

What Can We Learn from the 2008 Melamine Crisis in China?

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Most food adulterations only cause economic loss and may not necessarily compromise consumer health. While this may still be a valid argument, the melamine adulterated infant formula crisis in China in 2008 clearly shows that food adulteration could be a serious food safety and public health issue^[1-2]. According to the report by the Ministry of Health of the People's Republic of China^[3], 294 000 infants and young children in China had been diagnosed to have urinary tract stone by the end of November 2008. Although most patients had no symptoms and signs, acute renal failure did occur in some patients. More than 50 000 infants had been hospitalized with six deaths being confirmed. This food safety crisis not only is a serious issue of the public health but also has a serious impact on the international economy, food trade and even politics. In fact, infant formula from China, no matter which brand, were rejected from importation by many countries; food products other than infant formula from China which contained milk ingredients were also rejected due to the carry-over of melamine from tainted milk. In the Chinese domestic market, the sale of all brands and types of dairy products declined significantly. The whole Chinese dairy industry has suffered from a great deal of economic loss, no matter whether their products are tainted with melamine or not. At the same time, the positive image of China won from the very successful Olympics held in Beijing was greatly tarnished. Many Chinese people consider this crisis is a national shame, although it was only a single case of food adulteration.

It took several months to link the increase of urinary tract stones in infants and young children to the consumption of melamine tainted infant formula. Once the cause was identified, the Chinese government implemented a series of vigorous measures to control this crisis. Within one week, with the joint efforts of several ministries, the melamine adulteration crisis was quickly under control. The inspection data show that all dairy products,

including infant formula, have been in compliance with the control limits of melamine since September 14, 2008.

The whole process in dealing with this unfortunate event is considered as an example of successful implementation of the risk analysis principle recommended by FAO and WHO. The risk analysis usually starts from risk assessment. In this melamine event, scientists and doctors in collaboration with police force quickly identified that the epidemic of urinary tract stones in infants and young children in more than 10 provinces in Mainland China was caused by the illegal addition of "protein essence" (melamine, an industrially synthesized chemical) into raw milk (the main ingredient of infant formula) to falsely increase the protein content of raw milk after dilution with water. Although other brands of infant formula were also found with high levels of melamine, the Sanlu brand had the highest level of melamine^[1,4]. The dietary exposure based on the consumption of melamine-adulterated Sanlu infant formula in China at the median levels of melamine reported was estimated to range from 8.6 to 23.4 mg/kg body weight per day, according to the report provided by the Chinese Center for Disease Control and Prevention^[5]. This is about 40-120 times the TDI of melamine (0.2 mg/kg body weight)^[6], explaining the dramatic health outcome in Chinese infants. Although the quantitative risk assessment based on dose-response relationship was not possible, Chinese scientists believed that low levels of melamine found in certain samples of infant formula, liquid milk and adult milk powder would not cause health effects to consumers. Based on the scientific findings, the Chinese government took a series of risk management measures, raw milk collection and infant formula production were subjected to the intensive regulatory control and inspection, including special inspectors were stationed in every major dairy product manufacturer, each batch of raw milk was

tested for melamine and interim control limits for melamine were set up for infant formula and other dairy products, i.e. 1 mg/kg for infant formula and 2.5 mg/kg for liquid milk and adult milk powder^[7]. On the other hand, guidelines for the diagnosis of urinary tract stones in infants and young children were quickly developed^[8]; free medical check-up was provided by the hospitals for any children who had consumed those “problematic milk powder” and within 3 months more than 20 millions of children had been examined by ultrasound B. Free hospitalization and treatment were also provided to the affected children. Although the prognosis of the identified cases is expected to be good, in order to ensure the health of the patients, discharged patients are now being followed up every six months. In addition, the criminals in this case of melamine adulteration of milk had been sentenced by the court and the compensation to the affected children had been basically completed before the Chinese New Year in the late January, 2009. Lastly, proper risk communication among all the stakeholders relevant to food safety has proved to be very important in crisis management. The names of the 22 dairy companies whose infant formula products had been found tainted with melamine were immediately released by the State Council^[1]. Continuous information release during the crisis from the Government on the toxicological characteristics of melamine, testing results of melamine in dairy products, control actions taken by the Government agencies, interim control limits for melamine in infant formula and other dairy products, and policies on free check up and treatment of patients, made the consumers aware of the details of the crisis and reduced unnecessary anxiety among consumers. Frequent press conferences organized by the State Council and Ministry of Health since September, 2008 are considered as a successful way of risk communication. In summarizing what happened in the whole melamine crisis, the conclusion is that in a successful case of risk analysis, the proper implementation and interaction among risk assessment, risk management and risk communication are critical and necessary.

WHO in collaboration with FAO organized an expert meeting to review toxicological aspects of melamine and cyanuric acid in Ottawa Canada, 1-4 December 2008^[6,9]. Several highlights are worth mentioning. Firstly, on the basis of the available data, a tolerable daily intake (TDI) of 0.2 mg/kg body weight for melamine was established. The TDI is applicable to the whole population including infants. Secondly, in contrast to the melamine poisoning of pets occurred in 2007 and 2006 where melamine and cyanuric acid were both found in pet feed and the

urinary tract stones, in the Chinese melamine tainted infant formula event only melamine was found in the infant formula and cyanuric acid was negligible and the urinary tract stone was comprised of both melamine and uric acid. This shows that melamine alone at very high levels is able to cause crystal or stone in the urinary tract. Thirdly, humans are exposed to melamine and its analogues from a number of different sources, including food and environment, for instance, breakdown of the pesticide cyromazine, and migration from approved food packaging material^[10] to the adulteration of specific foods. A specific source of exposure for which very few data exist is carry-over from the (mostly non-approved) presence of melamine in animal feed or feed ingredients. Finally, many countries have introduced control limits for melamine in infant formula and other foods. Limits for melamine in powdered infant formula (1 mg/kg) and in other foods (2.5 mg/kg) would ensure a sufficient margin of safety for dietary exposure relative to the TDI. The Expert Meeting also provided a range of recommendations for further research.

To ensure food safety is the responsibility of food producers and the government. Honesty and credibility of food industry is the key to safe food. Food safety covers a long chain from farm to table, and the final safe food product is the result of many safe steps. Food and agriculture industry should have social responsibility to ensure the safety of food products. Secondly, the government food safety control system should cover the whole food chain without any possible holes or gaps. Obviously, the raw milk collection station was the crime site of melamine adulteration and no single government agency had clearly identified responsibility for controlling the numerous private raw milk collection stations. Considering there are thousand millions of farmer households and hundred thousands of small and medium size food manufacturers currently in China, to rely on government control and inspection to ensure food safety is not realistic and the major strategy in food safety control is to improve the honesty and credibility of the farmers and food manufacturers which of course is a “Long March”.

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(Received February 11, 2009 Accepted March 7, 2009)