An investigation into various somatic cell count thresholds as indicators of bovine intramammary infection status in quarter and composite cow milk samples

This study of quarter and composite cow milk samples investigated the use of somatic cell count (SCC) as a diagnostic tool to test the validity of current SCC threshold of 200 000 cells/ml suggested by industry as an indicator of general intramammary infections (IMI). The objectives of this study were to determine at various SCC levels sensitivity, specificity, predictive values and likelihood ratios to assess the efficacy of SCC to identify IMI and to determine "optimum" cut-off SCC thresholds to indicate IMI of both quarter and composite cow milk samples. This dataset contains micro-cytology results of 89 638 quarter and 385 594 composite cow milk samples from in most cases all lactating cows of 860 dairy herds. Cows differed in breed, parity, stage of lactation and milk yield.

In quarter milk the percentage samples from which bacteria was isolated at 100 000 and 200 000 cells/ml SCC levels did not differ much nor did they differ from the 18.3% IMI positive composite cow samples at the 200 000 cells/ml level. At 200 000 cells/ml higher sensitivity was achieved in quarter milk and specificity in cow milk samples. At the same SCC level for every one quarter infected 4.34 were not and for every 1 udder infected 1.13 were uninfected. The probability for detecting IMI at 200 000 cell/ml was very low at 50.0% in quarter and 62.4% in cow milk and for detecting uninfected quarters 81.3% and uninfected udders 69.4%.
To detect intramammary infection, quarter level SCC assessment was better than that at cow level. The optimum SCC cut-off levels determined were 250 000 and 150 000 cells/ml in quarter and composite milk respectively. SCC alone to predict the presence of IMI is not ideal.

Table 1. Sensitivity and predictability of quarter intramammary infections (IMIs) for different somatic cell count (SCC) cut-offs.

SCC x10^3 cells/ml	*True Prev*	*Sen*	*Sp*	*App Prev*	PPV	NPV	*PLR*	RE	AE
50	0.3399	0.9009	0.3361	0.7444	0.4110	0.8682	1.3571	1.1901	0.4045
100	0.3399	0.8244	0.4896	0.6171	0.4540	0.8441	1.6150	0.8155	0.2772
150	0.3399	0.7649	0.5728	0.5420	0.4800	0.8255	1.7903	0.5946	0.2021
200	0.3399	0.7179	0.6303	0.4880	0.5000	0.8127	1.9419	0.4357	0.1481
250	0.3399	0.6789	0.6714	0.4477	0.5150	0.8024	2.0658	0.3172	0.1078
300	0.3399	0.6438	0.7025	0.4152	0.5270	0.7930	2.1645	0.2215	0.0753
350	0.3399	0.6143	0.7261	0.3896	0.5360	0.7853	2.2428	0.1462	0.0497
400	0.3399	0.5884	0.7453	0.3681	0.5430	0.7786	2.3098	0.0830	0.0282
450	0.3399	0.5651	0.7616	0.3494	0.5500	0.7728	2.3701	0.0279	0.0095
500	0.3399	0.5448	0.7753	0.3335	0.5550	0.7679	2.4241	-0.0188	-0.0064
750	0.3399	0.4695	0.8236	0.2760	0.5780	0.7510	2.6619	-0.1880	-0.0639

True Prev= True prevalence; Sen = sensitivity, Sp = Specificity, App Prev = Apparent prevalence, PPV = Positive predicted value, NPV = Negative predicted value, PLR = Positive likelihood ratio; RE = Relative Error & AE = Absolute error

Table 2. Analysing composite cow milk samples at different Somatic Cell Count (SCC) levels

SCC x 10^3 cells/ml	True *Prev*	Sen	Sp	App Prev	PPV	PLR	AE
50	0.4337	0.8701	0.3948	0.7201	0.5240	1.4377	0.2864
100	0.4337	0.7489	0.5692	0.6471	0.5710	1.7383	0.2134
150	0.4337	0.6529	0.6684	0.6617	0.6013	1.9692	0.2280
200	0.4337	0.5778	0.7334	0.6659	0.6240	2.1669	0.2322
250	0.4337	0.5172	0.7745	0.6629	0.6372	2.2937	0.2292
300	0.4337	0.4671	0.8064	0.6593	0.6489	2.4130	0.2256
350	0.4337	0.4265	0.8292	0.6545	0.6565	2.4964	0.2208
400	0.4337	0.3921	0.8474	0.6500	0.6631	2.5700	0.2163
450	0.4337	0.3636	0.8627	0.6462	0.6697	2.6476	0.2125
500	0.4337	0.3382	0.8756	0.6425	0.6755	2.7178	0.2088
750	0.4337	0.2552	0.9144	0.6285	0.6954	2.9814	0.1948

True Prev = True prevalence, Sen = sensitivity, Sp=Specificity, App Prev = Apparent prevalence, PPV = Positive predicted value, PLR = Positive likelihood ratio & AE = absolute error

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