

## Buying Human Milk via the Internet: Just a Click Away

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### Abstract

**Background:** For past centuries, infants have been fed the milk of mothers who are not their own by latching to another woman's breast. Today, the majority of lactating women use electric pumps to extract milk from their breasts; thus, an infant now may be fed another woman's milk via a bottle or cup. The Internet is an emerging avenue to acquire pumped human milk. The purpose of our study was to participate in and describe the process of buying milk via the Internet. Our goal is to help those involved with the clinical care, research, and public health policy of mothers and infants better understand that families may be buying milk in this way.

**Subjects and Methods:** We anonymously bought 102 human milk samples via the Internet. We characterized the outside box, packing materials, milk container, temperature and condition of the milk, and cost.

**Results:** We bought 2,131 ounces of milk at a total cost of \$8,306. Eighty-nine percent of the milk arrived above the recommended frozen temperature of  $-20^{\circ}\text{C}$ ; 45% of it was even above the recommended refrigerator temperature ( $4^{\circ}\text{C}$ ). The mean surface temperature of the milk samples in each shipment was correlated with the cost of shipping, time in transit, and condition of the milk containers.

**Conclusions:** The prevalence and potential risks of this practice currently are unknown. Research related to milk quality and infant outcomes related to milk buying via the Internet is urgently needed.

### Introduction

FOR PAST CENTURIES, INFANTS have been fed the milk of mothers who are not their own by latching to another woman's breast. Today, the majority of lactating women use electric pumps to extract milk from their breasts<sup>1</sup>; thus, an infant now may be fed another woman's milk via a bottle or cup. The Internet is an emerging avenue to acquire pumped human milk.

Searching the Internet with phrases such as "human milk share," "human milk buy," or "looking for human milk" yields a variety of links, including donor milk banks, classified ads, blogs, and posts on social networking sites.<sup>2</sup> Many of these sites advertise themselves as an "informational resource" connecting families to one another. Buyers and sellers begin their "conversation" for the exchange of milk electronically, and shipping costs or arrangements for milk pick-up are agreed on between parties. Human milk is given for free or sold by the ounce

(usually between \$1 and \$10/ounce). Just as any commodity bought, sold, or traded on the Internet, unpasteurized human milk is typically advertised with a picture, a description of the source of the milk, and requirements for acquisition.

Currently there is no U.S. Food and Drug Administration oversight of this practice.<sup>3</sup> The legal precedence has not been set.<sup>4</sup> Concerns about the safety of feeding to infants unpasteurized human milk acquired via the Internet have been raised.<sup>2,3,5,6</sup> The biggest potential problem is that this shared human milk could transmit infectious agents or toxic substances to the individual who consumes it. Moreover, "milk" for sale on the Internet may, in fact, not be human milk at all. Buyers have no way of knowing if the milk quality has been affected by potentially infectious diseases, drugs, toxins, or the addition of water, cow's milk, or any other ingredient to enhance the volume.

The purpose of our study was to participate in and describe the process of buying milk via the Internet. Our goal is to help

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those involved with the clinical care, research, and public health policy of mothers and infants better understand that families may be buying milk in this way.

## Materials and Methods

### *Study organization*

We established an infrastructure within our lab to anonymously purchase human milk samples via the Internet. First, we created an e-mail account to communicate with the sellers. Next, we set up a PayPal<sup>7</sup> account to facilitate secure and prompt payment on a credit card via the Internet. Finally, we rented a mailbox off-site to serve as a delivery address where the milk could be received 6 days per week and maintain anonymity.

### *Searching the Web sites*

Before we bought milk, we studied how the process of milk sharing on the Internet worked.<sup>8</sup> We closely examined four sites: Eats on Feets,<sup>9</sup> Human Milk 4 Human Babies,<sup>10</sup> Milk Share,<sup>11</sup> and Only the Breast.<sup>12</sup> We did not use any sites operated through Facebook because we wanted to buy samples anonymously, and we would thus violate Facebook's policies of truthful representation.<sup>13</sup> Therefore, we chose to read advertisements or "postings" on the entirely publicly available sites.<sup>11,12</sup>

During 3 months in the summer of 2012, we regularly searched for postings in which milk was available. Because our goal was to simply participate in the process and we were not going to feed it to an infant, we sought to buy only a few ounces of milk from each seller. We included postings in which milk was for sale, milk was actively available, the posting was current, and the address was within the continental United States. We excluded postings that offered only direct breastfeeding ("wet nursing").

### *Correspondence required to obtain the milk*

We believed it important to maintain anonymity during the purchasing process so as to obtain samples of milk that were as representative as possible of the milk being sold via the Internet. We strictly confined our communications with sellers to the actual process of buying the milk and did not fabricate an identity for ourselves or mention the existence of a recipient infant as we felt that would be deceptive.

Eligible sellers were contacted with a standard inquiry requesting a "small" amount of milk. The seller was the one who set the price (\$/ounce) and chose the container type, packaging materials, shipping carrier, and payment method. We discontinued communications with sellers who no longer had milk to sell, wanted to sell only large amounts of milk, asked for personal information or a picture of the infant, or had questions about who was going to be fed the milk.

### *Receipt and evaluation of milk samples*

When a box arrived at the rented mailbox, personnel on-site notified us. One of the study staff went to the mailbox by private car and brought the box back to the lab. We calculated the number of miles between the zip code for the shipping address and that for the rented mailbox using Google Maps.<sup>14</sup>

When at the lab, we took digital images of the exterior condition of the box and then subsequently rated the condition of the box (from 1 = excellent to 5 = unsatisfactory/much

damage). Wearing sterile gloves, goggles, and a lab coat, we opened the box and immediately took the surface temperature readings of each milk container with a temperature gun.

We then took digital images of the interior of the box and recorded a description of the packing materials (Styrofoam<sup>®</sup> [Dow Chemical Co., Midland, MI], newspaper, none, etc.) and the presence of any ice. We noted the number of milk containers, the type of storage container for the milk (plastic bags, baby bottles, other hard-sided container, or other), the approximate volume of the milk containers, and the overall condition of the containers (from 1 = excellent to 5 = unsatisfactory/much damage). After this evaluation was complete, each container of milk was labeled with a study ID number and placed in the lab freezer.

### *Analysis*

Digital images served as a visual representation of the exterior and interior of the box and to verify the contents and condition. We performed univariate statistics on shipment characteristics. We also calculated the mean dollar amount per ounce of milk and shipping costs. Using Pearson's correlation, we compared the surface temperature of the milk samples (we used the mean temperature if more than one sample in the box) with the dollar amount per ounce of milk, cost of shipping, number of miles of each shipment, time in transit, and the rating score for both the exterior of the box and milk containers. We considered  $p \leq 0.05$  significant. For all analyses, we used SAS version 9.3 software (SAS Institute, Cary, NC). This study was deemed exempt from human subjects review by the Nationwide Children's Hospital Institutional Review Board.

## Results

It did not cost us any money to set up the e-mail, credit card, or PayPal accounts. The mailbox cost \$75 for a 6-month lease. We reviewed 523 postings; 495 (95%) met our eligibility criteria. Of the sellers to whose postings we responded, 304 (61%) replied. We had multiple e-mail "conversations" with each seller as we attempted to coordinate the purchase and shipping. Forty-one of the 304 sellers (13%) did not reply to us after our initial response. We discontinued communications with 57 (19%) because they wanted information that we were not willing to provide. Seventy-nine (26%) sellers agreed that they were going to send milk but never finalized the transaction and shipping details. Seventeen (6%) initial transactions were not resolved for miscellaneous reasons. Of the original 304 replies, we completed transactions with 110 (36%) sellers. We received milk from 102 sellers via one Web site.<sup>12</sup> Of the eight sellers who received our payment but never sent any milk, five sent us electronic refunds, and three did not.

We received 102 boxes containing 333 containers of milk. Forty-one (40%) of the sellers chose to ship by the U.S. Postal Service; 61 (60%) chose a commercial seller (UPS or Fedex). We did not receive any milk on the same day it was sent (Day 0). We received 51 (50%) of the samples the day after shipment (Day 1) and 38 (37%) on Day 2. The most number of days in which milk was sent until it was received was 6 days. This delay usually happened when sellers sent the milk on a Thursday or Friday. Shipments traveled a mean of 841 miles (SD, 578 miles; range, 131–2,426 miles).

Intact boxes highlighting dry ice labels, human milk content, and price of shipping (\$42.50)



Damaged boxes on arrival, some with leaking contents



FIG. 1. Examples of the outside of the box containing human milk bought via the Internet in the United States in 2012.

The condition of the shipments upon arrival was variable, with 41 (40%) boxes rated as excellent/no damage ("1") and nine (9%) rated as unsatisfactory/much damage ("5"). Examples of the boxes are shown in Figure 1. The mean rating of the boxes was 2.2 (SD, 1.3; range, 1–5). The mean temperature for the milk containers in all of the boxes was 2°C (SD, 18°C; range, –49 to 27°C). The surface temperatures of the average of the containers for each of the 102 boxes are shown in Figure 2. Using guidelines for human milk storage from the Human Milk Banking Association of North America,<sup>15</sup> 11 (11%) of the shipments had milk that arrived below the recommended frozen temperature of –20°C. Forty-five (44%) shipments arrived between the frozen and refrigerated range. Forty-six (45%) milk samples arrived above the recommended

refrigerator temperature of 4°C; 15 of these samples were 20°C or more.

Boxes in which the milk was shipped had a variety of packing materials, with some having multiple constituents (Fig. 3). Packaging materials included primarily Styrofoam (76%), newspaper (49%), and plastic bags (46%). Less frequent packing materials included other paper besides newspaper (19%), plastic grocery bags (12%), insulated lunch bags (9%), bubble wrap (7%), and air packs (6%). Two boxes had no packing materials. From labels on the outside of the box and contents inside, we knew that 63% of the boxes originally contained dry ice; however, only 51% of the boxes had dry ice pieces remaining on arrival. Eighteen percent of the boxes had gel packs, 4% had remnants of home freezer ice, and 19% had

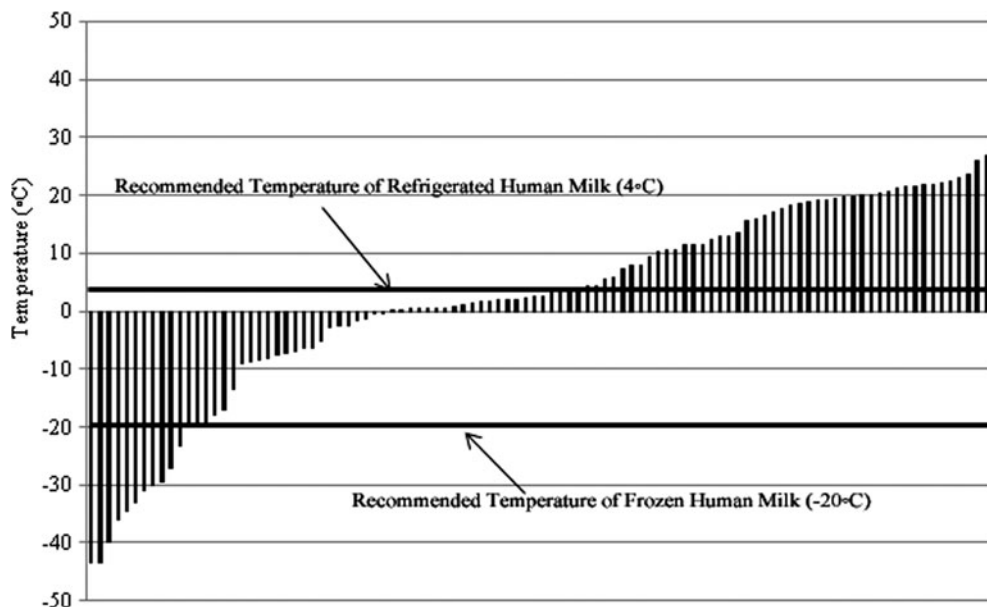


FIG. 2. Average temperature of milk containers in each shipment bought via the Internet.



FIG. 3. Examples of packing materials and containers of human milk bought via the Internet in the United States in 2012.

no cooling agent at all. The mean number of milk containers per box was 3.2 (SD, 1.1; range, 1–8). The mean volume of milk per box shipped was 16 ounces (SD, 6.0 ounces; range, 5–38 ounces).

The state of the milk containers was variable: 73 (72%) were rated as excellent/no damage (“1”), and 15 (15%) were rated more than “some damage” (“4 or 5”). The mean rating of the milk containers was 1.5 (SD, 0.9; range, 1–5). Figure 3 shows examples of container condition including the thawed state in which some milk arrived. Eighty-two percent of the milk was in plastic bags, 13% in bottles with screw-top lids that typically come with pumping kits, and 5% of the containers were hard-plastic food containers (e.g., used ready-to-feed infant formula bottles). Twelve percent of the milk containers had milk leaking out, and 3% of the milk containers were empty because all of the milk had leaked out into the packing materials. The mean surface temperature of the milk samples in each shipment was uncorrelated with the cost/ounce of milk ( $p = -0.11$ ,  $p = 0.28$ ), the miles traveled ( $p = -0.10$ ,  $p = 0.34$ ), and the exterior condition of the box rating ( $p = 0.15$ ,  $p = 0.14$ ) but was correlated with the cost of shipping ( $p = -0.42$ ,  $p < 0.001$ ), time in transit ( $p = 0.37$ ,  $p = 0.0001$ ), and milk container condition rating ( $p = 0.18$ ,  $p = 0.05$ ).

We paid a mean of \$1.47/ounce of milk (SD, \$0.67; range, \$0–3.00). We paid a mean per total shipment (including the milk) of \$70.99 (SD, \$46.06; range, \$0–230). We received two samples in which the seller gave us the milk for free and we paid the shipping and three samples in which we paid for the milk and the seller shipped it at no cost to us. Altogether, we bought 2,131 ounces of milk at a total cost of \$8,306.

## Discussion

The purpose of our study was to participate in the process of buying breastmilk via the Internet with the goal of informing others as to the process. We found that getting the milk via the Internet was not easy. Sellers may seem to be interested and say they have milk available; however, it took a great deal of time, organization, and money to get the milk. We responded to 563 postings and received milk from only 102 (18%) sellers.

It was also expensive to get milk over the Internet, particularly in the way in which we did, requesting only small amounts at a time. In total, we received 2,131 ounces of milk, which cost \$8,306. Based on the American Academy of Pediatrics guidelines, an infant consumes approximately 2.5 ounces for every pound of body weight.<sup>16</sup> Thus an average 1-month-old baby who weighs about 10 pounds (4.6 kg) would consume about 25 ounces/day. Dividing this amount into the total volume that we acquired, it would take the infant about 85 days to consume that amount of milk at about \$97/day. If the child was an average size of a 6 month old at about 18 pounds (8.2 kg) and still mostly fed milk, the infant would consume about 45 ounces/day. This means our allotment would last only about 47 days and cost \$176/day.

Of the milk received, a quarter had severe damaged, either to packaging of the box or to the containers within. Eighty-nine percent of the milk arrived above the recommended frozen temperature of  $-20^{\circ}\text{C}$ ; 45% of was even above the recommended refrigerator temperature ( $4^{\circ}\text{C}$ ). We do not know how long the milk was at these elevated temperatures, but this



is of serious concern because warm milk may contain high levels of bacterial contamination. It makes sense that the longer transit time would contribute to the milk being warmer (especially in the summer months when this study was conducted) and that less expensive shipping methods would take longer, thus increasing the time to get the milk to arrive to the lab. Milk container condition was also a telling indicator that the handling of the shipments may have in some way contributed to container damage and subsequently not have kept the contents as cold or have them leaked out.

The limitations to our study are that we only wanted to purchase milk (i.e., not solicit milk given away for free) in small quantities and remain anonymous. This method of milk purchase may not be generalizable to all human milk buying-selling transactions or exchanges where the milk is donated and the seller and donor are known. However, we were willing to make this trade-off because we believed it would have been unethical to pose as a mother with infant in need. If a milk seller and buyer develop a personal relationship, they might make an arrangement by which the milk and the shipments are less costly and timelier, thus avoiding milk temperature fluctuations. It might be possible that milk acquired over the Internet as a donation is safer than if it is purchased, although we do not know that for sure. We also do not know what is different about sellers who eventually carried out the transaction and sellers who do not. There needs to be further analysis of milk samples acquired on the Internet to yield more conclusive evidence as to the safety and quality of the milk. Milk sharing via the Internet is already happening. As previously mentioned by Akre et al.,<sup>17</sup> we agree that healthcare providers should make it a priority to determine realistic and appropriate guidelines.

### Conclusions

The purpose of our study was to participate in and describe the process of buying milk via the Internet. Our goal is to help those involved with the clinical care, research, and public health policy of mothers and infants better understand that families may be buying milk in this way. The prevalence and potential risks of this practice currently are unknown. Research related to milk quality and infant outcomes related to milk buying via the Internet is urgently needed.

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### Disclosure Statement

No competing financial interests exist.

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