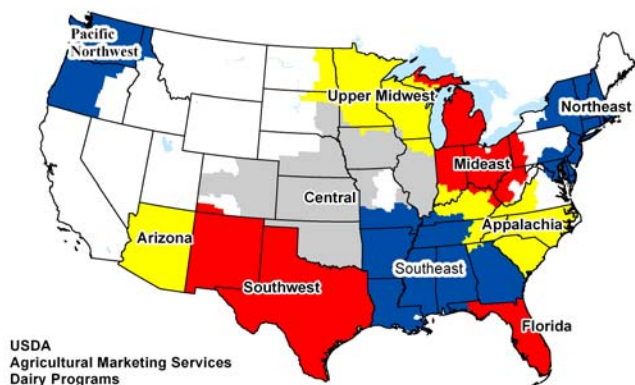


Determining U.S. Milk Quality Using Bulk-tank Somatic Cell Counts, 2011

The USDA's Animal and Plant Health Inspection Service's Centers for Epidemiology and Animal Health, in conjunction with USDA's Agricultural Marketing Service (AMS) and the National Mastitis Council'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]. The remaining six FMOs do not collect BTSCC information.

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. There is an inverse relationship between BTSCCs and cheese yield and the quality/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

* 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.

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, or
- 2) forego permit suspension, provided the milk in violation is not sold as Grade A, or
- 3) impose monetary penalty in lieu of permit suspension, provided the milk in violation is not sold or offered for sale as Grade A product.

Maximum BTSCC levels for other countries include 400,000 cells/mL in the European Union (EU),⁹ Australia, New Zealand,¹⁰ and Canada.¹¹ The maximum BTSCC level in Brazil is 1,000,000 cells/mL.¹²

Although there has been increasing support in the last few years for lowering the maximum BTSCC for Grade A milk in 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) did not lower the U.S. limit, despite new EU regulations for dairy products exported to the EU. These new regulations were developed in cooperation with AMS and went into effect in January 2012.^{13,14}

EU regulations are also centered on testing milk from individual farms but require adherence to a 3-month geometric mean BTSCC of less than 400,000 cells/mL. EU member states have some latitude in formulating the specific details of their individual programs.

U.S. producers that have four consecutive rolling three-month SCC means greater than the 400,000 cells/mL limit cannot export milk to the EU unless derogation** is requested and approved. If derogation is not approved, the milk supplier must suspend, segregate or discontinue certification.¹³

**A derogation is a provision in an EU legislative measure which allows for all or part of the legal measure to be applied differently, or not at all, to individuals, groups or organizations.

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 29,937 producers, 92.3 percent (all but 2,305) shipped milk with BTSCCs below 750,000 cells/mL during all months monitored.

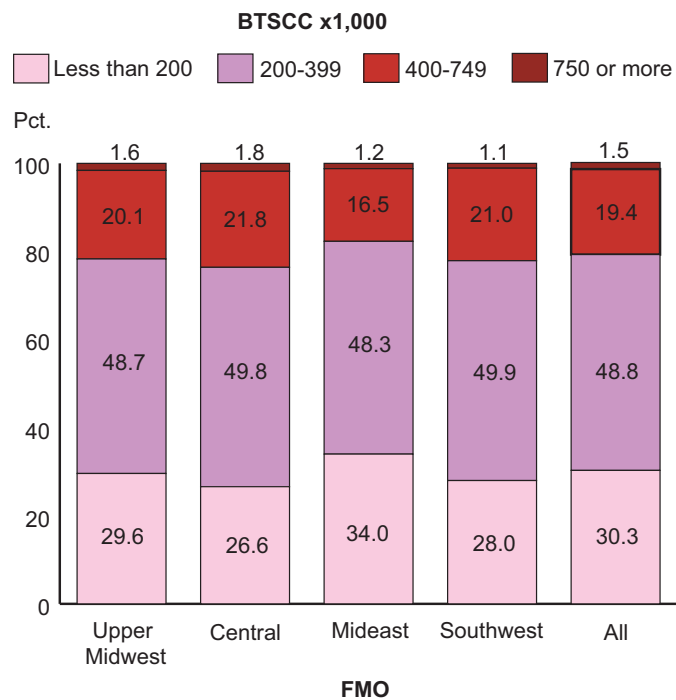
In 2011, during all monitored months, BTSCCs in 92.7 percent of milk was less than 400,000 cells/mL. Only 53.6 percent of producers shipped milk below this limit for the entire year.

Table 2. Percentage of milk, shipments, and producers by BTSCC level during 2011

BTSCC (x1,000 cells/mL)	Milk (91.2 billion lb)	Percent	
		shipments (324,465)	Producers (29,937)
Less than 100	4.8	4.1	0.6
Less than 200	47.7	30.3	11.2
Less than 400	92.7	79.1	53.6
Less than 650	99.3	96.7	86.4
Less than 750	99.7	98.5	92.3

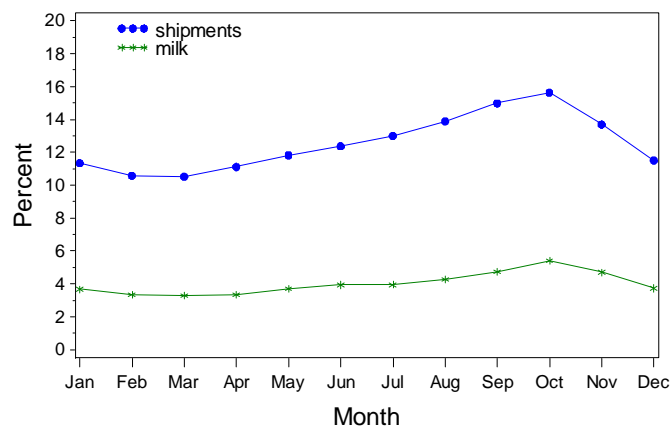
In 2011, almost 50 percent of shipments in all FMOs had BTSCCs between 200,000 and 399,000 cells/mL. The four FMOs had a similar percentage of shipments in each of the four BTSCC levels, although a higher percentage of shipments in the Mideast region were below 400,000 cells/mL (figure 4).

Figure 4. Percentage of Shipments, by FMO and by BTSCC Level, 2011



Based on the criteria for the EU Health Certification Program from USDA-AMS—which call for a 3-month geometric mean BTSCC of less than 400,000 cells/mL—10 to 16 percent of U.S. shipments would have been noncompliant during 2011 (figure 5). These shipments represented only 3.3 to 5.5 percent of milk shipped during the monitored months.

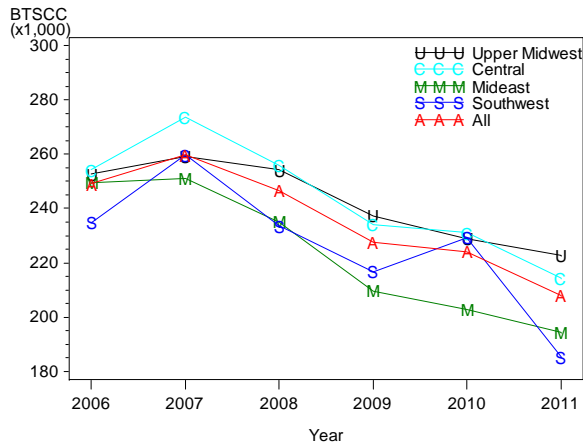
Figure 5. Percentage of shipments and milk in 2011 that would have been noncompliant with the EU Health Certification Program's BTSCC criteria, by month



FMO and State BTSCC trends

Overall, BTSCCs have decreased every year since 2007 (figure 6) and, with the exception of the Southwest FMO in 2010, milk-weighted BTSCCs have decreased for each FMO since 2007. The Upper Midwest FMO had the highest BTSCCs during 2011 at 218,000 cells/mL, while the Southwest FMO had the lowest at 188,000 cells/mL. BTSCCs in the Southwest FMO decreased dramatically from 229,000 cells/mL in 2010 to 188,000 cells/mL in 2011.

Figure 6. 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 93.1 percent of the monitored milk in the four FMOs (table 3). Michigan, Minnesota, New Mexico, Texas, and Wisconsin accounted for 68.6 percent of all FMO-monitored milk. Overall, milk shipments in 2011 from monitored FMOs showed a downward trend in milk-weighted BTSCC levels. Thirteen of the 14 States had decreased BTSCCs in 2011 compared with 2010.

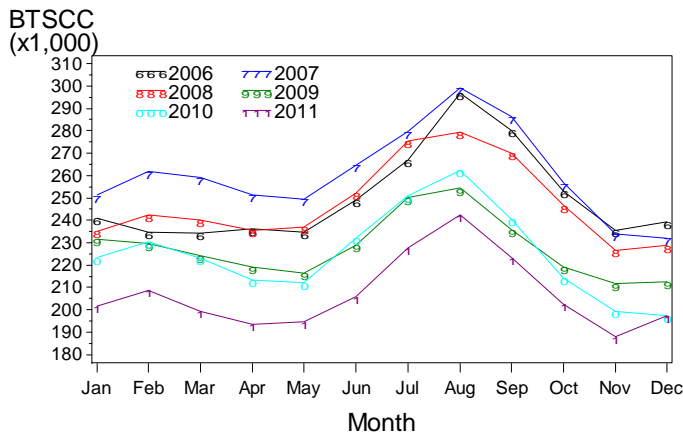
Table 3. Milk-weighted BTSCCs for States shipping 60 percent or more of their total milk production through monitored FMOs

State	BTSCC (x1,000)						
	Percent total monitored milk— 2011	2006	2007	2008	2009	2010	2011
CO	3.2	207	237	208	200	196	186
IL	1.8	282	272	262	260	258	241
IN	3.2	248	272	261	237	225	204
IA	7.2	269	282	281	252	241	228
MI	9.8	233	237	211	183	174	167
MN	10.0	261	270	266	249	236	227
NE	1.7	264	274	266	194	184	182
NM	10.0	217	236	216	196	207	167
ND	0.3	245	276	269	269	271	276
OH	4.5	270	267	253	225	226	220
SD	2.5	267	292	275	262	248	247
TX	10.0	258	285	254	239	253	208
WI	28.8	246	249	247	233	230	218
WY	0.1	234	335	356	196	139	127
14 States	93.1	247	258	245	226	223	206

Seasonal BTSCC trends

Monthly monitoring continues to show that BTSCCs peak during the summer months (July through September) when higher temperatures and humidity increase stress on cows and provide conditions more favorable for bacterial growth (figure. 7). In 2011, monthly milk-weighted BTSCCs were highest during August (243,000 cells/ml) and lowest in November (188,000 cells/mL). With the exception of December, BTSCCs were lower in all months during 2011 compared with 2010.

Figure 7. Milk-weighted BTSCCs by year and by month, 2006–11



Summary

BTSCCs from monitored FMOs are indicative of the quality of the Nation's milk supply. The overall BTSCCs from the four FMOs have decreased every year since 2007. Data from 2011 show a decrease of 18,000 cells/mL in the milk-weighted geometric mean BTSCCs compared with 2010. The BTSCCs for each of the four FMOs decreased between 2010 and 2011. Thirteen of the 14 States shipping 60 percent or more of their milk through the four FMOs had lower BTSCCs in 2011 than in 2010. In addition to improvements in management practices, the current EU import regulations may be partially responsible for the decrease in BTSCCs and the corresponding improvement in milk quality in 2011.

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