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**MILK CONTAMINATION PROBLEMS IN CHINA—
IMPLICATIONS FOR INTERNATIONAL DAIRY BUSINESSES**

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CONTENTS

	PAGE
EXECUTIVE SUMMARY	1
China's Milk Scandal	1
Implications for International Dairy Businesses	
CHINA'S MILK CONTAMINATION SCANDAL	3
Introduction	3
The Anatomy of China's Milk Scandal	3
Major Chinese Firms Involved in the Milk Scandal	5
Why Did the Contamination of China's Dairy Products Occur?	5
Fonterra's Involvement in the Milk Scandal	7
Developments in the Wake of the Melamine Scandal	11
Actions by China's Government	11
Actions by Foreign Governments	11
Sales and Financial Losses of China's Domestic Firms and Dairy Farmers	12
Responses from Foreign Companies	12
Actions by Foreign Competitors	13
Implications for International Dairy Businesses	14
REFERENCES	14

TABLES

TABLE 1. The "Big 6" Dairy Processors in China	3
TABLE 2. Selected Product Withdrawals Associated with Melamine Milk Contamination	4
TABLE 3. Corruption Perceptions Index, 2008	7
TABLE 3. Fonterra's Response to Melamine Contamination of Dairy Products at Sanlu Dairy	9
TABLE 4. Value of Food and Beverage Exports from China, 2007	11

MILK CONTAMINATION PROBLEMS IN CHINA—IMPLICATIONS FOR INTERNATIONAL DAIRY BUSINESSES

W.D. Dobson*

EXECUTIVE SUMMARY

China's dairy industry was struck by a huge and tragic milk contamination scandal in the autumn of 2008. The scandal arose because melamine, a poisonous industrial chemical used for making plastics, fertilizers, fire retardants, and other products, was added to milk to artificially elevate the protein content of the milk. Melamine was discovered in a host of Chinese dairy products, including milk powder, infant formula, fluid milk, yogurt, ice cream, cookies, cakes, coffee products, and candy. Early official reports blamed melamine poisoning for four infant deaths and sicknesses in over 54,000 people. A subsequent report issued by China's Ministry of Health in December 2008 showed that illnesses associated with melamine poisoning were more than five times greater than reported initially.

While China's milk contamination scandal made international headlines, milk contamination is not confined to China. Farmers, middlemen, and processors in other developing countries adulterate milk with water and harmful chemicals. This Discussion Paper analyzes the implications of milk contamination problems that have arisen in China for international dairy businesses.

China's Milk Scandal

Twenty-two Chinese dairy processing firms, including Sanlu Dairy and three other members of China's "Big 6" dairy processors, were identified in initial tests as sellers of melamine contaminated dairy products. Many additional processors were implicated in subsequent tests. Fonterra of New Zealand, which owns a 43 percent equity interest in Sanlu Dairy, and Sanlu came under scathing criticism in New Zealand and China for their handling of the milk contamination problem.

It is too soon to determine how effective the measures taken by China's government and the domestic industry will be for dealing with the country's complex, long-standing milk contamination problems. Interestingly, several major foreign companies (e.g., Fonterra, Nestle, and private equity group Kohlberg Kravis Roberts Company) have maintained, made, or increased financial investments in China's dairy industry, despite the melamine scandal. China will witness the formation of more integrated processing-milk production operations as mechanisms for avoiding future milk contamination problems. Whether these integrated operations will be fully successful models for operating in China's dairy industry remains to be determined.

A return to normalcy after China's tragic melamine scandal will not occur quickly. It probably will be one to two years before quasi-normal milk production and dairy product consumption patterns resume in China. Foreign consumers may remain skeptical of the quality of Chinese food products containing dairy ingredients for a longer period.

Implications for International Dairy Businesses

- Foreign direct investors in China's dairy industry and in the dairy industries of other countries with a history of milk contamination may find it advisable to stress test their investments to see whether the investments have a reasonably high probability of remaining profitable after a milk contamination scandal.

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- A foreign firm with a minority equity interest in a domestic dairy firm in a developing country may not be able to exercise the control needed to correct a problem in the event of a product scandal.
- Firms investing in dairy businesses in developing countries need procedures to safeguard the entire milk supply chain from the farm to food markets. Failure to do so will expose the firm to problems such as those encountered by Chinese dairy processors when middlemen-assemblers added melamine and water to milk purchased from farmers before delivering it to processing plants.
- Firms investing in China's dairy industry may find it profitable to affiliate with dairy processing companies that operate their own farms, particularly if China's government fails to adopt measures that substantially improve the quality of the country's milk. Integrated farming-processing firms can be operated in ways that maintain the quality of the milk supply. However, large, integrated dairy farming operations can be challenging to operate profitably because of herd health problems and diseconomies of scale.
- A multinational dairy company's reputation for selling high quality dairy products can be damaged by problems in the firm's developing country units. While there is no evidence that New Zealand milk products were involved in the sales of any contaminated dairy products, Fonterra risks harming its brands and sully the "clean-green" image of New Zealand dairy product companies as a result of association with problems encountered at Sanlu Dairy.
- Dairy exporters based in countries that have experienced milk contamination problems will need to make concerted efforts to ensure that they export safe products. Any hint of a renewed flare up of milk contamination in their country is likely to be used by competing exporters to create real or "manufactured" concerns about product quality to gain market share at the expense of exporters based in countries with a history of milk contamination.

CHINA'S MILK CONTAMINATION SCANDAL

The international spotlight focused on China's dairy industry in the autumn of 2008 because of the huge and tragic milk contamination scandal that erupted in that industry. The scandal arose because melamine, a poisonous industrial chemical used for making plastics, fertilizers, fire retardants and other products, was added to milk. A nitrogen-rich compound, melamine was used to artificially elevate the apparent protein content of milk adulterated with added water, and increase the price received for the milk.

Melamine turned up in many Chinese dairy products including milk powders, infant formula, fluid milk, yogurt, ice cream, cookies, cakes, coffee products, and candies. The most damaging effects of melamine poisoning were associated with baby formula, which caused kidney stones and kidney failure in infants. Early official reports attributed four infant deaths and sicknesses in over 54,000 people to melamine poisoning of milk. China's Ministry of Health reported in early December 2008 that 294,000 people were sickened by tainted milk products, more than five times the total reported earlier [5]. The longer-term impacts of melamine poisoning for the health of individuals who survived milk poisoning illnesses are unknown.

China's dairy scandal made international headlines, but problems with milk contamination are not unique to China. Farmers, middlemen, and processors in other developing countries adulterate milk with water and harmful chemicals. Milk contamination has broad implications for the health of people in developing countries, costs and returns of foreign firms making direct investments in dairy businesses in these countries, and dairy exporting prospects for companies located in developing countries.

This Discussion Paper analyzes implications of milk contamination problems that have arisen in China for international dairy businesses. Emphasis is placed on China because of the importance of China as an importer of dairy products and an exporter of food products containing dairy ingredients. Moreover, a number of implications flow from China's experience for other countries with milk contamination problems.

Introduction

The Anatomy of China's Milk Scandal. China's 2008 milk scandal occurred in a large, rapidly-growing, multi-product industry. Forecasts developed before the scandal indicated that China's milk production would total about 38 million metric tons in 2008, nearly a five-fold increase from the 8.3 million metric tons production total for 2000 [41]. The country is also an important importer of nonfat dry milk, whole milk powder, and whey products. Chao, writing in the *Wall Street Journal*, characterized the growth in sales of dairy products in China as follows [7]:

[Prior to the scandal] . . . dairy sales in China had been booming. According to market researcher Euromonitor International, revenue from the sale of milk formula rose to \$3.1 billion in 2007 from \$1.4 billion in 2003, while revenue from other dairy products grew to \$17.9 billion from \$8.8 billion in the same period.

China's dairy processing industry included a few giant processing firms and up to 1,600 smaller dairy processing firms in the mid-2000s [39]. The "Big 6" dairy processors operating in China in the mid-2000s are listed in Table 1. These processors accounted for more than one-half of the milk processed in China at mid-decade. As will be evident, the large number of smaller milk processors makes it difficult for government authorities to perform adequate milk quality

TABLE 1. The "Big 6" Dairy Processors in China.

Name of Firm	Headquarters Location
Mengniu Dairy Co., Ltd.	Inner Mongolia
Yili Industrial Co., Ltd.	Inner Mongolia
Bright Dairy & Food Co., Ltd.	Shanghai Municipality
Sanyuan Foods Co., Ltd.	Beijing Municipality
Sanlu Group Co., Ltd.	Hebei Province
Wandashan Dairy Co., Ltd.	Heilongjiang Province

Sources: Lu [26], Patton [37], and Market Watch [28].

inspections. The complex supply chain for China's dairy industry adds to the difficulty of maintaining milk quality.

When did the milk scandal start? Stories surfaced about the contamination of infant formula with melamine on September 11, 2008. Hebei province-based Sanlu Dairy was found to be selling melamine-laced infant formula that caused illnesses in infants. Accounts circulated that Sanlu Dairy knew of the contamination months earlier but suppressed information on the problem. It soon became evident that milk contamination with melamine was not confined to Sanlu Dairy.

Initial tests administered by China's Administration for Quality, Supervision, Inspection and Quarantine (AQSIQ) revealed the presence of melamine in infant formula marketed by 22 firms. The AQSIQ published results showing that 69 batches of infant formula produced by the 22 dairy companies tested positive for melamine [42]. Subsequently, 66 of 175 manufacturers of infant formula were ordered to cease production because of melamine contamination of their products. Eighty-seven companies producing infant formula that tested negative for melamine remained in operation.

Later tests revealed melamine contamination of products manufactured by other dairy firms. These firms also were ordered to suspend operations. Some firms that had suspended production resumed operations late in 2008 after demonstrating that they had restored product quality at their plants.

Albeit after initial delays, many contaminated Chinese dairy products were pulled from domestic food markets and from store shelves in a number of foreign markets. Countries that issued food recalls or bans of Chinese food products containing dairy ingredients include the U.S., European Union, Australia, New Zealand, Japan, Singapore, Malaysia, Philippines, Indonesia, Taiwan, India, Viet Nam, Thailand, Kenya, and South Korea [2,8,42].

At least two products that may contain contaminated Chinese dairy ingredients were found in the U.S. shortly after news of the melamine scandal broke. The first, White Rabbit candy, was recalled in September 2008 from markets in nine U.S. states, including several markets in Wisconsin [23]. The second, Koala's crème-filled cookies distributed by Lotte USA, were made in China and may contain melamine. The Koala cookies were pulled from Battle Creek, Michigan food markets in October 2008 [46].

In November 2008, the U.S. Food and Drug Administration (FDA) issued an updated warning to U.S. consumers about additional Chinese food products that may contain melamine [43]. The FDA recommended that consumers avoid Jacobina Biscuits, Yili Brand Milk Drinks, Blue Cat Flavored Drinks, several Mr. Brown Coffee Products, Mr. Brown Milk Tea, and infant formula manufactured in China. Subsequent FDA actions, which restrict Chinese food product imports unless they are proven to be melamine-free, are discussed later.

TABLE 2. Selected Product Withdrawals Associated with Melamine Milk Contamination.

Date of Withdrawal	Companies and Products Withdrawn from Markets
September 12, 2008	Shijiazhuang Sanlu Group removes more than 8,000 tons of product from markets in China
September 14	Hong Kong supermarket chain, Wellcome, recalls a line of Yili Group iced yogurt bars
September 20	Japan's Mardudai Food recalls five products made by its Chinese joint venture business
September 22	Nestle recalls a line of milk in Hong Kong
September 26	White Rabbit Creamy candy recalled by U.S. distributor QFCO Inc. after being pulled from shelves in other countries
September 26	Taiwan's King Car Food recalls seven Mr. Brown coffee and milk-tea products
September 29	Cadbury pulls 11 products made at its Beijing plant from stores in Asia
September 30	Unilever Hong Kong recalls four batches of Lipton milk-tea powder in Hong Kong and Macau

Source: Canaves and Ye [4].

Certain product withdrawals and prominent foreign firms involved in the withdrawals are noted in Table 2. Among other things, the information suggests that a number of large multinational firms risked damage to their brands as a result of marketing contaminated food products. The relatively rapid withdrawal of the products from markets may have limited the damage.

Additional products with international brands, which were pulled from markets outside of China because of concerns about melamine contamination are noted below [42]:

- Lipton, 3-in-1 Tea Mix
- Dove, Chocolates
- M&M's, Chocolates
- Oreo, Cookies
- Starbuck's, Milk
- Nestle's, Follow-on Formula
- Nabisco Brands, Chocolates
- Snicker's, Candy Bars
- Yum Brands, Cheese Powder

Major Chinese Firms Involved in the Milk Scandal. Two of China's Big 6 dairy processors, Sanyuan Foods Co., Ltd. of Beijing Province and Wandashan Dairy Co., Ltd. of Heilongjiang Province, were found not to be marketing dairy products contaminated with melamine in initial tests. This distinction positions the two dairies to be viable competitors in China's dairy industry and will perhaps enable the firms to acquire other companies damaged by the melamine scandal. These two firms, of course, will have to maintain melamine-free product status to take advantage of the favorable position.

The Chinese dairy firms identified as sellers of melamine contaminated dairy products, include the following Big 6 dairy industry giants:

- Sanlu Dairy
- Yili Industrial Company, Ltd.
- Mengniu Dairy Company, Ltd.
- Bright Dairy & Food Company, Ltd.

The Big 6 firms implicated in the scandal have attracted investments from major foreign dairy com-

panies. Fonterra of New Zealand, which acquired a 43 percent equity interest in Sanlu Dairy in 2006, made one of the noteworthy investments. Mengniu is a joint venture partner with Arla Foods of Sweden and Denmark. Bright Dairy Group was partly owned by Groupe Danone of France until October 2007 when Danone sold its interest in the Chinese firm [22].

Sanlu was one of China's largest producers of infant formula. The company's low-cost products were widely purchased by Chinese families, particularly those living in rural areas. This firm and its foreign partner, Fonterra, came under scathing criticism in China and New Zealand when the infant formula was found to be contaminated with melamine and that Sanlu had been slow to withdraw the product from the market.

The possibility of contamination of food products caused multinational food companies to conduct rapid analyses of the sources of ingredients for their food products. For example, the Tokyo-headquartered Lotte Group found that its Koala cookies sold in Hong Kong and Macau contained contaminated Chinese dairy ingredients, prompting withdrawal of the cookies from those markets [14]. Lotte Group subsequently sought to reassure its customers that Lotte products sold in Japan did not contain Chinese dairy ingredients. Similarly, Kraft Foods quickly notified its customers that none of its Oreo-brand products contain milk powder from China [14]. While these actions make sense from business standpoint, it may not be simple for multi-nationals to identify the source of all food ingredients since supply chains for products manufactured by multinational food firms sometimes span multiple countries.

Why Did the Contamination of China's Dairy Products Occur? What is there about China's business environment that would give rise to contamination of dairy products? Food contamination is, of course, a complex phenomenon that reflects economic factors, ethical considerations, and the regulatory environment.

Chao in a *Wall Street Journal* article characterized the economic environment in China's dairy industry as follows [7]:

The dairy industry is a competitive and low-margin business. Farmers sell milk to local dealers who in

turn sell it to companies like Sanlu. Authorities say it was the dealers who added melamine to the milk.

This simple statement says a lot. Importantly, it indicates that milk contamination can occur at different points in the farm-to-market supply chain. But it leaves much unexplained. In particular, it fails to suggest how difficult it will be to deal with the problem. Specifically, it will be difficult to guarantee milk quality in an industry that has rapidly evolved from one characterized by government ownership and control to a partially-privatized industry, characterized by fragmentation. It also may be difficult to overcome temptations associated with China's history of apparently profitable (for some) food contamination.

Contamination and false labeling of Chinese dairy products is not new. In the mid-2000s, scandals hit a few major domestic and foreign dairy firms in China, causing consumers to question the quality of dairy products [11,25]. Well-known firms were implicated in the scandals. Bright Dairy & Food Company was found to reprocess expired milk and to improperly date product containers, creating false impressions about the freshness of milk. Nestle's baby formula milk was found to contain excessive amounts of iodine. Infants died from consuming milk formula with no nutritional value made in Fuyang in East China's Anhui Province.

Wikipedia in a 2008 piece described the different facets of milk contamination in China in these terms [45, p. 6]:

Use of other potentially harmful chemical additives such as preservatives and hydrogen peroxide has been reported by independent media. Quality tests can be falsified with additives: peroxide is added to prevent milk going bad; industrial vegetable oil is emulsified and added to boost fat levels; whey is used to increase lactose content. However, such means and technology are seldom available to ordinary farmers, meaning that the procurement chain is also implicated—milk agents are often politically well connected. The big dairy producers were complicit in producing “test-tube milk.”

Fairclough in a *Wall Street Journal* article indicated that the Big 6 firm, Mengniu Dairy, and Nestle SA both knew that milk contamination had been going on for many years in China but didn't know that melamine

was one of the contaminants. Fairclough described one of the non-melamine milk adulterants in graphic terms, as follows [18]:

Among other common milk additives: a viscous yellow liquid containing fat and a combination of preservatives and antibiotics, known as “fresh-keeping liquid.”

C. MacLead, writing in *USA Today*, described food contamination in China in these terms [27]:

In 2004, fake Chinese-made baby formula that contained minimal nutrition caused at least 12 deaths and malnutrition for hundreds of infants. Other incidents in the past three years include cooked duck eggs colored with industrial red dye, vegetables with harmful pesticide residue, fish with dangerous pharmaceuticals, and vegetables and fruit injected with hormones.

Melamine contamination of eggs surfaced in China in October and November, 2008 in the aftermath of the milk scandal. The most likely source of melamine in eggs is chicken feed. Melamine appears to have been added to chicken feed to make it appear more protein rich—the same reason it was added to milk [3,18]. Concentration levels of melamine in eggs generally were lower than in contaminated milk but above levels (2.5 parts per million) prescribed by Chinese safety authorities.

Pet foods contaminated with melamine were detected in shipments from China to the U.S. in 2007. Melamine was added to wheat gluten and other pet food ingredients to artificially increase the protein content of pet foods. The contaminated pet food resulted in the death of an unknown number of dogs and cats in the U.S. Thus, the harmful effects of adding melamine to increase a product's protein content were known before the 2008 milk scandal.

Ethical considerations involved in the scandal are difficult to fully fathom and are largely beyond the scope of this paper. One quantitative measure that might approximate the linkages between adulteration of milk and ethical factors is Transparency International's Corruption Perceptions Index for China (Table 3). With a score of 3.6, China ranks substantially below dairy giants New Zealand and the U.S. In terms of all countries ranked, China's score placed the country in

TABLE 3. Corruption Perceptions Index, 2008.

Country	Index Number	Rank Among 180 Countries Evaluated
China	3.6	72 (tied with 7 other countries)
New Zealand	9.3	1 (tied with 2 other countries)
U.S.	7.3	18 (tied with 2 other countries)

Source: Transparency International [40]. Key for interpreting scores: 10 = highly clean, 1 = highly corrupt. High, median, and low scores for 180 countries ranked equal 9.3, 3.4, and 1.0, respectively.

72nd place in the 180 countries evaluated for 2008. A low score in the Corruption Perceptions Index might identify a business environment where corrupt and unethical practices are likely to emerge.

Ethical lapses, of course, are also evident in the information on economic factors associated with milk adulteration. This information suggests that some individuals knew of the harmful health effects of melamine but adulterated the milk with the chemical anyway.

What regulatory steps has China's government taken to deal with the problem? As might be expected, China's consumers were concerned about the government's response to the milk contamination scandal. Fairclough describes the situation and the initial government remedies in these terms [17]:

The scandal has badly shaken Chinese consumers' faith in the government's ability to protect the food supply. To restore confidence, the government has sacked officials, made dozens of arrests and deployed thousands of inspectors to dairy companies.

In addition, the Chinese government implemented recalls of various dairy products in mid-September 2008 and again approximately a month later as the extent of the product contamination became evident.

In the wake of the scandal, China's government also took steps to prevent a repeat of the contamination problems. Wang Yong, director of China's General Administration of Quality Supervision, Inspection and Quarantine, said that China's government intended to "make a substantial change in the production and distribution of dairy products [6]." The changes were to be implemented in part by the following measures:

- Dispatch 5,000 inspectors to supervise dairy factories around the clock to ensure raw materials are stored properly and quality-certified
- Dispose of raw materials that have deteriorated or contain nonfood or recycled content
- Require additives to be registered with quality-supervision departments
- Make inspections of exports comply with quality standards of importing nations
- Encourage investigations and reward whistle blowers
- Hold government officials above county level liable for food safety problems
- Solicit inexpensive, quick melamine testing methods

Sanlu Dairy reported that the local government in Shijiazhuang city, where the firm is based, is requiring the company increase its investment in imported melamine-testing equipment by five times to 5 million yuan (U.S.\$731,000) [6]. How this requirement will be affected by possible purchase of Sanlu by other Chinese processors is unclear.

Fonterra's Involvement in the Milk Scandal. Fonterra's involvement in the milk scandal was linked to the firm's equity interest in Sanlu Dairy. Sanlu started out as a large-scale state enterprise raising dairy cows and processing and packaging milk and milk powders. In the mid-2000s, the firm produced about 60 varieties of milk powder, including baby formulas and nutritional supplements, and had expanded into liquid milk, yogurt, and flavored drinks [31]. Sanlu believed that it would benefit from partnering with Fonterra since this would give the firm access to Fonterra's management experience, R&D, and advanced marketing skills.

Fonterra, the world's largest dairy exporting firm, is the mega cooperative formed by the merger of the New Zealand Dairy Group, Kiwi Cooperative Limited, and the New Zealand Dairy Board in 2001. The cooperative receives milk from about 11,000 producer-members in New Zealand and 2000 Australian farmers. It recorded revenues of about NZ\$19.5 billion (about US\$14.3 billion) for the 14-month period ending on July 31, 2008 [34]. Fonterra completed the purchase

of the 43 percent equity interest in Sanlu Dairy for U.S.\$107 million in 2006.

Mr. Andrew Ferrier, Fonterra's CEO, commented as follows in 2006 about the firm's purchase of the equity interest in Sanlu Dairy [36]:

Developing a closer working relationship with Sanlu is the logical next step for Fonterra's business in China . . . It complements our existing importing and consumer businesses there by partnering us with a local company that has access to local fresh milk supplies . . . New Zealand has been a successful exporter of dairy ingredients to China for decades, but as local production increases to meet the rapidly growing local demand, becoming part of the local industry will give Fonterra further opportunities to employ our expertise in all areas of the business from milk collection to consumer goods.

The Fonterra-Sanlu partnership made sense from a business standpoint for reasons described by McKinsey analysts, Cheung and Grant, in a 2006 report. Cheung and Grant described the coming shake-out in China's dairy processing industry, the reasons for the shake-out, and the more concentrated industry that would result, as follows [13]:

*Milk beverages and yogurt, for example, are innovation-driven products requiring strong R&D formulation and consumer segmentation skills, and many domestic dairy industry have little of either . . . the top five Chinese dairy companies, for instance, spend less than 1 percent of their revenues on R&D, compared with 3 to 4 percent for their Western counterparts . . . The domestic companies must build new capabilities in such areas as product development, branding, account management and marketing . . . But many of the smaller companies without such advantages (advantages gained in part from teaming with foreign firms) are likely to disappear in a wave of consolidation . . . **We expect that by 2010 more than half of China's 1,600 domestic dairy manufacturers will fail to survive the transition** (emphasis supplied).*

If one accepts the McKinsey analysts' view, it follows that the larger, surviving processors in China's dairy industry will employ advanced technologies, upgraded management skills, and R&D acquired, in

part, from foreign investors. Further, it is no stretch to conclude that because the Fonterra-Sanlu Dairy partnership included these attributes, it might be a successful model for China's future dairy processing industry.

Moreover, Fonterra undoubtedly was aware of foreign investment strategies that had failed previously in China's dairy industry. For example, several well-known foreign firms (e.g., Kraft, Danone, Parmalat, Unilever, and Friesland-Coberco) invested in China's dairy processing industries in the 1990s. With few exceptions, these firms suffered losses and withdrew from the market, frequently selling their dairy processing assets for cents on the dollar to domestic firms.

Chen Yu, a Beijing-based dairy marketing consultant, indicated that the mistakes made by the foreign dairy firms in China in the 1990s included the following [26]:

- Most foreign firms did not operate their own dairy farms in China. Chinese consumers value freshness highly. And China's consumers do not consider imported milk to be as fresh as milk produced by domestic companies, some of which operate dairy farms.
- Foreign companies failed to gain access to valuable distribution networks that extend into many cities and communities.
- Foreign processors largely misread the buying habits of urban consumers, leading to incorrect positioning of their products. Parmalat, for example, focused mainly on marketing its expensive high-end products in China. Its fruit-flavored yogurt (100 grams) was sold at 2 yuan (U.S.\$0.24) per cup, double the price of similar local brands.
- Foreign firms seldom used television or newspaper advertising to promote their products, which was a questionable marketing strategy in China's immature market where customers have little brand loyalty and are readily influenced by advertising and promotion.
- High operating costs contributed to problems of the foreign firms in an industry where profit margins are thin. In some cases, high salaries for expatriates consumed a major portion of the profits from dairy sales.

Fonterra through its equity interest in Sanlu Dairy was positioned to avoid many, if not all, of these problems and be successful in China's dairy industry. These advantages plus the extensive experience that Fonterra and its predecessor organizations had with joint ventures in many foreign countries should have produced a partnership with a high probability of success.

But despite Fonterra's apparently well-conceived plans, the cooperative found itself damaged by Sanlu's heavy involvement in the milk contamination scandal. The approximate sequence of developments surrounding Fonterra's involvement in the milk scandal appears in Table 3.

Fonterra came under strong criticism in New Zealand and China because of the delay between the time that Fonterra knew of milk contamination at Sanlu Dairy and when news of the milk contamination became public in China. The delay spanned the August

2, 2008 through September 10, 2008 period. And it was not until Helen Clark, then New Zealand's Prime Minister, notified Chinese government officials in Beijing of the melamine poisoning that rapid and public action to deal with the problem was initiated.

Fonterra is a well-run organization. Fonterra's management undoubtedly knew that prompt action is required when a problem such as food poisoning is uncovered. A generally accepted principal is that damage to a firm can be sharply limited by quick, effective action to recall a contaminated product and put in place measures to prevent a recurrence of the problem.

What prevented Fonterra from taking prompt action? Obviously Fonterra was concerned about Sanlu's refusal to go public with product withdrawal information after August 2. The cooperative considered going public outside of China to force Sanlu and China's government to go public with product contam-

TABLE 3. Fonterra's Response to Melamine Contamination of Dairy Products at Sanlu Dairy.

Date	Development and Response
August 2, 2008	Sanlu's board of directors, including Fonterra executives, were informed of melamine contamination of Sanlu's dairy products.
August 2 thru September 4, 2008	Fonterra encouraged Sanlu and local Chinese authorities to withdraw Sanlu's contaminated dairy products from the market. Sanlu agreed to withdraw contaminated dairy products but refused to go public with the announcement, citing the need for social stability as well as protection of public health. Sanlu, as promised, began quietly recalling 10,000 tons of tainted milk powder from the market. Fonterra considered going public outside of China to pressure Sanlu and Chinese government officials to go public with announcements of the product contamination and product withdrawal plans, but abandoned this option. Fonterra officials in Beijing and New Zealand held conference calls on how to deal with the scandal but apparently came to no substantive agreement until September 5.
September 5 to September 10, 2008	New Zealand Prime Minister Helen Clark was told of the problem on September 5. Three days later she ordered that Chinese authorities in Beijing be notified. Chinese government officials then took action against Sanlu's managers and launched investigations into the safety of products marketed by other Chinese dairy companies and product withdrawals.
September 11, 2008	Sanlu Dairy publicly disclosed that its products were contaminated. Information about product contamination at Sanlu and a number of other dairy companies began to circulate in China and in the international media. Sanlu's board chairwoman and general manager, Tian Wenhua, was fired in the wake of the incident. Wu Xianguo, the Communist Party chief of Shijiazhuang in Hebei Province was fired for delaying reports of the issue to higher authorities and incompetence in disposition of the matter.
September 24, 2008	Fonterra booked a NZ\$139 million (US\$95 million) impairment charge against the carrying value of its investment in Sanlu. This left a residual value of NZ\$62 million (U.S.\$43 million) in Sanlu, mainly its physical plant. Fonterra wrote off the value of the Sanlu brand. However Fonterra's board of directors said they would continue the firm's long-term strategic commitment to China.

Sources: *Wall Street Journal* [8,9,32,33] and *New Zealand Herald* [30].

ination and withdrawal information, but abandoned this option. Mr. Andrew Ferrier, Fonterra's CEO, said that such action would have caused Fonterra to "lose control of the whole thing [33]." The full implications of this comment are not clear.

A key factor that undoubtedly delayed public announcements of the milk scandal was the presence of the Beijing Olympic Games, which ran from August 8–August 24, 2008. These games were scheduled to begin less than one week after Fonterra learned of the milk contamination at Sanlu Dairy. China's government would have been embarrassed if international headlines about the milk scandal had surfaced immediately before or during the Olympic Games. It is thus no surprise that Sanlu's management and the local Communist Party officials in Hebei Province were reluctant to issue public pronouncements about the milk poisoning and product withdrawal on or immediately after August 2. It might also have damaged Fonterra's business prospects in China if the firm had gone public outside of China to force public announcements of the milk scandal. Fonterra clearly was not indifferent to the consequences of delays for the health of Chinese consumers of Sanlu's products but could not figure out how to deal effectively with the problem.

Fonterra found it necessary to take the NZ\$139 million (U.S.\$95 million) impairment charge as a result of problems at Sanlu Dairy. And the value of the Sanlu brand has been destroyed. It is unclear what will be the financial impact on Fonterra of a possible takeover of Sanlu by a Chinese dairy company that was not involved in the milk scandal. It is also unclear how much any lawsuits brought against Sanlu and Fonterra will cost the New Zealand cooperative.

Armed with hindsight, a few observers have pointedly criticized Fonterra for failing to exercise the authority the firm possessed and for not being better prepared for the scandal. One critic questioned the cooperative's continuing strategic commitment to China.

Dr. Deborah Petty, Strategy Advisor with Oxford Metrica in Britain, said Fonterra's 43 percent equity interest in Sanlu meant it had enough clout to deal with the crisis well before it did [44]. Petty asserted that "They [Fonterra] are a big shareholder, not just a stakeholder. That makes a difference." She added that having three directors on the board also gave Fon-

terra "ample opportunity to communicate and take responsibility." The reports of Petty's comments noted with approval that Fonterra has given NZ\$8.4 million (about US\$5.0 million) to set up a rural maternity and infant community healthcare program in China.

G. Cumming, writer for the *New Zealand Herald*, argued that Fonterra should have been aware of the risks associated with milk contamination in China, as follows [12]:

... Fonterra must have been aware of the risk of product-tampering in China. When the news [of melamine poisoning of milk] reached New Zealand this week, a Venture Southland official, Steve Canny, recalled the concerns of a Chinese businessman negotiating to buy 1,500 tons of baby formula in Southland earlier this year. He insisted the formula be supplied in sealed 1 kg containers to avoid the risk of contamination with materials like talcum powder or chalk once it reached China."

Financial writer, S. Louisson, commented as follows about the damage to Fonterra's reputation and questioned the wisdom of the decision by the cooperative's board of directors to maintain its long-term strategic commitment to China [24]:

Beyond the human toll, the scandal has damaged Fonterra management's reputation—the cooperative bosses took far too long to take effective action ... Fonterra's CEO, Andrew Ferrier, downplays the melamine disaster on the basis that Sanlu represents a relatively small investment. But the farmers may see it differently—as more trouble than it is worth and a sign management can't control its sprawling empire.

Fonterra has worked with Sanlu Dairy to put in place improved testing procedures to identify milk contamination at the dairy. After doing so, Fonterra pointed out that melamine poisoning of milk was unusual and that few, if any, dairy companies elsewhere in the world had tested for the presence of melamine in milk.

There is an axiom in business and government that, "Extreme cases make bad policy." Fonterra undoubtedly faced an extreme case in connection with the milk poisoning scandal at Sanlu Dairy. Indeed, because the scandal coincided with the Beijing Olympics, it was probably a perfect storm.

Fonterra might have “stress tested” its strategies for the equity investment with Sanlu Dairy to assess how the operation would perform in the presence of a major milk scandal. But, prior to the milk scandal, there were arguably so many possible negative developments in China’s dairy industry that it would be difficult to know whether milk contamination should be included in a stress test. Thus, it is questionable whether Fonterra could have accurately anticipated the full impact of the melamine scandal. However, given the huge and tragic experience with milk contamination in China in the autumn of 2008, it appears that stress testing will be a useful strategy for future foreign investors in China’s dairy industry.

Developments in the Wake of the Melamine Scandal

Milk contamination is a pervasive, long-standing problem in China’s complex, fragmented dairy industry. It is too early to tell how effective the steps taken by China’s government and the domestic industry will be for fully remedying the country’s milk contamination problems. However, developments that have unfolded in the wake of the scandal reveal some fragmentary information about how the scandal is being handled by China’s government, how foreign governments are responding to the scandal, how the scandal has affected dairy product sales and profits in China’s dairy industry, and how foreign competitors have responded to China’s milk poisoning scandal.

Actions by China’s Government. China’s AQSIQ announced on October 17, 2008 that it had cancelled 910 food production licenses of 872 enterprises, of which 66 licenses were for dairy products or dairy drinks [10]. The Sanlu Group was included in the list of firms subject to the cancellation. For Sanlu, it means that the firm no longer has a license to produce infant formula and young child formula milk powder.

Simultaneously, many Chinese dairy plants that had been forced to suspend production because of the scandal began resuming production. By mid-November 2008, 638 Chinese dairy companies had resumed production, representing about 80 percent of the total firms that had suspended production in the aftermath of the scandal [10].

Actions by Foreign Governments. Foreign governments have restricted or prohibited imports of Chinese foods containing dairy ingredients. A noteworthy, second-stage action was taken by the U.S. Food and Drug Administration (FDA) in mid-November 2008. Writing in the *Wall Street Journal*, Zhang and Mundy described this action as follows [47]:

The FDA directive requires importers to prove their food and drink shipments do not contain the industrial chemical melamine before they can be released to U.S. markets. The order may affect a big chunk of China’s \$3.8 billion in annual food and beverage exports to the U.S. (see Table 4) . . . The agency said it won’t release the imported food unless an independent laboratory verifies that representative samples contain no melamine or cyanuric acid, a melamine derivative. The products can also be released if labels or manufacturing records show they don’t contain milk.

The FDA action could drive up Chinese exporters’ costs since foods made with milk, and any other foods in the same shipping container, would be held in port pending clearance. Mr. Ben England, a former FDA official who now advises Chinese exporters, said “This will stop a lot of cargo anywhere from six weeks to three months . . . This is going to be very, very expensive [47].” Partly this is because some semi-perishable products will go out of condition while awaiting approval to enter the U.S. Presumably, the delays mentioned by England will be much shorter once China’s food manufacturers secure the services

TABLE 4. Value of Food and Beverage Exports from China, 2007.

Receiving Market	Value of Chinese Exports (US\$ Bil)
Japan	US\$7.30
U.S.	3.83
Hong Kong	2.71
South Korea	2.56
Russia	1.14

Source: *Wall Street Journal* [47].

of independent testing firms, which verify at the time of production that a food item is melamine-free.

In the November 2008, the FDA announced plans to open offices in three Chinese cities. These offices are part of a new effort to cooperate with Beijing on food safety [47].

Sales and Financial Losses of China's Domestic Firms and Dairy Farmers. The China Daily reported that the country's exports of dairy produce plunged 92 percent in October 2008, compared to a year earlier [21].

Mr. Peder Tuborgh, CEO of Arla Foods, reported in November 2008 that sales at the firm's joint venture business with Mengniu Dairy were about one-half of pre-milk scandal levels and that it would be more than a year before dairy product sales return to normal in China [19].

The U.S. Dairy Export Council (USDEC) reported the following information on sales reductions and losses incurred by China's two biggest milk processors in the aftermath of the scandal [42]:

- Sales of Mengniu and Yili dropped by more than 80 percent in the second half of September 2008 and their daily intake of raw milk was reduced by 81.5 percent to 3,672 metric tons.
- Mengniu and Yili have taken products off shelves worth U.S.\$900 million. It is estimated that the two firms will incur an additional loss of over US\$500 million, if the depressed sales situation continues for four to five months.

In part, the reduced milk intake by Mengniu and Yili may reflect the fact that the two firms have stopped buying from, or took control of, the small milk depots in their supply chain after news of melamine poisoning of milk broke in September 2008 [1]. These firms are, in essence, copying part of a Nestle strategy. Nestle states that it has avoided the middlemen since opening its first Chinese plant in 1987. Nestle says that it buys directly from farmers and that the milk is checked for quality at the farm before the containers are sealed. The milk is then transported to the factory, where it is tested again. Nestle claims that this buying practice promotes traceability and accountability over the overall supply chain [1].

China's dairy farmers were hit hard by processors' decisions to reduce or terminate milk intake and, in some cases, to stop buying milk from small dairy farmers. On the latter point, Bright Dairy stopped buying milk from smallholders after the scandal [10]. Bright Dairy announced that it would buy milk only from farmers who joined farming districts where systems are in place to permit better quality control than is possible when milk is purchased from individual smallholders. This was not a drastic step since Bright Dairy obtained only about 5 percent of its milk supply from smallholders. Moreover, it is not clear how many additional milk processing firms will follow Bright Dairy's lead. But, if a large number do, it would be disruptive, since smallholders account for as much as 60 percent of China's milk supply [10].

China's Ministry of Finance and Ministry of Agriculture reported on September 26, 2008 that relief payments would be made to dairy farmers to tide them through the rough times following the milk scandal [42]. Vice Minister of Agriculture, Gao Hongbin, announced in early November 2008 that dairy farmers in Inner Mongolia, Hebei, Liaoning, Shaanxi, Shandong, and Henan Provinces have received 300 million yuan (U.S.\$44 million) from the Ministries of Agriculture and Finance to offset their losses [38]. Dairy farmers may require longer-term relief payments, particularly if smallholders find it difficult to maintain markets for their milk.

Responses from Foreign Companies. Interestingly, a number of foreign firms have indicated that they will retain, make, or expand investments in China's dairy industry, as noted below:

- Fonterra, as noted earlier, plans to continue its strategic commitment to China's dairy industry. However, it may be too early to judge the extent of this commitment since it will be affected by any sale of Sanlu to other dairy companies in China and any legal actions taken against Fonterra and Sanlu by persons harmed by the melamine contamination.
- U.S. private equity firm, Kohlberg Kravis Roberts & Company (KKR) will invest about US\$100 million in the Mengniu Modern Animal

Husbandry Group, which was founded in 2005 [5]. In late 2008, the Mengniu Animal Husbandry Group operated four large farms and was in the process of opening an additional three, with a total of 26,000 cows. The Group plans to build 25 to 30 additional farms in the next two years. KKR and the equity group's Chinese partners believe that the large farms with proven milk quality maintenance procedures will thrive in the aftermath of the melamine milk scandal. The Mengniu Animal Husbandry Group will bear watching to see whether it is a successful model for China's dairy industry.

- Nestle has indicated that the company will continue to invest in China's dairy industry. The company plans to expand processing capacity in Inner Mongolia and Qingdao and to introduce new products, despite the melamine incident [10]. Nestle also has invested US\$10 million to build an R&D center in Beijing, which will conduct research on food safety and quality.

Actions by Foreign Competitors. As expected, foreign dairy companies and affiliated organizations are taking actions to demonstrate that their products are melamine-free. For example, the USDEC developed a Melamine Certification Program, which qualifying exporters can employ to assure buyers of U.S. dairy products that the products are melamine-free. This certification program is funded by USDEC member dues. The language in the USDEC certification document reads as follows [42]:

USDEC confirms that neither melamine nor cyanuric acid were detected at levels that exceed the U.S. tolerance level of 2.5 ppm in the (insert product name(s)) of (insert company name). This conclusion is based on an analysis of samples submitted to the USDA National Science Laboratory by the product manufacturer, following USDA sampling protocols from randomly generated Julian dates for (insert as appropriate) quarter of (insert year), using the liquid chromatography/mass spectrometry (LC/MS/MS) test method.

The USDEC plans to phase out industry testing for melamine if the U.S. government resumes appropriate

testing for this contaminant. It is not certain whether a phase-out will be feasible since the U.S. Environmental Protection Agency concluded in May 2000 that cyromazine (melamine is a metabolite of parent compound cyromazine) in milk is no longer a residue of concern. The status of USDEC's efforts to secure appropriate U.S. government testing for melamine is unclear at this writing.

USDEC officials made the following observations about the immediate and likely future impact of China's melamine scandal on international dairy markets [42]:

- Demand for U.S. exports of dairy products shrunk rapidly immediately after the scandal.
- Customs clearance for U.S. dairy exports to China were delayed due to inspectors being pre-occupied with the domestic melamine crisis.
- Payment delays and delinquencies are expected because of cash flow problems affecting Chinese buyers of dairy products.
- Demand for U.S. dairy products will rebound in the medium term, especially for food product ingredients.
- It will take one to two years before China's consumers regain confidence in domestically-produced dairy products. Higher income Chinese consumers may seek out foreign dairy brands while they observe the effectiveness of actions taken in the domestic industry to improve dairy product quality.
- In the longer-term, the demand for U.S. dairy ingredients and cheeses will continue to rise in China.

USDEC's estimates of the time it will take for dairy exports to China to return to approximately normal levels appear reasonable. A fundamental question for China's dairy industry is: How long will it take for the country to achieve somewhat normal exports of dairy products and food items containing dairy ingredients? The long-standing use of melamine and a host of other dangerous contaminants presumably will cause foreign customers to be skeptical of the quality of China's dairy-food products until there is durable proof that the products are contaminant free. Some of China's

larger dairy processing firms appear to be taking steps to reduce chances of future milk contamination. It is less clear that the hundreds of smaller milk processing plants operating in China are putting in place similar safeguards. It is safe to conclude that China's dairy industry is a risky place in which to do business in the aftermath of the milk scandal.

Implications for International Dairy Businesses

A number of points emerge from the melamine scandal that foreign dairy firms investing in China or other developing countries might find it useful to note:

- Foreign direct investors in China's dairy industry and in the dairy industries of other countries with a history of milk contamination may find it advisable to stress test their investments to see whether the investments have a reasonably high probability of remaining profitable after a milk contamination scandal.
- A foreign firm with a minority equity interest in a domestic dairy company in China or other developing country may not be able to exercise the control needed to correct a problem in the event of a product scandal.
- Firms investing in dairy businesses in developing countries need procedures to safeguard the entire milk supply chain from the farm to food markets. Failure to do so will expose a firm to problems such as those encountered by Chinese dairy processors when middlemen-assemblers added melamine and water to milk purchased from farmers before delivering it to processing plants.
- Firms investing in China's dairy industry may find it profitable to invest in dairy processing firms that operate their own farms, particularly if

China's government fails to adopt measures that substantially improve the quality of the country's milk. Integrated farming-processing firms can be operated in a fashion that maintains a quality milk supply. However, large, integrated dairy farming operations can be challenging to operate profitably because of herd health problems and diseconomies of scale. Significant problems with herd health, in particular, have been noted on China's large dairy farms [16].

- A multinational dairy company's reputation for selling high quality dairy products can be damaged by problems in the firm's developing country units. For example, Fonterra found it necessary to withdraw Annum Materna, a line of prenatal milk sold in China that it believed was contaminated by local milk. Fonterra announced that Annum Materna sold outside of China was made from New Zealand milk [8]. The need to make such an announcement raises questions about a company's products. While there is no evidence that New Zealand milk products were involved in the sales of any contaminated dairy products, Fonterra risks harming its brands and sully the "clean-green" image of New Zealand dairy products as a result of association with problems encountered at Sanlu Dairy.
- Dairy exporters based in countries that have experienced a milk contamination scandal need to make concerted efforts to ensure that they export safe products. Any hints of a renewed flare up of product contamination will be used by competing exporters to create real or "manufactured" concerns about product quality to gain market share at the expense of exporters based in countries with a history of product contamination.

REFERENCES

1. Bi, W., “China Follows Nestle in Crackdown on Milk Buyers 20 Years Later,” Bloomberg.com, December 3, 2008. <http://www.bloomberg.com/apps/news?pid=20670001&refer=asia&sid=aYeK30h4E>.
2. Buckley, C., “China Vows Export Crackdown Amid Milk Crisis,” *International Herald Tribune*, September 26, 2008. <http://www.ihf.com/bin/printfriendly.php?id=16501507>.
3. Canaves, S., “Report of Tainted Eggs was Delayed for a Month,” *Wall Street Journal*, October 30, 2008, p.A12.
4. Canaves, S. and J. Ye, “Chinese Parents File Milk Lawsuit,” *Wall Street Journal*, October 1, 2008, p.A21.
5. Carew, R., “KKR Invests in Chinese Dairy Farm,” *Wall Street Journal*, December 2, 2008, p.A9.
6. Chao, L., “China Moves to Test, Monitor Milk Supplies,” *Wall Street Journal*, October 7, 2008, p.A19.
7. Chao, L., “Chinese Dairies Face a Worsening Crisis,” *Wall Street Journal*, September 19, 2008, p.B1.
8. Chao, L., “More Firms Tied to Tainted Formula—China Officials Say Industrial Chemical was in Baby Food,” *Wall Street Journal*, September 17, 2008, p.A23.
9. Chao, L. and S. Louisson, “More Countries Ban Chinese Products Amid Milk Scandal,” *Wall Street Journal*, September 25, 2008, p.A12.
10. China Dairy Business, “News and Figures, Biweekly Report,” Vol. 0822, November 14, 2008.
11. Chinadairy.net, “Consumer Fears Hit Bright Dairy Sales,” updated: 2005-8-29.
12. Cumming, G., “Contaminated by Toxic Trade,” *New Zealand Herald*, September 20, 2008. http://www.nzherald.co.nz/nz/news/print.cfm?c_id=1&objectid=10533158&pnum=0.
13. Dairyreporter.com, “Chinese Dairies Lack R&D Spending” 01/05/2006. <http://www.dairyreporter.com/news/printNewsBis.asp?id=67429>.
14. Dallas Morning News, “China Tainted Milk Crisis Hits More Global Companies,” September 27, 2008. <http://www.dallasnews.com/sharedcontent/dws/news/world/stories/092708nintchinam>.
15. Doble, C., “Never Again?—The Global After-Effects of the Chinese Milk Scandal,” *Food Processing Technology*, November 6, 2008. <http://www.foodprocessing-technology.com/features/feature45017>.
16. Dobson, W.D., “Drivers of Change in China’s Dairy Industry-Implications for the U.S. and World Dairy Industries,” *Babcock Institute Discussion Paper No. 2006-4*.
17. Fairclough, G., “China Orders Wide Milk-Products Tests in Effort to Restore Public Confidence,” *Wall Street Journal*, October 15, 2008, p.A15.
18. Fairclough, G., “Tainting of Milk Is Open Secret in China,” *Wall Street Journal*, November 3, 2008, p.A1.
19. Food Business Review, “Melamine Scare Affects Arla Foods Sales in China, Says CEO,” November 11, 2008. http://www.food-business-review.com/article_news_print.asp?guid=BFA77A40.
20. Ford, P., “Behind Bad Baby Milk, an Ethical Gap in China’s Business,” *Christian Science Monitor*, September 17, 2008. <http://www.printthis.clickability.com/pt/cpt?action=cpt&title=Behind+bad+baby+milk>.
21. Gale, J., “Melamine Controls May Need Tightening Amid New Food Guidelines,” Bloomberg.com, December 6, 2008. <http://www.bloomberg.com/apps/news?pid=20670001&refer=home&sid=adqSgaHsDDX4>.
22. Kwok, V.W-y, “Danone Sells Out of Bright Dairy,” *Forbes.com*, October 16, 2007. http://www.forbes.com/2007/10/16/danone-bright-dairy-markets-equity-cx_vk_1016m.
23. Leow, J. and L. Chao, “Milk Scandal Taints China’s Cherished White Rabbit—Candy will Be Re-launched in New Packaging as Manufacturer Tries to Reassure Consumers that It’s Free of Contaminants,” *Wall Street Journal*, October 10, 2008, p.B8.
24. Louisson, S., “Dairy Giant Fonterra and the Chinese Milk Scandal,” *Wall Street Journal*, September 22, 2008. http://www.competitivemarkets.com/index2.php?option=com_content&task=view&id.
25. Lu, Z., “Dairy Industry Shunned by Public,” *China Daily* as reported in News Guangdong, updated 2005-06-23.

26. Lu, Z., “Milk Companies Vie for Re-entry,” *China Daily*, updated 2004-05-13.
http://www.chinadaily.com.cn/doc/2004-05/13/content_330340.htm.
27. MacLeod, C., “Many Chinese Doubt Food Scandals Will End—Public Unsure which Brands to Trust in Wake of Tainted Milk,” *USA Today*, October 8, 2005.
28. MarketWatch.com, “The Dairy Products Market in China Increased in Value to Reach RMB85.5bn,” August 1, 2006. <http://www.marketwatch.com/News/Story/Story.aspx?guid=%7BDD20DC2B-C2C4-4DF7>.
29. McKnight, M., “Global Dairy Outlook: 2009: The Demand Component,” USDEC Webinar, November 18, 2009. <http://www.DairyFoods.com>.
30. *New Zealand Herald*, “Contaminated Chinese Milk Costs Fonterra NZ\$139 Million,” September 24, 2008.
http://www.nzherald.co.nz/business/news/print.cfm?c_id=3&objectid=10533919&pnum.
31. *New Zealand Herald*, “Fonterra’s Sanlu Investment Looms Large,” [nzherald.co.nz/21/11/05](http://www.nzherald.co.nz/21/11/05).
32. Oster, S. and L. Chao, “China Arrests 2 in Milk Scandal as Number of Sick Infants Rises,” *Wall Street Journal*, September 16, 2008, p.A16.
33. Oster, S., L. Chao, J. Leow and J. Zhang, “FDA Warns Against Products Tied to Tainted Milk—Recall Is U.S. First In China Scandal Over Baby Formula,” *Wall Street Journal*, September 27–28, 2008, p.A14.
34. *Otago Daily Times*, “Farmers Get NZ\$800,000 Despite Fonterra’s Woes,” September 24, 2008.
<http://www.odt.co.nz/news/business/23797/farmers-get-800000-despite-fonterra039-woes>.
35. Patrick, A.O., J. Jargon, S. Canaves, and J. Dean, “Food Giants Scrutinize Chinese Suppliers,” *Wall Street Journal*, September 30, 2008, p.B1.
36. Patton, D., “Fonterra Stake in Sanlu Given All Clear,” AP-Food Technology.com, 6/04/2006.
37. Patton, D., “Uni-President Fails to Quell Rumors about Chinese Dairy,” 01/08/2006.
<http://www.ap-foodtechnology.com/news/ng.asp?n=69531>.
38. *People’s Daily Online*, “China Milk Quality ‘Greatly Improved’ After Melamine Scandal,” November 6, 2008. <http://english.peopledaily.com.cn/90001/90776/90882/6528273.html>
39. Schultz, L., “China, People’s Republic of, Dairy and Products, Market Survey of South China Dairy Products, 2006,” USDA-FAS GAIN Report CH6603, March 28, 2006.
40. Transparency International, “Corruption Perceptions Index, 2008.”
41. USDA-FAS, “Dairy: World Markets and Trade,” July 2008.
42. U.S. Dairy Export Council, “China Infant Formula Contamination,” Presentation for Board of Directors and Annual Membership Meeting, October 7–8, 2008.
43. U.S. Food and Drug Administration, “Melamine Contamination in China,” Updated November 13, 2008.
<http://www.fda.gov/oc/opacom/hottopics/melamine.html>
44. Van Den Bergh, R., “Fonterra’s Melamine Response ‘Too Late,’ ” *The Dominion Post*, November 10, 2008.
<http://www.stuff.co.nz/print/4755213a13.html>.
45. Wikipedia, “2008 Chinese Milk Scandal,” last modified October 2, 2008.
http://en.wikipedia.org/wiki/2008_baby_milk_scandal.
46. *Wisconsin State Journal*, “Recall of Cookies Underway,” October 18, 2008, p.C5.
47. Zhang, J. and A. Mundy, “U.S. Restricts China Milk Products,” *Wall Street Journal*, November 14, 2008, p. A3.