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# The Abuela Project: Safe Cheese Workshops to Reduce the Incidence of *Salmonella* Typhimurium From Consumption of Raw-Milk Fresh Cheese

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ABSTRACT

*Objectives.* A multiagency intervention was implemented in Yakima County, Wash, to reduce the incidence of *Salmonella* serotype Typhimurium infections resulting from eating *queso fresco* (fresh cheese) made from raw milk, a traditional food in the Hispanic diet.

*Methods.* A pasteurized-milk *queso fresco* recipe with taste and texture acceptable to the Hispanic community was developed. Trained Hispanic volunteers conducted safe cheese workshops, which were attended by more than 225 persons.

*Results.* Workshop participants' acceptance of the new recipe was excellent and positive behavior changes were maintained over 6 months.

*Conclusions.* Educational interventions in Hispanic communities can reduce the incidence of *Salmonella* Typhimurium associated with eating *queso fresco.* (*Am J Public Health.* 1999;89:1421–1424)

*Queso fresco* is a popular form of fresh cheese in Latin America that has traditionally been made with raw milk.[1] In comparison with hard, aged cheeses such as cheddar, fresh cheeses have a high moisture content and a relatively high pH, which provides an excellent environment for bacterial growth. As a result, fresh cheeses pose the highest risk of any type of raw-milk cheese.[2] Five of 11 cheese-associated outbreaks reported to the Centers for Disease Control between 1973 and 1992 were associated with soft cheeses such as *queso fresco.*[3]

In the United States, a strain of *Salmonella* serotype Typhimurium (Definitive Type [DT] 104) that is resistant to 5 major antibiotics has rapidly emerged as a pathogen of food animals and humans.[4,5] In 1997, raw-milk *queso fresco* was implicated as the source of *Salmonella* Typhimurium DT104 infections in California.[6]

From 1992 to 1996, the annual incidence of *Salmonella* Typhimurium infections in Yakima County, Washington, increased from 5.4 to 29.7 cases per 100 000 population, one of the highest rates in the United States.[7] Between January and May 1997, 89 cases of *Salmonella* Typhimurium were reported in Yakima County, of which 54 were culture-confirmed as DT104.[7] The median age of infected persons was 4.0 years (range 0–53 years). Ninety percent of the patients had Spanish surnames. A case–control investigation conducted by the Centers for Disease Control and Prevention indicated that the most probable source of the outbreak was raw-milk *queso fresco.*[7]

The investigation found that street vendors were the most frequent source of *queso*

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**TABLE 1—Attitudes and Behaviors of Abuela Project Educators and Participants Regarding *Queso Fresco* Before and After Safe Cheese Workshops: Yakima County, Washington, 1997–1998**

| | Abuela Educators, No. | | Participants | | | |
|---|---|---|---|---|---|---|
| | Before | After | Before (n=165), % | After (n=165), % | 6-Month Follow-up (n=47), % | $\chi^2$ |
| Will people in the community eat *queso fresco* made from pasteurized milk? | | | | | | |
| Yes | 9/15 | 15/15 | 71[a] | 94[a] | NA | 29.9* |
| No | 1/15 | 0/15 | 2 | 1 | NA | |
| Not sure | 5/15 | 0/15 | 27 | 5 | NA | |
| Are there health risks associated with eating unpasteurized milk and cheese? | | | | | | |
| Yes | 10/14 | 14/15 | 78[a] | 92 | 85[a] | 1.5[b] |
| No | 0/14 | 1/15 | 8 | 2 | 9 | |
| Not sure | 4/14 | 0/15 | 13 | 5 | 6 | |
| Do you make *queso fresco* with...? | | | | | | |
| Fresh unpasteurized milk | 6/12 | 1/15 | 47[a] | 1 | 0[a] | 19.3* |
| Fresh unpasteurized milk that you heat or pasteurized milk | 5/12 | 14/15 | 47 | 99 | 100 | |
| Not sure what kind of milk | 1/12 | NA | 5 | NA | NA | |

*Note.* Sample sizes for individual measures differ because of missing values. NA = not asked.
[a]Indicates that data were compared.
[b]No significant change.
*$P<.01$.

*fresco* for persons who developed illness (70%); friends and relatives were the second most common source (23%). Raw milk was used by some unlicensed *queso fresco* makers, who produced small batches either for home use or to sell via an informal network. Only one of 17 patients interviewed had purchased a commercial, pasteurized *queso fresco* from a supermarket.[7]

In response to the outbreak, a multiagency intervention was initiated that featured workshops introducing a pasteurized-milk *queso fresco* recipe, a mass media campaign about the risks of raw-milk cheese, and newsletter articles warning dairy farmers about the risks of selling or giving away raw milk. The goal of the intervention was to reduce the incidence of *Salmonella* Typhimurium infections resulting from consumption of raw-milk *queso fresco* while maintaining the traditional, nutritious food in the Hispanic diet.

The safe cheese workshops were conducted by older Hispanic women from the community—*abuelas* (grandmothers)—and this portion of the intervention was called the Abuela Project. The use of *abuela* educators to teach nutrition education had previously been demonstrated to be effective.[8]

Collaborating agencies in the intervention were the Department of Food Science and Human Nutrition, Washington State University; the Washington State University–Yakima County Cooperative Extension; Yakima Health District; and Washington Department of Agriculture.

## Methods

A preintervention survey was conducted in August 1997 to gather background information for use in planning the intervention. About one third of the 200 000 residents of Yakima County are Hispanic; some are permanent residents and some are seasonal workers. So that nonpermanent residents could be included in the sample, the surveys were conducted at community events and in residential areas in either Spanish or English (n = 85).

A respected Hispanic woman from Yakima had previously developed a pasteurized-milk *queso fresco* recipe. Dairy scientists at Washington State University modified the recipe to inhibit undesirable microbial growth, increase shelf life, and improve ease of preparation. The new recipe was tested by Hispanic persons and adjusted until flavor and texture were satisfactory.

A pamphlet was designed with step-by-step textual and graphical instructions on how to make pasteurized-milk *queso fresco*. The logo on the front of the pamphlet depicted a grandmother holding a child and the words *Queso Fresco Hecho Saludable* (Fresh Cheese Made Safely) and *Abuela Proyecto* (Grandmother Project). Spanish and English versions of the pamphlet were distributed at safe cheese workshops and were also made available to anyone who requested a copy. (Copies of the pamphlet are available from the corresponding author.)

Fifteen female Hispanic volunteers (*abuela* educators) from Yakima County were trained to make the new *queso fresco* recipe. Training was conducted in November 1997 in 3 locations and was primarily in Spanish. The training sessions were hands-on and interactive; participants were encouraged to ask questions and make comments.

After training, each *abuela* educator signed a contract indicating her willingness to teach at least 15 additional members of the community how to safely make *queso fresco* with pasteurized milk. A gift from the Washington State Dairy Products Commission was used to purchase demonstration materials for each *abuela* educator. The 15 *abuela* educators and the workshop participants (instructed by abuela educators) completed brief surveys before and after the workshops. In June 1998 (approximately 6 months after the workshops were conducted), a sample of *abuela* educators (n = 6) and workshop participants (n = 49) was contacted by telephone. Bilingual interviewers conducted interviews in the language preferred by each respondent. The cooperation rate was 91.5% for those reached by telephone (2 call attempts were made over a 2-day period).

In a multiagency public information campaign launched in September 1997, radio public service announcements, newspaper articles, posters, and medical alerts to physicians were used to increase awareness of the risks of consuming raw milk and cheese made from raw milk. More than 800 people requested copies of the Abuela Project pamphlet on safe cheese-making.

A postintervention survey was conducted to assess changes in awareness and

practices regarding *queso fresco* among Hispanics in Yakima County who did not participate in the safe cheese workshops. As with the preintervention survey, a sample of convenience was used so that nonpermanent residents of the county might be included. The survey was administered in May 1998 in residential areas, laundromats, grocery stores, and clinics (n = 165).

## Results

### *Workshop Participants*

Each of the 15 *abuela* educators fulfilled her commitment and taught at least 15 other persons to make pasteurized-milk *queso fresco*. *Abuela* educators returned 165 usable surveys from workshop participants. Informal comments during the workshops revealed that some of the attendees had made *queso fresco* and sold it through unlicensed channels.

In the preworkshop survey, fewer than half of the participants stated that they made *queso fresco* with pasteurized or heat-treated milk. In the 6-month follow-up survey, all participants surveyed reported that they were currently making *queso fresco* with heat-treated or pasteurized milk, a highly significant change ($P > .01$). After they participated in a safe cheese workshop, 94% believed that people in their community would eat *queso fresco* made from pasteurized milk (Table 1).

### *Area Residents Who Did Not Participate in Workshops*

Pre- and postintervention surveys of Hispanic area residents who did not participate in the workshops indicated that consumption of *queso fresco* did not decrease as a result of the intervention. Before the intervention, 77% reported using *queso fresco*; 79% reported using *queso fresco* after the intervention. After the intervention, a greater number of persons were aware that raw-milk *queso fresco* could cause illness than before the intervention ($P < .01$). However, more than 40% of those surveyed after the intervention remained unaware or unsure of the potential relationship of raw-milk *queso fresco* to illness (Table 2).

The proportion of persons who purchased *queso fresco* from a grocery store increased and vendor sales decreased after the intervention; however, the change was not large enough to be statistically significant. Respondents to the postintervention survey were divided into those who had heard of the Abuela Project (n = 49) and those who had not (n = 105). Those who had heard of the Abuela Project were less likely to buy raw-milk *queso fresco* ($P < .01$) and more likely to get *queso fresco* from a grocery store than those who were unaware of the project ($P < .01$).

**TABLE 2—Attitudes, Awareness, and Behaviors of Community Members Who Did Not Participate in Safe Cheese Workshops: Yakima County, Washington, 1997–1998**

| | Preintervention[a] (n = 85), % | Postintervention[b] (n = 165), % | $\chi^2$ |
|---|---|---|---|
| Eating *queso fresco* made from raw milk can cause illness. | | | |
| Yes | 30 | 56 | 25.3* |
| No | 42 | 13 | |
| Not sure | 28 | 30 | |
| Do you buy raw-milk *queso fresco*? | | | |
| Yes | 32 | 20 | 4.2[c] |
| No | 11 | 15 | |
| Not sure | 56 | 66 | |
| Have you heard of *Salmonella*? | | | |
| Yes | 41 | 62 | 9.7* |
| No | 59 | 38 | |
| I get *queso fresco* from | | | |
| Grocery store | 47 | 57 | 4.3[c] |
| Vendor | 32 | 24 | |
| Homemade (family member, neighbor, or self) | 21 | 19 | |

*Note.* Sample sizes for individual measures differ owing to missing values.
[a]Data collected August 1997.
[b]Mass media intervention by state and local agencies; data collected April 1998.
[c]No significant change.
*$P < .01$.

### *Reported Cases of* Salmonella *Typhimurium in Yakima County*

The incidence of *Salmonella* Typhimurium infection decreased rapidly to below pre-1992 levels after the intervention was initiated. Between June and December 1997, only 16 cases were reported in Yakima County, of which 2 were associated with consumption of *queso fresco*. There were 18 reported cases of *Salmonella* Typhimurium in 1998; none were associated with *queso fresco* (Hersh D, RN, BSN, Yakima Health District, oral communication, July 16, 1999).

## Discussion

The intervention, which was designed to reduce the rate of illnesses due to consumption of raw-milk *queso fresco* while maintaining the use of the traditional, nutritious cheese in the diet of the Hispanic community, was successful. The incidence of reported illnesses associated with consumption of raw-milk cheeses dropped rapidly after the initiation of the intervention in July 1997. However, consumption of *queso fresco* did not decrease.

The pasteurized-milk recipe was well accepted. Six months after the safe cheese workshops, 100% of the participants reported that they made *queso fresco* with pasteurized milk. None of the small local vendors were able to meet licensing requirements during the first year of the intervention. However, some of them attended the workshops, and they may have adopted use of the pasteurized-milk recipe for their products.

Those who did not participate in the safe cheese workshops had opportunities to learn about the dangers of raw-milk *queso fresco* from the public information campaign and from neighbors who did attend the workshops. Hundreds of copies of the pamphlet containing the pasteurized-milk recipe were distributed throughout the community. The postintervention community survey indicated that many Hispanics in Yakima County were not reached by the intervention; however, the scope of the intervention appears to have been sufficient to result in a rapid reduction in reported cases of *Salmonella* Typhimurium.

In addition to the Abuela Project, other factors in Yakima County could have contributed to reduced consumption of raw-milk *queso fresco*. The supply of raw milk may have been reduced because some dairy farmers, in response to warnings in newsletters sent as part of the intervention, posted signs that said workers must not take milk home from the dairy. A reduction in *Salmonella* Typhimurium infections in dairy cattle would likely result in a reduction in human salmonel-

losis; however, there is no evidence that cattle in Yakima County experienced a decrease in incidence of *Salmonella* Typhimurium similar to the decrease among humans during the intervention period (Tom Besser, PhD, DVM, Washington Animal Disease Diagnostic Laboratory, Washington State University, oral communication, November 20, 1998).

In conclusion, the use of Hispanic volunteers to teach workshops discouraging the use of raw-milk *queso fresco* and introducing a pasteurized-milk *queso fresco* recipe was an important aspect of this successful food safety intervention. Safe cheese workshops continue to be held in Yakima County, with special efforts made to reach the transient portion of the Hispanic community. The intervention has recently been expanded to 6 additional counties in Washington State, and 30 additional educators are conducting safe cheese workshops. The focus of the intervention has also expanded to provide assistance for small vendors of *queso fresco* to enable them to become licensed to produce and market *queso fresco* made with pasteurized milk. □

## Contributors

The intervention was jointly designed by R. A. Bell, V. N. Hillers, and T. A. Thomas. R. A. Bell designed all questionnaires and the safe cheese pamphlet and conducted the data analysis. T. A. Thomas supervised the training of the abuela educators and the data collection. V. N. Hillers supervised the project and data analysis. All 3 authors contributed to the writing of this paper.

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The Washington State University Institutional Review Board for Human Subjects approved the protocol for each survey conducted before, during, and after the intervention. All who were surveyed gave consent before they participated.

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