VIỆN KIỂM NGHIỆM AN TOÀN VỆ SINH THỰC PHẨM QUỐC GIA
NATIONAL INSTITUTE FOR FOOD CONTROL

Study case 1:
Acute poisoning in Vietnam caused by adulteration of alcoholic drinks with Acetonitrile

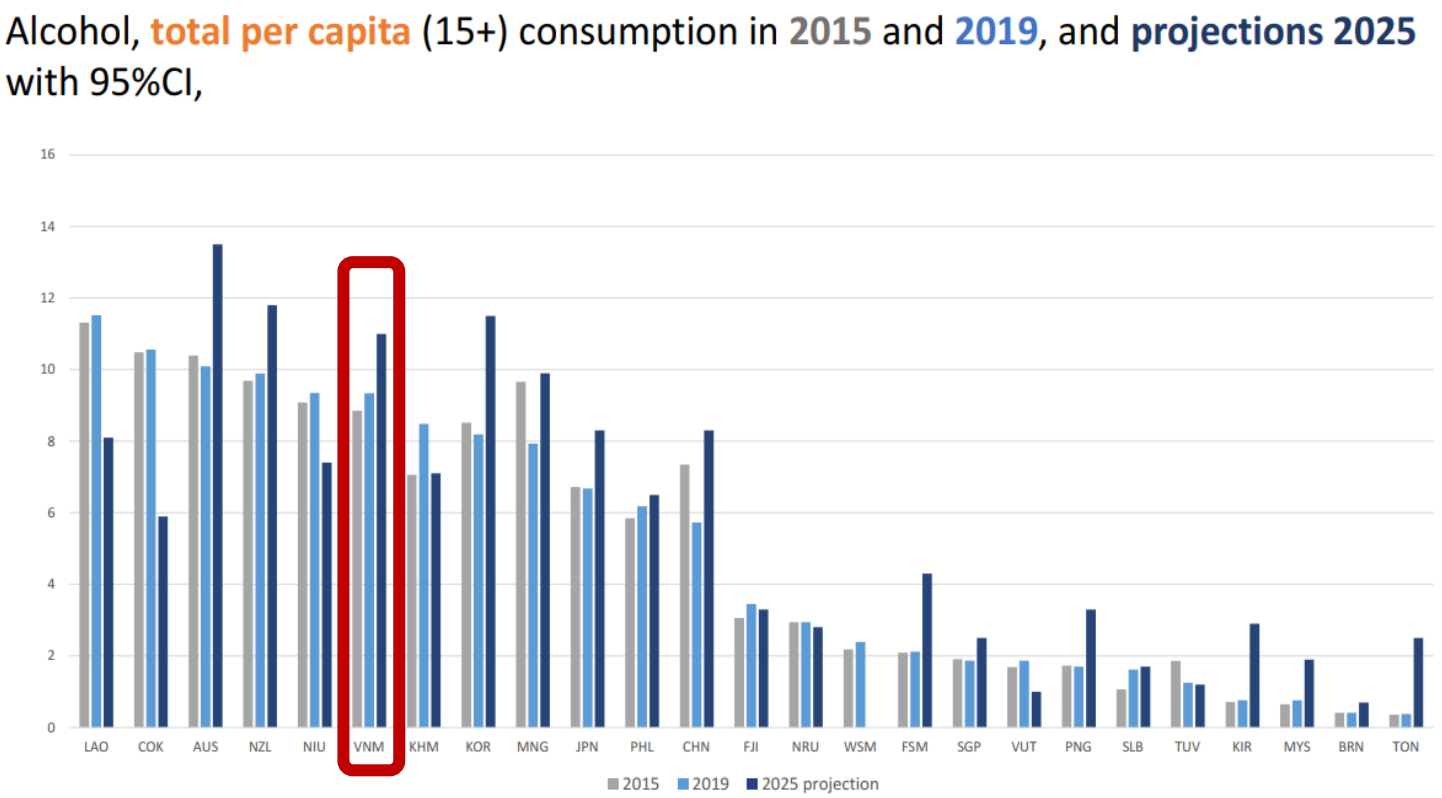
Hanoi Department of Food Safety
National Institute for Food Control

CONTENTS

1. Overview of the poisoning event
2. Subclinical characteristics and analytical methods
3. Discussion and recommendations

Alcohol poisoning– A Public health issues

- Alcohol is widely consumed in many countries→ increased poisoning rates
- May be rapidly fatal
- Typically easily identifiable



Source: https://www.who.int/data/gho/data/themes/topics/sdg-target-3_5-substance-abuse

Challenges in identification of causative agents of alcohol poisoning

- The trigger is not always clear
- Symptoms may be atypical
- May involve chemicals other than food

The role of non-target screening

- Detection of off-list substances
- Independence from initial assumptions
- Applicability in complex cases

Clinical course and contextual background of the poisoning incident

19th Dec 2024 - Hanoi

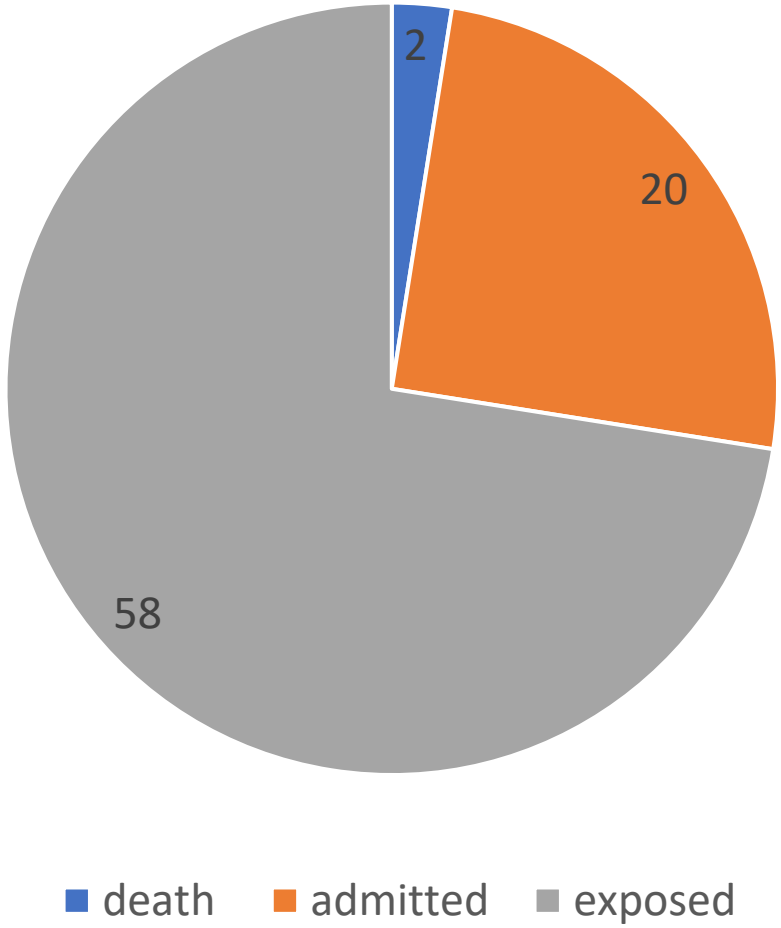
Catering dishes prepared by the conference center kitchen

Client-supplied alcohol (feed company), stored in three containers

Magnitude and epidemiological indicators

Poisoning case statistics:

- **80 individuals** involved
- **2 fatalities**
- **20 hospital admissions**
- 27 individuals with potential alcohol consumption



Clinical symptom characteristics

Headache, dizziness

Nausea, vomiting

Metabolic acidosis

Severe stage (ICU)

Respiratory failure

Disease progression

Mild → Moderate → Severe

Typical clinical features: Metabolic acidosis with respiratory involvement

Initial hypotheses on the causative factors

- Methanol Suspected
- Consistent with alcohol-related exposure context
- However, atypical clinical presentation

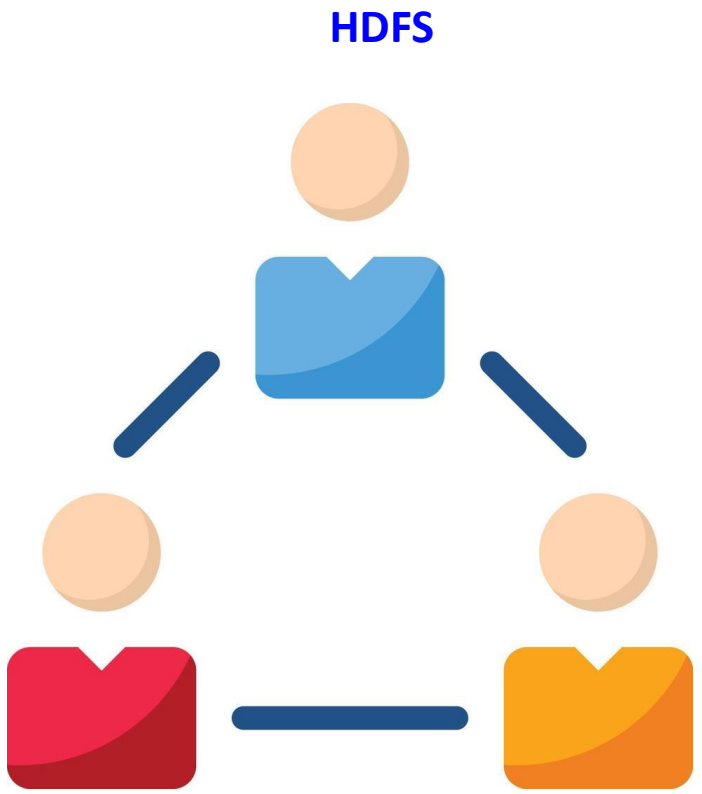
Characteristics	Methanol	Agent X
Mechanism	→ formic acid	???
Metabolic acidosis	Peak 12 – 24h	6 – 24 hours, extended
Characteristic clinical manifestations	visual damage	Cellular hypoxia

→ Initial hypothesis insufficiently robust

Epidemiological investigation design

- Rapid epidemiological investigation (within 24 hours)
- Participant interviews (within 24 hours)
- Biological specimen collection (24–48 hours)
- Multi-agency coordination

→ Rapid deployment with multi-source data integration

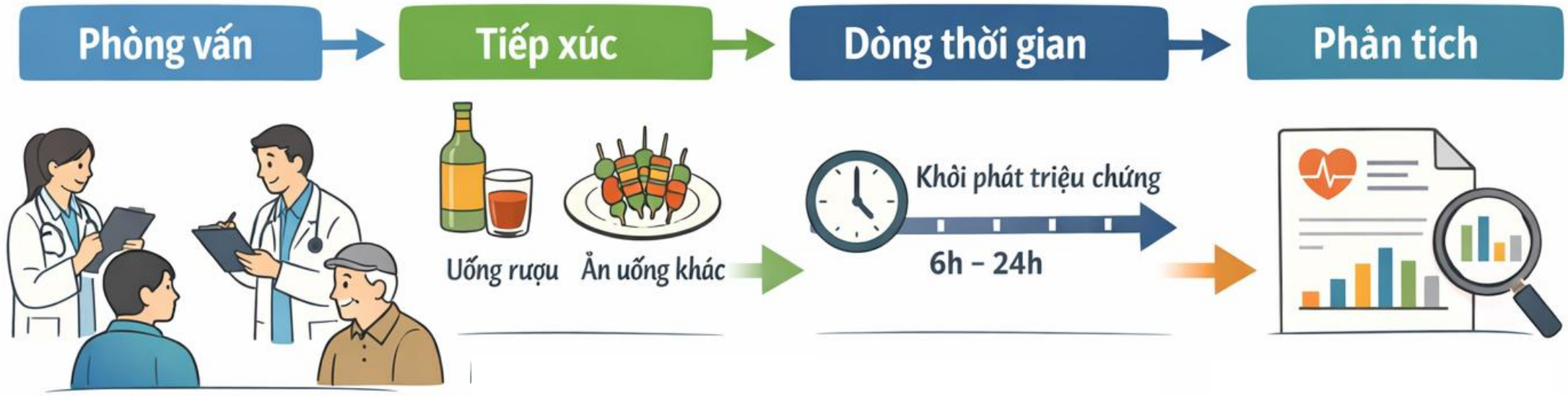


Exposure data collection and analysis

Exposure profile reconstruction

- Dietary intake information
- Symptom onset timing
- Symptoms
- Medical records

Bệnh nhân trong sự cố an toàn thực phẩm tại một Trung tâm hội nghị ở Quận Long Biên (Hà Nội) điều trị tại Bệnh viện Bạch Mai.



Comparison of alcohol use and non-alcohol use groups

- **Alcohol-consuming group: symptomatic**
- **Non-alcohol-consuming group: asymptomatic**
- Clear association identified
- Alcohol as the primary risk factor

Client-supplied alcohol stored in three containers

Identifying the source of the initial suspicion

- Externally sourced alcohol
- Outside restaurant control
- Sole distinguishing factor
- Risk source outside the controlled supply chain

Client-supplied alcohol stored in three containers

Food safety condition assessment

- According to inspection by the Hanoi Sub-Department of Food Safety:

  The restaurant met food safety requirements; no violations detected

- According to analytical results from the National Institute for Food Safety Control:

  No foodborne hazards detected

→ Exclusion of foodborne source as the cause

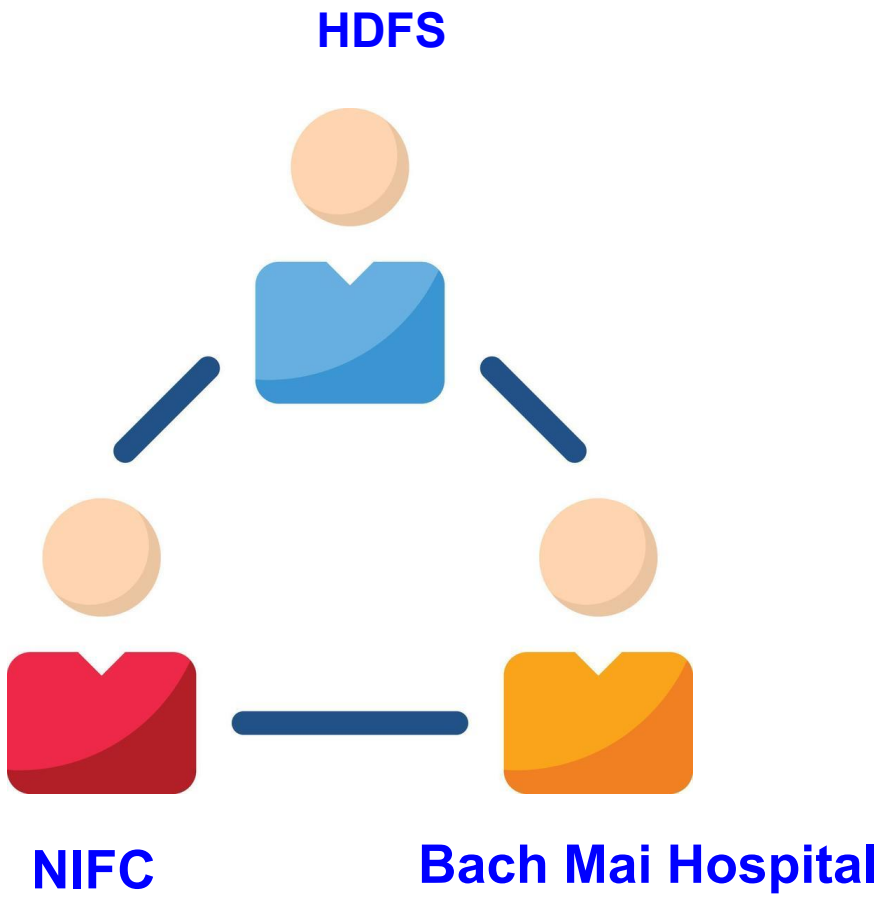
Multisectoral coordination in outbreak investigation and response

•Hospitals: case admission, treatment, and clinical assessment

•HDFS: epidemiological investigation

•NIFC: laboratory analysis

→ Timely information sharing and coordination as the critical determinant



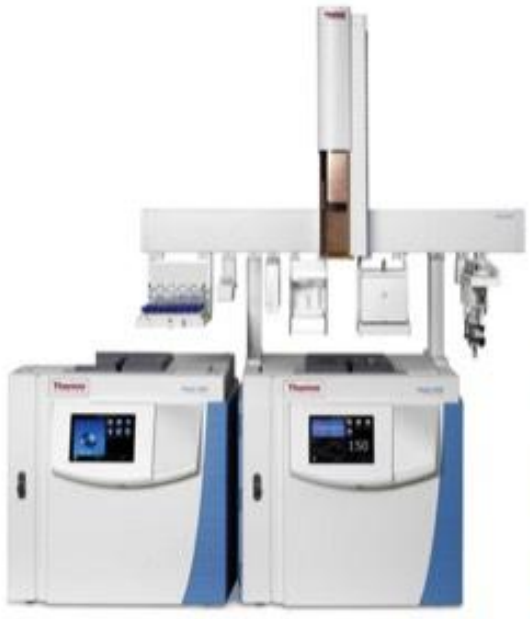
Sample analysis in poisoning investigations

- Alcohol sample analysis
- Integration of multiple analytical methods
- Priority on rapid detection

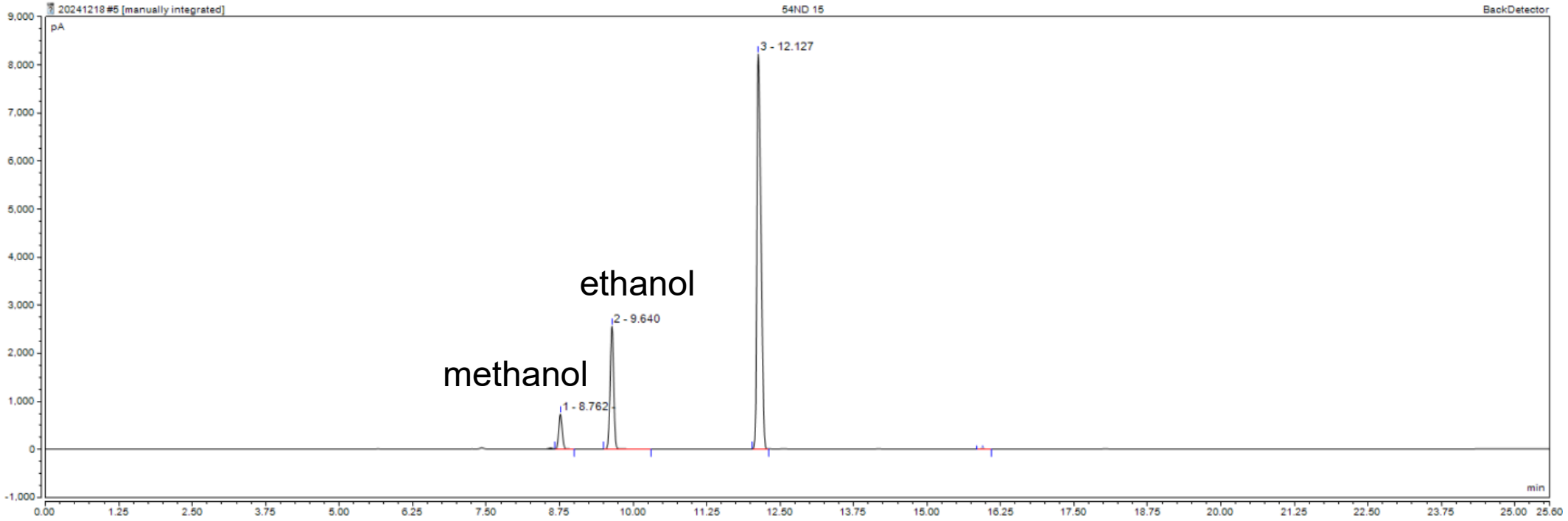
•Target analytes according to QCVN 6-3

•Screening for unknown/foreign substances

•Parallel implementation



Detection of methanol and limitations in causal interpretation

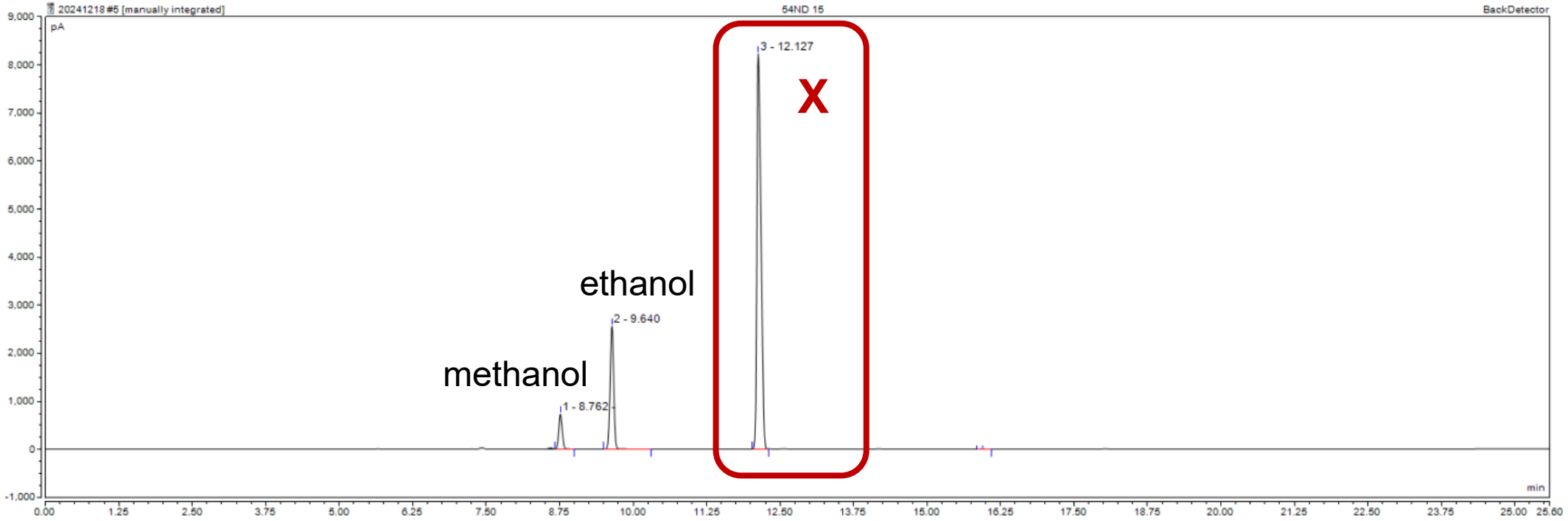


Analytical results from the NIFC:

- Methanol concentration: 5% v/v
- Ethanol concentration: 13% v/v
- Alcohol strength: 34% v/v

→ Insufficient to account for fatality; does not fully explain the clinical presentation

Detection of abnormal compounds in alcohol samples

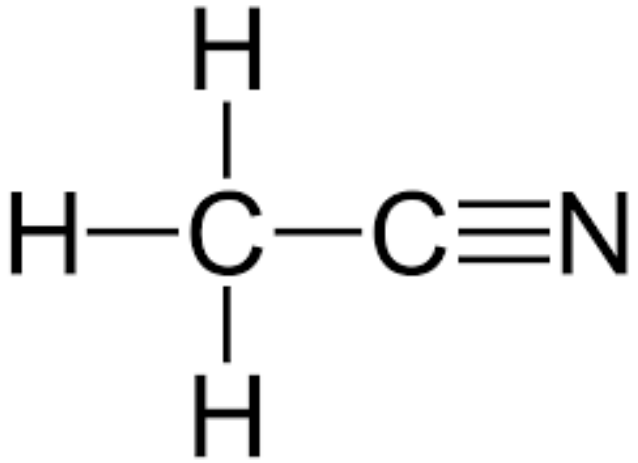


- Methanol concentration: 5% v/v
- Ethanol concentration: 13% v/v
- Alcohol strength: **34% v/v ->???**

Extended analysis for detection of unknown compounds
Not belonging to common substance groups
Structural elucidation required

Identification of acetonitrile as the primary causative agent

An unexpected finding from non-targeted analysis



IUPAC: ethanenitrile; additional names: methyl cyanide, cyanomethane, methanecarbonitrile

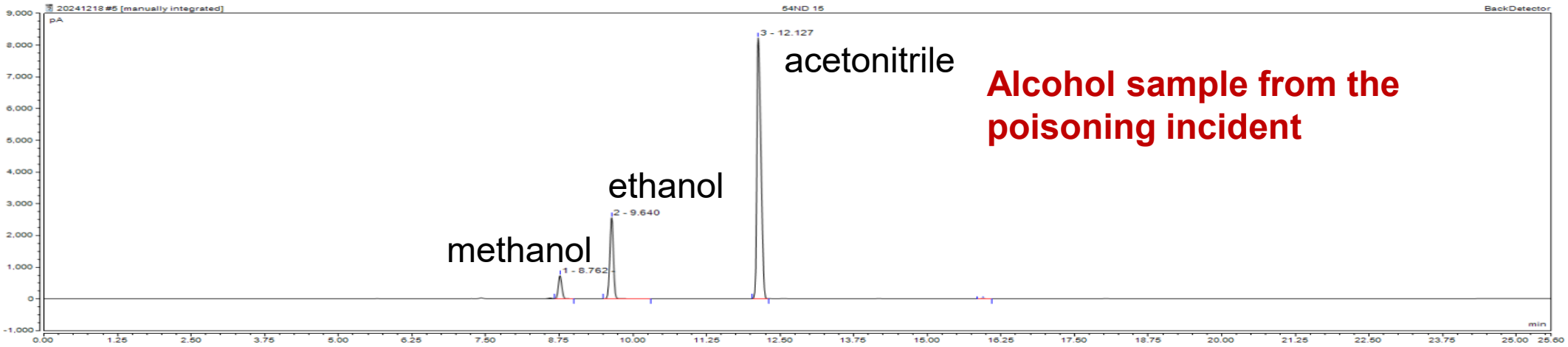
Globally, an estimated 180 thousand tons were produced in 2022, with the Asia–Pacific region being the largest producer and consumer [1]

X = Acetonitrile

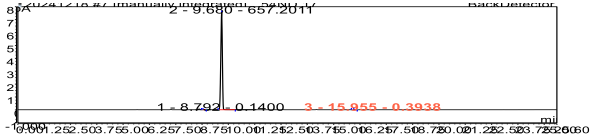
Not a naturally occurring component in food

[1] Acetonitrile Market Analysis: Industry Market Size, Plant Capacity, Production, Operating Efficiency, Deman & Supply, End-Use, Sales Chanel, Regional Demand, Company Share, Manufacturing Process, Policy and Regulatory Landscape, 2015-2032. [Internet]. ChemAnalyst. 2023 [cited 2025 May 12]

Chromatographic results and compound confirmation



Alcohol sample from the poisoning incident



ethanol

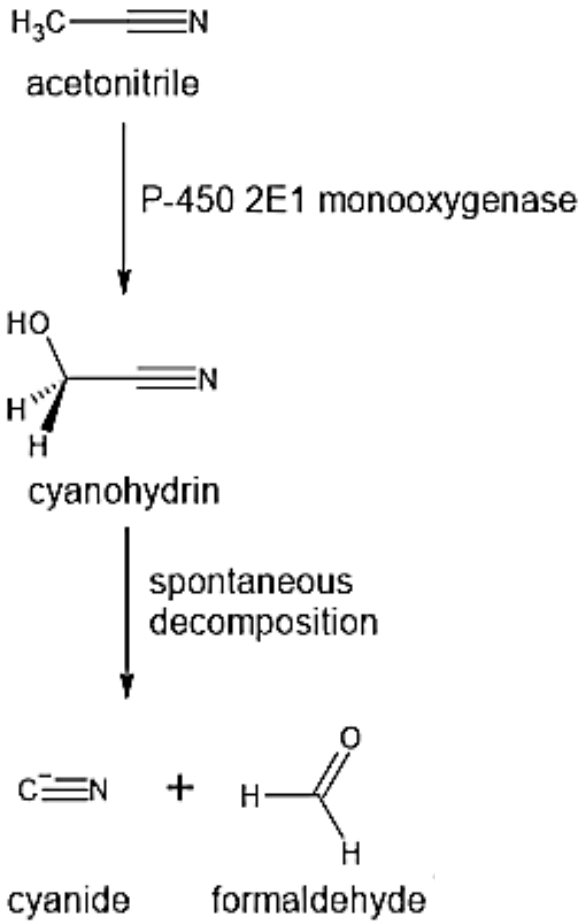
Reference alcohol sample

→ Qualitative and quantitative confirmation (~16%)

Clinical symptoms of the patients

Số bệnh nhân	14
Giới tính	
Nam (% theo báo cáo)	13 (93)
Nữ (% theo báo cáo)	1 (7)
Độ tuổi trung bình (khoảng)	43.5 (30-69)
Thời điểm xuất hiện triệu chứng (trung vị, khoảng)	6.5 giờ (3-20)
Triệu chứng ban đầu (% theo báo cáo)	
Buồn nôn/ Nôn	12 (86)
Đau đầu	11 (79)
Đau bụng	11 (79)
Tiêu chảy	7 (50)
Lơ mơ	2 (21)
Chóng mặt	3 (14)
Trung bình (khoảng) của các xét nghiệm lâm sàng khác nhau	
Acetonitrile (µg/mL)	74.8 (10-170)
Cyanide (µg/mL)	0.16 (<0.003-0.398)
pH	7.46 (7.33-7.51)
Lactate (mmol/L)	3.8 (1.3-32)
Bicarbonate (mEq/L)	22 (7-29)
Creatinine (µmol/L)	79 (36-99)
Aspartate aminotransferase (IU/L)	21 (6.0-69)
Peak Troponin (ng/L)	30 (3.0-140)
N-terminal-prohormone brain natriuretic peptide (pg/mL)	438 (20-2129)

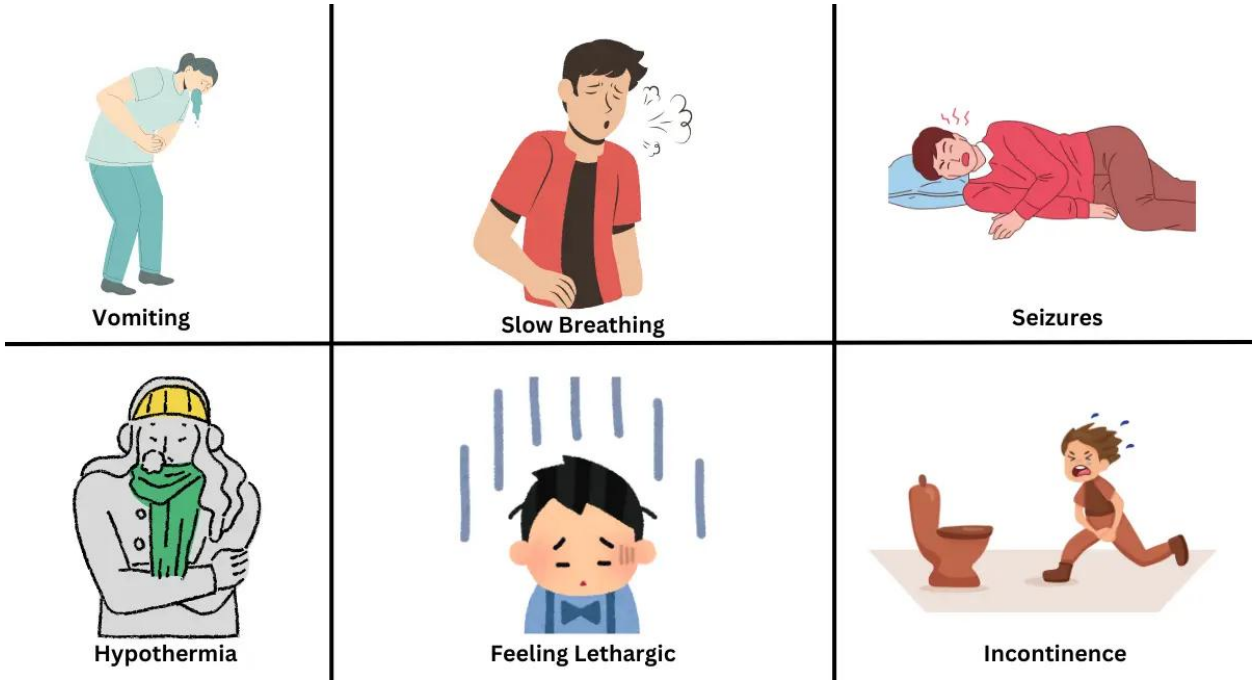
Toxic mechanisms of acetonitrile



ACN → Metabolized into cyanide

→ Inhibition of cellular respiration

→ Indirect toxicity mechanism



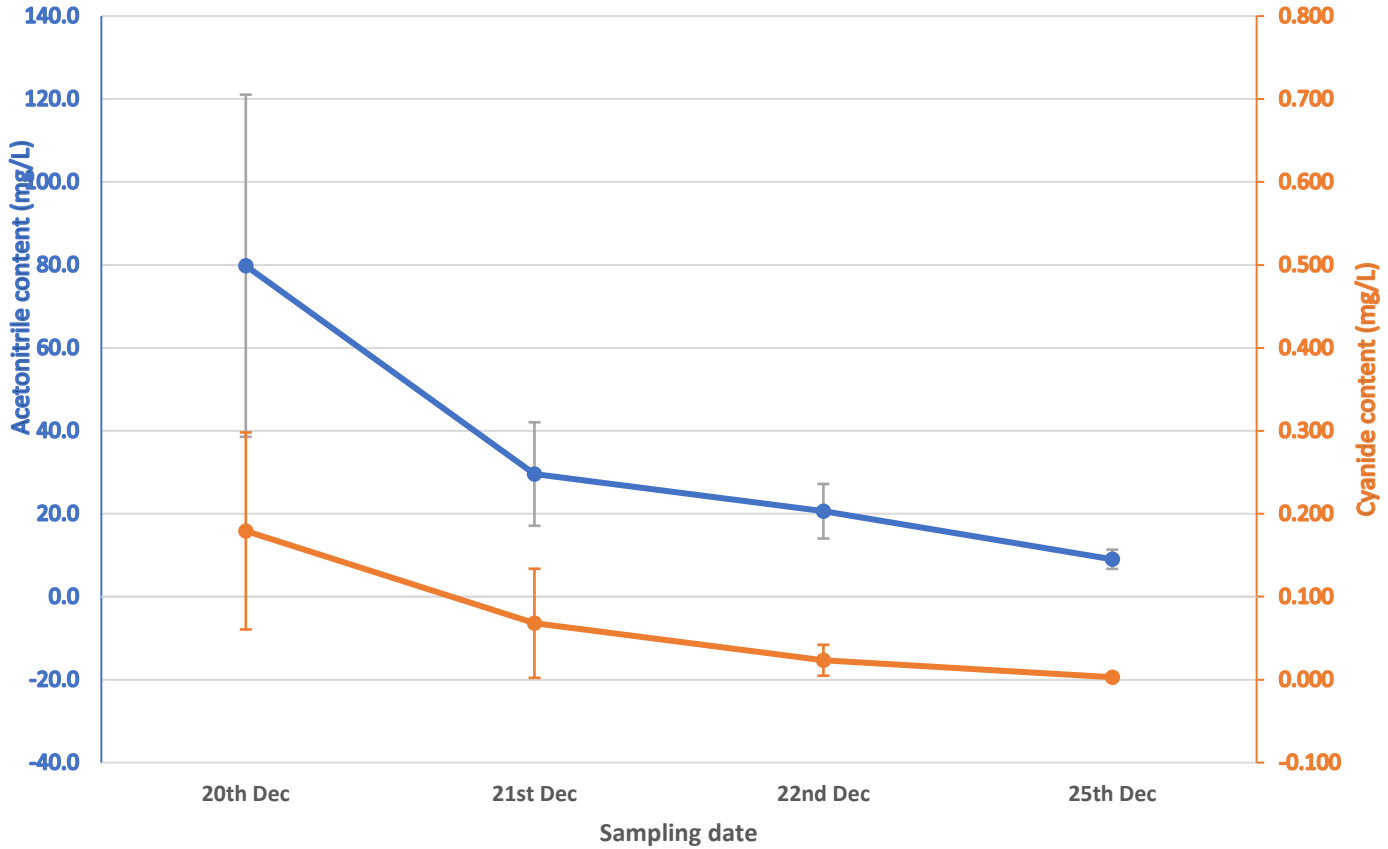
Delayed toxicity and clinical implications

- Intensive care and symptomatic treatment
- Two patients required intubation and vasopressor support

-> Delayed toxicity is highly dangerous

Patient	Acetonitrile				Cyanide			
	20th Dec	21st Dec	22nd Dec	25th Dec	20th Dec	21st Dec	22nd Dec	25th Dec
1	27.6	10.0	-	-	0.045	<LOQ	-	-
2	42.9	28.8	26.9	-	0.324	0.050	<LOQ	-
3	69.8	46.8	24.7	-	0.115	<LOQ	<LOQ	-
4	170	32.4	14.7	6.22	0.331	0.175	0.032	ND
5	74.7	47.4	15.3	6.55	0.170	0.035	0.015	<LOQ
6	41.9	19.8	18.3	-	0.052	<LOQ	<LOQ	-
7	101	19.9	19.8	7.18	0.398	0.123	0.024	ND
8	77.1	38.2	14.2	-	0.173	0.121	0.013	-
9	115	-	25.8	9.89	ND	-	0.052	ND
10	74.8	24.7	23.2	10.3	<LOQ	0.167	0.051	ND
11	52.2	19.4	18.0	8.82	0.163	<LOQ	ND	ND
12	144	40.2	35.3	13.1	0.160	0.026	0.054	ND
13	38.9	15.2	10.8	-	0.025	<LOQ	ND	-
14	87.4	41.8	21.0	10.2	0.196	0.137	0.028	ND
Average	79.8	29.6	20.6	9.0	0.179	0.068	0.023	0.00
SD	41.2	12.5	6.6	2.3	0.119	0.066	0.019	0.00

Changes in acetonitrile and cyanide concentrations in blood



Changes in acetonitrile and cyanide concentrations in patients' blood samples

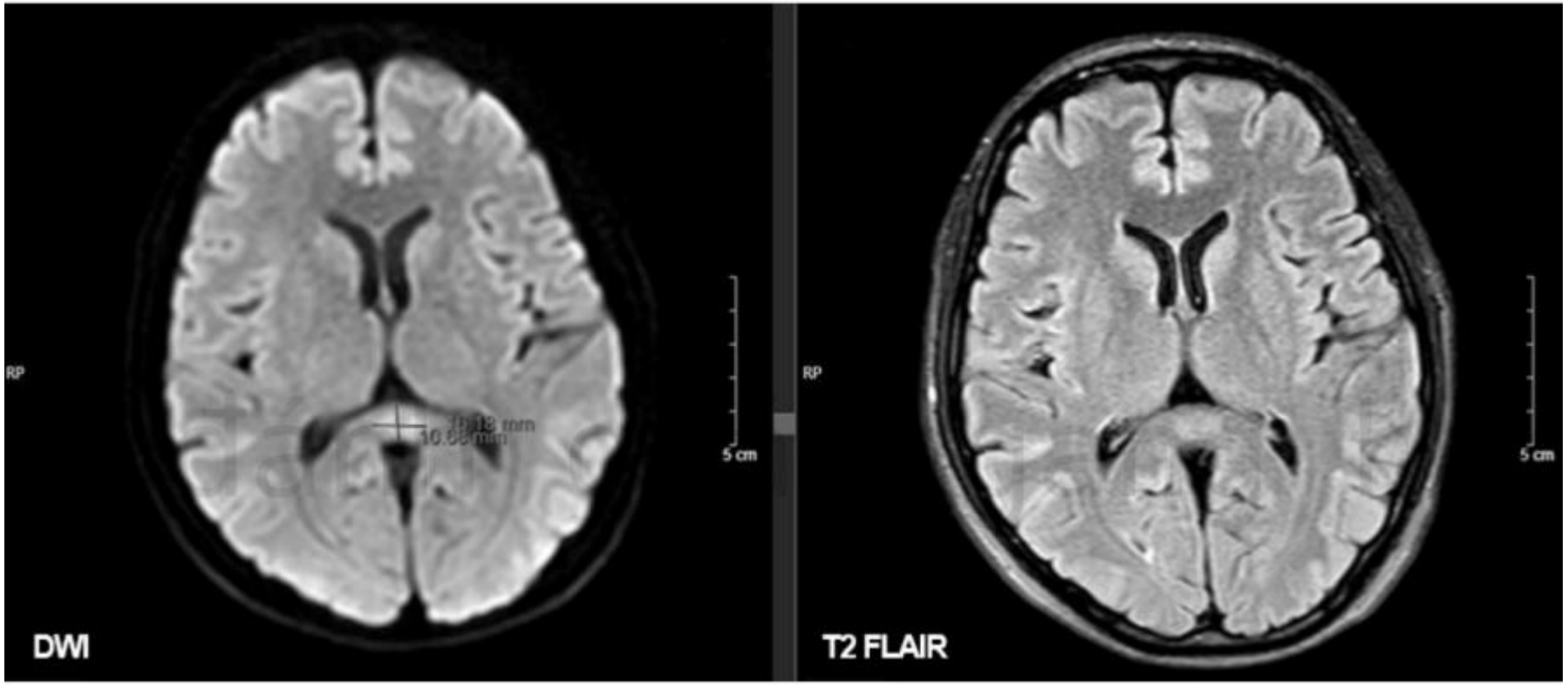
- 14/14 patients survived
- Length of hospital stay: 3–14 days (mean: 6)
- 1-month follow-up: no neurological sequelae

Confirmation of the clinical diagnosis

- Elevated lactate (median 3.8 mmol/L, up to 32.8)
- Cardiac injury markers (Troponin, NT-proBNP) elevated
- Acetonitrile blood level: 10–170 µg/mL
- Cyanide blood level: 0.003–0.398 µg/mL

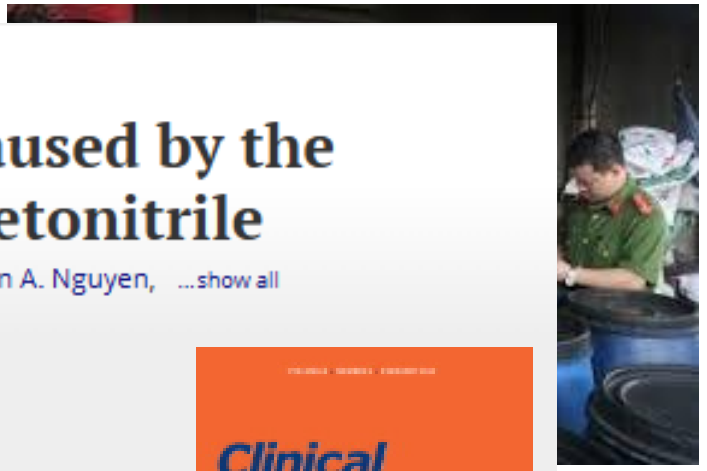
Elevated lactate levels are associated with higher acetonitrile and cyanide concentrations

ACN is the primary cause
Methanol only contributes
Fully explains the clinical symptoms



Magnetic resonance imaging (MRI) of a patient with acetonitrile poisoning

Communication activities following the poisoning incident



safety conditions

Clinical Research

An outbreak of poisoning in Vietnam caused by the adulteration of alcoholic drinks with acetonitrile

Tien H. Nguyen, Son C. Tran, Thuan Q. Le, Dung T. Nguyen, Chien M. Nguyen, Tuan A. Nguyen, ...show all

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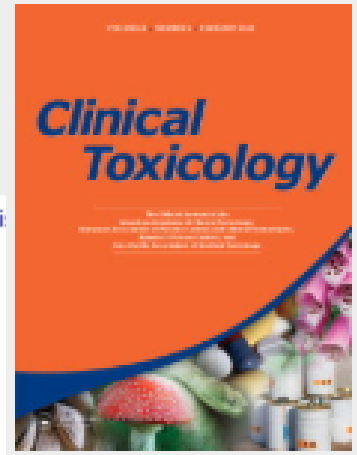

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Y tế Thời sự Tra cứu bệnh

Y TẾ > Tin nóng y tế Thành

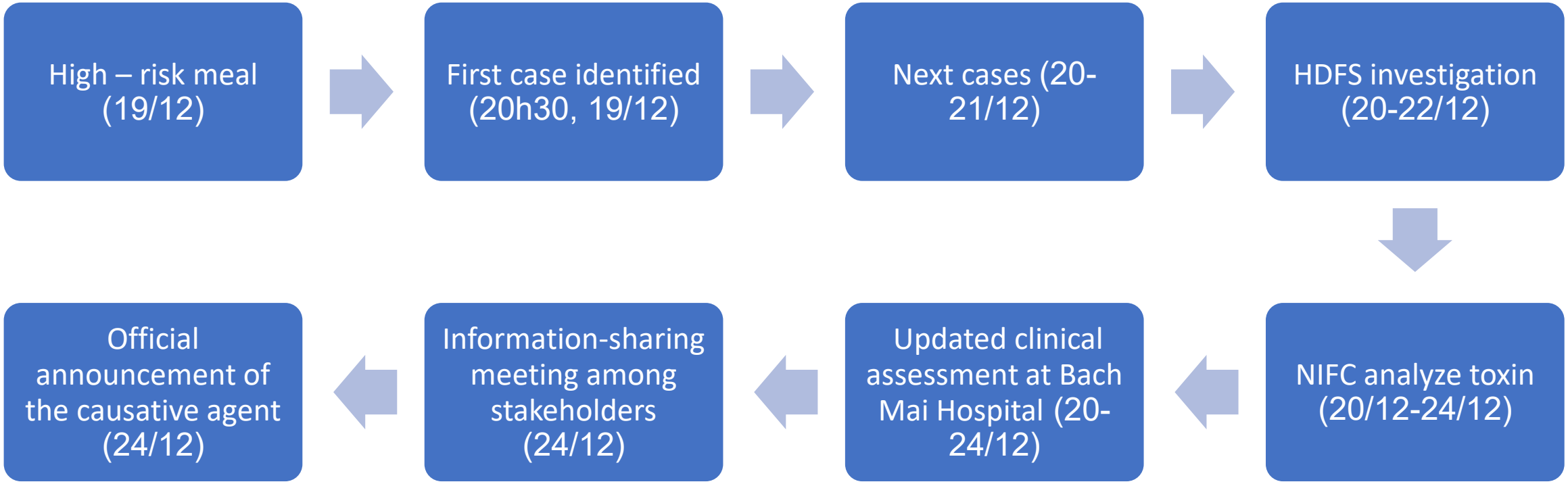
Abstract

Introduction

Acetonitrile causes potentially fatal inhibition of cytochrome c oxidase. We report a mass poisoning event linked to consumption of alcohol adulterated with acetonitrile.

contamination through media channels

Summary of the timeline



5 days

Coordinated traceability and timely information sharing are essential prerequisites for identifying the cause and guiding effective treatment

Conclusions

- The rapid investigation identified the toxic agent as alcohol containing high levels of methanol and **acetonitrile**, with acetonitrile determined to be the **primary cause of the poisoning**.
- **Acetonitrile and cyanide** concentrations may persist in the patients' blood for up to **48 hours**.
- Findings from this investigation contribute to strengthening the public health surveillance system and support the prevention of similar poisoning incidents in the future.

Acknowledge

- National Institute for Food Control *(https://nifc.gov.vn)*
- Hanoi Department of Health
- Vietnam Food Administration
- Hanoi Department of Food Safety
- Bach Mai Hospital
- Duc Giang Hospital

Thank you for your attention!