THE DETERMINATION AND APPRECIATION OF OCCUPATIONAL TOXICITY AT WORK

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ABSTRACT: *The occupational toxins are those chemicals that workers come into contact with during the exercise of the profession and which under certain conditions have harmful effects on the body. The paper aims to address the determination and assessment of occupational toxicities in a workplace with the aim of ensuring an adequate working enviro nment as well as preventing occupational diseases, accidents and chronic fatigue.*

Keywords: Microclimate, temperature, humidity, air currents

Introduction

Occupational toxins are very dangerous, sometimes even endangering the lives of workers who come into contact with them. [1], [2], [3] For this purpose, warning symbols were developed as shown in Table 1, which warns of the main types of hazards, depending on the specificity of the professional toxicities they are referring to.

Table 1 *The main types of hazards and warning symbols of professional toxins*

Symbolization	Description of the risks
T+  **Very toxic**	Substances and preparations which, by inhalation, ingestion or cutaneous penetration in very small quantities, can cause death or chronic or acute affections of health; Examples: hydrogen cyanide, arsenic anhydride
T  **Toxic**	Substances and preparations which, by inhalation, ingestion or cutaneous penetration in small quantities, may cause death or chronic or acute health conditions; Examples: methanol, benzene, phenol
Xn	Substances and preparations which by inhalation, ingestion or cutaneous penetration can cause death or chronic or acute health conditions; Examples: ethylene glycol, xylene

 **Harmful**	
C  **Corrosive**	Substances and preparations which, in contact with living tissues, exert a destructive action on the latter; Examples: hydrochloric acid with a concentration greater than 25%, sodium hydroxide (caustic soda) with a concentration above 2%.
Xi  Irritating	Non-corrosive substances and preparations which, through immediate, prolonged or repeated contact with the skin or mucous membranes, may cause an inflammatory reaction; May cause inflammation of the skin, mucous membranes, respiratory tract, allergies (sensitizing substances), eczema Examples: ammonia between 5 and 10%, hydrochloric acid between 10 and 25%, acrylates
F+  Extremely flammable	Liquid chemicals and preparations having a very low boiling point and a low boiling point, as well as gaseous substances and preparations which are flammable in contact with air at ambient temperature and pressure; They can ignite under the action of an energy source (flame, spark, etc.) even at temperatures below 0 ° C Examples: hydrogen, acetylene, ethyl ether
F  Highly flammable	Substances and preparations which can be heated and then ignited in contact with air at ambient temperature without energy input; Or solid substances and preparations which can easily ignite after brief contact with a source of ignition and which continue to burn or to be consumed after removal of the source; Or liquid substances and preparations with a very low flash point; Or substances and preparations which, in contact with water or wet air, emit highly flammable gases in dangerous quantities; Examples: acetone, ethyl alcohol.
Flammable	Flammable - Liquid substances and preparations with a low flash point; May ignite under the action of an energy source (flame, spark, etc.) Examples: white-spirit.

E  **Explozive**	Solid, liquid, pasty or gelatinous substances and preparations that can exothermally react in the absence of oxygen in the atmosphere, producing gas emissions immediately and which, under determined conditions, detonate, produce a rapid deflagration or under the effect of heat explodes when they are Partially closed; They can explode either in the presence of a flame or by knocking or rubbing. Examples: nitroglycerin.
O  Oxidizing	Substances and preparations which in contact with other substances, especially those which are flammable, have a strong exothermic reaction; They can release oxygen, causing or burning corrosive substances. Examples: chlorates, nitric acid over 70%, peroxides
<<N  Dangerous for the environment	Substances and preparations which, introduced into the environment, could present or present an immediate or delayed risk to one or more components of the environment; Being in the environment may present a hazard immediately or in time to the aquatic environment, soil, atmosphere or nature in general Examples: lindane

The main routes of entry of the occupational toxicities are by: inhalation, ingestion and contact.

If accidentally dispersed in the environment, occupational toxicity is recommended when calling for the following measures: isolating a leak if this can be done safely; Taking environmental protection measures as well as ventilating the affected area.

Exposure to gas is one of the most common situations in which workers are exposed in the industrial environment.

Description of the appliance

The device used, Testo 327, which is shown in Figure 1, is a portable measurement instrument for gas in apartment houses and methane or liquid fuel burning systems. The instrument is designed in accordance with BS 7967 and has the sealing test facility and CO test function.

Fig.1 *Portable flue gas analyzer*

These systems can be adjusted with testo 327 and checked within the applicable range.

Warning: Testo 327 should not be used in potentially explosive atmospheres Long-term measurements or as a safety tool (alarm)! The Testo 327 with the Bluetooth option can only be used in countries where this feature is approved.

The working and connecting areas of the gas analyzer measuring instrument are shown in Figure 2, as follows:

1: IR interface (327-2: IRDA) for printer connection, ON / OFF switch on / off;
2- symbols displayed
• Battery capacity (: max.,: Empty);
• print function: value transmission;
• Control keys
3-key functions
• Key functions (3x): shows the relevant display functions;
• Up / Down keys: Change display screens;
• screen illumination on / off;
• Menu key;
• Cancel key.
4- TC temperature probe connector, gas sampling probe connector,
Gas outlet, main plug
5 lLateral: The condensate trap window with fill level display
6 on the back: service compartment (battery, measuring cells)
7 on the back: tool mount magnets on surfaces

Fig.2 *Measuring instrument*

The instrument requires detecting probes or sensors that are connected before entering measurement. If the detection is not done, stop the instrument, check the probe connection and then restart.

Experimental determinations

Experimental determinations consist of three phases: the phase of the collection of professional toxins and the phase of their analysis

The Occupational Stage Phase

Before you begin to determine toxics at work, the technological process must be known. On this basis the places, moments and methods of harvesting are established.

The harvesting places (s) are selected taking into account the following:

• at the workplace, where workers are permanently or regularly employed to perform or supervise the production process;

• in close proximity to toxic generating sources;

• the harvesting level is claimed at the workers' respiratory level, so about 1.5 m from the ground.

In cases where the harmful substance is represented by gases or vapors with net densities higher or lower than air, samples are taken at different levels to detect a possible concentration of the toxic at certain levels in the working room.
The harvesting moments depend primarily on the continuous or discontinuous nature of the technological process:
• In uniform technological processes: sampling is done at the beginning, mid and end of the working day;
• In discontinuous technological processes and comprising several phases, each with different operations, samples are taken during each phase of the technological process;
• harvesting must be done at least once in the hot season and once in the cold season; Samples will be taken both during the operation of the ventilation and during its malfunctioning to control the efficiency of the mechanical ventilation system.

With regard to harvesting methods, there are two general methods for harvesting toxic substances from the working atmosphere:
• methods of harvesting in retention devices;
• methods of harvesting in closed capacities of known capacity.

The principle of the harvesting method in containment devices is as follows: the air containing the toxin to be determined is aspirated in an absorbent medium, adsorbant or a filter capable of retaining it. The adsorbent medium is a liquid (water, chemical reagent), the adsorbent medium can be silicon gel, aluminum gel, coal, etc., and different filters are used as the filter media. Absorbent and adsorbent media are used to harvest toxic gases or vapors, and filter media to collect toxic, solid powders.

The harvesting apparatus consists of: air suction devices (vacuum cleaners); Retaining devices: absorbing devices, funnels, alloys; devices for measuring the flow or volume of air: gas meter.

The method of harvesting in closed containers of known capacity consists of introducing air into these vessels. So harvesting from the work area can be done through three processes: liquid displacement; airborne harvesting; and harvesting in vacuum vessels.

Phase of the analysis of professional toxins

For the analysis of professional toxicities, the following methods are used in particular: spectrophotometric methods (colorimetric, turbidimetric, fluorimetric); volumetric (titrimetric) methods; chromatographic methods - in particular gaseous chromatography; electrochemical methods (potentiometric, polarographic, etc.); methods of rapid determination of toxicities: indicative and automated.

The most commonly used methods for the determination of professional toxins are methods of rapid determination.

Indicative methods are based on certain chemical reagents that, in the presence of the substance sought, change color. The device used for this purpose is the Drager apparatus, which is made up of two parts, namely: hand pump and detector tube. The air is sucked through the detector tube - a glass tube filled with an absorbent substance soaked with the

respective color reagent. The color change along the column indicates the presence of toxic in the air and the length of the colored column is proportional to the concentration of the substance. Reading is in ppm (parts per million). Automatic methods use gas analyzers in which, by means of a pump, the air is sucked in and passed through a detector based, in particular, on a physical or physico-chemical principle. The device is coupled with a sound and light warning system.

For the correct interpretation of laboratory data and therefore for risk assessment, the following should be observed:

- the existence, functionality and efficiency of ventilation must be appreciated;
- the microclimate conditions and intensity of physical effort must be known;
- when there is more than one pollutant at the same time (combined, noxious);
- consider their synergistic action, so their combined harm;

In the rules of occupational medicine some chemicals have some indications:
P can enter the body and through the skin and mucous intact;
PC-toxic substances that are potentially carcinogenic;
C-ones that have the marker are carcinogenic;
FP - "very dangerous" substances.

Interpretation of results

The interpretation of the analytical data of the Toxicology Laboratory is an essential milestone for determining the degree of occupational poisoning risk in a workplace.

The time weighted average concentration (CMPT) when there is only one toxic substance at work or more toxic independently effect substances is calculated with relation 1:

$$CMPT = (C_1 \times t_1 + C_2 \times t_2 + C_3 \times t_3 + ... + Cn \times t_n)/(t_1 + t_2 + t_3 + ... + t_n) \quad 1$$

Where: C1, C2 ..., Cn are the average concentrations of the various specific phases of the process, expressed in mg / m3; And t1, t2 ..., tn represents the duration of the different specific phases of the technological process expressed in minutes,

The occupational atmospheric concentrations of air are compared with the maximum permissible concentration or permissible peak concentration, expressed in mg / m3, as prescribed in the occupational health standards.

The maximum permissible CMA concentration on work shift is the mean toxic concentration below which no symptom or sign of disease can be produced which can be accounted for by the most sensitive tests, except in the case of hypersensitivity.

Exceeding CMA by CMPT is expressed in two ways: X and%.

The permissible peak concentration (15 minutes) is the concentration of airborne toxicity in the workplace that should not be exceeded at any time during the workday. When more professional toxic substances are found in the workplace, the relationship 2 is used for the calculation.

$$CMPT_1/ CMAS_1 + CMPT_2/ CMAS_2 + \dots CMPT_n/ CMA_{Sn} \quad 2$$

In which: CMPT1, CMPT2 ..., CMPTn is the air concentration determined for each substance (CMPT), and CMAS1, CMAS2 ... CMASn, is the maximum admissible concentration for each substance on the shift.

This relationship should not exceed 1, overdelivery is expressed in two ways: how many times X and percentage%.

The combined effect of toxic substances may be synergistic or antagonistic. The synergistic effect may be:

• Addition synergy: A + B = AB;

• potency synergism: A + B <AB The antagonistic effect is epimerized by: A + B> AB.

Conclusions

For the correct interpretation of laboratory data and therefore for risk assessment:

• the existence, functionality and efficiency of ventilation must be appreciated;

• the microclimate conditions and intensity of physical effort must be known;

• when there are more pollutants at the same time (combined, noxious, combined), their synergistic action will be taken into account, so their combined harmfulness;

In the rules of occupational medicine some chemicals have certain indications: P - they can enter the body and through the intact skin and mucous membranes; PC - toxic substances that are potentially carcinogenic; C that have the marker are carcinogenic and FP - "very dangerous"

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