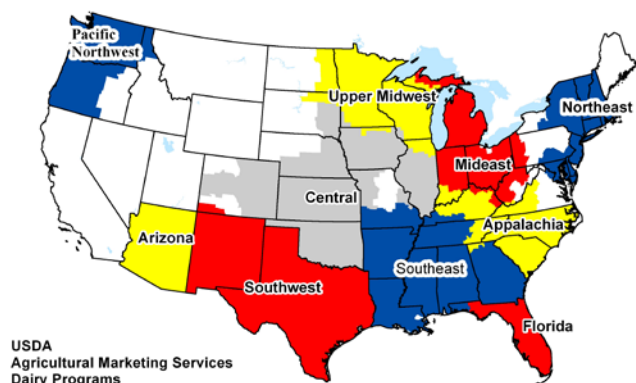


Determining U.S. Milk Quality Using Bulk-tank Somatic Cell Counts, 2010

The USDA's Animal and Plant Health Inspection Service's Centers for Epidemiology and Animal Health, in conjunction with USDA's Agricultural Marketing Service and the NMC's Milk Quality Monitoring Committee, monitor U.S. milk quality using bulk-tank somatic cell count (BTSCC) data provided by 4 of the Nation's 10 Federal Milk Marketing Orders (FMOs*) [figure. 1].

Figure 1.

Federal Milk Marketing Order Areas



BTSCC refers to the number of white blood cells (primarily macrophages and leukocytes), secretory cells, and squamous cells per milliliter of raw milk.¹ BTSCCs are used as a measure of milk quality and as indicators of overall udder health. High BTSCCs can negatively impact cheese yield and reduce the quality and shelf life of pasteurized fluid milk.^{2,3,4} Numerous studies have also shown that operations with increased BTSCCs are more likely to have milk that violates antibiotic residue standards.^{5,6,7} The most frequently cited reason for antibiotic residues in milk is placing cows treated with

antibiotics in the milking string before the recommended withdrawal period.⁶

To ensure high-quality dairy products, BTSCCs are monitored in milk shipments using standards outlined in the U.S. Pasteurized Milk Ordinance (PMO).⁸ In the United States, the legal maximum BTSCC for "Grade A" milk shipments is 750,000 cells/mL. If a producer has two out of four shipments that test above the maximum (usually tested 30 to 45 days apart) a written notice is issued and an additional sample is tested within 21 days. If three of the last five counts exceed the maximum, regulatory action is required, which includes:

- 1) suspension of the producer's permit;
- 2) milk in violation not being sold as Grade A product; and/or
- 3) monetary penalties.

Maximum BTSCC levels for other countries include 400,000 cells/mL in the European Union (EU),⁹ Australia, and New Zealand¹⁰; 500,000 cells/mL in Canada¹¹; and 1,000,000 cells/mL in Brazil.¹²

Although there has been increasing support in the last few years for lowering the maximum BTSCC for the United States to 400,000 cells/mL, no changes have been made to the PMO. In May 2011, the National Conference on Interstate Milk Shipments (NCIMS) voted down two proposals to lower the U.S. limit, despite new regulations for dairy products exported to the EU in 2011.^{13,14}

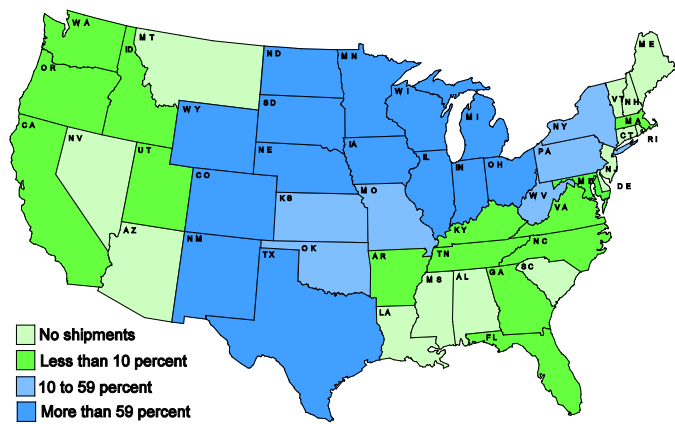
The EU's regulations are also centered on testing milk from individual farms to encourage adherence to a 3-month geometric mean BTSCC of 400,000 cells/mL, although EU member states have some latitude in formulating the specifics of their individual programs. It is not yet known how the United States may alter its BTSCC testing program for dairy shipments to the EU in light of this new information regarding the EU's regulations. Legislation has been introduced in Congress that may result in changes to the U.S. BTSCC limit outside of the normal NCIMS process.¹⁴

Monitored FMOs

In 2010, four FMOs were monitored: Central, Mideast, Southwest, and Upper Midwest. These FMOs monitored milk from 31,912 producers located in 34 States and accounted for 87.8 billion pounds, or 45.6 percent, of the 192.5 billion pounds of pooled and nonpooled milk produced in the United States in 2010. Each of the 34 States marketed at least 1 shipment through the monitored FMOs during 2010 (figure 2).

* FMOs are administrative units made up of groups of States and were established under the authority of the Agricultural Marketing Agreement Act of 1937, as amended. Their purpose is to stabilize markets by placing requirements on the handling of milk; data are collected to provide accurate information on milk supplies, utilization, and sales. Monitored orders were Central, Mideast, Southwest, and Upper Midwest.

Figure 2. Percentage of Total Milk Production Shipped Through Monitored FMOs in 2010, by State



In 2010, 340,551 milk shipments were monitored (table 1). The upper Midwest FMO accounted for 48.1 percent of the milk monitored and 21.9 percent of all milk produced in the United States. The Upper Midwest and Mideast FMOs had a higher percentage of shipments relative to the amount of monitored milk. The opposite was true for the Southwest FMO, in which 2.4 percent of the shipments accounted for 16.8 percent of the monitored milk, which reflects the larger herd sizes in the Southwest FMO.

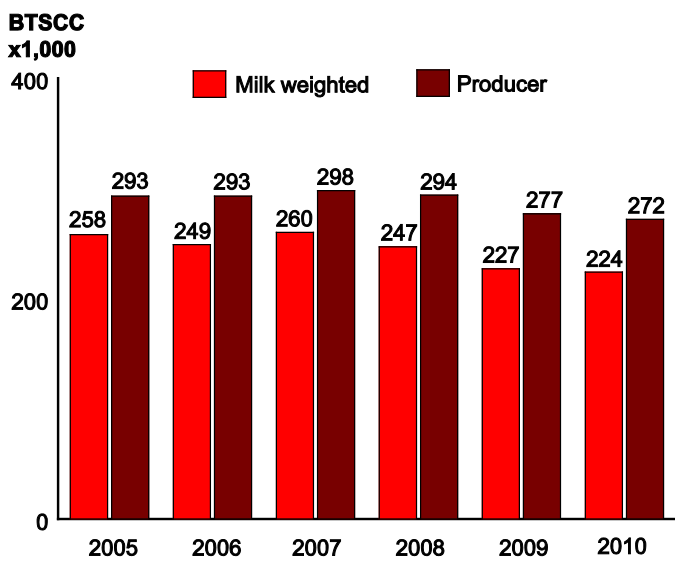
Table 1. Percentage of milk and shipments marketed through monitored FMOs during 2010

FMO	Milk			Shipments	
	Billion pounds	Pct. Monitored	Pct. of U.S. Production	Number (x1,000)	Pct.
Upper Midwest	42.2	48.1	21.9	209.9	61.6
Central	13.9	15.9	7.2	38.7	11.4
Mideast	16.9	19.2	8.8	83.7	24.6
Southwest	14.8	16.8	7.7	8.3	2.4
Total	87.8	100.0	45.6	340.6	100.0

2010 BTSCC trends

The milk-weighted geometric BTSCC mean in 2010 was 224,000 cells/mL compared with 227,000 cells/mL in 2009 (figure 3). The milk-weighted BTSCC takes into account the amount of milk shipped by a producer, resulting in an overall BTSCC mean of monitored milk. The producer shipment BTSCC—which is a geometric, nonmilk-weighted mean of all shipments—decreased from 277,000 cells/mL in 2009 to 272,000 cells/mL in 2010.

Figure 3. Milk-weighted and Producer BTSCC, 2005-2010



Evaluating BTSCC levels

More than 99 percent of milk and 98 percent of shipments monitored met the current PMO limit of 750,000 cells/mL (table 2). Of the 31,912 producers, 91.2 percent (all but 2,808) shipped milk with BTSCCs below 750,000 cells/mL during all months monitored.

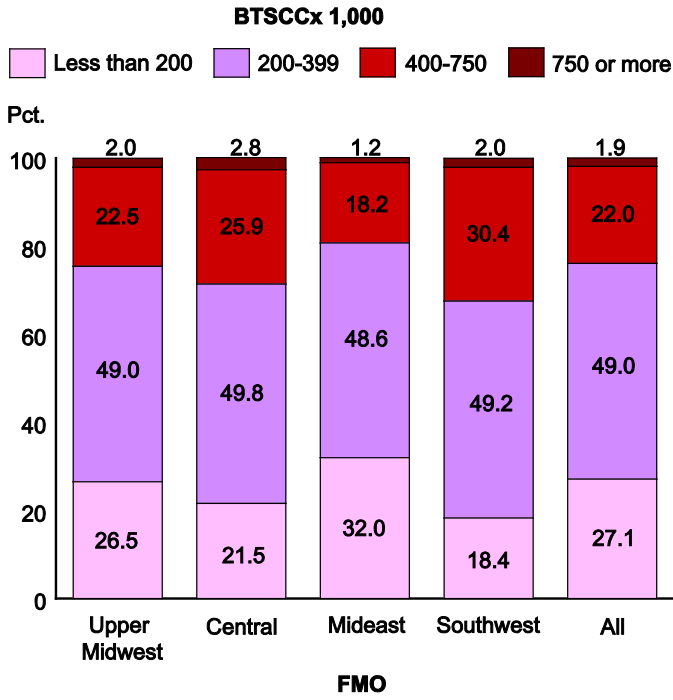
In 2010, during all monitored months, 89.5 percent of milk would have met the goal of 400,000 cells/mL, but only 50.7 percent of producers would have done so.

Table 2. Percentage of milk, shipments, and producers by BTSCC level during 2010

BTSCC (x1,000 cells/mL)	Percent		
	Milk (87.8 billion pounds)	Shipments (340,551)	Producers (31,912)
Less than 100	3.0	3.3	0.6
Less than 200	40.6	27.1	10.0
Less than 400	89.5	76.1	50.7
Less than 650	98.9	95.9	84.6
Less than 750	99.6	98.1	91.2

In 2010, almost 50 percent of shipments in all FMOs were between 200,000 and 399,000 cells/mL. Of all shipments, 1.9 percent had BTSCCs above 750,000 cells/mL (figure 4).

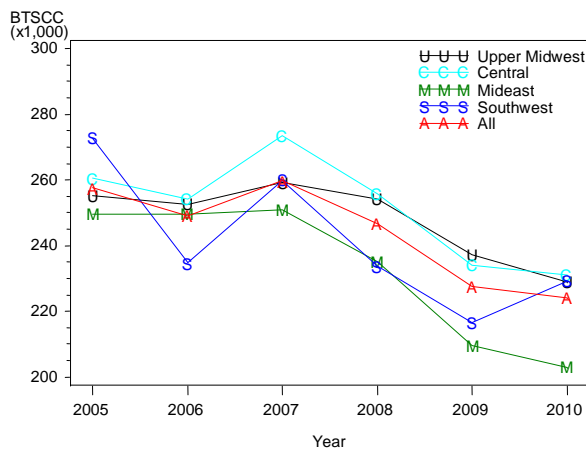
Figure 4. Percentage of Shipments by FMO and by BTSCC Level, 2010



FMO and State BTSCC trends

With the exception of the Southwest FMO in 2010, the milk-weighted BTSCC has decreased for all FMOs since 2007 (figure 5). The Central FMO had the highest BTSCC during 2010 at 231,000 cells/mL, while the Mideast FMO had the lowest at 203,000 cells/mL.

Figure 5. Milk-weighted BTSCCs by FMO and by year



Fourteen States marketed 60 percent or more of the milk produced in their States through the monitored FMOs and accounted for 93.0 percent of the total monitored milk (table 3). Michigan, Minnesota, New Mexico, Texas, and Wisconsin accounted for

69.1 percent of all FMO-monitored milk. Overall, milk shipments in 2010 from monitored FMOs showed a downward trend in milk-weighted BTSCC levels. Ten of the 14 States that shipped 60 percent or more of total milk production had decreased BTSCCs in 2010 compared with 2009.

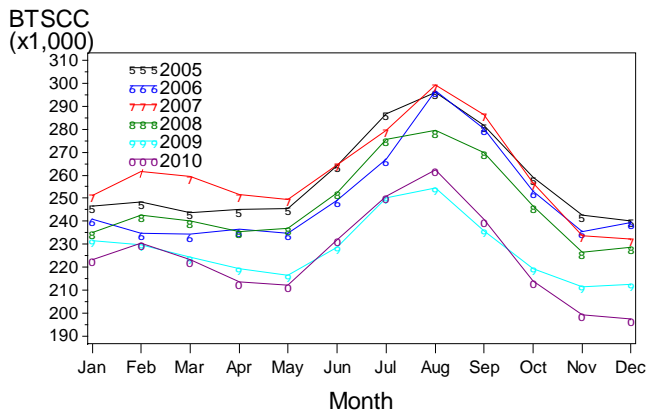
Table 3. Milk-weighted BTSCC for States shipping 60 percent or more of total milk production through monitored FMOs

State	Percent Total Monitored Milk—2010	BTSCC (x1,000)					
		2005	2006	2007	2008	2009	2010
CO	3.1	215	207	237	208	200	196
IL	1.8	260	282	272	262	260	258
IN	2.8	247	248	272	261	237	225
IA	7.1	272	269	282	281	252	241
MI	9.8	239	233	237	211	183	174
MN	10.5	276	261	270	266	249	236
NE	1.7	285	264	274	266	194	184
NM	9.9	250	217	236	216	196	207
ND	0.3	277	245	276	269	269	271
OH	4.4	269	270	267	253	225	226
SD	2.6	282	267	292	275	262	248
TX	9.2	305	258	285	254	239	253
WI	29.7	246	246	249	247	233	230
WY	0.1	296	234	335	356	196	139
14 States	93.0	257	247	258	245	226	223

Seasonal BTSCC trends

Monthly monitoring of BTSCCs continues to show that BTSCCs peak during the summer months when higher temperatures and humidity increase stress on cows and provide conditions more favorable for bacterial growth (July through September) [figure. 6]. In 2010, monthly milk-weighted BTSCCs were highest during August (262,000 cells/ml) and lowest in December (197,000 cells/mL).

Figure 6. Milk-weighted BTSCCs by year and by month, 2005–10



Summary

BTSCCs from monitored FMOs are indicative of the quality of the Nation's milk supply. Data from 2010 show a decrease of 3,000 cells/mL in the milk-weighted geometric mean BTSCC compared with 2009. The Southwest FMO was the only FMO to see an increase in BTSCC from 217,000 cells/mL in 2009 to 229,000 cells/mL in 2010. Ten of the 14 States shipping 60 percent or more of their milk through the four FMOs had lower BTSCCs in 2010 compared with 2009. The recognition of the EU testing requirements will likely put increased pressure on the United States to adopt a 400,000 BTSCC limit in the near future.

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