ID-212

Using DHIA Records for Somatic Cell Count Management

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DHIA (Dairy Herd Improvement Association) records are an essential part of dairy herd management for many progressive dairy operations. The old adage "If you can't measure it, you can't manage it" holds true when it comes to dairy farm management, particularly when it comes to somatic cell count (SCC) management. When working with dairy farmers, we often hear the statement "I don't know how I would be able to manage my somatic cell count without my DHIA records." Recent market trends increase the need for managing SCC. More producers are now seeing the value of having monthly individual cow SCC; however, for producers new to DHIA, interpreting the meaning of all this information can be a bit overwhelming. Even producers who have been DHIA members for many years may not fully understand all the value that DHIA records can provide for SCC management. What follows is a description and interpretation of SCC-related information available to dairy producers on DHIA test reports.

The "Hot Sheet"

The "hot sheet" is often described as the single most useful DHIA report provided to dairy producers. An example hot sheet is depicted in Figure 1 with column headings described in Figure 2. Although it can be a bit overwhelming to examine at first, the concept of the hot sheet is fairly simple. Each cow in the herd contributes somatic cells to the herd's bulk tank. How many cells an individual cow contributes is a factor of the somatic cell concentration within her milk (measured in cells per mL) and the volume of milk she produces. From DHIA testing, we have both SCC concentration and milk volume. So, each cow's contribution of somatic cells to the bulk tank can be calculated using these two pieces of information. A "weighted average SCC" is calculated for the bulk tank using this information from all cows. Then, using the cells contributed by each cow and her milk production, the percentage of cells in the bulk tank for each cow is calculated. Cows on the hot sheet are ranked, with the cow contributing the most cells in the tank on the top of the list and the cow contributing the least cells in the tank on the bottom of the list. The column farthest to the right on the

Hot Sheet

Mid-South Dairy Records ******* HOT SHEET ******* Page 1
41 samples collected 4-28-10 tested 5-03-10

Index	Barn	Milk	Fat	Pro	SNF	MUN	SCC	Count	DIM	Lac	CAR	B#
Avg	41 cows	59.8	3.9	3.3	9.0		3.6		140			

Highest 20 SCC Cows — Weighted Average SCC: 492

Index	Barn	Milk	Fat	Pro	SNF	MUN	SCC	Count	DIM	Lac	CAR	W/O	%
7	7SWISS	42.1	4.7	4.0	8.8		9.2	7352	12	1		373	25.6
56	56	30.2	5.3	4.6	8.3		9.0	6400	180	3		297	15.9
54	TESSY	81.5	3.6	3.2	8.7		6.9	1493	12	2		254	10.1
302	GLITTER	83.1	3.3	3.0	8.2		6.3	985	47	3		226	6.8
14	IZZIE	62.7	3.6	3.3	9.1		6.5	1131	145	5		200	5.9
457	NIKKI	81.4	3.2	2.9	8.1		5.9	746	34	2		179	5.0
554	AIDA	44.8	4.3	3.4	9.2		6.3	985	150	1		161	3.7
289	WHITCHA	61.7	3.2	3.2	9.0		5.4	528	308	4		149	2.7
68	5639556	85.1	4.0	3.0	8.8		4.9	373	15	1		139	2.6
17	M17	47.2	2.9	3.0	8.8		5.6	606	41	1		127	2.4
608	ELIZABE	36.1	4.1	3.2	8.9		5.8	696	107	2		116	2.1
47	PEYTON	68.2	4.8	3.3	9.0		4.8	348	117	6		106	2.0
35	SQUIRRE	58.0	3.8	3.4	9.3		4.7	325	50	1		99	1.6
119	BGEORGE	66.2	3.0	3.1	8.7		4.4	264	162	2		92	1.4
113	BETH	72.4	3.4	3.4	9.0		4.1	214	316	3		86	1.3
4	GRACEFU	56.9	6.0	3.7	9.3		4.4	264	204	4		80	1.2
285	ANN	60.5	4.2	3.7	9.2		4.3	246	210	4		72	1.2
42	42	76.0	3.6	3.3	9.1		3.7	162	28	1		67	1.0
86	86	65.3	2.4	3.1	8.9		3.9	187	26	1		61	1.0
282	WITCHIE	68.1	3.9	3.1	8.6		3.7	162	137	3		55	0.9

Figure 1. An example of a DHIA hot sheet.

A		C		E		G		I		K		M	
Index		Barn		Milk		Fat		Pro		SNF		MUN	
7		7SWISS		42.1		4.7		4.0		8.8			
	B		D		F		H		J		L		N

SCC	Count	DIM	Lac	CAR	W/O	%
9.2	7352	12	1		373	25.6

a. cow number
b. cow barn name
c. test day milk (lbs)
d. test day fat (%)
e. test day protein (%)
f. test day solids non-fat (%)
g. test day milk urea nitrogen (%)
h. somatic cell count score
i. somatic cell count, in thousands (example = 7,352,000)
j. days in milk
k. lactation #
l. condition affecting record (in heat, abnormal, etc.)
m. predicted bulk tank average SCC without this cow in the tank
n. % of cells in tank contributed by this cow

Figure 2. DHIA hot sheet column heading terminology descriptions.

hot sheet shows the percentage of cells in the tank from each cow in the herd. Moving left, the next column lists what the weighted average bulk tank SCC would be without that cow and all cows above her in the bulk tank. For most producers, these are the only two columns that need to be examined, though the other columns may provide additional useful information such as that cow's somatic cell count (in thousands) and milk yield.

Let us walk through an example using the information provided in Figure 1. For this herd, the weighted average SCC was 492,000 cells/mL. Cow 7 contributed the most somatic cells to the weighted SCC average. Her SCC was 7,352,000 cells/mL. She was responsible for 25.6 percent of the somatic cells in the bulk tank. Without including her in this average, the weighted average SCC for this milking would have been 373,000 cells/mL. Cow 56 contributed an additional 15.9 percent of the cells with a SCC of 6,400,000. Without these top two cows (Cows 7 and 56) the weighted average SCC for this milking would have been 297,000 cells/mL. We can quickly see the impact that only two cows had on the herd's SCC. Cows with particularly high SCC or high milk production with moderately high SCC can have a huge impact on herd SCC, particularly in small herds. With larger herds, the impact that one cow has on SCC is smaller because this milk is diluted by the milk from other cows. This information can prove very valuable for dealing with a short-term high SCC problem.

It is important to discuss a few limitations of the "hot sheet."

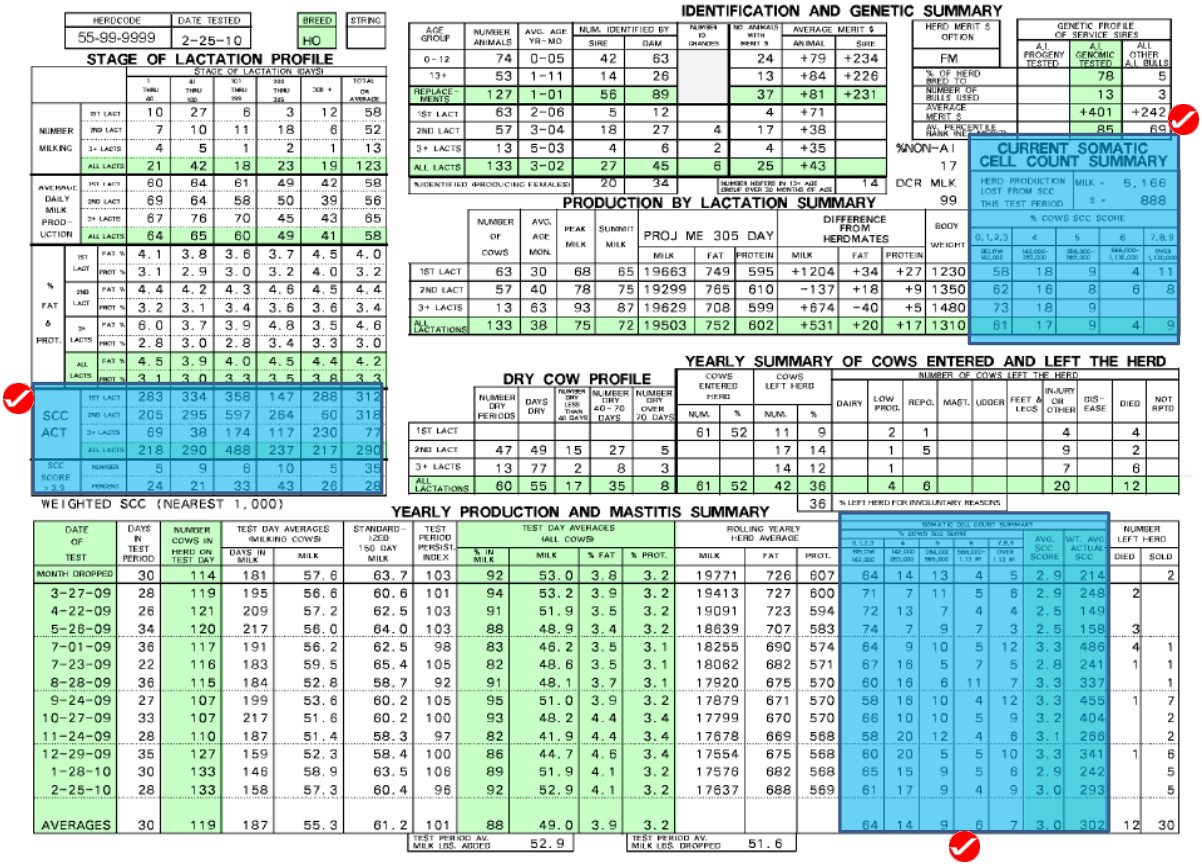
- The numbers reflect the samples collected from and the milk production of the cows on that particular milking on test day. SCC fluctuates considerably among individual cows from milking to milking.
- The weighted average SCC may not match bulk tank SCC exactly because of differences in cows tested versus those included in the bulk tank and the fact that cows are sampled at one milking of the two or four milkings included in the bulk tank. For example, if cows sampled on DHIA test are treated and their milk withheld from the bulk tank, differences between the two herd SCC measures may occur.
- If the highest SCC cows are removed from the herd, other cows will take their place on the top of the list. Part of this is just simple math indicating that a cow will be the highest SCC cow in the herd.

Nevertheless, it is also important to realize that eliminating high SCC cows is only an emergency treatment of the problem without getting at its root cause. If you only focus on removing high SCC cows from the herd without determining why these cows have high SCC and how to incorporate preventive practices, you will continue to cull or dump milk from top SCC cows test after test. To fully benefit from the DHIA hot sheet, you may want to consider collecting milk samples for bacteriological culture for all cows with SCC greater than 200,000 for two consecutive months or at least the top 10 or 20 cows on the list. This practice would provide valuable information for developing prevention strategies and making individual cow treatment or culling decisions. Don't be too quick to cull high SCC cows; make decisions based on multiple SCC and trends instead of a single cell count for a particular cow. The use of three consecutive monthly SCCs improves decision making, especially when combined with other cow factors such as age, stage of lactation, and time of year. First, check to see if high cows are chronically high SCC cows ("chronic cows" are defined as those with two consecutive months with a cell count >200,000 cells/ml in a single lactation). Those cows are the most likely culls. If the SCC is high on a single test, the cow may recover on her own or with the assistance of treatment.

DHIA Herd Summary

The DHIA herd summary (often DHI-202 for records processed by Dairy Records Management Systems in Raleigh, NC) also provides valuable herd-level SCC information. The areas where SCC is located on the DHI-202 are highlighted in blue in Figure 3. Note that some producers may receive their reports with SCS (somatic cell score) rather than SCC (somatic cell count). This herd summary provides useful information for diagnosing the source of increased SCC within a herd. For each test period (Figure 4) the herd production lost and the economic value of that milk are presented within the herd summary. Cows with a high SCC do not produce to their full potential, resulting in economic losses. This figure also presents the percentage of cows within various SCC concentrations or SCS by lactation number. This piece of information can be very useful toward distinguishing whether a mastitis problem exists in younger or older animals. If a higher percentage of first calf heifers have high SCC, prevention efforts should be focused on heifer rearing programs. If a higher percentage of cows with high SCC are observed in older cows, dry cow management and milking procedures may be examined. Finally, SCC distributions among SCC categories are also provided. Producers should strive to have greater than 85 percent of cows with SCC less than 200,000 cells/mL and less than 5 percent of cows with SCC greater than 1,130,000 cells/mL. In small herds, these numbers must be interpreted with caution because of the small number of cows represented in each category. A small herd makes it difficult to determine whether an observation is a herd or individual cow problem.

Figure 5 depicts SCC categorized by stage of lactation and lactation number for the current test. Again, this information can be useful for pinpointing the source of an SCC problem. If SCCs are highest in early lactation, dry and fresh cow management should be examined. If SCCs are low in early lactation but increase during lactation, milking procedures and lactating cow housing may be examined. SCC concentrations increase in later lactation because of reduced milk production, which increases the concentration of somatic cells. For each lactation category, the percentage of cows with SCC greater than 200,000 cells/mL (SCS >3.9) is presented. Producers should strive to have less than 15 percent of cows in this category. Figure 6 depicts SCC trends by test date. This information can be useful for identification of the time frame when SCC began to increase (i.e. change in equipment, employees, or weather). Additionally, this information can be helpful for identifying seasonal trends in SCC.



HERDCODE 55-99-9999 | DATE TESTED 2-25-10 | BREED HO | STRING

STAGE OF LACTATION PROFILE

		1 THRU 60	61 THRU 100	101 THRU 199	200 THRU 305	305 +	TOTAL OR AVERAGE
NUMBER MILKING	1ST LACT	10	27	6	3	12	58
	2ND LACT	7	10	11	18	6	52
	3+ LACTS	4	5	1	2	1	13
	ALL LACTS	21	42	18	23	19	123
AVERAGE DAILY MILK PRODUCTION	1ST LACT	60	64	61	49	42	58
	2ND LACT	69	64	58	50	39	56
	3+ LACTS	67	76	70	45	43	65
	ALL LACTS	64	65	60	49	41	58
% FAT & PROT.	1ST LACT FAT %	4.1	3.8	3.6	3.7	4.5	4.0
	1ST LACT PROT %	3.1	2.9	3.0	3.2	4.0	3.2
	2ND LACT FAT %	4.4	4.2	4.3	4.6	4.5	4.4
	2ND LACT PROT %	3.2	3.1	3.4	3.6	3.6	3.4
	3+ LACTS FAT %	6.0	3.7	3.9	4.8	3.5	4.6
	3+ LACTS PROT %	2.8	3.0	2.8	3.4	3.3	3.0
	ALL LACTS FAT %	4.5	3.9	4.0	4.5	4.4	4.2
	ALL LACTS PROT %	3.1	3.0	3.3	3.5	3.8	3.3
SCC ACT	1ST LACT	283	334	358	147	288	312
	2ND LACT	205	295	597	264	60	318
	3+ LACTS	69	38	174	117	230	77
	ALL LACTS	218	290	488	237	217	290
SCC SCORE ≈3.3	NUMBER	5	9	8	10	5	35
	PERCENT	24	21	33	43	28	28

WEIGHTED SCC (NEAREST 1,000)

IDENTIFICATION AND GENETIC SUMMARY

AGE GROUP	NUMBER ANIMALS	AVG. AGE YR-MO	NUM. IDENTIFIED BY SIRE	NUM. IDENTIFIED BY DAM	NUMBER ID CHANGES	NO. ANIMALS WITH MERIT $	AVERAGE MERIT $ ANIMAL	AVERAGE MERIT $ SIRE
0-12	74	0-05	42	63		24	+79	+234
13+	53	1-11	14	26		13	+84	+226
REPLACEMENTS	127	1-01	56	89		37	+81	+231
1ST LACT	63	2-06	5	12		4	+71	
2ND LACT	57	3-04	18	27	4	17	+38	
3+ LACTS	13	5-03	4	6	2	4	+35	
ALL LACTS	133	3-02	27	45	6	25	+43	
%IDENTIFIED (PRODUCING FEMALES)			20	34	NUMBER HEIFERS IN 13+ AGE GROUP OVER 30 MONTHS OF AGE		14	

HERD MERIT $ OPTION: FM

GENETIC PROFILE OF SERVICE SIRES

	A.I. PROGENY TESTED	A.I. GENOMIC TESTED	ALL OTHER A.I. BULLS
% OF HERD BRED TO		78	5
NUMBER OF BULLS USED		13	3
AVERAGE MERIT $		+401	+242
AV. PERCENTILE RANK IN		85	69

%NON-AI 17

DCR MILK 99

CURRENT SOMATIC CELL COUNT SUMMARY

HERD PRODUCTION LOST FROM SCC THIS TEST PERIOD: MILK = 5,166 / $ = 888

% COWS SCC SCORE	0,1,2,3 BELOW 142,000	4 142,000-283,000	5 284,000-565,000	6 566,000-1,130,000	7,8,9 OVER 1,130,000
1ST LACT	58	18	9	4	11
2ND LACT	62	16	8	6	8
3+ LACTS	73	18	9		
ALL LACTATIONS	61	17	9	4	9

PRODUCTION BY LACTATION SUMMARY

	NUMBER OF COWS	AVG. AGE MON.	PEAK MILK	SUMMIT MILK	PROJ ME 305 DAY MILK	PROJ ME 305 DAY FAT	PROJ ME 305 DAY PROTEIN	DIFFERENCE FROM HERDMATES MILK	DIFFERENCE FROM HERDMATES FAT	DIFFERENCE FROM HERDMATES PROTEIN	BODY WEIGHT
1ST LACT	63	30	68	65	19663	749	595	+1204	+34	+27	1230
2ND LACT	57	40	78	75	19299	765	610	-137	+18	+9	1350
3+ LACTS	13	63	93	87	19629	708	599	+674	-40	+5	1480
ALL LACTATIONS	133	38	75	72	19503	752	602	+531	+20	+17	1310

DRY COW PROFILE

	NUMBER DRY PERIODS	DAYS DRY	NUMBER DRY LESS THAN 40 DAYS	NUMBER DRY 40-70 DAYS	NUMBER DRY OVER 70 DAYS
1ST LACT					
2ND LACT	47	49	15	27	5
3+ LACTS	13	77	2	8	3
ALL LACTATIONS	60	55	17	35	8

YEARLY SUMMARY OF COWS ENTERED AND LEFT THE HERD

	COWS ENTERED HERD NUM.	COWS ENTERED HERD %	COWS LEFT HERD NUM.	COWS LEFT HERD %	NUMBER OF COWS LEFT THE HERD: DAIRY	LOW PROD.	REPO.	MAST.	UDDER	FEET & LEGS	INJURY OR OTHER	REPRO. DIS-EASE	DIED	NOT RPTD
1ST LACT	61	52	11	9		2	1				4		4	
2ND LACT			17	14		1	5				9		2	
3+ LACTS			14	12		1					7		6	
ALL LACTATIONS	61	52	42	36		4	6				20		12	

36 % LEFT HERD FOR INVOLUNTARY REASONS

YEARLY PRODUCTION AND MASTITIS SUMMARY

DATE OF TEST	DAYS IN TEST PERIOD	NUMBER COWS IN HERD ON TEST DAY	TEST DAY AVERAGES (MILKING COWS) DAYS IN MILK	TEST DAY AVERAGES (MILKING COWS) MILK	STANDARDIZED 150 DAY MILK	TEST PERIOD PERSIST. INDEX	TEST DAY AVERAGES (ALL COWS) % IN MILK	TEST DAY AVERAGES (ALL COWS) MILK	TEST DAY AVERAGES (ALL COWS) % FAT	TEST DAY AVERAGES (ALL COWS) % PROT.	ROLLING YEARLY HERD AVERAGE MILK	ROLLING YEARLY HERD AVERAGE FAT	ROLLING YEARLY HERD AVERAGE PROT.	SOMATIC CELL COUNT SUMMARY % COWS SCC SCORE 0,1,2,3 BELOW 142,000	4 142,000-283,000	5 284,000-565,000	6 566,000-1,130,000	7,8,9 OVER 1,130,000	AVG. SCC SCORE	WT. AVG. ACTUAL SCC	NUMBER LEFT HERD DIED	NUMBER LEFT HERD SOLD
MONTH DROPPED	30	114	181	57.6	63.7	103	92	53.0	3.8	3.2	19771	726	607	64	14	13	4	5	2.9	214		2
3-27-09	28	119	195	56.6	60.6	101	94	53.2	3.9	3.2	19413	727	600	71	7	11	5	6	2.9	248	2	
4-22-09	26	121	209	57.2	62.5	103	91	51.9	3.5	3.2	19091	723	594	72	13	7	4	4	2.5	149		
5-26-09	34	120	217	56.0	64.0	103	88	48.9	3.4	3.2	18639	707	583	74	7	9	7	3	2.5	158	3	
7-01-09	36	117	191	56.2	62.5	98	83	46.2	3.5	3.1	18255	690	574	64	9	10	5	12	3.3	486	4	1
7-23-09	22	116	183	59.5	65.4	105	82	48.6	3.5	3.1	18062	682	571	67	16	5	7	5	2.8	241	1	1
8-28-09	36	115	184	52.8	58.7	92	91	48.1	3.7	3.1	17920	675	570	60	16	6	11	7	3.3	337		1
9-24-09	27	107	199	53.6	60.2	105	95	51.0	3.9	3.2	17879	671	570	58	16	10	4	12	3.3	455	1	7
10-27-09	33	107	217	51.6	60.2	100	93	48.2	4.4	3.4	17799	670	570	66	10	10	5	9	3.2	404		2
11-24-09	28	110	187	51.4	58.3	97	82	41.9	4.4	3.4	17678	669	568	58	20	12	4	6	3.1	266		2
12-29-09	35	127	159	52.3	58.4	100	86	44.7	4.6	3.4	17554	675	568	60	20	5	5	10	3.3	341	1	6
1-28-10	30	133	148	58.9	63.5	108	89	51.9	4.1	3.2	17576	682	568	65	15	9	5	6	2.9	242		5
2-25-10	28	133	158	57.3	60.4	96	92	52.9	4.1	3.2	17637	688	569	61	17	9	4	9	3.0	293		5
AVERAGES	30	119	187	55.3	61.2	101	88	49.0	3.9	3.2				64	14	9	6	7	3.0	302	12	30

TEST PERIOD AV. MILK LBS. ABOVE 52.9 | TEST PERIOD AV. MILK LBS. DROPPED 51.6

Figure 3. Back side of DHIA herd summary with areas with SCC management information highlighted in blue.

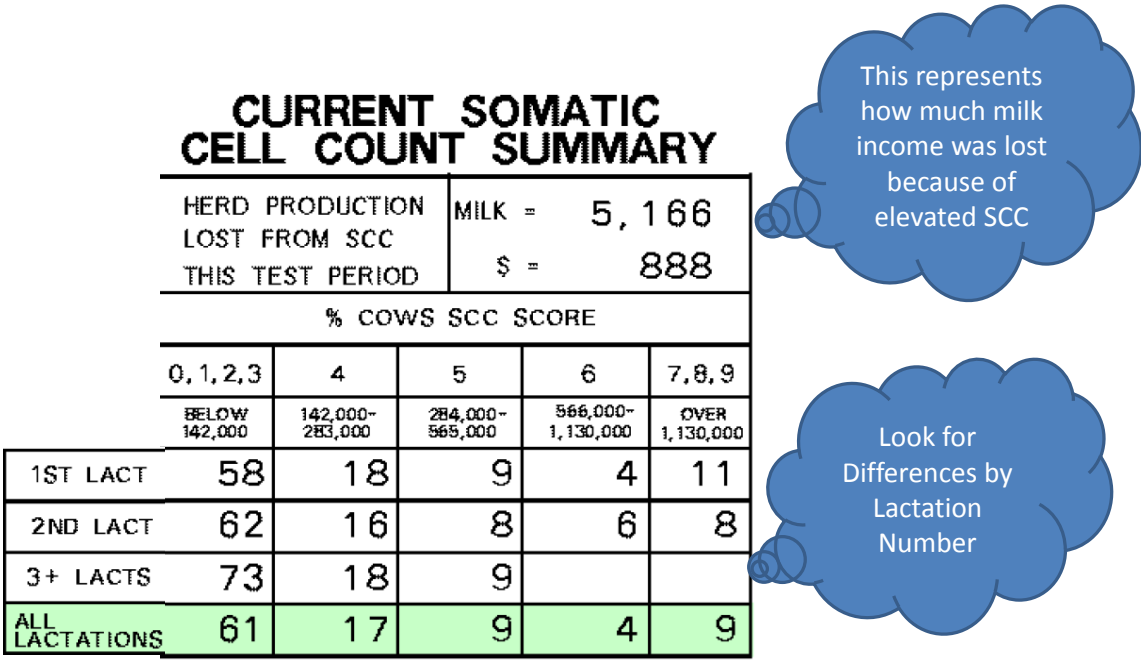


Figure 4. Current somatic cell count summary with income losses and SCC breakdowns by lactation.

PCDart graphs

PCDart is a software program available to dairy producers on DHI test. For producers who have this software or work with a veterinarian or consultant who does, two graphs (Figures 7 and 8) provided by this program can be very useful. Both of these graphs can be accessed through the "Cow" graph button within PCDart. To create a graph like the one shown in Figure 7, select "Prev SCC vs Curr SCC." To create a graph like the one shown in Figure 8, select "Prlc Last SCC vs 1st SCC." After opening each graph, click the CrossHairs button on the bottom of the screen. Move both the horizontal and vertical CrossHairs to SCS of 4 (equivalent to SCC >240,000 cells/mL). This distinction defines all cows with SCC above this level as having mastitis. Each graph divides the herd into four quadrants. The upper right quadrant represents chronically infected cows or those with high SCC for both time periods. The upper left quadrant represents new infections where SCC was low for the first time frame and high for the second. The lower left quadrant represents consistently clean cows with low SCC for both time frames. Finally, the lower right quadrant represents cures where SCC was high during the previous time frame but low during the current time frame. Goals for each quadrant are listed in these graphs.

Figure 7 shows the SCC for the current and the last DHI test. This graph demonstrates changes in SCC from month to month. If a high percent of the herd lies in the chronic infections quadrant, preventive efforts should be focused on control of contagious mastitis and on milking procedures. These chronic cows should be cultured. If a high percentage of the herd is in the new infections category, changes in the environment or milking procedures should be examined.

Figure 8 depicts changes in SCC from one lactation to the next by comparing the SCC from the first test in a new lactation to the last test from the previous lactation. To an extent, this information provides an evaluation of the effectiveness of dry and fresh cow management. If too many cows are in the upper right quadrant, the dry cow program is not effective at controlling existing infections.

		STAGE OF LACTATION (DAYS)					
		1 THRU 40	41 THRU 100	101 THRU 199	200 THRU 305	306 +	TOTAL OR AVERAGE
SCC ACT	1ST LACT	283	334	358	147	288	312
	2ND LACT	205	295	597	264	60	318
	3+ LACTS	69	38	174	117	230	77
	ALL LACTS	218	290	488	237	217	290
SCC SCORE > 3.9	NUMBER	5	9	6	10	5	35
	PERCENT	24	21	33	43	26	28

Look for Trends by Stage of Lactation. For example, is SCC higher in early lactation?

What percent of cows have SCCS > 3.9 (SCC> 200,000). Goal <15%

Figure 5. SCC distribution by stage of lactation for each lactation group.

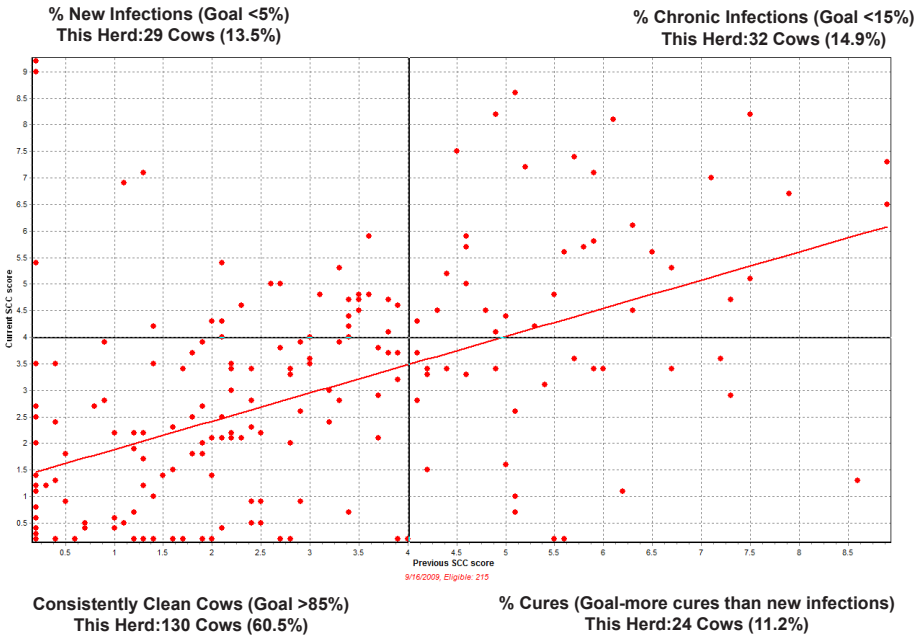
DATE OF TEST	SOMATIC CELL COUNT SUMMARY						
	% COWS SCC SCORE					AVG. SCC SCORE	WT. AVG. ACTUAL SCC
	0,1,2,3 BELOW 142,000	4 142,000 283,000	5 284,000 565,000	6 566,000- 1.13 M	7,8,9 OVER 1.13 M		
MONTH DROPPED	64	14	13	4	5	2.9	214
3-27-09	71	7	11	5	6	2.9	248
4-22-09	72	13	7	4	4	2.5	149
5-26-09	74	7	9	7	3	2.5	158
7-01-09	64	9	10	5	12	3.3	486
7-23-09	67	16	5	7	5	2.8	241
8-28-09	60	16	6	11	7	3.3	337
9-24-09	58	16	10	4	12	3.3	455
10-27-09	66	10	10	5	9	3.2	404
11-24-09	58	20	12	4	6	3.1	266
12-29-09	60	20	5	5	10	3.3	341
1-28-10	65	15	9	5	6	2.9	242
2-25-10	61	17	9	4	9	3.0	293
AVERAGES	64	14	9	6	7	3.0	302

Look for trends by season. Check when an increase started.

Figure 6. SCC trends by test date.

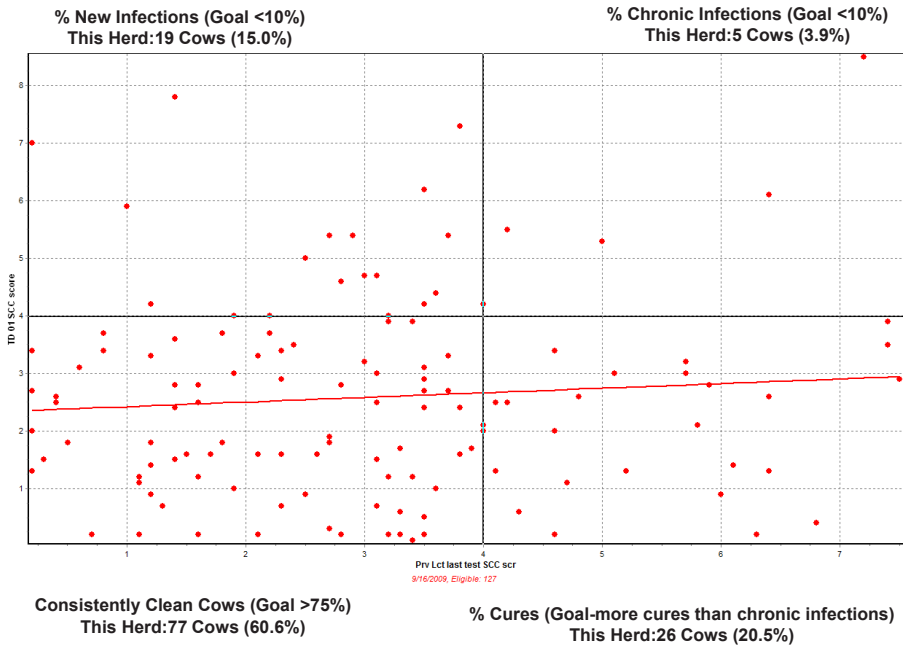
More problemetic would be scenarios where too many cows are in the upper left corner, indicating that cows developed new infections during the dry or fresh period. These situations would indicate a need to look at dry cow housing, environment, and preventive dry cow therapy, vaccination, dry cow nutrition, and calving facilities.

As you can see, DHI provides a wealth of information from each test period from that one test. Additional or alternative graphs and tables may be available from different DHI processing centers, but the concepts hold true regardless. This information can be extremely useful in efforts to lower SCC and diagnose SCC problems within a herd. Remember to consult with your veterinarian before changing any treatment or vaccination protocols to best target the pathogens responsible for an increased SCC. Remember that DHI testing is not for finding and culling the highest SCC cows each month in order to stay under the legal limit; rather it is a tool to help find the underlying causes of mastitis within a herd to help producers correct these problems. Prevention of mastitis is always more economical than treatments.



Current Versus Last Test SCC Score

Figure 7. PCDart Graph depicting distribution of SCC changes between tests.



First Test SCS versus Last Test in Previous Lactation SCS

Figure 8. PCDart graph depicting distribution of SCC changes between lactations.

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