1 to 2 days	1 to 5 days
	<i>Butabarbital (Butisol)</i>	48 hours	90 days	1 to 2 days	1 to 10 days
	<i>Butalbital (Fiorinal)</i>	48 hours	90 days	1 to 2 days	1 to 10 days
	<i>Phenobarbital</i>	2 - 3 weeks	90 days	4 to 7 days	1 to 10 days
Sedatives, hypnotics, anaesthetics	<i>Diazepam (Valium)</i>	Single use: not detected Frequent use: up to 30 days	90 days	6 to 48 hours	1 to 3 days
	<i>Oxazepam (Serax)</i>	Single use: not detected Frequent use: up to 7 days	90 days	6 to 48 hours	1 to 10 days
	<i>Alprazolam (Xanax)</i>	Single use: not detected Frequent use: up to 7 days	90 days	6 to 48 hours	1 to 10 days

Classification	Substance	Test used			
		Urine	Hair	Blood	Saliva
Sedatives, hypnotics, anaesthetics	Clonazepam (<i>Klonopin</i>)	Single use: not detected frequent use: up to 14 days	90 days	6 to 48 hours	1 to 10 days
	Chordiazepoxide (<i>Librium</i>)	Single use: not detected Frequent use: up to 7 days	90 days	6 to 48 hours	1 to 10 days
	Lorazepam (<i>Activan, Loraz</i>)	Single use: not detected Frequent use: up to 7 days	90 days	6 to 48 hours	1 to 10 days
	Fluritrazepam (<i>Rohypnol</i>)	3 days	90 days	12 to 24 hours	No info
	Gamma-hydroxybutyrate (<i>Somatomax</i>)	12 hours	90 days	No info	No info
	Ketamine Hydrochlorite (<i>Ketajet</i>)	72 hours	90 days	No info	1 to 7 days

3.8 - Cut-off levels

The “cut-off level” is a drug testing concept that refers to the point under which a drug test is called negative and above which a drug test is called positive. A positive result means that the person is under the influence of a psychoactive drug. The cut-off level is determined at a point that optimises drug detection while maintaining a minimum of false positive results. Thus, a negative result does not mean that a sample is drug-free.

The confirmation cut-off test is used to avoid a false positive: When a sample is received at a laboratory, a portion is screened to check for the presence of drugs. There will be a confirmation test on another portion of the sample only in the case that a drug is detected above the defined cut-off level in the 1st portion.

The cut-off levels discussed in the table below are those of urine tests published by most competent bodies. Also, blood toxicity is indicated in the last column. Toxicity is the degree to which a chemical substance can damage the organism. Note that most values of confirmation tests are those using “Gas chromatography - Mass spectrometry”. However other procedures such as “Liquid chromatography - Mass spectrometry” (LC) or “Screening single use Elisa device” (ED) can be used for certain substances.

The concentrations are explained in nanomiligram per millilitre (ng/ml) and microgram per millilitre (µg/ml). One nanomiligram is 1 billionth of a gram (10⁻⁹), and one micromiligram is 1 millionth of a gram (10⁻⁶). The concentrations of alcohol are expressed in milligram per decilitres (1 milligram equal 0.001 gram)

Note that the results may be influenced by food. As an example, ingestion of bakery products containing poppy seeds can cause morphine to be excreted in urine. If large amounts are consumed, it can result in concentrations up to 2,000 ng/ml for a period of 6 to 12 hours after ingestion.

Classification	Substance	Cut off levels in urine		Toxic blood level
		Screening cut-off	Confirmation cut-off	
Alcohols, diols, & ketones	Alcohol (<i>ethanol, ethyl alcohol</i>)	10 mg/dl	10 mg/dl	80 - 400 mg/dl
	Methanol (<i>Wood Alcohol</i>)	5 mg/dl	5 mg/dl	> 20 mg/dl
	Isopropanol (<i>rubbing alcohol, Isopropyl alcohol</i>)	5 mg/dl	5 mg/dl	> 50 mg/dl
	Acetone	5 mg/dl	5 mg/dl	> 33 mg/dl
	Ethylene glycol (<i>Antifreeze</i>)	5 mg/dl	5 mg/dl	> 50 mg/dl
Opiates & opioids	Opium	2000 ng/ml	300 ng/ml	> 200 ng/ml
	Heroin (<i>Diacetylmorphine</i>)	2000 ng/ml	300 ng/ml	> 200 ng/ml
	Morphine (<i>duramorph</i>)	2000 ng/ml	300 ng/ml	> 200 ng/ml
	Methadone (<i>Dolophine Amidone</i>)	300 ng/ml	200 ng/ml	1 to 2 µg/ml
	Meperidine (<i>Demerol, Pethidine</i>)	200 ng/ml	200 ng/ml	> 1000 µg/ml

Classification	Substance	Cut off levels in urine		Toxic blood level
		Screening cut-off	Confirmation cut-off	
Opiates & opioids	<i>Codeine</i>	2000 ng/ml	300 ng/ml	> 1.1 µg/ml
	<i>Propoxyphene (Darvon, Darvocet-N)</i>	300 ng/ml	200 ng/ml	> 500 ng/ml
	<i>Oxycodone (Oxycontin, Oxy/r, Percocet)</i>	100 to 500 ng/ml	100 to 300 ng/ml	> 200 ng/ml
	<i>Hydrocodone (Lorcet, Vicodin, Lortab, Hycodran)</i>	300 ng/ml	100 ng/ml 50 ng/ml (LC)	> 100 ng/ml
	<i>Hydromorphone (Dilaudid)</i>	300 ng/ml	100 ng/ml 50 ng/ml (LC)	> 100 ng/ml
	<i>Fentanyl (Sublimaze, duragesic, actiq, Fentora)</i>	1.5 ng/ml	1.5 ng/ml (ED)	> 34 ng/ml
Hallucinogens	<i>Lysergic acid diethylamide (LSD)</i>	0.5 ng/ml	0.1 ng/ml (LC)	> 2 n/ml
	<i>Marijuana (marie jeanne) and cannabinoids (hashish)</i>	100 to 20 ng/ml	15 ng/ml	50 to 200 ng/ml
	<i>Phencyclidine (PCP)</i>	25 ng/ml	25 ng/ml	10 mg/ml
Stimulants	<i>Cocaine</i>	300 ng/ml	150 ng/ml	30 to 50 µg/ml
	<i>Amphetamines (Benzedrine, Dexedrine)</i>	100 ng/ml	500 ng/ml	0.5 to 0.1 µg/ml
	<i>3,4-Methylene-dioxymethamphetamine (MDA - Ecstasy)</i>	3000 to 5000 ng/ml	5 ng/ml	0.1 to 1 µg/ml
	<i>Methamphetamine (Desoxyn, Methedrine)</i>	100 ng/ml	500 ng/ml	0.1 to 1 µg/ml
Barbiturates	<i>Pentobarbital (Nembutal)</i>	425 ng/ml	200 ng/ml	11 µg/ml
	<i>Secobarbital (Seconal)</i>	200 ng/ml	200 ng/ml	> 10 µg/ml
	<i>Butabarbital (Butisol)</i>	312 ng/ml	200 ng/ml	20 µg/ml
	<i>Butalbital (Fiorinal)</i>	342 ng/ml	200 ng/ml	20 µg/ml
	<i>Phenobarbital</i>	505 ng/ml	200 ng/ml	> 40 µg/ml
Sedatives, hypnotics, anaesthetics	<i>Diazepam (Valium)</i>	240 ng/ml	100 ng/ml	> 3 µg/ml
	<i>Oxazepam (Serax)</i>	240 ng/ml	100 ng/ml	> 1.4 µg/ml
	<i>Alprazolam (Xanax)</i>	240 ng/ml	100 ng/ml	> 350 µg/ml
	<i>Clonazepam (Klonopin)</i>	540 ng/ml	100 ng/ml	> 23 µg/ml
	<i>Chordiazepoxide (Librium)</i>	2000 ng/ml	300 ng/ml	> 1.1 µg/ml
	<i>Lorazepam (Activan, Loraz)</i>	675 ng/ml	100 ng/ml	0.05 to 0.24 µg/ml
	<i>Fluritrazepam (Rohypnol)</i>	16 to 60 ng/ml	0.1 ng/ml (LC)	50 ng/ml
	<i>Gamma-hydroxybutyrate (Somatomax)</i>	1 to 10 ng/ml	1 to 10 ng/ml	250 mg/ml
	<i>Ketamine Hydrochlorite (Ketajet)</i>	15 ng/ml	5 to 10 ng/ml	7 to 27 µg/ml

4 - Organize and implement preventive measures

Preventive measures are the procedures that must be in place to make sure that people under the influence of psychotropic substances cannot reach the work sites. For this purpose, the following actions should be performed:

- Ensure that the management system of the company is adequately structured to control such problems.
- Study of data and evaluation of the populations who may be at risk.
- Consult the legal and medical authorities of the countries where the company is settled and where the project is planned to take place.
- Publication of a company policy regarding drug and alcohol abuse and insertion of this policy in the contracts of employment.
- Ensure to gain the involvement and confidence of the employees.
- Medical checkups and other control measures.

4.1 - Management system and people involved in the prevention of drug and alcohol abuse

4.1.1 - Drug and alcohol abuse and Health, Safety & the Environment (HSE) policy

A lot of companies consider only the single aspect of the legislation in force in the countries where their company operates. As a result, they separate drug and alcohol abuse from their Health & Safety policy. Also, the majority of these isolated drug abuse policies are only based on interdictions and repression without any proper explanation regarding the reasons such substances must be banished from the work sites. A lot of past and present experiences prove that regulations which reasons are not properly explained obtain poor results.

As an example, a lot of governments of the fast-growing economies made mandatory wearing helmets when driving motorbikes. However, due to lack of means of communication, the reasons for the laws have not been properly explained, and it is common to see people not wearing a helmet in areas where police controls are rare, or people wearing a helmet but not attaching it, or people transporting passengers who are wearing their helmet, but who do not provide head protection to their passengers. Also, people may have the temptation to defy the authorities.

Such incidents are much minimized when the reasons for a policy are documented and explained as people generally react very positively regarding the protection of their lives and those of their colleagues. For these reasons, the Drug and Alcohol abuse policy must be part of the health and safety policy and all the precautions and restrictions indicated in this policy and the various Health and safety documents must be properly argued.

An important point to highlight is that drug abusers should be considered as victims, even though we know their capacity to become a potential harm to themselves and the people working in their proximity. As explained previously, the goal is to make sure that such persons will never reach the work sites and will be medically assisted as soon as possible.

4.1.2 - Company key people involved in the prevention of drug and alcohol abuse.

Drug and alcohol abuse are particular problems to which the Health & Safety team is normally not confronted every day. However, as for other problems, the Health and Safety system must be organized to allow managing them at any time. The Health and Safety manager is in charge of the writing of the policy and its implementation. He is assisted by the medical specialist appointed by the company. However, these two persons must be helped by the entire management and of course every worker. For this reason, it is important to remind the function of the key people regarding health and safety.

4.1.2.1 - Directors

Most small companies are managed by only one director who may be the owner or the principal shareholder. However, more important structures such as multinational groups are under the control of a board of directors who are collectively responsible for the Health, Safety, and Environment (HSE) policy of the company. Generally, the board of directors appoints a managing director to control the everyday operations of the company and represent its members who may have several activities and interest in other domains.

- The directors fulfil their legal responsibilities with the publication of an appropriate and reviewed safety policy. This Policy is adequately defined and reflects an appropriate health and safety strategy and objectives. Note that the managing director signs the published policies.
- The directors mobilize sufficient resources to implement the HSE system and maintain its efficiency. Also, they make sure that the responsibilities for health and safety are adequately assigned and accepted by the management and the workers.
- The directors have the responsibility of the organization and relationship with the senior managers and the other workers. The managing director appointed by the board also has the duty to report to its members and explains the future HSE goals of the company. The board may approve or reject the action of the managing director and may request additional actions.

4.1.2.2 - Senior managers (General manager, Department managers, & Project managers)

- They organize the department(s) they are responsible for the implementation and the monitoring of the Health, Safety, and Environment (HSE) policy which includes the Alcohol & drug abuse policy.
- They provide appropriate resources to implement training programs to the people under their responsibility.
- They make sure that the managers under their responsibility give priority to HSE at any level.

4.1.2.3 - Health, Safety, and Environment (HSE) manager

The HSE department makes sure of the consistent quality of services by developing and enforcing good safety practices, validating processes, providing documentation, management tools, and HSE specialists.

The HSE department manages safety tools such as the “stop card system” of the company and is permanently in contact with the managing director. The HSE manager, who is the person in charge of this department has the following duties:

- supervise the Health and Safety and Environment programs
- promote health, Safety, and environment
- ensure that the company is aware of its obligations (Legal) and code of practices
- set up and maintain quality controls and documentation, interpret new legislation and standards, assess customers requirements, and liaise with the other departments to establish a clear management system
- write the HSE procedures and policies that are compliant with national and international standards, make sure that they are approved by the managing director, and inform the management and workers.
- advise the managers of their responsibilities
- ensure that quality programs are applied and of a continual improvement of services
- work closely with purchasing staff to establish suppliers’ safety performances criteria and monitor their safety performances
- provide regular health and safety inspections and audits
- advise through line management where improvements in health and safety are appropriate
- advise of possible hazards, make sure that risk assessments are properly performed, Make sure that appropriate protections are in place, and develop the permit to work system
- make sure of safe written procedures of work and that they are transmitted to the workers. Also, make sure that safe written procedures are transmitted to the sub-contractors
- organize safety records and returns as required by the management and legal requirements
- check (sometimes lead) incident/accident investigation and prepare statistics to monitor the health and safety performance
- identify the safety training needs
- ensure the provision of first aid, fire safety, and emergency procedures
- nominate and manage the health and safety specialists
- act as the key contact with customers' auditors and ensure the execution of corrective actions and ongoing compliance with customers' specifications.
- develop good working relationships with auditors or statutory organizations
- liaise with the human resources department to make sure that the certificates of the personnel at work are valid and organise medical and drug abuse check-ups
- liaise with the medical specialist appointed by the company to establish procedures, policies, solve safety cases or incidents the teams may be confronted with, and be sure that the medical certificates provided are valid, and that the people at work are not under the influence of a psychoactive substance.

4.1.2.4 - Human resources department

The human resources department is in charge of the recruitment of new personnel and the career management of the people already employed. The human resources department works with the HSE department and the other services of the company. Also, the human resources manager reports to the managing director. Regarding health, safety, and environment, his duties include the following:

- organise for the recruitment of the personnel according to the HSE requirements
- provide employment contracts where the HSE policy which includes the alcohol and drug abuse is explained with other legal aspects of the contract.
- ensure that people at work hold the relevant certifications
- liaise with the legal authorities and participate in investigations regarding misconduct, arrests, or illegal activities of employees
- recommend terminations and additions to personnel and provide statistics and reports
- liaise with the HSE manager

4.1.2.5 - On site managers (workshop & store managers, construction managers, superintendents, vessel masters, etc.)

These managers are responsible for the health and safety of the people working under their authority and that the environment remains preserved. They have the power to reject a person whose condition may represent a danger to him/herself and the people working with him/her. They work hand in hand with the HSE manager and must ensure that:

- appropriate safety precautions and safe working procedures are in place and understood by all the staff.
- hazards are evaluated, eliminated or minimized.
- regular workplace inspection + advice and support to improve the methods are carried out
- health and safety training has taken place, and appropriate safety personnel are available
- the contact with the HSE department is always established and the recommendations of the HSE authority on site are taken into account
- all accidents and dangerous occurrence are investigated
- safety reports are sent to the management, analysed, and corrective actions are implemented
- the certificates of the personnel at work are valid (liaise with the company doctor and the human resources department)
- contact is established with the medical specialist appointed by the company to solve safety cases or incidents the teams may be confronted by. Be sure that the medical certificates provided are valid and that the people at work are not under the influence of a psychoactive substance.

4.1.2.6 - Supervisors

Supervisors report to their manager and are responsible for the health and safety of the people working under their authority. The supervisor is entitled to give direct orders in relation to health and safety to any person taking part in, or who has any influence over, the operation. They have the power to ask every person whose condition may represent a danger to him/herself and the people working with him/her to quit the working area. They work hand in hand with the onsite HSE authority and must:

- ensure that the planned procedures and working practices are safe and that the necessary information and instruction have been adequately provided to the workers.
- ensure that remedial actions to reduce or eliminate the hazards are in place and that the operation is carried out safely.
- ensure that medical assistance is available at all times
- ensure that the people under their responsibility are in good condition and able to fulfill safely their duties
- investigate and document all incidents or accidents that may happen to their team.
- report any incident to the management

4.1.2.7 - Health and safety authority on site

He is a safety specialist who acts as health and safety supervisor and reports to the onsite manager and the HSE manager (who is not on the worksite). Also, he is normally in charge of the permit to work. However, during projects with reduced teams this position is filled by a supervisor or the onsite manager who combines the two functions. He works closely with the supervisors and the employees and must:

- promote and implement the health, safety, and environment management system.
- give advice regarding safety of the operations planned
- ensure that remedial actions to reduce or eliminate the hazards are in place and that the planned operations will be carried out safely before signing the permit to work
- investigate and document all incidents or accidents that may happen on site
- report any incident to the management
- manage casualties and people who are not in condition to safely fulfill their duties
- ensure that medical assistance is available at all times and work closely with the onsite medic and the appointed medical specialist (doctor)
- manage other health and safety specialists on site if relevant.

4.1.2.8 - First-aiders and diver medic technicians

First-aiders, also sometimes called 1st responders (US) are people who are appropriately trained to provide immediate medical care for those who suffer injury or sudden illness. They are not part of the medical staff. Basic first aiders have a very limited medical knowledge. However, advanced first aiders have received additional training and knowledge that extend their competencies and are appropriate to the particular circumstances of the workplace. As an example, an "IMCA diver medic technician" is a member of the dive team who is trained to provide basic medical care in a decompression chamber. First-aid workers and diver medic technicians must:

- ensure that the first aid equipment and facilities are available.
- ensure that medical assistance is available at all times.
- intervene in any situation where ill or injured workers require medical attention.
- recover and secure the casualties.
- treat minor injuries and minimize the consequences of important injuries until medical help arrives on site.
- treat injuries under the direction of a doctor (diver medic & advanced 1st aider)
- Raise alarms and report any incident to the management
- Prepare or help to prepare patients for medical evacuation (MEDEVAC) and organise it with the onsite manager if there is no medical staff onsite.

4.1.2.9 - Employees

They are with the medical staff the most important people to make a drug abuse policy successful as this policy must be written to protect them and will be successful only if they perceive it positively. They should:

- Take reasonable care of his own health and safety and that of others who may be affected by his acts or omission at work.
- Update and upgrade his technical and health and safety knowledge
- Give safety and working suggestion to the management
- Cooperate with the employer so far as necessary to help him to fulfil his legal requirements
- Raise an alarm and report any incident or suspicious condition to the management
- In the case of an incident cooperate with the management and the 1st aiders to secure the area, evacuate the casualties, and explain the incident.

4.1.3 - Medical staff

The medical staff is a crucial element of the HSE policy.

It is composed of physicians (doctors) and nurses. Excepted in the case of very big companies, the doctors are independent physicians who have passed a specific agreement with the company. In most cases, they are not on site, except when the worksite is in the direct proximity of their premises.

They generally manage the cases remotely with the onboard medical staff or advanced first aiders. Note that to fulfill the onboard medical requirements and liaise with the doctor, a lot of companies operating vessels engage experienced nurses instead of doctors to reduce their operating costs. Also, it often happens that there is no nurse on board small units. In this case, emergency medical support is done by the advanced first aiders and the system of quick evacuation to a medical facility (MEDEVAC).

4.1.3.1 - Appointed physicians and diving medical specialists

Note that the physicians in charge of the divers must be qualified diving doctors. They are also called “Diving medical specialists” or “Diving medical officers” when they are military.

The process to become a recognized diving physician is indicated in the Diving Medical Advisory Committee (DMAC) guidance #29 “Approval of Diving Medicine Courses”.

Doctors are approachable, compassionate and they respect the confidentiality of their patients. They stay updated and informed of the latest best practices. The appointed company doctor is in charge of:

- Conducting the medical check-ups of the people working for the company to assess their health condition. Note that the divers must be checked by a diving medical specialist
- Giving pieces of advice to promote health
- The examination of patients suffering from illness or injury to reach a diagnosis based on scientific knowledge and provide appropriate prescriptions.
- Prescribing and interpreting samplings and laboratory tests to identify infections or abnormalities
- Prescribing medications or drugs and providing comprehensive instructions for administration
- Liaising with other physicians, medical specialists, on-site doctors and nurses, or first aiders
- Keeping records of patients’ diseases, operations or other significant information
- Providing the appropriate medical certificates and stopping the people whose physical condition does not allow them to fulfill safely their duties. This is done with a minimum respect for confidentiality

4.1.3.2 - Onsite nurses

Company nurses plan and provide medical care to patients suffering from chronic or acute physical or mental health problems or who have been injured in the worksite hospital or on the site where the accident has happened. Qualified nurses hold a certificate delivered by the government of the country where they have studied. They may be qualified to intervene inside a chamber (a hyperbaric certificate is required) and may have diving medical knowledge. When they are working on vessels, excepted on board big units where another nurse or a doctor is present, they often operate alone and have the ability to deal with emotionally charged and pressured situations. They are in charge of:

- Assessing and planning nursing care requirements
- Providing emergency support or pre and post operation care when necessary
- Liaising with the company doctor or another medical specialist and following his instructions
- Administering prescribed medication
- Taking patient samples, pulses, temperatures and blood pressures and monitoring the patients
- Organizing the transfer of samples to the selected laboratory
- Preparing the patient for medical evacuation
- Writing records
- Providing emotional support to patients and relatives
- Supervising junior staff or first aiders (if relevant)
- Liaising with the onboard management team

4.1.3.3 - Note regarding the involvement of the company medical personnel regarding cases of drug abuse

IMCA SEL 040 says: *“There should be careful consideration of in what circumstances a company’s medical personnel (for example a medic on board the vessel) could be involved in the testing, particularly where such medical personnel have a role as counsellor or are bound by a confidentiality obligation”.*

We consider that the medical personnel must be involved in all cases for the following reasons:

- The medical staff is the most qualified to carry out a preliminary examination and make sure of the condition of a suspicious person. They are also the most qualified to detect false positive cases.
The onboard or company doctor is the only person skilled in deciding whether a medical treatment has an adverse effect on health and judgment.
- The medical personnel are the most qualified to take care of those who are affected by drugs or alcohol. Note that dependence on such substances is considered a sickness.
- Some methods of testing are invasive, and only medical personnel are qualified to take these samples.
- When it is established that a person can endanger his/her life and the life of others the argument of confidentiality is no more valid. Thus, it is the duty of the medical personnel to intervene.
- Sampling must be done with a maximum of privacy, comfort, confidence, and in a dedicated room. For these reasons, the laboratory, and when at sea, the onboard hospital are the best places, and the medical personnel the most qualified to do it discreetly and safely.
- Diving and ROV operations are mostly performed from boats and barges that are closed environments where abnormal physical or mental conditions are quickly detected. So a secret is quickly well known.
- It is the duty of every person involved in operations to alert the management in the case that a person seems not having all his/her physical or mental capacities.

4.2 - Collect and interpret reliable facts

To be able to implement preventive measures it is important to collect facts and create a database that can be used to analyse the situation. This analysis is used to establish a strategy that is based on reliable facts. This job is generally undertaken by the health and safety department.

4.2.1 - Collect and classify published data regarding the proliferation of drugs

Numerous interesting studies regarding the evolution of the psychotropic substances market are available on the Internet and through other systems of publication. They are made by national and international organizations.

Note that governments have triggered a lot of studies. However, they are often relevant only in the countries where they have been created or in countries of similar culture and economic level.

Documents such as those published by the United Nations Office on Drug and Crime (UNODC), the International Narcotics Control Board (INCB), and the World Health Organization (WHO) give global and local references from internationally recognized organizations and should be consulted.

Note that alcohol abuse is frequently taken apart from the other substances for the reasons discussed previously. It is the case with the reports published by the United Nations Office on Drug and Crime (UNODC).

Note that the access to most reports is free through the Internet and that useful references are indicated in the chapter “Bibliography” at the end of this document.

Detailed reports regarding the evolution of drug abuse in countries where the company operates and also the neighbouring countries should be collected to build accurate databases. Documents regarding people at risk, so those who were drug dependent and needed assistance during the period of investigation should be also collected. Precautions should be the rule when selecting them.

The local, regional, and global data can be then classified and analysed to understand the status of drug abuse in the areas the company operates and to foresee the evolution of the phenomenon. It is obvious that for a company operating regionally, it is unnecessary to consider detailed data of countries that are outside the operational areas of the company. However, it is important to compare regional data with global ones.

It is very difficult to list all the drugs that are sold in the country studied. For this reason, the study should be limited to only the most employed. As an example, some UNODC reports are limited to only drugs such as Amphetamines, Cannabis, Cocaine, Ecstasy, Opioids, and Opiates. It is obvious that depending on the country studied new substances can be added and some others should be withdrawn.

Also, complementary elements of the countries indicated in the list above can be added that can give parameters that can be used to link drug abuse to societal and economical phenomena. Depending on whether the company operates worldwide or regionally the following parameters can be collected:

- To identify the countries where the consumption of illicit substances is high, a classification that is based on the average consumption of most illicit substances encountered in these countries can be created. They can be classified using numeric values or categories similar to those indicated below, but other systems of classification can be organized:
 - Very high: The consumption of most substances ranks among the highest.
 - High: The consumption of some substances ranks among the highest, but the consumption of some others is more moderate.

- Medium: The country ranks among those where the consumption of drugs is high only for a few substances and low for the others. Or the consumption of all the categories of substances indicated is at a medium level.
 - Low: The consumption of the drugs indicated is at a low level, or maybe at a high or medium level only for one or two substances.
- The elements below have to be recorded to be able to edit statistics:
- Total population and repatriation by sex. Note that women are increasingly involved in the offshore industry and not only in positions of secretaries. For this reason, they must not be ignored.
 - Population aged 15 years and older which is sometimes limited to a maximum age such as 64 years old. This element allows calculating the percentage of the adult population and the percentage of the population at work.
 - Consumption per capita, which allows classifying the consumption of one or several types of drugs.
- It is essential to classify the countries studied in economic and political ensembles that have similar laws and practices and are grouped in the same economical and geographic area. Note that religions practiced in some countries influence the perception of drugs and the substances that are the most spread.
For consistency, it is crucial to describe kingdoms and republics like the United Nations record them.
Regarding the point above, exceptions can be made with overseas territories of kingdoms or republics that can be classified in another economical region. As an example, Bermuda is a British territory that is situated in the Caribbean, which has its own money (Bermudian Dollar) and does not economically depend on the United Kingdom.
- Other data can be added to the tables to confirm or deny common beliefs:
- The official language may confirm whether drug abuse is linked to a particular culture and the influence of a country to another one. As an example, a lot of countries of South America where Spanish is the national language are ex Spanish possessions.
 - The percentage of urban population is often used by specialists in the economy to classify the development of a country. It has also an impact on the manner drugs are produced, distributed, and consumed.
 - The GNI per capita, which is the dollar value of a country's final income in a year, divided by its population. Is used by economic advisers to reflect the average income of a country's citizens. It is used to classify the countries by "income groups" (low, middle, high).
 - The Human Development Index (HDI), which has been developed for the United Nations Development Program (UNDP), is a composite statistic taking into account the life expectancy, education, and per capita income indicators. A country scores a high HDI when the life-span, education level, and gross domestic product per capita are high. Of course, this index has some limitations and must not be considered solely. Human Development Index is indicated numerically in percentages. However, for convenience, the classification can be made into several categories such as
 - "Very high human development index".
 - "High human development index".
 - "Medium human development index".
 - "Low human development index".
 - "The inequality of incomes", is used by investigators to analyse the repartition of the wealth and incomes in a country. It is based on values between 0 and 1, where 0 corresponds with perfect equality (*where everyone has the same income*) and 1 corresponds with perfect inequality (*where one person has all the income, and everyone else has zero income*). For convenience, and based on the fact that "perfect" is a status that cannot be reached, it can be simplified into several categories such as:
 - Nearly perfect (*where incomes are nearly equal*)
 - Acceptable
 - Unequal
 - Very unequal (*where a few persons have a very high income, and most people have nearly zero income*)
 - Health consequences allow seeing the impact of drugs on abusers and how they are treated.
 - Policies and interventions allows to compare the laws in force in the countries and their means of application. These laws may have some Impact on the quantities and the way alcohol is consumed.
 - Disability-adjusted life years (DALYs) represent a time-based measure of the overall burden of disease for a given population. DALYs are the sum of years of life lost due to premature mortality as well as years of life lost due to time lived in less than full health. It is used by the World Health Organization (WHO) and other competent bodies to demonstrate the impact of drug and Alcohol abuse

Alcohol is the most consumed drug, but its production and consumption are not ruled the same way as other psychoactive substances as it remains a legal drug in the majority of countries which is the reason data related to its consumption and abuse are often discussed separately.

Among the reports that can be introduced in a database, the "Global status report on alcohol and health" published by the World Health Organization (WHO) gives an overview of the consumption and abuse of alcohol with detailed elements of comparison for each country. Other governmental studies exist that mostly focus on the countries where they have been created and should be also added to the database.

Note that some cannabinoids such as Marijuana (*Marie Jeanne*) are now authorized for recreational use in some countries such as Canada or states of a country such as Colorado or California in the United States of America. As a result, they are removed from the list of illicit substances and considered similarly to alcohol in these countries.

4.2.2 - Analysis of the database

The documents collected in the database need to be analysed. That must be done with a lot of precautions for the reasons discussed below.

Although the sincerity of the investigators should not be doubted, we must take into account the fact that the data published in these official reports are those that were possible to collect and that their reliability is not a 100% guarantee. As an example, people from the countryside do not discuss openly with people from towns, it is also the case of communities who live in the suburban areas of towns in developed or developing countries and do not discuss with other people than those who are members of their group.

Other variations are the methods used to collect the data that may differ from one country to another and the fact that governments or pressure groups may change these data for political or economical reasons.

Also, the data published by these organizations have often been collected several years before their publication and things may have changed. As a result, these reports may not perfectly reflect the situation.

For these reasons, public studies and data must not be the only documents on which the drug and alcohol policy of a company is based.

The person in charge of the analysis must work in a scientific manner to not be influenced by any prejudice.

As an example, a common belief is that drug abuse is linked to poverty. However, the studies we have made regarding the human development indexes of the countries listed among those where the consumption of drugs is high, show that there is no evidence that poor countries are those where consumption of drugs is the most elevated. In fact, a lot of countries that rank among those where the human development index and the distribution of incomes are the most favourable are among the most affected. Similarly, the analysis of the reports from the United Nations Office on Drug and Crime we have made show that there is also no evidence that psychoactive substances abuse is linked to a particular culture. Thus, the reasons for drug abuse must be investigated for more complex societal reasons.

In addition, some reports from reputed organizations can be based on studies that are uncontrolled and not validated by the scientific community, which is problematic when the publishers are organizations that are supposed rigorous. As an example, the United Nations Office on Drugs and Crime (UNODC) report 2016 says in chapter 1:

“Genetic variability can determine to a large extent an individual’s risk of dependence. Therefore, understanding the role of genetic factors may assist in the treatment of drug dependence. It is thought that genetic factors account for between 40 and 60 per cent of a person’s vulnerability to addiction. Studies of twins have revealed that the likelihood of heritability of addictive disorders, on a scale from 0 to 1, ranges from 0.39 for hallucinogens to 0.72 for cocaine. A meta-analysis of studies of twins conducted by Verweij and others (2010) estimated that, among females, 59 per cent of problematic cannabis use could be attributed to shared genes, while among male twins, just 51 per cent was attributed to shared genes.” However, inconsistencies have been found in the results of the study taken in reference, and replication of these tests by other teams was not conclusive. It is the case in a study published by the University of Queensland (Australia) called *“No association of candidate genes with cannabis use in a large sample of Australian twin families”* that is published on the Internet. It is not the first time that it is demonstrated that studies should be interpreted with caution and validated by several independent teams. As a result, we can say that even official organizations such as the United Nations Office on Drugs and Crime can emit documents that are not based on scientifically proved facts.

Several reasons may explain the publication of such a study without further controls:

- We can suppose that the reputation of some members of the team may have been considered a guarantee of infallibility.
- There may be various pressures from people who may consider these results valid or who may have economic interests in the application of measures indicated in the study.
- The authors of the report may not have the capacity to control the provenance and the logicity of the data they receive.

This last point is problematic for an organization in which publications are taken into references. It is also the proof that the readers must keep with a minimum of analysis and critical spirit and be aware of the potentially destructive effects of studies that have been improperly reported or not approved by the global scientific community.

As a reminder, several unverified studies regarding the transmission of criminal addictions, mental disorders, and superior racial characteristics by the genetic have been published at the end of the 19th century and have triggered the Nazi theories. Most authors of these studies and theories (but not all of them) did not expect that their works will be used later on to kill millions of people in an industrial manner and with less respect than for animals. At the opposite of what is said, Hitler has not invented such theories; he was merely their result.

One very positive aspect of the Internet is that it allows us to publish and transmit any kind of documents to the worldwide connected community. However, the publication of fake news and illogical theories that may be imposed on the public by some pressure groups has also increased. As a result, decisions and rules that were more based on propaganda instead of proved medical or technical facts have been taken and implemented in the past and can be taken and implemented in the future, and that must be definitively stopped.

4.3 - Organize the primary control measures

The purpose of these control measures is to ensure that people under the influence of psychoactive substances cannot reach the work sites of the company. Note that offices and workshops are considered work sites.

4.3.1 - Maintain a permanent contact with the authorities.

The Health, Safety, and environmental (HSE) department and the other departments must maintain good relationships with the HSE, medical, and legal authorities of the countries where the company operates.

- Published safety, medical, or legal recommendations must be implemented.
- A clarification must be asked for any text, which could be interpreted in several manners. It may happen in the case of texts originally published in the national language that is then translated into English.
- The management must attend the information meetings that may be organized by the authorities.
- Data obtained from the local authorities should be used to complete those from the World Health Organization (WHO), the United Nations Office on Drug and Crime (UNODC), the International Narcotics Control Board (INCB), and other international and national organizations.
- A gap analysis should be performed regarding the HSE procedures, medical practices, and laws published by the various ministries to ensure that the company procedures are at least compliant, or better, more stringent than the required standards.
- Drugs stored in the medical kits and in the worksite infirmaries or hospitals must be scrupulously declared. Consumption or theft must also be declared with proper reports. Note that thefts will normally be investigated by the legal authorities.
- Authorities must be warned in the case of an incident or accident, and their recommendations applied.

4.3.2 - Inform and involve the personnel

The Health and Safety manager and his aids cannot implement the HSE system and the control measures of drug and alcohol abuse alone. For this, they need the full support of the entire company staff. However, the adhesion of the employees to a project is not possible if these people think that their management does not esteem them, or that they are exploited without any counterpart. As already explained in point 4.1.1, company rules not properly explained will be improperly applied or not applied if the employees consider that the management imposes rules that are at the opposite of their interests. Of course, such misunderstanding will have a negative impact on all aspects of the HSE system and the productivity of the company.

Note that even though an advantageous salary policy can be considered a motivator, it is not the only element that will trigger a positive relationship regarding the health, safety and environmental policy. This phenomenon has been described and theorized in numerous studies. Also, some theories such as Maslow's hierarchy of needs explains that when people have filled their basic needs, they are looking for safety, socialization, and esteem. For these reasons, it is essential to ensure that procedures are in place to allow the employees expressing their concerns and to demonstrate that their well being is the primary aim of the directors. As a result, the managers will gain the confidence of their teams.

4.3.2.1 - Provide relevant documentation

The company policy regarding Health Safety and Environment (HSE) which should include drug and alcohol drug abuse is not limited to only the letter of intent that summarizes the engagement of the company regarding HSE, which is signed by the managing director. It consists of all the documents and measures in place to protect the people at work and the environment.

A document that describes the various psychoactive substances and their action on the body, as it is the case at the beginning of this guidance, should be edited and distributed. The reason is that we cannot fight an enemy (psychoactive substances abuse) if this enemy, the areas it will attack, and the process it will use are not identified.

This document must describe the consequences of psychoactive substances on the health and safety of the consumers and also those who are working and living with them. Recorded scenarios of accidents triggered by drug abusers should be used. These can be accidents where people were killed or injured, or be major ecologic disasters such as the shipwreck of the Exxon Valdez where the captain was reported to have been drinking heavily during the night prior to departure and was not at the controls when the ship struck the reef that ruptured its hull and resulted of 41,640 cubic meters (11 million gallons) of crude oil spilled.

The laws of the country where the company is settled or where the intervention is planned to happen must be explained. Also, there must be strong warnings for the operations in countries where the consumption of illicit substances can be sentenced to long jail punishment and traffickers can be sentenced to death. For these reasons and to avoid any incident with newcomers who are not nationals with the legal authorities and the other employees, a note explaining the rules and traditions in force in the country should be provided to them prior to their arrival in the country.

The procedures that are in place to control drug and alcohol abuse at work should be explained. Note that the document must describe the means of detection that are discussed in chapter 3 and the procedures in the case a person is found positive. The consequences of a false positive wrongly interpreted must also be explained. The reader must understand that a person with an unusual behaviour, having an indisposition, or whom a drug test is positive is not automatically under the influence of a drug and that an experienced doctor is the only qualified to emit a diagnostic.

The procedures for the protection and removal of the person affected from the workstation, and for reporting the facts should be also explained.

4.3.2.2 - Ensure that the health, safety, and environmental targets of the company are known

The letter of intent that summarizes and demonstrates the commitment of the company regarding Health, Safety, and Environment, and which includes the drug and alcohol abuse policy, must be displayed in strategic points of the work sites. It must be signed by the managing director.

Note that this document should be part of legal documents such as contracts of employment and contracts of services with the subcontractors.

4.3.2.3 - Organize discussions with the people at work

Using the documents described in the previous points, meetings, and discussion with the people at work must be organized.

The Managers and HSE technicians must ensure that the elements indicated in the documents are understood and well perceived by the workers. For this reason, the control measures in place and their justifications, that must be indicated, may have to be explained more. Also, the workers may propose other solutions that must be taken into account.

Note that it is important to remind the employees the importance of the reporting of unsafe conditions, unsafe acts, and incidents, and to dissociate them from what a lot of workers continue to interpret as a denouncement.

The result of these discussions must be scrupulously logged.

Such discussions can be organized by the HSE manager, the HSE authority on site, or the on-site manager. It is recommended to involve the onsite medic (doctor or nurse) and the first aiders who can efficiently help to explain the ravages caused by psychoactive substance abuse and the reason for the control measures.

Also, drug abuse is a topic that can be discussed during the daily toolbox talks.

4.3.2.4 - Lead by example

The managers must be aware that they cannot ask the people under their authority to follow the company rules if they do not apply them to themselves.

Any deviance from the company rules they may have will be poorly interpreted by the workers and risks to ruin the work previously done to implement the HSE system (which includes drug and alcohol abuse). As an example, the workers may cease to recognize the authority of their managers and some employees may consider that the procedures in place are used to spy, blame, and exploit them. As a result, they may decide not to apply, or knowingly misinterpret the company rules. In this case, reporting of incidents may cease, the people under the influence of psychoactive substances or who are not able to work safely will not be identified on time. In addition, the orders will not be appropriately transmitted and applied. To avoid such disaster, the managers must always be the first to follow the company rules scrupulously. Also, they must demonstrate intelligence, comprehension, compassion, and be accessible to everybody.

4.3.3 - Organize preventive testing

Preventive testing is an efficient means to detect drug abuse. To make it legal and avoid disputes with some members of the personnel or some subcontractors who may initiate a lawsuit, this method of investigation must be indicated in the Health and Safety policy and be part of the duties of the employees or the subcontractors that are indicated in the contract of employment or the contract of service.

4.3.3.1 - Pre-Employment Testing

All employees who are engaged by a company, particularly those who work in sensitive areas or in positions where decisions can have an impact on the safety, efficiency, or the reputation of the company and its clients should be tested prior to engagement. It is also the case for the employees of a subcontractor.

Although it is usual that urine samples are used for such testing, the doctor in charge of the tests might require other methods. This test is usually performed during the pre-employment medical checkup by competent medical personnel and remains confidential.

When the doctor operates in a clinic, the sampling and the analysis are generally done by the laboratory of the clinic. However the doctor may not have the possibility to analyse samples in his office. In this case, the person to be tested may have to transfer to the selected laboratory where the sampling and the analysis will be performed, or the sampling may be performed in the office of the doctor and then shipped to the laboratory using the procedures described in chapter 3 "Means of detection and cut-off levels".

The HSE manager must ensure that the relevant medical checkups of the employees of subcontractors are transmitted to the company doctor for analysis and recording. The company doctor may request additional tests or a new medical checkup.

4.3.3.2 - Routine testing

The employees working permanently for a company should be tested at least annually. The test is usually performed during their medical checkup. The methods employed and the people in charge of these tests are the same as for the pre-employment testing.

4.3.3.3 - Testing prior to transfer to a worksite

It is a usual procedure that clients test the employees working on their facilities. Also, such tests may be imposed by the

legal authorities to prevent disasters. For this reason, tests must be organized prior to the final transfer to the worksite. Urine samples are commonly used for such testing. However, the doctor in charge of the tests may ask for other methods. Depending on the tests used, the testers who are not members of the medical staff should comply with the requirements indicated in chapter 3 “Means of detection and cut-off levels” and should not operate alone. Also, trained medical personnel should be present during these tests.

Note that the people who have been found “positive” cannot be transferred until complementary tests have proved that they can perform their duties safely. That may result in a transfer delay in the case of a false positive or an episodic alcohol abuse, or people to be replaced for more serious matters. The doctor in charge of the test is responsible for selecting the method for the confirmation test. He may decide to transfer the suspicious person to the nearest hospital or laboratory where more adapted means of investigation are in place.

Note that removing a person from duty can create severe problems if the person is assigned to a key position or when the teams are limited to the legal minimum. In such cases, the operations can be compromised if the suspected employee is not replaced as soon as possible. However, returning a person that has been confirmed positive to his/her position and removing him/her when the replacement arrives onsite is not morally and legally acceptable.

4.3.3.4 - Everyday testing at the entrance of the premises

Though pre-boarding drug tests are generally approved by the people working offshore, everyday tests at the entrance of the premises of the company are generally badly perceived by some employees who consider that the management is not confident and spy on them at all times. It must be noted that the mentality of people working offshore, where the living conditions are organized around the project to be achieved in a dangerous environment, is different from those of employees who are working in a more routine surrounding and return home every day. Also, the pre-boarding test is done prior to starting a rotation of several weeks and is not renewed every day. As a result, such tests at the entrance of the premises may create an unpleasant environment, and become counterproductive. Also, these tests are expensive to organize as in addition to the team in charge that is mobilized every day and the cost of the various methods of sampling, such operation slows down the entrance of the personnel and triggers delays and loss of productivity. For these reasons, most companies do not organize them and use other procedures of detection. However such procedures can be mandatory at the entrance of sensitive areas where a person under the influence of psychotropic substances can become an extremely dangerous threat. In the case that these procedures are organized, the teams in charge of the test are similar to those in charge of the pre-boarding tests. Of course, as for the pre-boarding drug tests, the persons that are found positive cannot enter in the premises until reliable complementary tests, approved by the doctor in charge, have proved that they can perform their duties safely.

4.3.3.5 - Selecting the laboratory

The laboratory must be selected before starting the project. The medical specialist is in charge of the selection of appropriate laboratories. However, it may happen that in the case that the legal authorities are involved, the laboratory may be imposed. The following points should be considered:

- The laboratory and the procedures applied must be recognized by the government of the country where the operations are carried out and, if necessary or requested, other internationally recognised organizations.
- Most companies have a purchase management system where a purchase order that is sent to the service provider must be signed by the general manager or his representative. However, this process is too long and too complicated for medical services where the life of a person may be linked to a rapid analysis and a quick and efficient diagnostic of the medical assessor. For this reason, a contract for services must be in place prior to starting the project. Also, the procedures for the fast transfer of samples from work sites situated inland or at sea to the laboratory must be established.
- The name of the laboratory and of the person in charge of the analysis must be indicated in the emergency response plan with the procedures for transferring the samples and receiving the results of the tests.

4.3.3.6 - Procedure in the case of a positive confirmation test

If an employee is confirmed positive, he cannot be maintained in his position.

Nevertheless, an investigation must be undertaken to ensure that the samples are valid and to determine whether the employee can be considered guilty of a breach of the law. Another sampling (maybe using another method) should be organized to confirm the previous ones.

The company management, the client, and the legal authorities will decide on the next actions according to the results of this investigation and of the laws of the country. If possible, a treatment for rehabilitation should be proposed.

4.3.3.7 - Cases of people refusing to test

At the moment that the precautions indicated in the points 5.1.2.1 & 5.1.2.2 are in place, drug & alcohol abuse tests are considered standard procedures applied by the company, and no one can avoid them. A person refusing to submit to these tests cannot be engaged or should be demised from his/her functions. The person in charge of the test can request the help of members of the team to evacuate a suspicious person who becomes aggressive.

4.3.4 - Ensure the compatibility and the control of medical treatments

The Health and Safety manager and the doctor in charge must make sure that the medical treatments prescribed to some

employees are compatible with their functions and the laws of the country where the operations are carried out. As indicated before, some medical treatments are based on psychoactive substances that may have side effects to those taking them. Also, the document from the United Nation Office on Drug and Crime (UNODC) *“Guidelines for national regulations concerning traveller under treatment with internationally controlled drugs”* says that when entering the country of destination and depending on the type of preparation and amount of controlled substances involved, the traveller should have in his/her possession the documents required by that country: medical prescription, certificate and/or permit, confirming his/her legal authority to possess, for personal use, medical preparations containing internationally controlled drugs.

For these reasons, a medical prescription must be declared to the company doctor who may decide to modify it or to remove the employee from duties during the period he is under the effects of the prescribed drugs. However, some employees may be afraid to lose their job if they are temporarily removed from duties. For this reason, they may decide not to declare their prescription and not taking it before the planned drug tests, and then follow their treatment after these periods. Also, some employees may not realize that the medications they are taking have side effects. Of course, that may result in an accident or legal problems, and the employees must be encouraged to declare their medical prescription. This should be highlighted in the published HSE documentation and during the discussions. Another problem may arise with employees who are living in countries where the consumption of psychoactive substances such as cannabinoids is legal and who may forget that these substances are strictly prohibited in most countries and that the company policy is zero drugs.

To ensure that undeclared drugs are not transferred to the work sites, inspection of the belongings can be performed prior to transiting the teams. In the case that psychoactive substances are discovered, their proprietors must not be transferred to the work site. Also, the possession of undeclared psychoactive substances must be considered an intentional breach of the rules of the company, and be severely sanctioned. In addition, this may be considered a breach of the laws of the country where the operations are organized. For this reason, and as already explained in point 5.1.2.1, the employees must be warned of the consequences of drug abuse and trafficking in some countries where punishments can be extreme, prior to starting the project.

Inspection of the belongings must be carefully organized: Even though such controls are usual in the airports, or at the entrance of big supermarkets in some areas, this procedure is often not well perceived by the employees. For this reason, its purpose must be explained and discussed, and the privacy of the people must be thoroughly respected. Note that inspections by hand take a long time, request much-specialized personnel, and can trigger disputes. For this reason, a specific machine, which is similar to those in service in the airports, is preferable. However, these machines are expensive and must be operated by trained technicians. In the case that a belonging has to be opened and closely inspected, two specialized employees must be present, and the inspection must be performed in an area that is far from the eyes of others.

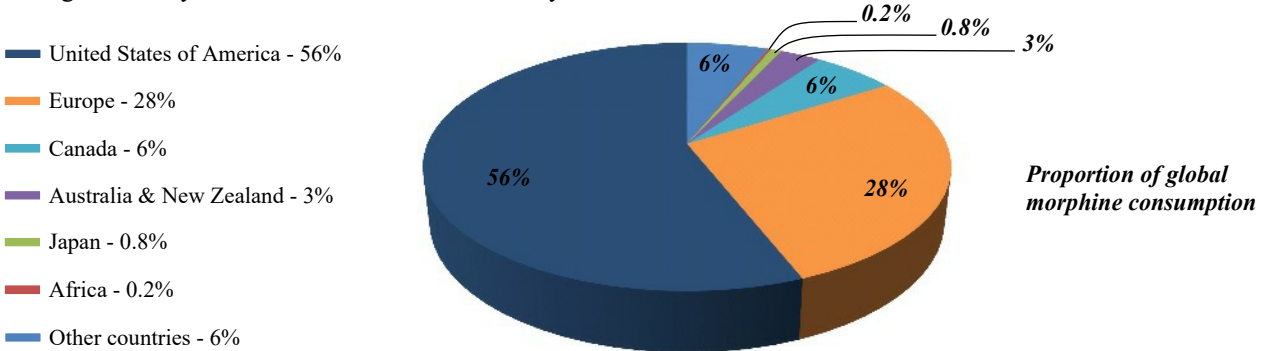
Note that people transferring prohibited mixtures to the work site may use the luggage of others. For this reason, the employees should be warned and encouraged to lock their belonging, and of course not accept the belonging of others.

4.3.5 - Manage appropriately the medical kits.

The Health and safety manager and the doctor in charge must ensure the availability of the drugs prescribed in the medical kits and that these prescriptions are compatible with the laws of the country where the operations are planned. Also, they must make sure that the medications and medical accessories are protected from robbery.

4.3.5.1 - Assess the medical drugs and local legislations.

The International Narcotics Control Board (INCB) publishes guidelines such as *“Guide on Estimating Requirements for Substances under International Control”* and *“Ensuring Adequate Access for Medical and Scientific Purposes”* which say that there is a problem of inappropriate levels of consumption of internationally controlled substances which is too high in some countries and too low in others. A few developed countries account for ninety percent of global consumption of analgesics, with overconsumption of certain controlled substances. In contrast, eighty percent of the world’s population has limited or no access to these medicines, meaning that many individuals suffer unnecessarily.



It is recognized that a lot of medical conditions cannot be adequately treated without access to narcotic drugs, for example in the treatment of pain, or in the treatment of mental and neurological diseases. For this reason, the doctor of the company, the Health and safety manager, and the manager in charge of the project must ensure that such medications will be adequacy provided.

Impediments to the adequate availability of internationally controlled substances vary between countries, and it is the responsibility of national authorities to identify these impediments and take appropriate measures to remove them. Unfortunately, many countries still find it difficult to identify their actual requirements of narcotic drugs and psychotropic substances and are therefore unable to provide adequate estimates and assessments or, in some cases, to provide any estimates at all. As a result, some medications that may be used as recreational drugs are merely banished in some countries.

Note that, the “*List of Psychotropic Substances under International Control (green list)*” published by the International Narcotics Control Board indicates the substances officially recorded and the countries where some of them are forbidden. This list is completed by the “*list of narcotic drugs under international control (yellow list)*”, and by the “*List of Precursors and chemicals Frequently used in the illicit manufacture of narcotic drugs and psychotropic substances under International Control (red list)*”. These documents should be consulted prior to organizing operations.

4.3.5.2 - Prepare the medical kits.

The medical kits must be prepared by a nurse or a chemist according to the prescription of the company doctor. They must comply with the laws of the country where they are used.

Problems may happen with some specific medical kits such as DMAC 15, which contains drugs such as Morphine and codeine that are listed in the yellow list INCB and are strictly forbidden in some countries. Diazepam (Valium) is also recorded as a medical drug that is often used for recreational purpose. However, this kit, that has been designed by the members of the Diving Medical Advisory Committee (DMAC) is internationally recognized. For this reason, a dispensation should be obtained from the medical authorities to use these drugs with the aim of relieving pains of an injured or sick diver. In the case that the authorities continue to reject the use of the medications initially planned, medicines of substitution must be adopted. As an example, Tramadol can replace morphine and codeine. However, substitution drugs may also contain addictive substances, or be less efficient than those they replace.

4.3.5.3 - Secure the drugs stored for medical purposes

An IMCA safety report says that drugs stored for medical use in the infirmary of a ship have been stolen. For this reason, the drugs, and medical kits must be stored in places that can be locked. Also, such requirements are often imposed by the medical and legal authorities. However, these kits must be immediately available in the case of an emergency. For this reason, the key must be under the responsibility of a member of the team. This person can be the supervisor or an advanced first aider, or both. A checklist should be performed at the beginning of the operations and then at regular intervals. There must not be missing medication, except if the medical kit has been used. In this case, any missing drug must be justified in the report of the intervention, and the medical kit must be refurbished.

The worksite hospital must be closed when the medic is not in it. Also, patients must not be left alone in an area where drugs or medical tools are stored. As for those of the medical kits, the drugs must be kept under lock and key. The onsite medic is responsible for the keys that must be left on the bridge or the office of the manager when he is not on duty.

4.3.6 - Control cargos and equipment transferred to the work sites.

The Health and Safety officers and managers should ensure that cargos and equipment that are sent to the work sites are not used to transfer illicit substances. This is a difficult task as the imagination of some people is without limits. As an example, cases of alcohol bottles hidden in the middle of tools and food have been reported. Such scenarios are uncommon with very short-term projects but may happen with long-term projects where people may have sufficient time to establish contacts and organize.

For this reason, the people preparing the containers must be persons of confidence, and the containers must be filled in areas that have limited and controlled access. The list of items constituting the cargo transferred must be very precise and the identification of the various items must be easy. When the containers are onboard they must be opened in the presence of an officer and the cargo dispatched to the relevant stores only after control. However, this procedure takes a long time and is based on the honesty of the personnel involved as it is easy to hide drugs or alcohol in the middle of the packs transferred. For this reason, the best procedure to fight these practices is the publication of documents that describe the dangers of drug abuse in addition to frequent discussions and good relationships with the teams.

4.3.7 - Remember the list of the countries applying death penalty for drug offences

Thirty-three countries apply the death penalty for drug offences and most of them are situated in areas where commercial diving /ROV operations are likely.

We have not found a recent list published by an official internationally recognized organization such as the United Nation Office on Drugs and Crime (UNODC). However, several non-governmental organizations, which most of them are engaged against the death penalty, have published such data. Although the purpose of this guidance is not to express a position regarding the laws applied by the countries listed, it is important to remind those who are organizing projects in these countries.

The report 2017 published by Harm Reduction International named “Death Penalty for Drug Offences” gives a precise status of the countries applying death penalties. For this reason, this report can be considered a reliable reference. This report classifies the countries as follows:

- High application states:

High application states are those in which the sentencing of those convicted of drug offences to death and/or carrying out executions is a regular and mainstreamed part of the criminal justice system. The following countries are listed in this category:

- | | |
|----------------|------------|
| - China | - Iran |
| - Saudi Arabia | - Malaysia |
| - Singapore | - Vietnam |
| - Indonesia | |

- Low application States:

They are those where executions for drug offences are an exceptional occurrence. Although executions for drug offences may have been carried out within the last five years, in practice such penalties are relatively rare. The following countries are listed in this category:

- | | |
|------------|---------------------------|
| - Egypt | - Iraq |
| - Pakistan | - Palestinian territories |
| - Taiwan | - Thailand |

- Symbolic application States:

They are those that have the death penalty for drug offences within their legislation but do not carry out executions, or at least there has not been any record of executions for drug-related offences. Some of these countries may occasionally pass death sentences, but there is little or no chance that such a sentence will be carried out. The following countries are listed in this category:

- | | |
|---------------------------|----------------------------|
| - Bahrain | - Bangladesh |
| - Brunei Darussalam | - Cuba |
| - India | - Kuwait |
| - Laos | - Myanmar |
| - Oman | - Qatar |
| - South Korea | - South Sudan |
| - Sri Lanka | - Sudan |
| - United Arabian Emirates | - United States of America |

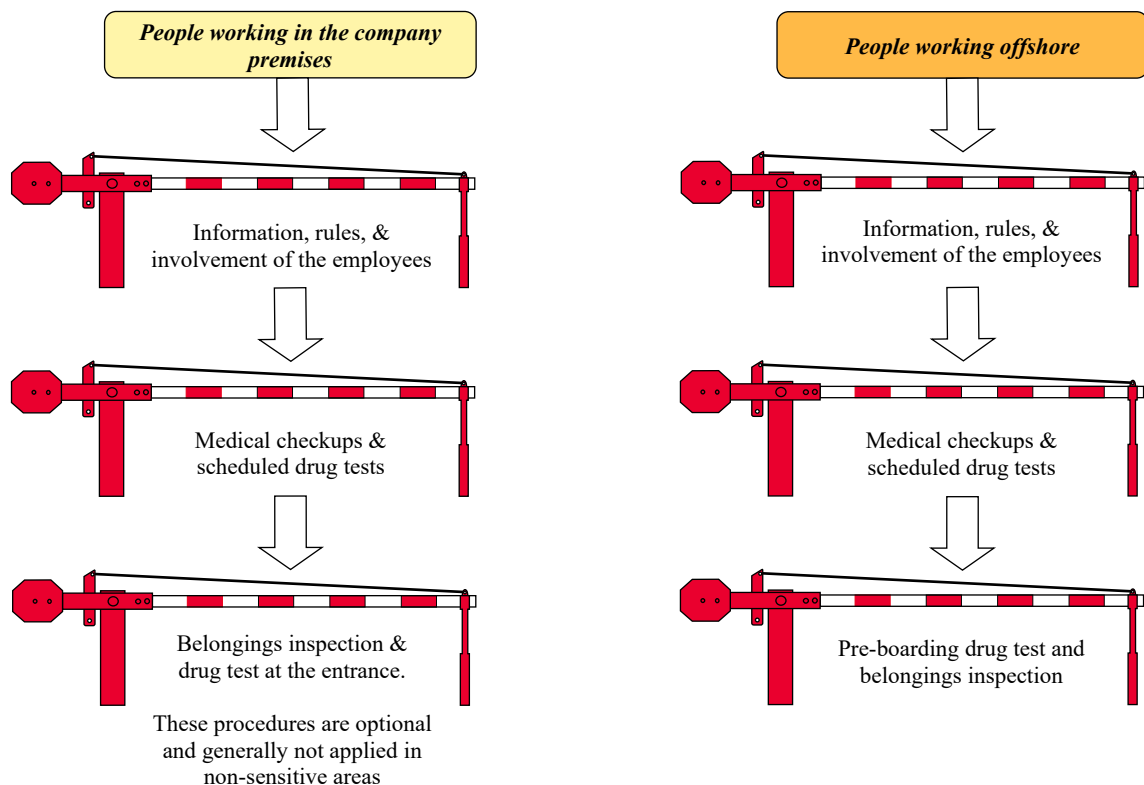
- Insufficient data:

This category is used to denote instances where there is simply not enough information to classify the country accurately. The following countries are listed in this category:

- | | |
|---------|---------------|
| - Libya | - North Korea |
| - Syria | - Yemen |

4.3.8 - Summary of the barriers in place to prevent drug abusers from entering the work sites

The drawing below visualizes the precautions described in the previous texts. Of course, barriers are easier to establish in an offshore environment as in the company premises where such measures can become unproductive if they are too present and constraining. For this reason, the information and the involvement of the employees is the best method to prevent efficiency people under the influence of psychotropic substances from entering the workplaces.



4.4 - Prevention of drug and alcohol abuse on the worksite

The aim of the preventive measures is to make sure that people under the influence of drug and alcohol cannot reach the work site. Nevertheless, some people may have passed through the controls that are in place. For these reasons, procedures must be implemented to discover them and take care of them properly before an incident happens.

4.4.1 - Policy applied on the work site

A point to consider is the fact that a company working in an oilfield must follow procedures that are compliant with those selected by the operator of the concession, who is generally the client.

Also, the operations at sea are often organized within the limit of the “territorial waters” of the country. According to part two of the 1982 United Nations Convention on the Law of the Sea, “territorial waters” of a state is the part of the ocean adjacent to its coast not exceeding 12 nautical miles (22.2 km) wide where the sovereignty of this state applies in full. These distances are calculated from the baselines which are the sea levels during the lowest tides. Note that the authority of a state is partially extended in the “Contiguous Zone” which extends up to 24 nautical miles (44.4 km) from the baseline, and the “Exclusive Economic Zone” (EEZ) which extends up to 200 nautical miles (370.4 km) from the baseline. They are described in parts two and five of the 1982 United Nations Convention.

For these reasons, the company policy regarding Health, Safety, Environment, and drug and alcohol abuse must be at least compliant with the ones applied by the client, and the laws of the state where the operations are carried out. In the case that the company policy is less stringent than the standard requested, it must be readjusted. It can be done when writing the bridging documents. Also, the methods for managing cases of drug abuse must be part of the emergency response plan.

4.4.2 - Additional key people operating offshore

Company key people involved in the prevention of drug and alcohol abuse are described in point 4.1.2. However, some key people such as the shipmaster have specific responsibilities and may not be employees of the company. Note that the boat may be operated by a subcontractor, or be contracted separately by the client. Other key people who are not employees of the company are those appointed by the client or the government.

4.4.2.1 - The captain of the vessel

The captain of the vessel, also called shipmaster, is considered a site manager and his duties regarding Health, Safety, Environment, and psychotropic substances abuse are described in point 4.1.2.8. However, his responsibilities are far beyond the scope of a management position, as he is responsible for all the aspects of the operations and the maintenance of the ship. He is also the legal authority of the flag of the ship, which laws apply when the vessel is cruising outside the territorial waters. For this reason the people on board his vessel are under his responsibility and authority.

He must be informed of any incident or accident that has happened on his vessel, and he has the power to stop the operations if he considers that the safety of his vessel is jeopardized or the laws are not applied. Of course, he can request that people he considers dangerous are removed from the operations and sent back to the shore.

4.4.2.2 - The client representatives on-site

They are appointed by the client and are responsible for:

- Ensuring that work procedures and management of change are followed.
- Ensuring that health, safety, & environmental issues are kept foremost.
- Monitoring competence issues with the team performing work at the site.
- Ensuring the compliance of the operations with the local & international regulations.
- Monitoring the safety & efficiency of the operations.
- Reporting on the work done, lessons learned, and recommended improvements for future operations.

They must be informed of any incident happening in the concessions and the premises of the company they represent, and they have the power to stop the project and to ask for the replacement of any person they consider unsafe.

4.4.2.3 - Legal authorities onboard

They can be policemen or other civil servants in charge of an investigation or to ensure the compliance of the operations with the regulations of the country. They must be informed of any incident and can lead an investigation team. Note that the militaries who may be on site for the protection against piracy or other dangers are also legal authorities.

Depending on their function and the orders they receive, the legal authorities have the power to stop the operations or ask for the replacement of any person they consider unsafe or not respecting the laws of the country and organize an investigation for drug abuse. Also, they can request the master to return the vessel to the shore.

4.4.3 - Means of investigation

4.4.3.1 - Exceptional testing on-site

Exceptional testing can be organized by the client, the legal authorities, or the HSE authority to make sure that the drug and alcohol policy is applied.

The people in charge of the organization are those who are named by the HSE manager and the doctor in charge or by the client or/and the legal authorities.

As for the other tests, the testers who are not members of the medical staff should comply with the requirements indicated in chapter 3 “Means of detection and cut-off levels” and should not operate alone. Also, trained medical personnel should be present during these tests.

These tests are often organized in the premises of the company and may be organised offshore.

The sampling should be performed in the on-site hospital or infirmary which is the best place for this purpose. Nevertheless, this room can be too small, and the doctor may prefer keeping it available in the case of an accident.

For these reasons, the collection of samples on site can be organised in another room. In this case, the room selected must be as described for each means of sampling in chapter 3 “Means of detection and cut-off levels”.

Note that in the case that these tests are organised onshore, the sampling can be organised in a laboratory or in a clinic that is at proximity and to which transfer of the personnel can be easily organized.

As with the tests discussed previously, a person who is confirmed positive must be removed from his/her duties.

As indicated in point 4.3.3.3, this can create severe problems if the person is assigned to a key position or when the teams are limited to the legal minimum. However, returning a person that has been confirmed positive to her/his position and removing him/her when the replacement arrives onsite is not morally and legally acceptable.

In the case of a positive initial test, the physician in charge must decide which type of confirmation test must be performed and whether this test is to be performed in the onsite hospital or in the nearest specialised clinic or laboratory where more resources are available.

In the case that the confirmation test is also positive, the guidelines described in point 4.3.3.6 should be followed. Also, remember that the guidance in the case that a person refuses to test is indicated in point 4.3.3.7.

Exceptional tests are not organized at regular periods, and the personnel is not informed of these test in advance.

For logistical reasons, it may not be possible to control all of the people. In this case, the inspection may focus on several teams only. However, such organization may not be well perceived by the staff who may consider that the people tested are discriminated (why these people and not the others?). This may result in loss of cohesion and productivity on the work site. For these reasons, this organization must be explained and discussed during the meetings.

Also, these tests will be extremely badly perceived if they are organized following a mistake from the managers.

As an example, transferring to the work site people assigned to key positions who have been confirmed positive for economical reasons, and then arranging such tests to the rest of the staff.

4.4.3.2 - Detection by employees and the Health and Safety authority on site

People under the influence of psychotropic substances can be detected by the other employees and indicated through the safety observation cards system, or directly to the HSE authority on site, who should inform the HSE department, the on site medic, and the onsite manager before starting an investigation.

Note that the HSE authority onsite must not investigate alone and be always with a reliable person. Also, he must be assisted by the onsite nurse and the medical specialist of the company.

As the information is based on the judgment of people who may not have medical knowledge, there may be some possibilities that illness, injury, or other factors could also cause these circumstances and conditions. For these reasons, the person affected must be removed from duty and transferred to the onsite hospital for examination.

Note that in the case that the event happens onshore, the person can be directly transported to the nearest hospital.

Tests for psychoactive substances can be requested by the key managers on site (Construction manager, Client representative, Legal authority, HSE authority). However, the tests should be made only after advice and instructions from the physician in charge. Also, the doctor may decide to trigger a MEDEVAC to continue the investigation in an onshore hospital where more equipment and specialists are immediately available. In this case, precautions must be in place to ensure that the casualty is transportable.

Note that in the case that there is suspicion of a particular substance, the table in point 3.7 of this document gives the approximate detection periods for several types of tests that can be used. We can see that there are at least two tests that can be used for each substance indicated despite the delay of several hours due to the transfer of the person to the medical facility. **For this reason, we can consider that transfer of suspicious cases to the onshore hospital is the preferable option, particularly when the transfer can be organized within a reasonable amount of time.**

Important points to remember:

- The key people in charge of the project have the authority to request a MEDEVAC or organize an evacuation if they consider that the person represents a danger.
- A suspicious person must not be considered guilty of drug abuse until a document that is validated by the doctor in charge confirms it.
- As indicated above, the procedure in the case of a positive confirmation test is described in point 4.3.3.6, and the procedure in the case that a person refuses to test is indicated in point 4.3.3.7.

4.4.3.3 - Detection of a key person under drug abuse by the employees under his responsibility

A person under the influence of psychotropic substances can be a member of the management staff.

For these reasons, the safety observation cards system must be organized in such manner that a person who is responsible for a team or a project cannot intercept and eliminate the observation cards that have been emitted.

This is generally achieved by a management system where the safety observation cards are collected by the HSE

authority on site and their records are sent separately to the project manager and the HSE department who should compare and discuss their records. As with any employee, this report should result in an investigation which procedures are those indicated in point 4.3.2.2 above.

The emitters of the cards must not be blamed even though the tests are negative and the person has no health problem. However, disciplinary prosecutions should be undertaken if the investigation proves that the safety alert has been triggered to intentionally impair the person.

4.4.3.4 - Procedure in the case that a suspicious case is not taken into consideration by the management

Based on the fact that any person has the right and the duty to stop an operation he/she considers unsafe, a “stop card” system must be implemented.

A stop card system is a tool that can be used in the case that the management in charge of the project disagrees to reconsider a situation that is considered unsafe by the “reporters”. Thus, the stop card is designed to solve a health and safety problem leading to a conflicting situation where a positive dialogue is not possible. It can be ultimately used in the case that several employees have reasonable reasons to suspect that the behaviour of a person is abnormal and dangerous and that their safety observations are not taken into account by their management.

- When the stop card is emitted, the teams must stop the work even though the leaders disagree to do it. Thus, the work is frozen until a further evaluation confirms whether the operation is safe or should be reconsidered.
- The stop card is then transmitted to the health and safety authority and the worksite manager, or the person in charge of this function, who must acknowledge reception.
- The worksite manager should organize an investigation. The job should not start again if the risk indicated by the reporters is not under control.

The reporters should not be blamed if no problem is found, excepted if the investigation proves that the safety alert has been triggered to intentionally impair a person.

4.4.3.5 - Cases of very small teams operating isolated

Teams with minimum personnel where the supervisor combines his normal functions with those of on-site operation manager and HSE authority are frequently used to perform small interventions. These teams may operate alone in isolated areas and without on-site medical staff (nurse, doctor).

For these reasons, the proper examination of a person who presents signs that may be due to drug abuse, but that can be also the fact of illness, injury, or other factors cannot be performed properly on site, and a **MEDEVAC must be organised as soon as possible**. The first aiders must support and prepare the casualty for the transfer according to the instructions they receive from the medical specialist of the company.

4.4.4 - Sending the samples from offshore or an isolated worksite to the laboratory

When sampling has to be performed offshore, depending on the substance to detect, it is preferable to use methods that give a direct reading and that can be immediately interpreted onboard. Also, when it is possible, it is preferable to send the suspicious person to the onshore hospital where the means of intervention are more adapted. The table of the approximate detection periods in point 3.7 of this document proves that sampling will be possible despite the time lost for the transportation.

However, it may happen that the suspicious person is not in any condition to be transferred immediately, or that passengers and casualty transfers are too dangerous due to weather conditions, but that it is possible to send a box of samples from one vessel to another. Also, the doctor in charge may decide to perform the collection of samples on board and send them to the laboratory onshore for other reasons.

The procedure for sending samples from an offshore or an isolated worksite to the laboratory must be indicated in the emergency response plan.

4.4.4.1 - Documents to be sent to the laboratories

Note that, depending on the doctor, several laboratories may be involved in the investigation. In the case that the services of laboratories are requested, the documents sent to these establishments must be confidential and must not influence their diagnostics. For this reason, a lot of specialised guidelines recommend that the name of the patient and the results of tests that may have been performed must never be indicated. The request for analysis can be sent through the Internet to the laboratory and the medical assessor (Doctor in charge) who may not be onboard the vessel. However, a copy must accompany the samples. The form should indicate the following:

- The date
- The name and the address of the company
- The reference number of the document, and the reference number of the report it is linked to
- The name and contact details of the medical assessor (doctor in charge)
- The name and contact details of the person in charge for the company.
- The name and the address of the laboratory and the reference of the agreement.
- The samples collected, the methodology to collect them (note that each step must be recorded), the name of the collector, and the date and time they have been collected.
- The reference number of each sample sent to the laboratory. As said previously, these reference numbers must be designed to identify easily the report they are linked to. In the case that two or more laboratories are involved,

the reference numbers must allow knowing to which laboratory a sample is sent.

- The substances the medical assessor is looking for.
- The test(s) asked and eventually the method requested.
- Signatures of the collector, and the person in charge.
- The date the answer from the laboratory is expected.

4.4.4.2 - Organize the transfer of samples to the laboratory

The container of the sample(s) and the copy of the request for analysis should be in the same pack, so the laboratory receives them at the same time. The sticker of the container must indicate:

- The reference number that corresponds to the one indicated in the request for analysis
- The name of the company
- The name of the medical assessor
- The content of the container

Depending on the container that protects the sample, the pack can be a sealed envelope or box that is designed not to be opened without breaking its seal, so the receiver knows whether the packet has been opened. Only the names and the addresses of the receiver and the sender are visible.

Note that these confidential documents are carried by one or several persons appointed to this mission. The names and contact details of these people must be indicated in the emergency response plan. They should report when they receive the pack and when it is delivered to the laboratory or to the next contact in charge of the delivery. Note that, when it arrives onshore, the packet can be delivered by a recognized mailing company that allows tracking the delivery of the pack.

5 - Testing following incidents and accidents

The procedure applied will depend on the responsibilities of the people involved in the undesirable event and whether they are injured or not.

Of course, an incident or an accident that arises due to an employee under the influence of a psychotropic substance means that the control measures in place are not sufficiently efficient to stop drug abusers from reaching the work-sites. It is what should never happen, and a full revision of these procedures will have to be undertaken to discover the weaknesses of the prevention system, and select additional, or more effective control measures that must be implemented as soon as possible.

5.1 - Team leading the investigation

The team leading the investigation should be decided according to the area where the events happened:

- If an incident/accident happens within the concession or the facilities of the client, the investigation will be lead by the client and/or the legal authorities (police, labour ministry).
- If an incident/accident happens outside the facilities of the client but in territorial waters, the investigation will be lead by the legal authorities (police, labour ministry) of the country. If the State of occurrence does not institute an investigation, it is the responsibility of the State of Registry (flag) of the boat to do so.
- For incident/accidents that happen within international waters, the main legal basis lies in the United Nations' Convention on the Law of the Sea (UNCLOS). In Article 94, it states that it is the responsibility of the Flag State to institute an 'inquiry' (investigation) into accidents on the high seas.

5.2 - Sampling

5.2.1 - Test the people involved in the undesirable event

Client rules or state rules may oblige to carry out such tests even though there are no external signs that prove that a test is necessary. The procedure used for the analysis is the same as those for exceptional testing.

5.2.2 - Test the injured persons involved

Difficulties arise from the wide range of post accident situations that can develop:

- Care needs to be taken that injured personnel are treated for their injuries first. Treatment might affect the validity of a test.
- Testing might not be possible or might affect the proper care of the injured person.
- The injured person might or might not have contributed to the accident.
- There could be an interval of time from the accident to when a test is possible that would make it unlikely that any test would reveal whether the performance of the casualty was affected by drugs or alcohol.

For these reasons:

- **Testing should not be undertaken without medical advice.** If a test is practicable, the persons involved in the accident should be be tested within a certain time frame. Thus, medical advice would need to be taken as to how long that should be.
- The legal authorities and the client should be consulted before undertaking tests. The legal authorities may decide to perform this test themselves or appoint an independent assessor or the hospital where the person is hospitalised.

6 - Reporting

In the case that a person under drug abuse is discovered on the work site a report that describes the events will have to be published. Also, the reports are necessary to classify the cases, enrich the database, and can be used to improve the Health, Safety, environment, and drug and alcohol abuse management system.

6.1 - Forms to be used

Depending on where the project is carried out, the forms from the client, or those edited by the state where the operations are undertaken, or those from the country where the ship is registered might have to be used and/or could be compliant for this purpose.

Also, in the case that the suspicious person has been sent to the onsite hospital but that the investigation has proved that tests for drug abuse were unnecessary as the initial examination has identified a problem that was not linked to any psychoactive substance, the standards Health and safety form should be sufficient.

However, in the case that the existing forms are not adapted, a new form that reports the investigation, the sampling, and the analysis practiced may have to be created.

Note that the initial report must be sent 24 hours maximum after the beginning of the investigation.

6.2 - Elements to be sent to the people in charge of the project

The document that records the investigation undertaken for cases of drug abuse and the evolution of the case is filled by the person in charge (HSE authority on site) who keeps the original. It must be sent using an official channel to:

- The onsite manager
- The HSE department of the company
- The medical assessor (doctor)
- The master of the vessel
- The client representative if the events have happened during the operations planned in the oilfield or the premises of the customer
- The legal authorities in the case that illicit substances have been discovered or an incident has happened in the concession, or the premises of the client in the country, or in the territorial waters.

Note that this document may have to be used in the case of a prosecution. For this reason, it must be scrupulously filled out and should display the following:

- The reference number of the report.
- Whether it is the initial report or the continuation (update) of the initial report (if the initial report is in another document, the reference number of this document must be indicated).
- The names and positions of the managers to whom the copies of the report are sent (see above).
- The name(s) of the patient(s) (the “suspicious” person(s)).
- The names and functions of the members of the investigation and collecting team.
- The events that have triggered the investigation and the sampling.
- The record of events from the beginning of the investigation to the date of the report.
- If conversation has been registered during the investigation, the reference number of the media where the conversation is recorded. Copies of this record can be sent to the recipients of this report.
- The substances the medical assessor was looking for, and the methods of investigation selected.
- If one or more tests have been performed on the job site (onboard hospital or job site infirmary), for each test:
 - The test used (Manufacturer, type, reference number, and substances detected).
 - The names of the collectors
 - The methodology applied (it must conform to the one indicated by the manufacturer). Note that the steps must be chronologically recorded.
 - The values recorded and whether the test is positive or negative.
 - The date and time the analysis has been fully completed.
- If the initial test or the confirmation tests or additional tests are planned to be performed by a laboratory:
 - The name and the address of the laboratory and the name of the contact.
 - The test(s) to be performed.
 - The reference number of each sample sent to the laboratory. Note that these reference numbers must be designed to identify easily the report they are linked to. In the case that two laboratories are involved, the reference numbers must allow knowing to which laboratory a sample is sent.
- If the tests performed by the laboratory have been completed and received on site:
 - The references of the reports from the laboratory.

- The name of the person in charge of the test for the laboratory
- The date and time the tests have been performed.
- The tests performed, and whether they are positive or negative.
- The date and time the test has been received.
- Whether additional tests are necessary.
- Suggestions from the investigation team
- The signatures of the people involved in the investigation (Person in charge, collector, medical assessor, and witnesses).
- The date and the time the report has been completed
- The stamp of the company and if the operations have been performed at sea, the stamp of the boat.
- The document should be open for further updates. So there should be some space to record the decisions of the management, the additional actions performed or planned, and whether the case is closed. It is advantageous to record the last updates by continuing the next reports on the initial document, so the reader can see the events since the beginning to the end on only one document.
However, if the team prefers updating the case using another report, the references to the previous reports should be indicated. Note that the person in charge should record the updates and send the updated documents to the managers who are listed.

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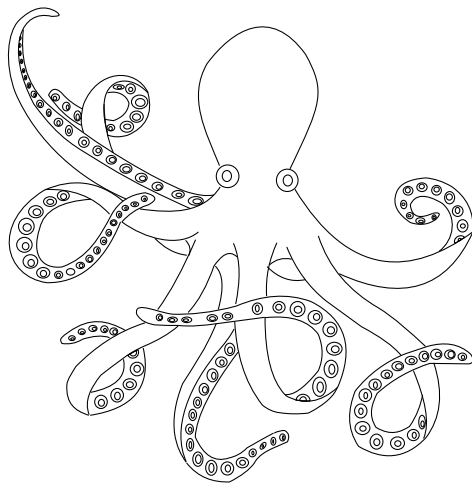
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- United nations office on drug and crime: ***World drug report 2018 – doc #2 - Global overview of drug demand and supply***
- United nations office on drug and crime: ***World drug report 2018 – doc #3 - Market analysis of plant based drugs***
- United nations office on drug and crime: ***World drug report 2018 – doc #4 - Market analysis of synthetic drugs***
- United nations office on drug and crime: ***World drug report 2018 – doc #5 - Drug problems and organized crime, illicit financial flows, corruption and terrorism***
- World Health Organization: ***Global status report on alcohol and health***
- United nations office on drug and crime: ***Global status report on alcohol and health***
- United nations office on drug and crime: ***Drug seizures Report – Feb. 2018***
- United nations office on drug and crime: ***Annual prevalence of drug use, by region and globally***
- United nations office on drug and crime: ***Annual prevalence of use as a percentage of the population aged 15-64 - Amphetamines***
- United nations office on drug and crime: ***Annual prevalence of use as a percentage of the population aged 15-64 - Cannabis***

- United nations office on drug and crime: *Annual prevalence of use as a percentage of the population aged 15-64 - Cocaine*
- United nations office on drug and crime: *Annual prevalence of use as a percentage of the population aged 15-64 - ecstasy*
- United nations office on drug and crime: *Annual prevalence of use as a percentage of the population aged 15-64 - Opioids*
- United nations office on drug and crime: *Annual prevalence of use as a percentage of the population aged 15-64 - Opiates*
- United nations office on drug and crime: *Annual prevalence of use as a percentage of the population aged 15-64 – Tranquillizers and sedatives*
- United nations office on drug and crime: *Annual prevalence of use as a percentage of the population aged 15-64 – Stimulants*
- United nations office on drug and crime: *Cannabis in Africa*
- United nations office on drug and crime: *Drug Prices Report - Cannabis-type*
- United nations office on drug and crime: *Drug Prices Report - Cocaine-type*
- United nations office on drug and crime: *Drug Prices Report - Opioids-type*
- United nations office on drug and crime: *Drug Prices Report – Excitants & amphetamines-type*
- International Narcotics Control Board: *Availability of Internationally Controlled Drugs: Ensuring Adequate Access for Medical and Scientific Purposes*
- World Health Organization: *Guidance on the WHO review of psychoactive substances for international control*
- International Narcotics bureau board: *Availability of narcotic drugs for medical use*
- Harm Reduction International: *The Death Penalty for Drug Offences: Global Overview 2017 – March 2018 -*
- Catherine A. Hammett - Department of Pathology & Laboratory Medicine University of North Carolina & Lynn R. Webster - Medical Director Lifetree Clinical Research & Pain Clinic Utah: *A Clinical Guide to Urine Drug Testing*
- Federal agency workplace drug testing programs - USA: *Urine Specimen Collection Handbook*
- Gifford Lum & Barry Mushlin - Boston Healthcare System, Boston USA: *Urine Drug Testing: Approaches to Screening and Confirmation Testing*
- Center for substance abuse treatment. Substance abuse & Substance abuse and mental health services administration USA: *Urine collection and testing procedures and alternative methods for monitoring drug use*
- GW Hanks, F de Conno, N Cherny, M Hanna, E Kalso, HJ McQuay, S Mercadante, J Meynadier, P Poulain, C Ripamonti, L Radbruch, J Roca, I Casas, J Sawe, RG Twycross, and V Ventafridda - British Journal of Cancer 2001 Cancer Research Campaign: *Morphine and alternative opioids in cancer pain: the EAPC recommendations*
- Karin J. H. Verweij, Brendan P. Zietsch, Jimmy Z. Liu , Sarah E. Medland, Michael T. Lynskey, Pamela A. F. Madden, Arpana Agrawal, Grant W. Montgomery, Andrew C. Heath 3 & Nicholas G. Martin - Genetic Epidemiology, Molecular Epidemiology, and Queensland Statistical Genetics Laboratories - Queensland Institute of Medical Research, Brisbane, Queensland, Australia 1 - School of Psychology, University of Queensland, Brisbane, Queensland, Australia 2 - Department of Psychiatry, Washington University School of Medicine, St Louis, MO, USA: *No association of candidate genes with cannabis use in a large sample of Australian twin families*
- Jacqueline M. Vink, Behavioural Science Institute, Radboud University, Nijmegen, The Netherlands: *Genetics of addiction: Future focus on gene × environment interaction?*
- Alok Tiwari, Mohammed Moghal, and Luke Meleagros - Journal of the royal society of medicine (UK) : *Life threatening abdominal complications following cocaine abuse*
- International Marine Contractor Association (IMCA): *IMCA SEL 040*

- Goran Ilić, Radovan Karadžić, Lidija Kostić-Banović, Jovan Stojanović - Journal of the royal society of medicine (UK): ***Chronic Intravenous Heroin Abuse: Impact on the liver***
- Terry D. Rees - Baylor College of Dentistry, Dallas, Texas USA: ***Oral Effects of Drug Abuse***
- Benita Tamrazi, Jeevak Almast - Radiological society of North America: ***Imaging of Drug-related Changes in the Central Nervous System***
- National Council on Alcoholism & Drug Dependence - USA: ***Introduction to Drug Screening***
- National Institute of Drug Abuse - USA: ***Impacts of drugs on neurotransmission***
- Catherine Spooner and Kate Hetherington – National Drug and Alcohol Research Centre, University of New South Wales, Sydney, 2004: ***Social Determinants of drug use***
- Encyclopedia of Drugs, Alcohol, and Addictive Behavior - The Gale Group Inc.: ***Drug Testing Methods And Clinical Interpretations Of Test Results***
- Diving Medical Advisory Committee (DMAC): ***DMAC 15***
- United Nations: ***United Nations Convention on the Law of the Sea***
- Bernard Seguy: ***Physiologie - Preparation au diplome d'infirmieres (Physiology - Preparation to Nurse diploma)***
- Pierre Kamina: ***Anatomie (Anatomy)***

Useful websites

- Addiction center - USA (*Fighting of drug abuse*): **<https://www.addictioncenter.com>**
- Pub Chem (*Data base of drugs*): **<https://pubchem.ncbi.nlm.nih.gov/>**
- US National Library Of Medicine (*Medical publications*): **<https://www.nlm.nih.gov/>**
- Drug Abuse.com - USA (*Fighting of drug abuse*): **<https://drugabuse.com/>**
- National Institute of Drug Abuse - USA (*Fighting of drug abuse*) : **<https://www.drugabuse.gov/publications/>**
- Chemistry – Libre texts (*Educational association*): **<https://chem.libretexts.org/>**
- Saylor.com academy (*open online courses*): **<https://www.saylor.org/>**
- Web MD (*Fighting of drug abuse and other deceases*): **<https://www.webmd.com/>**
- Encyclopedia of Drugs, Alcohol, and Addictive Behavior: **<https://www.encyclopedia.com/>**
- Drug Bank database: **<https://www.drugbank.ca/>**
- Prefecture de police - Paris (*Fighting of drug abuse*): **<https://www.prefecturedepolice.interieur.gouv.fr/>**
- Journal of the royal society of medicine - UK (*Medical publications*): **<http://journals.sagepub.com/home/jrs/>**
- The royal society of medicine: **<https://www.rsm.ac.uk/>**
- United nations office on drug and crime: **<http://www.unodc.org/>**
- International Narcotics Control Board: **<http://www.incb.org/>**
- World Health Organization: **<http://www.who.int/>**
- United Nations: **<http://www.un.org/>**



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