

Don't Cry Over Spilled Milk: A Case Report on Intoxicating Mystery for Forensic Chemistry

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Abstract

Under the Bharatiya Nyaya Sanhita 2023, Section 274, adulterating milk with hazardous chemicals including hydrogen peroxide is a punishable crime. This caustic chemical poses significant health risks, particularly to children, causing corrosive harm to their developing bodies. The law explicitly targets those who endanger public health by adulterating food or drink intended for sale, imposing strict penalties to deter such malicious practices. Ensuring the safety and integrity of consumables, especially milk, is crucial for protecting innocent children and maintaining public trust.

Keywords: Corrosive; Caustic; Adulterated Milk; Crime; Hydrogen peroxide.

INTRODUCTION

Milk adulteration has long been a concern in India, impacting public health and undermining trust in essential food supplies. One alarming practice is the deliberate adulteration of milk with hydrogen peroxide, a caustic chemical. In some countries hydrogen peroxide is added to milk as an adulterant for shelf-life extension. However, in most countries the concentration of hydrogen peroxide in milk is limited or it is even prohibited

to add this substance to the product.¹ Under the Bharatiya Nyaya Sanhita (Indian Penal Code) 2023, Section 274,² addresses this issue explicitly, criminalizing the adulteration of food or drink intended for sale. This legislation underscores the severe repercussions of such actions, particularly due to the corrosive harm caused to innocent children.

Hydrogen peroxide, a powerful oxidizing agent, is sometimes added to milk to extend its shelf life by preventing bacterial growth. However, this practice is not only unethical but also highly dangerous. Hydrogen peroxide can cause significant health issues when ingested, including irritation and damage to the gastrointestinal tract, vomiting, and abdominal pain. In children, whose bodies are still developing, the impact is even more severe, posing risks of long-term health complications or even life-threatening conditions.

The adverse effects of hydrogen peroxide in milk are particularly pronounced in children, who are more vulnerable to the toxic effects of chemicals. The ingestion of adulterated milk can lead to immediate

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symptoms such as burns in the mouth and throat, difficulty swallowing, and severe digestive issues. Long-term exposure can impair organ function and stunt growth, underscoring the critical need for robust legal protections.

By criminalizing the adulteration of milk with hydrogen peroxide, Section 274 of the Bharatiya Nyaya Sanhita 2023 plays a pivotal role in ensuring the safety and well-being of the population, particularly children. It sends a strong message to milk producers and distributors about the serious consequences of compromising food safety. This legislative measure is part of a broader effort to enhance food safety standards in India, promoting public health and reinforcing consumer confidence.

CASE REPORT

In the midnight, a 4-year-old child was brought by his parents with alleged history of hazardous chemical poisoning, in acute distress and crying state, with profuse transparent secretions from oral cavity, compromising his airway. On arrival, he was immediately received in resuscitation bay in our emergency department in Medanta the Medicity, sector 38, Gurugram. As per Pediatric resuscitation guidelines, Airway was secured, and breathing supported by mechanical ventilator. On local examination, the mucosa in oral cavity was reddened, sluffed and fragile, with whitish deposits adherent to the airway. ABG reported severe metabolic acidosis with raised lactates. For suspected foul play, medicolegal report prepared, and the concerned police authority informed for further medicolegal investigation of the case. A detailed history was noted, in which the parents of child stated that they are owner of a milk dairy commercially, working from home, and there they have kept a hazardous chemical: concentrated Hydrogen peroxide (H_2O_2) in liquid jar, which is accidentally ingested by their child, while playing with it. When enquired further for why H_2O_2 is kept in their home, the patient's father explained that they used H_2O_2 as an adulterant to increase the quantity of buffalo's milk, for commercial gains. The patient was shifted to the Intensive Care Unit and underwent Upper Gastrointestinal Endoscopy, which reported corrosive caustic lesions in the stomach and food pipe. The patient started on antibiotics, proton pump inhibitors with intravenous fluids and kept Nil per orally. In the meanwhile, we requested the patient's father to bring the chemical jar of concentrated Hydrogen peroxide, which was consumed by the patient, so that the jar

was sent to chemical analysis for identifying the hazardous chemical, in the biochemistry laboratory at Medanta Hospital, where the senior Biochemist reported that it contains concentrated Hydrogen peroxide. Later the alleged chemical jar and blood samples were sent to the Forensic Science Lab and medicolegal investigation. After intensive therapy and closed monitoring of vital parameters, the patient recovered and was discharged in stable condition.

CASE DISCUSSION

Worldwide, 80% of caustic ingestions occur in young children.³ Adulterated milk in circulation and consumption poses a bigger threat to regulators, consumers, and the milk industry equally in the implementation of food safety standards. Adulteration in most food products is a rising challenge and a matter of concern in front of the authorities of countries, especially the developing ones.⁴ Adulteration of Buffalo milk, white in colour with similar looking but hazardous caustic chemical: Hydrogen peroxide, which turns white in contact with urea and water. Although it looks like the white milk, and to make it taste sweet, an artificial sweetener is added. Hydrogen peroxide is an oxidizing agent, but it is very unstable and readily breaks down to oxygen and water. Generation of oxygen gas in closed body cavities can potentially cause mechanical distension that results in gastric or intestinal perforation, as well as venous or arterial gas embolization.

H_2O_2 is acidic, not an alkali

Hydrogen peroxide typically has a pH between 3 and 6, influenced by its concentration and production method. In aqueous solution, H_2O_2 releases two hydrogen ions, whereas water releases one. Because H_2O_2 protonates more extensively than water, it has a higher acid dissociation constant (K_a), making it a stronger Brønsted-Lowry acid compared to water. Acids cause coagulation necrosis, forming an eschar that limits further damage, primarily affecting the stomach more than the esophagus. In contrast, alkalis cause rapid liquefaction necrosis without forming an eschar, allowing damage to persist until the alkali is neutralized or diluted, and they typically affect the esophagus more than the stomach.⁵

Hydrogen peroxide is commonly used in dental products like mouth rinses and tooth whiteners, as well as in skin disinfectants, hair treatments, and earwax removers. It also has numerous industrial

applications. In veterinary medicine, it is used to induce vomiting. Hydrogen peroxide for household use is available in 3–5% solutions and causes only mild throat and gastric irritation with ingestion of less than 1oz.⁶ However, gas embolization has occurred with low concentrations used in surgical irrigations.⁷ Hair-bleaching solutions may contain hydrogen peroxide concentrations above 10%, which can be corrosive. Most reported fatalities involve ingesting undiluted 35% hydrogen peroxide, sold as “hyperoxygen therapy” in health food stores or labeled “food grade” in industrial settings.

Consult an expert pediatric gastroenterologist for a potential Upper Gastrointestinal endoscopy after children ingesting corrosive agents like concentrated hydrogen peroxide or potassium permanganate. Most ingestions are benign, causing only mild, self-limited irritation. However, for gas emboli resulting from concentrated peroxide ingestion, consider hyperbaric oxygen treatment.

Concentrated hydrogen peroxide solutions (20–30%) are strong irritants to the skin and mucous membranes, causing significant irritation upon contact. Even at lower concentrations, such as 6%, it acts as a weak irritant, releasing 20 vol% oxygen on contact with skin or mucous membranes. When used in colonic lavage, hydrogen peroxide can cause severe complications like gas embolism and intestinal gangrene, even at concentrations as low as 0.75%.

For treating hydrogen peroxide ingestion, it is crucial to immediately provide water to dilute the substance. Using a gastric tube is recommended to prevent increased internal pressure and mitigate potential damage. Given the risks associated with concentrated hydrogen peroxide, particularly for medical or cosmetic uses, handling should always be cautious, and appropriate protective measures should be taken. Additionally, seeking prompt medical attention is vital to manage any adverse effects effectively, especially in cases of high-concentration exposure or internal use.

Legal aspects of Adulteration of edible natural product with hazardous chemical

As per BNS (Bharatiya Nyaya Sanhita) 2023, **Section 274:** Whoever adulterates any article of food or drink, so as to make such article noxious as food or drink, intending to sell such article as food or drink, or knowing it to be likely that the same will be sold as food or drink, shall be punished with imprisonment of either description for a term which may extend to six months, or with fine which may extend to five thousand rupees, or with both.⁸

During the recent legal update by the Parliament, the cost of penalty is increased from one thousand,⁹ to five thousand rupees, although it's still peanuts for anyone adulterating milk, who are earning in lakhs every month,¹⁰ by illegal act, harming the others.

Section 274 of the Bharatiya Nyaya Sanhita 2023 is a critical piece of legislation designed to protect consumers from such hazardous practices. The section stipulates strict penalties for anyone found guilty of adulterating food or drink with harmful substances. By explicitly mentioning “adulteration of food or drink intended for sale,” the law aims to safeguard public health and ensure that consumables meet safety standards. This provision is especially pertinent in the context of milk, a staple in the diet of children across India.

The inclusion of hydrogen peroxide in milk constitutes a clear violation of Section 274. The law recognizes the act of adding harmful substances to food as a deliberate and malicious attempt to deceive consumers and endanger their health. The perpetrators of such acts are subject to stringent legal consequences, reflecting the gravity of their offenses. This legal framework serves as a deterrent, aiming to curb the prevalence of food adulteration by imposing severe punishments on offenders.

Toxic Detective's analysis of intoxicating idiom: Do not cry over spilled milk!

The phrase ‘Don't Cry over Spilt Milk’ means there's no use in worrying over past events which cannot be changed, to feel sorry or sad about something that has already happened.¹¹ Toxic Homonyms are similar sounding words with different meanings, causing impact in thoughtful investigation by a toxic detective. The title of the riddle is very titillating, for the youth, as it indicates revenge by injuring an eye for an eye. But as preachers like Mahatma Gandhiji said, injuring an eye for an eye, in revenge and the whole world will go blind. So, forgiveness is a bigger way of forgetting the harm suffered than taking petty revenge. But nature has its own way to handle the balance of right and wrongs done by greedy people, who adulterate the food supplied for commercial purposes, and make easy money, after diluting its contents, not only reducing the nutritional value, but increasing its harming capacity. As mostly cheap adulterants are synthetic chemicals, which are hazardous for ingestion. Don't Cry Over Spilled Milk: A Case Report on Intoxicating Mystery for Forensic Chemistry says it all about its adulteration, thus creating toxic emergencies, from time to time, resulting in untimely deaths of innocent population.

Table 1. Toxic Riddle in Rhymes

Toxic Proverb in Rhymes: Tit for Tat. ¹²
Do U know an intoxicating Case Scenario to Chat! A strategy for iterated Prisoner's Dilemma in splat. Toxic Riddle in Rhymes based on homonyms Scat. Where there's Equivalent Retaliation, by Tit for Tat! When Milk is Adulterated After Milking Teat to Get? Extra amount of white coloured content alike that. Which kills its consumer whether it's a Cat or Rat. As it acts as an oxidizing agent when it's diluted at! 1-2% of its strength derived from industrial combat, By nature's revenge, Adulterator's child drank that, Brought to Emergency, in Comatose State, full flat, Thus, Milkman who misused, the harmful HAZMAT! To dilute, pure milk, and increase its quantity STAT. Didn't thought that it is dangerously toxic to hepat, But when his own Child admitted in ICU, where at, & he realized criminal act harming human habitat, Child suffered corrosive ulcers needing hemostat, Underwent urgent laparotomy to seal leaked spat, Let's Decode this toxic Riddle & win a cocked Hat. Where chemical is adulterated in milk to look fat

CONCLUSION

In conclusion, the adulteration of milk with hydrogen peroxide is a grievous offense under the Bharatiya Nyaya Sanhita 2023, Section 274. This practice not only deceives consumers but poses significant health risks, especially to children. The law's stringent penalties for such actions are essential in safeguarding public health and maintaining the integrity of the food supply. Ensuring the safety of milk and other consumables is a critical responsibility, and the legal framework provided by Section 274 is a vital tool in achieving this goal.

Conflict of Interest: Nil

REFERENCES

- Ivanova AS, Merkuleva AD, Andreev SV, Sakharov KA. Method for determination of hydrogen peroxide in adulterated milk using high performance liquid chromatography. Food Chem. 2019 Jun 15;283:431-436. doi: 10.1016/j.foodchem.2019.01.051. Epub 2019 Jan 17. PMID: 30722894.
- BNS (Bharatiya Nyaya Sanhita) 2023, Section 274-Adulteration of food or drink intended for sale.
- Gerald F. O'Malley. Caustic Ingestion-Injuries; Poisoning-MSD Manual Professional Edition (msdmanuals.com) Last accessed on 18th June 2024. Link: <https://www.msdmanuals.com/en-in/professional/injuries-poisoning/poisoning/caustic-ingestion>
- Yadav AK., et al. Key Milk Adulterants in India and their Detection Techniques: a Review. Food Analytical Methods. Springer 2022. Link <https://doi.org/10.1007/s12161-022-02427-8>
- Henry MC, et al. Hydrogen peroxide 3% exposures. J Toxicol Clin Toxicol 1996;34:323
- Gerald F. O'Malley. Caustic Ingestion-Injuries; Poisoning - MSD Manual Professional Edition (msdmanuals.com) Last accessed on 18th June 2024. Link: <https://www.msdmanuals.com/en-in/professional/injuries-poisoning/poisoning/caustic-ingestion>
- Mullins ME, Beltran JT. Acute cerebral gas embolism from hydrogen peroxide ingestion successfully treated with hyperbaric oxygen. J Toxicol Clin Toxicol 1998;36:253
- BNS (Bharatiya Nyaya Sanhita) 2023, Section 274-Adulteration of food or drink intended for sale.
- IPC (Indian Penal Code) 1860, Section 272-Adulteration of food or drink intended for sale. Read more at: <https://devgan.in/ipc/section/272/>
- Tomar, Shruti. Hindustan Times. 2 brothers turned millionaires in 7 yrs, sold synthetic milk in Delhi, UP | Latest News India-Hindustan Times Last accessed on 18th June 2024. <https://www.hindustantimes.com/india-news/how-synthetic-milk-powered-the-meteoric-rise-of-chambal-traders/story-baBu9ldQfrz2H6SFCHyzCK.html>
- Cry Over Spilled Milk - Cambridge English Dictionary. Last accessed on 18th June 2024. Link: <https://dictionary.cambridge.org/dictionary/english/cry-over-spilled-milk>.
- Poisoned Tit for Tat: Toxic Homonyms eBook : Verma, Vivekanshu: Amazon.in: Kindle Store. 5 April 2024, Kindle Book Publications (KDP) Link to the Riddle Book: <https://www.amazon.in/dp/B0D128NLZW>