

Addapedia Editorial Analysis 21st June 2024

Methanol Poisoning

(The Hindu, 21/06/24)

At least 38 people had died after consuming spurious liquor in the Kallakurichi district of Tamil Nadu while as many as 82 others were receiving treatment in hospitals.

- The tragedy echoes a similar incident a year ago in the State, in which more than 20 people died after consuming spurious liquor.
- Liquor sales in Tamil Nadu are controlled by the State, through around 5,000 outlets.

What is the alcohol in liquor?

- In the beverages consumed for recreational purposes, the alcohol in question is **almost always ethanol**.
- In this context, ethanol is technically a psychoactive drug that, in low doses, reduces the level of neurotransmission in the body, leading to its typical intoxicating effects.
- Liquor is differentiated by its alcohol content — from the 5% or so of beer to the 12% or so of wine to the 40% or so of distilled spirits (all by volume).
- Contrary to popular belief, the World Health Organisation has found “no level of its consumption is safe for our health”. Long-term use leads to dependence, heightens the risk of some cancers and heart disease, and may eventually cause death.
- Inside the body, ethanol is metabolised in the liver and the stomach by alcohol dehydrogenase (ADH) enzymes to acetaldehyde. The adverse effects of alcohol consumption, from the hangover to a cancer, are due to

What is spurious liquor?

- Spurious liquor is characterised by the liquid mixture **containing methanol** as well.
- In many older cases, spurious liquor has typically been a homemade liquor to which methanol was added to **strengthen the intoxicating effects** (in colloquial parlance, its ‘kick’) and/or to increase its bulk volume.
- The Food Safety and Standards (Alcoholic Beverages) Regulations 2018 stipulate the maximum permissible quantity of methanol in different liquors.
- These values span a wide range, including “absent” in coconut fenny, 50 grams per 100 litres of country liquor, and 300 grams per 100 litres of pot-distilled spirits.

What is methanol?

- The most common way to produce methanol (CH₃OH) is to combine carbon monoxide and hydrogen in the presence of copper and zinc oxides as catalysts at 50-100 atm of pressure and 250° C.

- In the pre-industrial era, going back to ancient Egypt, people made methanol (together with several other byproducts) by heating wood to a very high temperature.
- Methanol has several industrial applications, including as a precursor to acetic acid, formaldehyde, and aromatic hydrocarbons. It is also used as a solvent and as antifreeze.

How does spurious liquor kill?

- The deadliness of spurious liquor arises from methanol.
- The human body contains infinitesimal quantities of methanol (4.5 ppm in the breath of healthy individuals, per a 2006 study) as a result of eating some fruits. But even for an adult, more than 0.1 ml of pure methanol per kilogram of body-weight can be devastating.
- Once ingested, ADH enzymes metabolise methanol in the liver to form formaldehyde (H-CHO). Then ALDH enzymes convert formaldehyde to **formic acid (HCOOH)**.
- The accumulation of formic acid over time leads to a condition called metabolic acidosis, which can lead to acidaemia: when the **blood's pH drops below its normal value of 7.35**, becoming increasingly acidic.
 - The blood's pH is normally maintained by a balance between an acid, like carbon dioxide (CO₂), and a base, like the bicarbonate ion (HCO₃⁻).
- The acidic blood disrupts the body's normal functions, particularly harming the nervous system and organs like the eyes and kidneys.
- In severe cases, methanol poisoning can lead to blindness, coma, respiratory failure, and even death.

How can methanol-poisoning be treated?

- There are two immediate ways to treat methanol poisoning. One is to administer **pharmaceutical-grade ethanol**. This may sound counter-intuitive but ethanol competes very well with methanol for the ADH enzymes, which metabolise ethanol around 10x faster. As a result, the methanol is kept from being metabolised to formaldehyde.
- The other option is to administer an **antidote called fomepizole**, which has a similar mechanism: it slows the action of the ADH enzymes, causing the body to produce formaldehyde at a rate the body can quickly excrete, preventing the deadlier effects from kicking in.
- Both courses of action are limited by availability: fomepizole is expensive whereas pharmaceutical-grade ethanol needs to be administered under expert supervision.
- Healthcare workers may also have the individual **undergo a dialysis** to remove methanol and formic acid salts from the blood.
- They may also administer **folinic acid**, which encourages the formic acid to break up into carbon dioxide and water.
 - Both **fomepizole** and **folinic acid** are in the WHO's list of essential medicines.

The U.S.-Saudi agreement, from fist-bump to embrace

(The Hindu, 21/06/24)

The US and Saudi Arabia have had a complex relationship for over 80 years. It started with an "oil-for-security" pact and has seen both cooperation (Gulf War) and tension (US inaction after the Abqaiq oil processing attack in 2019).

What's the potential Strategic Alliance Agreement (SAA) about?

The SAA could be a **major upgrade** to the **US-Saudi relationship**. China's growing influence in the region, particularly its close ties with Saudi Arabia, might be pushing the US to act.

Each side will have their own set of goals to be achieved through this deal, i.e.

Saudi Arabia's goals include:

- A formal defense pact requiring the US to defend Saudi Arabia.
- US supplying advanced weaponry (including F-35 jets) to Saudi Arabia.
- Surprisingly, the US might even agree to peaceful nuclear technology for Saudi Arabia.
- A ceasefire in Gaza and progress on a two-state solution for Israel-Palestine

The US might be looking for:

- Saudi Arabia to recognize Israel and normalize relations.
- Saudi Arabia to distance itself from US rivals like China and Russia.
- Maintain coordination to influence global oil markets.
- Ensure American companies get a big share of Saudi Arabia's Vision 2030 projects.

What are the challenges to the SAA?

There are two major hurdles:

- **Trust Deficit:** Recent events like the US not fully supporting Saudi Arabia in past conflicts have eroded trust.
- **Gaza Conflict:** Ongoing violence makes it difficult for Saudi Arabia to reconcile with Israel, a key US demand

What are the potential outcomes of the SAA?

There are three possibilities:

- **Full SAA:** This would reassert US dominance in the region, potentially burying the Palestinian cause.
- **No SAA:** The region remains unstable with Iran-backed actors causing trouble.
- **Partial SAA:** A scaled-down agreement might involve other countries if a full deal is unattainable

How does this impact India?

An SAA could benefit India by:

- Promoting regional stability.
- Creating economic opportunities.
- Helping India pursue its "Act West" policy.

India should closely monitor the SAA negotiations while continuing its own independent foreign policy initiatives in the region.

Can you answer the following question?

The US and Saudi Arabia are reportedly considering a major strategic alliance. What are the historical factors influencing this potential agreement, and what are the key sticking points that need to be addressed?