

## PREVENTION AND PRE-MEDICAL ASSISTANCE TO VICTIMS OF CARGO FUMIGATION WORK

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### Abstract

Ukraine is one of the recognized world leaders in grain exports, the volume of which and the geography of supplies are steadily increasing (3rd place in the world after the United States and the European Union).

Of particular difficulty is cargo fumigation in the holds of sea vessels, containers, port warehouses and grain elevators, as well as other transport facilities.

Along with other health risks to which cargo seafarers are already exposed, workers who fumigate cargo have an increased risk of poisoning and death.

Acute fumigant poisoning is often accompanied by dangerous breathing, blood circulation, and liver function disorders and requires urgent, urgent measures that should begin even before the doctor arrives, when providing first aid to the victim.

The aim of the work was to develop preventive measures and a combination of drugs for the provision of first aid in case of phosphine poisoning.

The authors offer a number of preventive measures and first aid kit complete set of first aid in case of poisoning with fumigants.

**Keywords:** *cargo fumigation, prevention, phosphine poisoning, first aid kit*

## Introduction

Ukraine is one of the recognized world leaders in grain exports, the volume of which and the geography of supplies are steadily increasing (3rd place in the world after the United States and the European Union) [1-3].

Of particular difficulty is cargo fumigation in the holds of sea vessels, containers, port warehouses and grain elevators, as well as other transport facilities.

Along with other health risks (Figure 1) to which cargo seafarers are already exposed, workers who fumigate cargo have an increased risk of poisoning and death [4, 5].

Phosphine, methyl bromide, sulfur dioxide, carbon dioxide are used to neutralize quarantine cargoes from insects on ships and in ports. Depending on the amount of poison entering the body per unit of time, acute or chronic poisoning develops. Acute poisoning usually occurs immediately following the action of large doses of fumigation poison and is often accompanied by dysfunction of vital organs and systems. Chronic poisoning occurs as a result of prolonged exposure to poison in small doses or concentrations. In this case, there is an accumulation in the body of a toxic chemical or the consequences of its effects [6-10].

Diseases are caused by the direct effect of pesticides on the skin, mucous membranes of the nasopharynx and oral cavity, respiratory tract, mucous membranes of the stomach and small intestine.

Damage to the respiratory tract, liver, kidneys, central and peripheral nervous, cardiovascular and other body systems occurs as a result of a general toxic effect caused by inhalation, ingestion, ingestion of fumigants through the skin and mucous membranes.

The aim of the work was to develop preventive measures and a combination of drugs for the provision of first aid in case of phosphine poisoning.

## Results

The relevance and necessity of creating a combination of drugs for the provision of pre-medical and medical care is confirmed by the fact that in the period from 2006 to 2019, only among the seafarers engaged in the carriage of phosphine-

fumigated cargo on ships of the "river-sea" and "handysign" type, there were about 50 cases acute poisoning and 12 cases of death of sailors in the ports of the Black, Caspian and Mediterranean seas.

The results of many years of observations, research work and data from investigations of infrequent cases during the transportation of fumigated regulated cargo on ships of the bulk fleet ("Shachtar", "Roksolana-1", "St. Stephan", "Trady Unity" in the ports of Ukraine, "Nefrit "In Cote D, Voir," Ulus Sky "in Russia) allow to systematize and describe the most probable risks for workers of fumigation teams during fumigation work on board the vessel and offer specific recommendations to eliminate or minimize the following risks:

- risk of phosphine poisoning of cargo fumigators
- risk of phosphine poisoning of crew members
- risk of burns when ignited fumigation preparations

- the risk of biological action of hazardous factors during fumigation of grain cargo. In addition to the risk of biological effects of grain cargo on seafarers and marine fumigators, preparation for transportation and transportation of fumigated feed cargo (sunflower, rapeseed, corn, cotton cake) is associated with a dangerous risk of damage to the body by pathogens of infectious diseases of the group of intestinal pathogenic bacteria that cause colibacillosis and salmonellosis: high fever, headache, weakness, abdominal pain, vomiting, diarrhea. The biological effect of the fumigation gas of phosphorous hydrogen (phosphine) is a predominantly nerve poison that also affects the respiratory system, liver, kidneys, and gastrointestinal tract. The damaging biological effect of preparations of carbon dioxide, methyl bromide, carbon tetrachloride and carbon disulfide is not considered, since they have practically lost their importance as fumigants for the disinfection of grain cargo in the fleet.

- risk of mental health problems
- risk of exposure to sea waves and seasickness on fumigators

Acute fumigant poisoning is often accompanied by dangerous breathing, blood circulation, and liver function disorders and requires urgent, urgent measures that should begin even before the doctor arrives, when providing first aid to the victim.

## Conclusions

Basic principles of first aid for acute poisoning:

1. cessation of the intake of poison into the body (put on a gas mask, remove the victim from the zone of poisoning, remove contaminated clothing, remove poison from the skin or mucous membranes);
2. Restoration of impaired body functions and maintenance of life (artificial respiration, heart massage);
3. excretion of poison from the body (gastric lavage, emetics, adsorbents);
4. use of appropriate antidotes and medications that enhance the body's defenses.

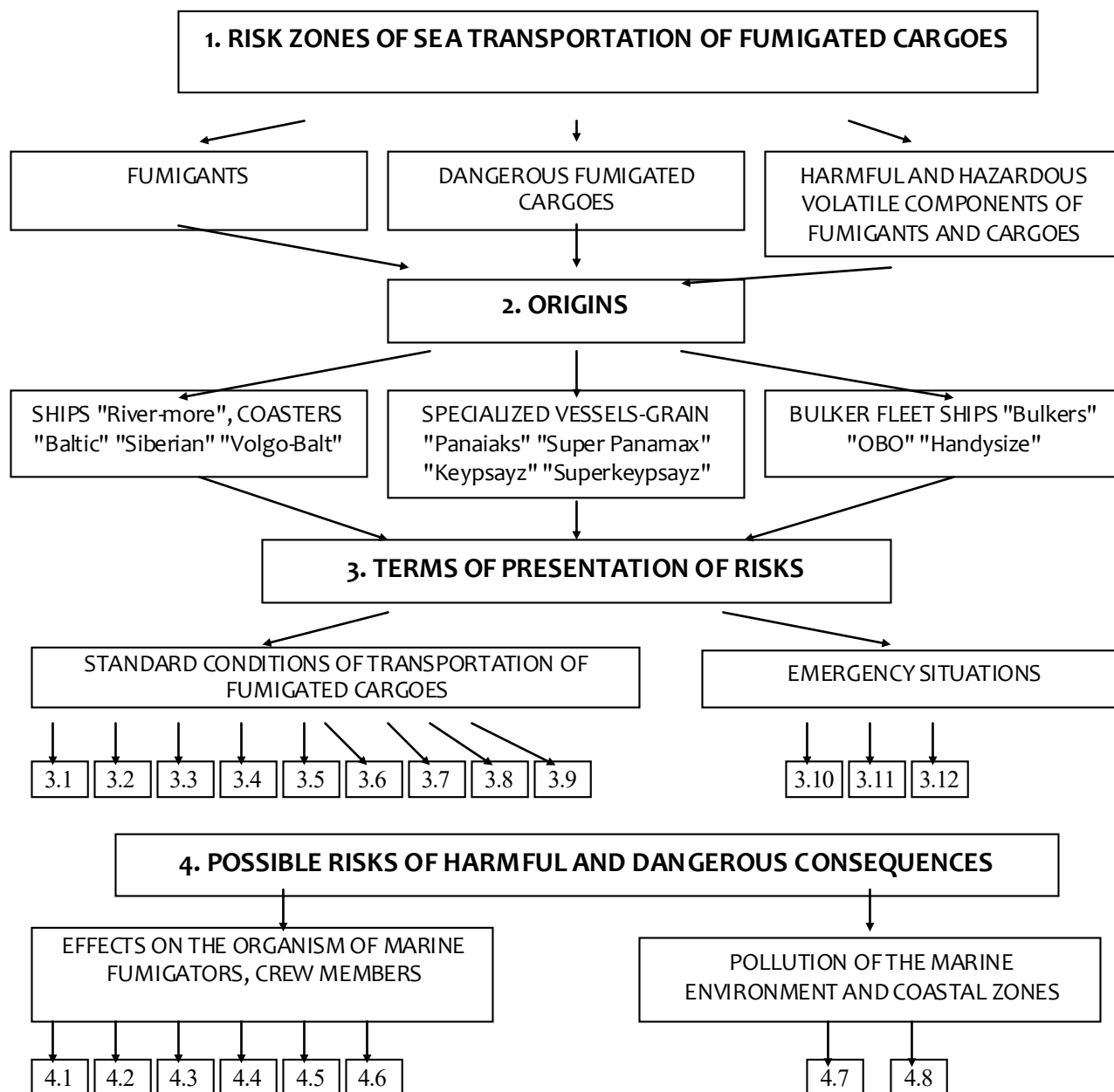
In order to improve the effectiveness of the provision of medical care in case of phosphine poisoning on board the vessel, it has been developed and proposed for use by marine fumigators and sailors «Special Medical Chest at Phosphine Poisoning on Board of the Ship» (Table 1).

## Acknowledgments

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## Denotation

- 3.1 Falling overboard and drowning
- 3.2 Drowning in the grain
- 3.3 Danger of closed rooms
- 3.4 Falls and serious injuries on the cargo deck
- 3.5 Fall from vertical ladders in the hold, overboard
- 3.6 Phosphine poisoning of marine fumigators
- 3.7 Biological action of grain cargo
- 3.8 Seasickness in fumigators
- 3.9 Violation of the mental state
- 3.10 Poisoning of sailors from phosphine leaks from holds
- 3.11 Injury and poisoning from explosions of phosphine
- 3.12 Burns from fires of fumigants in holds

- 4.1 Acute phosphine poisoning
- 4.2 Mass poisoning and death
- 4.3 Severe head and body injuries
- 4.4 Diseases
- 4.5 Decreased adaptive and immune forces of the body
- 4.6 Pre-pathology
- 4.7 Dangerous ingestion of poisonous fumigants and packaging waste into the sea
- 4.8 Dangerous consequences of the action of packaging and waste products

**Figure 1.** Diagram of the risk zone for the hazard of sea transportation of fumigated cargo on ships

**Table 1.** Complete set «Special Medical Chest at Phosphine Poisoning on Board of the Ship»

Name of product	Packing	Quantity, pcs.
<b>1. Antishock, cardiac, antispasmodic, sedative</b>		
Beklazon - EKO metered manual inhaler	pack	2
Valocordin solution in a dropper bottle	bottle	2
Adaptol tablets, 20 tablets per pack	pack	2
Mezaton, phenylephrine 1% – 1 ml*	ampule	20
Prednisolone 1,0 ml*	ampule	6
Reopolyglyukin 200 ml*	bottle	4
<b>2. Anti-inflammatory, antiseptic</b>		
Thiotriazoline 0,5 ml eye drops in a dropper bottle	bottle	2
Olazol aerosol with dispenser	spray	1
Biosept solution – 50 ml*	bottle	1
<b>3. Aids</b>		
Ammonia solution 10% - 1 ml	ampule	10
<b>4. Means for applying bandages</b>		
sterile bandage (5 sm x 5 m)	pack	3
non-sterile bandage (5 cm x 5 m)	pack	3
sterile medium gauze wipes	pack	3
non-sterile cotton wool 50 g	pack	1
scissors	-	1
<b>5. Means for injection and transfusion of anti-shock solutions</b>		
system for blood transfusion and solutions*	pack	3
sterile disposable syringes –5,0 ml*	-	10
<b>6. Means for dosing and receiving liquids and solutions</b>		
graduated plastic bottle 30,0 ml	PCS.	1
<b>Notes:</b> 1. The medical supplies, syringes and blood transfusion system marked with an asterisk are only used by emergency medical personnel who have arrived at the call of the Marine Fumigation Team, or by a ship officer who is medically trained if phosphine poisoning occurs during fumigation on board. 2. Completion is allowed only in marine fumigation squads and ship pharmacies.		