

Civil Protection in Mass Methanol Poisoning in the Czech Republic

Michaela Vašková, Jan Hrdlička, Otakar J. Mika, Jiří Barta, Gabriela Clemensová

Abstract—The paper is focused on the methods to solutions of the crisis situation in the Czech Republic associated with the mass methanol poisoning. The emphasis is put on tasks of individual state bodies and of Integrated Rescue System during the handling of the crisis.

The theoretical part describes poisonings, ways of intoxication, types of intoxicants and cases of mass poisoning by dangerous substances in the world.

The practical part describes the development, causes and solutions of extraordinary event, mass methanol poisoning in the Czech Republic. The main emphasis was put on the crisis management of the Czech Republic in solving this situation.

Keywords—Crisis management, poisoning, methanol, hazardous substances, extraordinary event.

I. INTRODUCTION

IN September 2012 a very dangerous affair, associated with unauthorized and hazardous use of methanol in distillates and spirits, broke out in the Czech Republic. Because it failed to reveal the origin of methanol in drinking alcohol immediately, the first victims succumbed to this insidious killer. Unfortunately, some victims suffered very severe permanent health impairment – the loss of eyesight. The health conditions of a number of victims were critical for a long time and required a long-term intensive hospital treatment or they succumbed to poisoning.

To illustrate the seriousness of the situation can be noted that in earlier classifications of the national standards was methanol marked as a very hazardous poison. Current national legislation surprisingly classifies this very hazardous chemical only as toxic. Nevertheless the case of mass methanol poisoning in the Czech Republic was not finished because more sporadic cases of poisoning by this substance still occur (April 30, 2014).

A total of 15,000 litres of contaminated alcohol was produced. The amount of produced mixture could poison up to 158,000 people. It is estimated that over 2,000 litres of malicious alcohol has not been found yet. [1]

M. Vašková, J. Barta, and J. Hrdlička are with the Department of Emergency Management, University of Defence, Brno, Czech Republic (e-mail: michaela.vaskova@unob.cz, jiri.barta@unob.cz, jan.hrdlička@unob.cz).

O. J. Mika is with the Department of Logistics and Emergency Management, University of Tomáš Baťa in Zlín, Uherské Hradiště, Czech Republic (e-mail: mika@flkr.utb.cz).

G. Clemensová is with the Department of Chemistry and Technology of Environmental Protection, University of Technology, Brno, Czech Republic (e-mail: clemensova@fch.vutbr.cz).

II. THE THEORETICAL PART

A. Methanol – Hazardous Substance

Methanol also known as methyl alcohol or wood alcohol is the simplest aliphatic hydrocarbon. It is a clear, volatile liquid with a boiling point of 64.7°C. Methanol is highly toxic, volatile and flammable, and its vapors are explosive.

Not only Czech toxicological literature warns that the biggest hazards of methanol are determined by its easy interchangeability with ethanol on the base of its smell, taste, colour and viscosity. It is necessary to realize that these substances have similar molecules and that it is difficult to distinguish pure methanol from ethanol. This similarity has caused countless tragedies. In the last 10 years there have been reported 55 cases. [2], [3]

A lethal dose of methanol is 30 ml, but a dose of 5-20 ml can already cause serious health problems. [3]

Methanol itself is a natural part of nature spirits, such as in plum and apricot brandy, calvados, etc. European and Czech national standard stipulates that liter of pure alcohol (ethanol) can contain a maximum of 12 g of methanol. The presence of methanol in fruit spirits is completely natural and expected, but only in small quantities. In compliance with only the basic rules and principles of distillation is essentially not possible to contain dangerous amounts of methanol. Estimated and safe amount of methanol in natural distillates is about 1%. This amount is considered to be completely safe.

B. Methanol Poisonings in Europe

The mass methanol poisoning in the Czech Republic is not the only case of methanol poisoning in Europe or in the world. Really original in the Czech case was that methanol was obtained legally, because of the change of classification from very hazardous poison to toxic substance.

In September 2001 the mass methanol poisoning broke out in the south-western part of Estonia. These accidents were caused by illegally produced alcoholic beverages containing 50-100% of methanol. In most cases methanol was diluted with water. Methanol was stolen from the stores of the company Baltfett. The number of the stolen 200-litter barrels totaled 10. Methanol was sold for 76,000 Estonian croons to illegal producers of alcohol. The two major offenders, who participated in the adulterated, were sentenced to five and two and a half years in prison.

The hospital received a total of 141 handicapped with suspicion of methanol poisoning, at 36 people was not methanol detected. Finally, total number of methanol victims climbed to 154, of which 69 % were men. The most frequently represented age group was the group at the age of 50-60 years

(37%). [4]

Patients were treated with infusions of NaHCO_3 , ethanol, dialysis and mechanical ventilation. Lack of experience with the treatment of methanol poisoning caused considerable problems. The only literature dealing with this issue was the work from 1943, which dealt with visual impairments in those exposed individuals.

A lot of institutions and bodies of state authorities and self-government had participated to face this extraordinary event. The main authorities involved in dealing of the extraordinary event include:

- The Ministry of Social Affairs,
- Ministry of Interior,
- Ministry of Health,
- Other relevant authorities (Police, Customs Service hospitals, hygiene management, regional authorities, ...).

[5]

The Solution of extraordinary event:

- warning and informing the population about emergencies - all media and press,
- medical checks for people who ingested contaminated alcohol,
- police investigation → closure of the black market, trying to find the source of methanol and potential perpetrators, all perpetrators responsible for the sale of contaminated alcohol were arrested and punished, find and destroy the source of methanol and the black market,
- cooperation with other countries (especially from a medical point of view). [5]

The emergency plan was established for better preparedness of authorities for the extraordinary event, of mass poisoning type. [5]

In 2007, Estonia was made a study on the state of people, who were affected by methanol poisoning in 2001, after the six years expiration. From the 86 survived patients 26 died (30%), 33 patients (38%) could not be traced for the purpose of the study. [5]

In Norway, methanol poisoning has been reported three times. First time in 1979, when methanol poisoned 33 people, three of them died. The second case of mass methanol poisoning was recorded in 2002 and lasted to 2004. During this period, there were recorded 59 poisonings, of which 17 were fatal. The case of mass poisoning methanol from 2002 to 2004 is one of the most known cases of methanol poisoning in the world. The last case of mass methanol poisoning in Norway was recorded between 2007 and 2008, when as a result of methanol ingestion 4 people died. Alcoholic beverages containing 30% methanol and 70% ethanol were produced in Sweden and in Norway sold by one of the retail chains. [6]

The case of methanol poisonings in Norway (2002 - 2004) is one of the cases with the greatest impact. Drinks were brought into the country illegally and sold in 10 liter plastic bottles, later in bottles similar to the original beverage bottles. Patients received ethanol or fomepizole as a medicament (it was the first time, when fomepizole was used).

As one of the main causes of mass methanol poisoning in

Norway was undoubtedly the economic advantage of using methanol. The price of methanol is significantly lower than the price of ethanol, so the confusion brings profit. The high price of alcoholic beverages in the country makes another reason for methanol poisoning. The tax imposed on alcoholic beverages in Norway is the second highest in the world, after Iceland. [6]

Authorities involved in the solution of extraordinary event:

- Ministry of Health,
- Police, Customs Administration,
- National Control Centre poisoning ("PCC"),
- Specialists from the Department of Acute Medicine, Oslo University Hospital. [7]

The solution of extraordinary event:

- warning the population about the harmful effect of products contaminated by methanol,
- providing information about course and development of the extraordinary event - media, press, website of PCC,
- using procedures according to experience from the extraordinary event in 1979,
- cooperation with foreign countries.

Preparation for the next extraordinary event:

- seminars for doctors (still ongoing, irregularly)
- preparation of the plan of action of hospital facilities, center of Chemical, Biological, Radiological and Nuclear Defence ("CBRN") and the government in case of mass poisoning by hazardous substance,
- improving cooperation between PCC, Norwegian CBRN, government and hospitals,
- monitoring of cases of mass poisoning abroad. [7]

In recent years the mass methanol poisoning was recorded twice in Turkey. The first time in 2005, the second time in 2011. In March 2005, 44 men were taken to hospitals in Istanbul. The source of poisoning in Istanbul was illegally produced alcoholic beverage "anisette". For over 20 people was poisoning fatal. For threaten of public health were three men, who produced and distributed poisoned drink, sentenced to 8 years in prison. [8], [9]

The second case of mass methanol poisoning in Turkey happened at the end of May 2011 during a party on a cruise from Bodrum to Antalya. As a result of methanol poisoning 4 people died and another 22 were hospitalized. The victims were mostly women of Russian nationality, who during the voyage drank whiskey with Coca-Cola. [8], [9]

Turkish police investigation revealed that alcohol was served while sailing, namely whiskey from Jasmine company, which was contaminated by methanol. There were totally confiscated 12,000 dangerous bottles. Poisoned alcohol was imported to Turkey from Cyprus. [8], [9]

III. METHODS

This paper uses the basic methods of scientific work, especially the analytic-synthetic method. As the investigated area is very large, it was necessary to separate the irrelevant information from the essential issues.

The theoretical part uses the method of literature review that summed up the knowledge of the subject matter.

The practical part of the work uses mainly the method of comparison, especially when comparing mass poisoning data in the Czech Republic and abroad.

IV. THE PRACTICAL PART

A. Mass Methanol Poisoning in the Czech Republic

In the period from 1. 9. 2014 to 10. 1. 2014 136 cases of methanol poisoning were recorded in the Czech Republic. Up to 31. 3. 2014 52 people died as a result of ingestion of contaminated alcohol. [1]

The following long-term police investigation revealed that if all Czech bootleg alcohol had been sold in shops and pubs, it would have been enough to kill 158,000 people. This is only a theoretical number; however, it certainly possesses its informative value too. [1]

The mass methanol poisoning of the Czech population uncovered the existence of sophisticated illegal bootleg alcohol market in the country. The police investigation discovered hiding places sealed with concrete the purpose of which was to save 3 million litres of pure ethanol for rainy days.

B. Activity of Chemical Laboratories of Fire and Rescue Service

The activity of Fire and Rescue Service chemical laboratories was launched on 12. 9. 2012 by document, which was sent by the Operational Information Centre of the General Directorate of Fire and Rescue Service. The operating Centre mobilized all its laboratories which were turned into the mode of continuous services. This day is the beginning of the preparations for receiving the large number of samples and the preparation of the methods for each device. It was done concurrently with the development of the methodology for flagship Gas chromatography supplemented with Mass spectrometry (GS / MS) the methodology for Infrared Spectroscopy with Fourier transformation (FTIR) and Raman spectrometer. The First Defender was developed, which is available not only for all the laboratories of Fire and Rescue Service of Czech Republic, but also for the individual regional fire stations. The intake system for a large number of samples was also developed and a special department for their income was established.

In this paper we focused on the activity of specific chemical laboratory of Fire and Rescue Service in Tišnov. On 13. 9. 2012 this laboratory received the first samples that were immediately analysed by gas chromatograph with mass detector (GC / MS), infrared Fourier transform spectrometer (FTIR) and Raman spectroscopy. [10]

From 11. 9. 2012 to mid-January of 2013 2,773 samples of alcoholic beverages were analysed to detect the presence of methanol. The laboratory in Tišnov analyzed 1,159 samples. However, these numbers are not final, as the samples suspected of being contaminated with methanol continue to come to the laboratories of The Fire Rescue Service [10].

In the first days, the chemical laboratory in Tišnov developed a reliable method to detect the health-threatening concentrations of methanol in alcoholic beverages using

Raman spectrometer The First Defender XL. Since the detection limit of this method is too high, it is not able to detect the methanol concentration at the level of food legislation, which determines the concentration of methanol depending on the type of alcoholic beverage in the range of 0.5-12 g / L of methanol converted to absolute alcohol, the more sensitive method using vice Gasmet DX-4015 was developed. [10]

C. Course of the Extraordinary Event of Mass Methanol Poisoning and Taken Measures

From 6 September 2012, the first officially confirmed reports of methanol poisoning appeared and the Ministry of Health began to deal with this situation. From 10. 10. 2012 the emergency inspection began focusing on origin of the alcohol and controlling the documentation. The control of public health authorities focused mainly on alcoholic beverages offered in mass catering establishments. The control included:

- The regional health departments,
- State Agricultural and Food Inspection
- Czech Trade Inspection
- Customs Administration,
- Laboratories of Fire and Rescue Service (the "FRS"). [11]

The day after, on September 11, the Ministry of Health issued warning, which alerted the public against consumption of alcoholic beverages that are not clear and guaranteed origin, due to the increasing number of cases of methyl alcohol poisonings. Warning was followed by a summary of information and instruction how to proceed in case of suspected methanol poisoning. [11]

On 12 September 2012, due to the increasing number of poisonings and the growing severity of the problem, the Ministry of Health decided to issue emergency measures. The taken measures were announced by the former Minister of Health Leos Heger in the nationwide television and radio broadcasts. [11]

"Operators of food stalls, mobile kiosks and other mobile and temporary operations are prohibited to sale spirits and rum-type spirits with alcohol content over 30 per cent of alcohol until the revocation of this emergency measures". [11]

At the same time Government Decree no. 675 of 2012 established the Temporary Crisis Staff. The primary task of the Crisis Staff was regular assessment of the situation and the effectiveness of implemented measures. Working groups were established at the regional level, their members were representatives of the Regional Health, the State Agricultural and Food Inspection Authority, Fire Brigade, Police and representatives of regional authorities, the Department of Health, Department of Emergency Management and trade unions. The activities of the working groups were coordinated by the instructed heads of regional hygienic stations. The working groups met initially several times a day, then according to the needs and the situation changes. Checks carried out by public health authorities were focused not only on the compliance with emergency measures, but also on the control of the acquisition of spirits. Controls were specifically targeted to questionable establishments and especially on stalls, an establishment of "lower" price, casinos, bars and

pubs, where spirits are the parts of the main menus. [11]

Measures to prevent mitigate or complete elimination of the emergency was divided into short and long term.

1. Short-term measures:

- organizational,
- safety,
- control - (increased controls regulatory bodies, the creation of test sites for the population, which can be used free of charge test "suspect alcohol")
- information - challenges and informing the population through all available means of communication is a serious risk (television, radio, newspapers, local radio, websites, etc.).
- publication of a limited prohibition on the sale and administration of "schnapps" was another quick and effective measure to deal with the difficult situation.

2. Long-term measures:

- implementing controls of the amount of methanol in the Czech Republic and in the EU,
- controls on trade with methanol,
- improving cooperation and coordination with community groups representing the catering industry and organizations representing the business sector,
- common inspections of control bodies and stakeholders, cooperation with the private sector,
- legislative measures:
 - the sale of alcoholic beverages exclusively in specialized stores,
 - the licensed sale,
 - about QR codes
- the "birth certificates" of alcoholic beverages,
- the establishment of a new body, the elements in ensuring the protection of the public against poisoning,
- informing the population about the harmful effects of hazardous substances,
- preventive and educational activities - prevention is one of the most important aspects in the preventing incidents. It is based on:
 - the public awareness of the toxicity of the substance, its effects the on the organism;
 - the health and safety principles when working with methanol;
 - education of the population regarding the illegal production of spirits;
 - the first aid for poisoning;
 - knowledge the emergency numbers;
 - preventive and educational activities in the problems of alcoholism.
- design the model action plan.

Certainly by the long-term measures should be reinstated methanol between particularly dangerous poisons, as it was in the previous years. This would lead to the improvement of accounting and control movement of the substance.

V.CONCLUSION

The paper approaches the problem of mass methanol poisoning in the Czech Republic. The theoretical part

describes the experiences with solving methanol poisonings in selected European countries, with an emphasis on the experience with solving this extraordinary event by emergency management authorities. The emphasis was put on solving the extraordinary event from position of crisis management. The main part is focused on the activities of the authorities in dealing with the crisis in the Czech Republic. There were identified short-term and long-term measures for prevention, preparedness and solutions of emergency situation. The most important measures are in the short and long terms are, in our view, control and information measures and the classification of methanol as one of the very hazardous poisons.

Another benefit of this paper was a modification of the method semi-quantitative determination of methanol in the spirits.

The toxicity of methanol is the dominant and most dangerous property of chemical substances. The case of mass methanol poisoning in the Czech Republic has illuminated many serious professional failings of both the state and its institutions.

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REFERENCES

- [1] Police Presidium of the Czech Republic. Methanol: Summary report on the performance of the main priorities in the Czech Republic for the year 2013. Prague, 2014.
- [2] Oslo University Hospital. Methanol poisoning outbreaks: Rapid diagnosis and management. Oslo, 2011. Available from: <http://www.docstoc.com/docs/136733967/Methanol-poisoning-outbreaks---Rapiddiagnosis-and-management-CC>
- [3] Marhold J.: Summary of of Industrial Toxicology, Organic Substances, Volume 1, AVICENUM - Medical Publishing House, Prague 1986.
- [4] Methanol mass poisoning in Estonia: Outbreak in 154 patients. Pärnu: Informa Healthcare, 2007.
- [5] Paasma, Raido. Methanol poisoning in Estonia. Personal communication. Hospital Pärnu.2014.
- [6] Journal of Internal Medicine. Methanol outbreak in Norway 2002–2004. 2005. Available from: <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2796.2005.01521.x/pdf>.
- [7] Hovda, Knut Erik. Methanol poisonings in Norway. Personal communication. Oslo University hospital. 2014
- [8] Unsal, Abdulkadir, Taner Basturk, Tamer Sakac, Elbis Ahbap, Yener Koç a Mürvet Yilmaz. Epidemic Acute Methanol Intoxication as a Result of Illicit Alcohol Ingestion. Nephro-Urology Monthly. 2011-11-18, vol. 4, issue 1, s. 366-371. DOI: 10.5812/kowsar.22517006.1522. Available from: <http://www.numonthly.com/?page=article>
- [9] Surrogate alcohol kills two Russian tourists in Turkey's Bodrum. English pravda.ru: Russian news and analysis (online). 2011 (2014-04-21). Available from: http://english.pravda.ru/hotspots/crimes/02-06-2011/118097-turkey_bodrum-0/
- [10] Hrdlička, Jan. Possibilities of using a special monitoring vehicle of the Fire and Rescue Service of the Czech Republic in the tasks chemical reconnaissance. Brno, 2014. Doctoral thesis. University of defense. Supervisor doc. Ing. Josef Kellner CSc.

- [11] Arnotová, Kateřina. Security Policy Department, Security threats and crisis management department. Ministry of Interior. Personal communication. 2013.