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CHEMCOS News Bureau

Milk is the latest poison (Chemical aspects of the recent melamine poisoning)

Milk, which was considered to be a primary source of nutrition for new born mammals before they are able to digest other types of foods, turned into poison for around 53,000 kids in China. The milk powder that was being sold in China was found to be contaminated with the industrial chemical “MELAMINE”.

Little over a month ago, melamine was known as the material used to make unbreakable plates and as an industrial additive. But since then it had gained considerable fame as a chemical which, when added to milk, boosted its protein level at the cost of damaging the consumer’s kidneys. China's dairy farmers, eager to boost their milk sales, had been watering down their milk and then lacing it with melamine so that tests show the same protein content as unwatered milk.

Chemically melamine is an organic base and a trimer of cyanamide, with a 1,3,5-triazine skeleton. Melamine combines with cyanuric acid to form melamine cyanurate, which had been implicated in the Chinese protein export contaminations.

Melamine by itself is nontoxic in low doses, but when combined with cyanuric acid it can cause fatal kidney stones due to the formation of an insoluble melamine cyanurate [1]. FDA scientists explained that when melamine and cyanuric acid are absorbed into the blood-stream, they concentrate and interact in the urine-filled renal microtubules, then crystallize and form large numbers of round, yellow crystals, which in turn block and damage the renal cells that line the tubes, causing the kidneys to malfunction [1].

Melamine is reported to have an oral LD_{50} (lethal dose, 50%) of 3248 mg/kg based on rat data. It is also an irritant when inhaled or in contact with the skin or eyes. The reported dermal LD_{50} is >1000 mg/kg for rabbits. In a 1945 study, large doses of melamine were given orally to rats, rabbits and dogs with "no significant toxic effects" observed [2]. Ingestion of melamine may lead to reproductive damage, or bladder or kidney stones, which can lead to bladder cancer [3].

These have been several cases of melamine poisoning earlier as well. In 2007 a pet food recall was initiated by Menu Foods and other pet food manufacturers who had found their products had been contaminated and caused serious illnesses or deaths in some of the animals that had eaten them [4]. In March 2007, the US Food and Drug Administration reported finding white granular melamine in the pet food, in samples of white granular wheat gluten imported from a single source in China, Xuzhou Anying Biologic Technology as well as in crystalline form in the kidneys and in urine of affected animals. Another incident in 2007 involved melamine which had been purposely added as a binder to fish and livestock feed manufactured in the United States. This was traced to suppliers in Ohio and Colorado [5].

Coming back to the recent melamine scandal in China, the milk quality has been greatly improved after the nationwide campaign. However the question that is still to be answered is that before an imported food or pharmaceutical product, including milk, is allowed to be distributed/put on the shelves on supermarkets and pharmacies, it should first be registered with and tested by BFAD? Who is responsible for approving and declaring such products safe for human consumption?

References:

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Separation of CO_2 from natural gas by Metal organic framework

To obtain good quality of natural gas — CO_2 separation [1], use of metal organic frameworks has emerged as a prominent option, since CO_2 degrades the quality of natural gas and corrodes the pipeline. MOFs have high selectivity and low cost which make it a competent candidate. Selection of adsorbent depends on the gas selectivity and capacity to store it.

In MOFs, the metal vacant-coordination site created by the solvent, the pore size of the framework by appropriate choice of ligands and metal and mode of interaction of the metal to the adsorbate are the major factors to govern the selectivity of the adsorbent to adsorbate i.e. MOF to gas. In other words coordinatively unsaturated MOFs show better selectivity. Carborane based MOF has emerged as a potential candidate for CO_2 separation [1, 2]. It (carborane based MOF) has adequate rigidity, high thermal stability and high chemical selectivity with respect to earlier MOFs viz. MOF-5 and Cu-BTC [2].

By varying the pore size of the framework, i.e. from tetrahedral to octahedral, selectivity of the MOFs have been tuned for CO_2, H_2, CH_4 and C_2H_6 and carborane based MOFs are found to be an excellent option for CO_2 separation. CO_2 has quadrupolar nature but CH_4 is nonpolar [2]. The MOF-partial charge quadrupole interaction is responsible for CO_2 selectivity of carborane based MOFs. Pressure and mole fraction of the gas also govern selectivity and it has been found that low pressure of the mixture of the gas and high mole fraction of the CH_4 increases the selectivity.

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HIV just got older by 20 years !!!!!!

UNAIDS/WHO estimated that HIV – the deadliest killer ever known to mankind — claimed over three hundred thousand lives in 2007 – nearly a thousand every day [1]! AIDS was not known until the 1980s, however, HIV was infecting humans well before then. It was previously thought to have originated in 1915–1941, but recent studies indicate that it might well have started its deadly act a century ago [2].

In 1998, researchers isolated HIV–1 sequences from a blood sample taken in 1959, from a male living in what was then Léopoldville (now Kinshasa, the capital and largest city of the Belgian Congo). Analysis revealed that HIV–1 might have originated sometime between 1915 and 1941 [2].

In a more recent study, researchers analysed a biopsy taken in 1960 from an African woman who also lived in Léopoldville [3]. Evolutionary biologist Michael Worobey and his team sequenced the HIV–1 genes of this sample, using a combination of methods to sequence its DNA and RNA. Next, they used a database of HIV–1 sequences and an estimate of the rate at which these sequences change over time to model the emergence of HIV–1. It was concluded that HIV–1 emerged in about 1908, when Léopoldville was emerging as a centre for trade. At that time, Léopoldville — and most population centers in central Africa — was small, providing only a small pool in which HIV could spread. But as the cities grew, HIV diversified, the researchers suggested.

Further investigations into the origin and evolution of HIV are expected to lead to the design of suitable vaccines and to reveal how the virus took the leap from chimpanzees to humans.

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