SARE Grant 2004 Final Report:
Can use of a Teat Sealant Alone Prevent New Cases of Mammary Infection During a Dry Period? FNE04-509

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2. Project Goals

We propose to determine if the traditional use of high dose intramammary antibiotics at dairy cattle dry off can be eliminated in lower risk cows by employing a teat sealant product called Orbeseal.

For dairy cattle, the dry period is a high risk time for mammary gland infections. To combat this threat, a cow's defense system is supposed to form a protective keratin plug in the teat canal at dry off to block the infection entry route. However, recent research shows that only 50% of teats form this plug by one week after dry off. Furthermore, the teats of some higher producing cows never form this plug, leaving them at a much greater risk of developing a new infection.

In an effort to fight the increased danger of infection, standard practice calls for each teat on every lactating animal to be treated with a commercial intramammary dose of antibiotic at dry off. This practice is done to treat any existing udder infections as well as to fight any new infections that occur during the dry period.

Orbeseal (bismuth subnitrate) is a non-antibiotic intramammary infusion introduced in the United States in 2003. It aims to prevent new intramammary infections throughout the dry period by acting as a keratin plug substitute. Following Orbeseal application, a teat canal seal is formed and maintained throughout dry cow period.

Our study investigated whether Orbeseal alone can significantly protect a cow against new mammary infections by comparing the infection rates and indicators of infection in an Orbeseal only test group with the infection statistics gleaned in antibiotics only and antibiotics plus Orbeseal control groups.

3. Farm Profile

Table Rock Farm is a 1,000 cow, fourth generation dairy with 25 full and part-time employees. The farm's mission is to produce quality milk for the public need, and to be competitive with any area in the world in order to provide a good lifestyle for owners, employees and their families. About 1550 acres of hay and corn are cropped each year to feed cattle, and in 2004, the farm shipped almost 1.3 million pounds of milk per full-time employee equivalent. Up to 4,000 pounds of quality milk are harvested per hour, and we pride ourselves on our milk bacteria count below 3,000 and somatic cell count between 120,000-160,000.

Infection-causing organisms found at Table Rock Farm during the study period were categorized as follows: Ecoli 35%, Staph species 14%, Strep species 12%, Yeast 5%, Klebsiella 4% , Staph Aureus 2%. 28% of cultures yielded no growth. During the duration of the study, the Linear Score for Table Rock ranged from 3.1 to 3.9.

4. Participants

The grant Project Leader is Willard De Golyer, owner of Table Rock Farm. In addition to grant management, he coordinated collaborators and continues to monitor overall grant results and progress.

Catherine Book, Herdsperson at Table Rock Farm, designed the study protocol and record-keeping system. She was responsible for data collection and accuracy. Herd Manager Michael Lanpher, Herdsperson Thomas Nickerson and Ms. Book worked together to carry out the study protocols, including animal treatment, sampling and observation.

Leslie Scott De Groff, DVM, is the herd veterinarian. He is on farm premises weekly. Dr. De Groff helped shape the study protocol and monitored study progress as well as overall animal health.

Francis Welcome, DVM, is a Senior Extension Associate with Quality Milk Production Services in Ithaca, NY. He advised on grant design and secured statistical analysis of study data and interpreted study findings.

Bradley Rauch is Manager of Contract Research at Quality Milk Production Services in Ithaca, NY. He performed statistical analysis for this grant.

Meghan Hauser, owner of Table Rock Farm, acted as grant administrator and completed the Outreach portion of this grant.

5. Project Activities

Experiment Structure and Process

In March 2004, all lactating animals were sampled by a Dairy One DHIA technician, and somatic cell scores (SCC) were obtained to establish animal baselines. Cows entered in the study exhibited an initial somatic cell count of 200,000 or less (individual animals ranged from 13,333 to 187,000 SCC) and had not had a clinical mammary infection during their last lactation.

Beginning in April 2004, a total of 150 qualified study animals were randomly assigned to one of three groups during weekly dry-off sessions:

Group 1: Administration of Orbeseal only. (52 animals)

Group 2: Traditional dry off treatment with a commercially-prepared dose of one million units of penicillin and 1000 mg of dihydrostreptomycin (48 animals)

Group 3: Traditional dry off treatment, followed by administration of Orbeseal. (50 animals)

After urging from an Orbeseal product representative and agreement from Dr. Welcome, animals were additionally tested for signs of mastitis with a California Mastitis Test (CMT) at time of dry-off and were excluded from the study if results were positive. The change was made to ensure that study subjects had not become infected since the initial SCC was established. This procedure was added to the study in April, so approximately 30 study cows were not CMT tested prior to enrollment.

All other aspects of the dry off process were identical for each study group. Following treatment, dry cows were housed in a bedded-pack facility until freshening.

Upon freshening, study animals were CMT tested. Within 35 days of freshening, a milk sample was taken from each study individual by a Dairy One technician and tested for SCC. SCC testing by a Dairy One technician was repeated for each individual at the time of the next monthly herd test.

Any animal that did get a mammary gland infection was noted in study records and was treated according to our standard protocol.

Data Collection

Study variables were collected in written form at various treatment locations around the farm, including the dry off area, the calving pen, and the milking parlor. Records were then transcribed into an Excel format for use in statistical analysis of study findings (see Appx 1).

Other data gathered, but not expressly used for study findings include:

1. Daily records of individual milk production via the Afikim system.
2. Records of the course of known infection and treatment in study animals
3. Calving experience (calving ease, size, condition)
4. Expenses.

Our farm veterinarian had access to records during his weekly herd checks. Francis Welcome was available for consultation via e-mail.

6. Results

Study data were submitted to Quality Milk Production Services in January 2005 for statistical analysis. Brad Rauch, Manager of Contract Research performed the analysis using Microsoft Excel and Statistical Analysis System v8.0 (SAS) His methods and findings follow:

Methods

For study purposes, a clinical infection was defined by abnormal milk (e.g. clots, flakes, etc.), while a subclinical infection was defined when a cow did not have clinical signs, but had a measured SCC above 200,000 at 30±15 days after freshening (DAF). Descriptive statistics for study variables (treatment, drydays and season) were produced using PROC FREQ. A logistic regression analysis, using PROC LOGISTIC (SELECTION = backward), was performed to evaluate the effect of treatment on the prevalence of subclinical mastitis at 30±15 DAF. A "time-to-event" analysis was performed to evaluate the effect of treatment on the DAF of clinical mastitis events while adjusting for right-censored data. PROC LIFETEST was used to plot the hazard associated with each variable in order to test the proportion hazards assumption. PROC PHREG was used for the final analysis of the clinical event data. Time-dependent covariates for treatment, season and drydays were incorporated into the model after the proportion hazards assumption failed. Dummy variables were coded for treatment categories and their associated interaction terms. The SELECTION = backward option was used to exclude terms that were not significant ($P > 0.05$). This procedure was validated by evaluating all possible models individually.

The variable definitions and models that were evaluated are as follows:

Variable definitions:

Trt = treatment (Orbeseal, quartermaster, orbeseal+quartermaster)
Drydays = number of days each cow was dry ($\leq 50, > 50$)
Season = Whether or not calving occurred in "Summer" or "Fall"
(May – Aug and Sept – Dec, respectively)
Dimclin = Days in milk of a clinical event

Logistic Regression model: *Subclinical = trt drydays season trt*drydays*

Time-to-event analysis model: *Clinical = trt1 trt2 drydays season trt1*drydays trt2*drydays trt1*season trt2*season drydays*season trt1*dimclin trt2*dimclin season*dimclin drydays*dimclin*

Terms that were not significant ($P<0.05$) were removed from each model. The final model terms and corresponding p-values are presented.

NOTE: The *trt*season* interaction could not be evaluated in the logistic model since cell sizes were inadequate.

Descriptive Statistics Results:

Table 1. Sample size and percentage of cows with clinical signs or elevated SCC stratified by treatment.

Treatment	N	% Clinical	% Elevated SCC
Both	52	30.8	15.4
Orbeseal	47	29.8	17.0
Quartermaster	50	30.0	14.0
Total	149	30.2	15.4

Table 2. Sample size and percentage of cows with clinical signs or elevated SCC, stratified by treatment and drydays (≤50, >50).

	N		% clinical		% elevated SCC	
Treatment	≤ 50 d	> 50 d	≤ 50 d	> 50 d	≤ 50 d	> 50 d
Both	28	24	28.6	33.3	10.7	20.8
Orbeseal	33	14	33.3	21.4	18.2	14.3
Quartermaster	32	18	34.4	22.2	15.6	11.1
Total	93	56	32.3	26.8	15.1	16.1

Table 3. Sample size and percentage of cows with clinical signs or elevated SCC, stratified by treatment and season ("Summer", "Fall").

	N		% clinical		% elevated SCC	
Treatment	Summer	Fall	Summer	Fall	Summer	Fall
Both	32	20	34.4	25.0	15.6	15.0
Orbeseal	34	13	26.5	38.5	11.8	30.8
Quartermaster	33	17	27.3	35.3	9.1	23.5
Total	99	50	29.3	32.0	12.1	22.0

Logistic Regression Results:

No terms in the model were significant (P<0.05), therefore, all terms were removed. Below are the P-values associated with the Wald Chi-Square values for each model, during the selection procedure.

Model	Wald Chi-Square	p-value
*Subclinical = trt drydays season trt*drydays*	1.2526	0.5346
Subclinical = trt drydays season	0.0103	0.9192
Subclinical = trt season	0.2745	0.8718
Subclinical = season	2.4208	0.1197

Time-to-Event Analysis Results

Both procedures (SELECTION = backward, all possible models) had the same overall results. No terms in the model were significant (P<0.05), therefore all terms were removed. The P-values associated with the Wald Chi-Square values are not presented for simplicity of reporting. If needed in the future, they can be retrieved from QMPS at any time.

Result Interpretation

Orbeseal, Quartermaster and a combination treatment of both Orbeseal and Quartermaster were evaluated for their effect on SCC and clinical mastitis following calving. There were 149 cows enrolled in the study, with nearly equal numbers in each treatment group. Cows within each treatment group were also distributed fairly evenly amongst categories of secondary variables (season, drydays). SCC was measured at 30±15 DAF, while clinical events were recorded from freshening to the end of the study (March 14, 2005). There were no detectable differences in SCC or the occurrence of clinical mastitis between any of the three treatment groups in this study. Additional SCC data that included various sampling times outside the 30±15 day range indicated a significant effect of when sampling occurred on the likelihood of an elevated SCC being detected. Considering this, it is important to clearly present the SCC results of this study as 30±15 DAF. A study with samples taken at 10±5 DAF, for example, may have provided different results.

7. Conditions

As mentioned above, the study took place over the course of two Western New York seasons.

Additionally, our herd's Linear Score range of 3.1-3.9 may have impacted the effectiveness of the treatments and therefore, the outcome of the study. A farm with a higher Linear Score, or rate of infection, may need to use both an Orbeseal and a traditional dry-off treatment in order to see a reduction in infection rates.

Animals excluded from the study analysis included subjects lacking necessary SCC data and one animal that did not have any dry days.

8. Economics

During the study, Orbeseal cost $7.60 per single animal treatment. A single treatment with Quartermaster cost $5.55. A treatment with both Orbeseal and Quartermaster cost $13.15.

9. Assessment

On-farm observation led us to believe that the Orbeseal/Quartermaster combination was the most successful treatment. Therefore, we were quite interested to learn that analysis indicated that each treatment method was equally effective, given the parameters for SCC and previous animal history of infection that we established for the study

Therefore, the findings are exciting for farmers who wish to more effectively address the following issues:

On-farm antibiotic use

Farmers can use Orbeseal alone to decrease risk of on-farm antibiotic contamination. Decreased risk of contamination can only reduce associated costs of producing milk. Additionally, those wishing to produce an organic product can use Orbeseal alone to dry off animals, apparently without affecting animal health.

However, each farm should carefully evaluate their Linear Score in relation to the score at Table Rock during the period of the study. A farm with a higher Linear Score may need to use both an Orbeseal and a traditional dry-off treatment.

Dry Treatment Expenses

Dry treatment is expensive and is performed on every lactating member of the herd. A farmer armed with this study can base his/her treatment decision on product cost and personal management style, without concern for a loss of product effectiveness.

Plans for Future Study

If this study was conducted again, we would consider purchasing an individual SCC test kit. This product became available on the market after grant funding was approved.

For this study, we had to wait for a monthly visit from the milk tester in order to obtain SCC information. Therefore, some cows were only days fresh when tested, and others were a month or more fresh when tested. Individual testing would allow the freedom of measuring SCC count within a narrower range after freshening, and could lead to different study results.

10. Adoption

Currently at Table Rock, we are using both a traditional dry treatment and Orbeseal when drying off most animals. Any animal which may not survive the duration of the dry period is treated with Orbeseal only.

The decision to use both treatments was reached after consultation with our herdspersons and herd veterinarian, and takes into account that the study was performed on animals with known SCC counts and without clinical mammary infection in the previous lactation. If we had use of an individual cow SCC measurement tool, we would use Orbeseal only treatment on animals with less than 200,000 SCC at dry off and no history of mastitis in the last lactation.

9. Outreach

Appendix B includes a press release that was distributed to the following media outlets:

Locally: Wyoming County Cooperative Extension's Agricultural News
Perry Herald (weekly)
Country Courier (weekly)
Daily News (Batavia)

Regionally: Country Folks
FarmShine
Northeast Dairy Business Magazine
Northeast Dairy Producers Association
(180 producer members from Maine to Maryland)

Nationally: Hoard's Dairyman
Dairy Herd Management

A study synopsis was shared with members of New York State's PRO-DAIRY Extension team, which consults with farmers across the State.

An article was submitted to the Bovine Practitioner, at the urging of Dr. Welcome.

FOR IMMEDIATE RELEASE AUGUST 22, 2005

TABLE ROCK FARM REPORTS FINDINGS FROM SARE-FUNDED STUDY

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Table Rock Farm, a dairy in Castile, NY, has recently completed a on-farm study of dry cow practices. The study, funded in part by The Northeast Sustainable Agriculture Research and Education organization (SARE), concluded that a teat sealant is as effective as traditional antibiotics when used in dairy cattle with low somatic cell counts (SCC).

The 2004 study randomly assigned 150 dairy cows with a SCC of less that 200,000 to one of three groups: teat sealant only, traditional antibiotics, or a combination of antibiotics and teat sealant. All other aspects of the dry off process were identical.

A CMT was administered upon freshening and SCC was measured on the next official herd test date. Statistical analysis of the findings revealed no detectable differences in SCC counts or in the occurrence of clinical mammary infections in any of the three study groups.

The Table Rock study protocol was designed by Catherine Book, and study procedures were carried out by Michael Lanpher, Thomas Nickerson, Ms. Book and Gail Flint. Leslie Scott De Groff of the Perry Veterinary Clinic offered guidance, and results of the study were analyzed by Quality Milk Production Services under the direction of Dr. Frank Welcome.

This study was partially funded by The Northeast Sustainable Agriculture Research and Education organization (SARE). SARE's mission is that agriculture in the Northeast be diversified and profitable and provide healthful products to its customers. Furthermore, farming will be conducted by farmers who manage resources wisely, who are satisfied with their lifestyles, and who have a positive influence on their communities and the environment.

For a complete copy of study results, please contact Meghan Hauser at 585 493 5770.

SARE Grant FNE04-509

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Key: Bold items indicate animal with high SCC count at first or second test after freshening.
Underlined items indicate animal with clinical mastitis occuring during study.

Cow No.	Study No.	Dry Date	SCC @ Dry off	Fresh Date	# Days Dry	DIM 1st Test	SCC @ 1st test	DIM 2nd test	SCC @ 2nd test
5636	1	6/15/2004	13,000	8/3/2004	49	20	23,000	52	27,000
5754	1	6/15/2004	13,000	8/3/2004	49	20	66,000	52	141,000
5745	1	7/7/2004	13,000	8/30/2004	54	25	18,000	60	13,000
5718	1	7/19/2004	13,000	8/28/2004	40	27	33,000	62	71,000
5690	**1**	**4/27/2004**	**14,000**	**6/24/2004**	**58**	**1**	**2,263,000**	**32**	**27,000**
5752	1	6/7/2004	18,000	7/26/2004	48				
5793	1	8/17/2004	19,000	10/3/2004	47	26	13,000	54	47,000
5613	1	5/18/2004	22,000	7/15/2004	58	11	27,000	39	13,000
5812	1	6/27/2004	22,000	8/25/2004	59	30	115,000	65	25,000
5706	1	7/7/2004	22,000	8/31/2004	55	24	15,000	59	14,000
5756	1	7/7/2004	22,000	8/25/2004	49	30	22,000	65	27,000
5691	1	7/20/2004	22,000	9/3/2004	45	21	66,000	56	29,000
5657	**1**	**7/19/2004**	**25,000**	**9/11/2004**	**54**	**13**	**214,000**	**48**	**200,000**
5585	1	6/15/2004	27,000	8/2/2004	48	21	41,000	53	23,000
5093	**1**	**7/26/2004**	**27,000**	**9/7/2004**	**43**	**17**	**400,000**	**52**	**200,000**
5583	1	5/4/2004	29,000	6/6/2004	33	19	27,000	50	100,000
5372	1	7/19/2004	31,000						
5399	**1**	**7/26/2004**	**35,000**	**9/4/2004**	**40**	**20**	**93,000**	**55**	**460,000**
5464	1	8/11/2004	35,000	9/27/2004	47	32	29,000	60	62,000
5790	**1**	**6/27/2004**	**38,000**	**8/14/2004**	**48**	**9**	**528,000**	**41**	**606,000**
5791	**1**	**7/27/2004**	**38,000**	**9/21/2004**	**56**	**3**	**373,000**	**38**	**429,000**
5804	1	7/13/2004	44,000	8/27/2004	45	28	17,000	63	13,000
5156	1	4/21/2004	50,000	6/1/2004	41	24	27,000	55	44,000
5334	1	5/23/2004	54,000	7/6/2004	44	20	33,000	48	66,000
4747	1	5/4/2004	57,000	6/11/2004	38	14	35,000	45	13,000
4313	1	6/1/2004	57,000	8/7/2004	67				
5649	1	6/27/2004	57,000	8/10/2004	44	13	44,000	45	57,000
5345	1	7/26/2004	57,000	9/7/2004	43	17	76,000	52	107,000
5699	1	5/11/2004	62,000	6/30/2004	50	26	14,000	54	23,000
5742	1	7/13/2004	66,000	9/2/2004	51	22	87,000	57	57,000
4293	1	8/2/2004	66,000	9/12/2004	41	12	57,000	47	29,000
4897	1	4/21/2004	71,000	6/9/2004	49	16	29,000	47	13,000
5679	1	5/4/2004	71,000	6/28/2004	55	28	13,000	56	22,000
3335	1	4/27/2004	76,000	8/16/2004	111	7	57,000	39	29,000
5239	**1**	**6/7/2004**	**81,000**	**7/18/2004**	**40**	**8**	**566,000**	**36**	**115,000**
5350	**1**	**5/4/2004**	**87,000**	**6/4/2004**	**31**	**21**	**107,000**	**52**	**303,000**
5729	1	6/21/2004	87,000	7/3/2004					
3884	1	5/11/2004	93,000	6/29/2004	49	27	71,000	55	22,000
5685	**1**	**5/18/2004**	**93,000**	**7/5/2004**	**48**	**21**	**264,000**	**49**	**283,000**
5671	**1**	**8/17/2004**	**93,000**	**10/17/2004**	**61**	**12**	**400,000**	**40**	**7,880,000**
5362	**1**	**6/20/2004**	**100,000**	**8/2/2004**	**43**	**21**	**38,000**	**53**	**7,352,000**
5247	**1**	**6/15/2004**	**107,000**	**8/3/2004**	**49**	**20**	**5,972,000**	**52**	**919,000**
4984	**1**	**5/12/2004**	**141,000**	**6/19/2004**	**38**	**6**	**174,000**	**37**	**857,000**
4803	1	5/23/2004	141,000	7/7/2004	45	19	107,000	47	29,000
4492	**1**	**5/18/2004**	**152,000**	**7/25/2004**	**68**	**1**	**985,000**	**29**	**23,000**
5192	1	5/23/2004	187,000	7/2/2004	40	24	22,000	52	71,000
4558	1	8/17/2004	187,000	11/13/2004	88	13		48	13,000
4718	**1**	**8/24/2004**	**187,000**	**10/11/2004**	**48**	**18**	**857,000**	**46**	**2,786,000**

5789	2	6/15/2004	13,000	7/29/2004	44	25	20,000	57	18,000
5651	2	6/21/2004	13,000	8/13/2004	53	10	162,000	42	100,000
5820	2	7/26/2004	13,000	8/1/2004	6	22	31,000	54	27,000
5711	2	7/7/2004	15,000	8/28/2004	52	27	50,000	62	17,000
5603	2	7/27/2004	17,000	9/9/2004	44	15	29,000	50	14,000
5209	2	5/18/2004	20,000	6/28/2004	41				
5571	2	5/18/2004	22,000	6/28/2004	41	28	19,000	56	14,000
5449	2	6/7/2004	22,000	7/29/2004	51	25	29,000	57	20,000
5824	2	7/19/2004	23,000	9/2/2004	45	22	23,000	57	13,000
5458	2	6/7/2004	27,000	8/4/2004	57	19	23,000	51	27,000
5735	2	6/15/2004	27,000	8/12/2004	58	11	62,000	43	19,000
5344	2	8/11/2004	29,000	9/21/2004	41	3	123,000	38	31,000
5677	2	4/21/2004	31,000	6/2/2004	42	23	152,000	54	81,000
5662	2	4/27/2004	31,000	6/15/2004	49	10	123,000	41	81,000
4163	2	7/26/2004	31,000	9/7/2004	43	17	123,000	52	162,000
5737	2	5/23/2004	33,000	7/14/2004	52	12	62,000	40	14,000
5373	2	5/24/2004	35,000	7/4/2004	41	22	20,000	50	13,000
5175	**2**	**6/26/2004**	**35,000**	**8/15/2004**	**50**	**8**	**3,430,000**	**40**	**2,425,000**
5377	2	7/19/2004	35,000	10/30/2004	103	27	54,000	62	47,000
5485	2	4/21/2004	38,000	6/10/2004	50	15	66,000	46	87,000
5707	**2**	**5/11/2004**	**44,000**	**6/22/2004**	**42**	**3**	**1,715,000**	**34**	**44,000**
5486	2	5/18/2004	47,000	7/4/2004	47	22	14,000	50	13,000
5059	2	7/26/2004	50,000	9/18/2004	54	6	152,000	41	38,000
3434	**2**	**7/27/2004**	**50,000**	**9/4/2004**	**39**	**20**	**857,000**	**55**	**325,000**
5368	**2**	**6/15/2004**	**57,000**	**7/24/2004**	**39**	**2**	**1,300,000**	**30**	**115,000**
3009	**2**	**7/7/2004**	**57,000**	**9/4/2004**	**59**	**20**	**132,000**	**55**	**2,111,000**
5089	2	7/19/2004	57,000	9/3/2004	46	21	27,000	56	107,000
5364	**2**	**6/1/2004**	**66,000**	**7/9/2004**	**38**	**17**	**152,000**	**45**	**460,000**
4708	**2**	**7/13/2004**	**66,000**	**8/21/2004**	**39**	**2**	**303,000**	**34**	**93,000**
3982	**2**	**7/7/2004**	**71,000**	**9/9/2004**	**64**	**15**	**919,000**	**50**	**283,000**
5753	2	8/2/2004	71,000	9/26/2004	55	33	17,000	61	31,000
4763	2	5/4/2004	76,000	6/26/2004	53	30	71,000	58	44,000
4673	**2**	**8/24/2004**	**76,000**	**10/12/2004**	**49**	**17**	**6,400,000**	**45**	**3,200,000**
5882	2	8/17/2004	81,000	10/5/2004	49	24	14,000	52	27,000
5165	2	5/4/2004	87,000	6/13/2004	40	12	41,000	43	13,000
3542	2	5/23/2004	100,000	7/30/2004	68	24	50,000	56	76,000
4918	**2**	**6/20/2004**	**100,000**	**7/30/2004**	**40**	**24**	**152,000**	**56**	**283,000**
5245	2	8/2/2004	100,000	9/16/2004	45	8	174,000	43	29,000
5290	2	6/27/2004	107,000	8/8/2004	42	15	23,000	47	13,000
5259	2	7/13/2004	107,000	8/23/2004	41	32	35,000	67	31,000
4830	**2**	**8/17/2004**	**107,000**	**9/24/2004**	**38**	**35**	**31,000**	**63**	**460,000**
4988	**2**	**4/27/2004**	**115,000**	**7/10/2004**	**74**	**16**	**174,000**	**44**	**214,000**
5075	**2**	**7/13/2004**	**123,000**	**8/24/2004**	**42**	**31**	**230,000**	**66**	**800,000**
4328	**2**	**5/12/2004**	**132,000**	**6/17/2004**	**36**	**8**	**696,000**	**39**	**35,000**
5243	**2**	**7/27/2004**	**132,000**	**9/2/2004**	**37**	**22**	**2,111,000**	**57**	**115,000**
5298	**2**	**5/11/2004**	**141,000**	**7/22/2004**	**72**	**4**	**283,000**	**32**	**373,000**
5358	2	6/20/2004	141,000	8/2/2004	43	21	33,000	53	50,000
5323	2	5/4/2004	152,000	6/29/2004	56	27	38,000	55	132,000
4801	**2**	**4/27/2004**	**187,000**	**6/18/2004**	**52**	**7**	**230,000**		
5392	2	8/17/2004	187,000	10/24/2004	68	5	71,000	33	29,000

5674	3	5/18/2004	13,000	7/12/2004	55	14	38,000	42	13,000
5652	**3**	**6/7/2004**	**13,000**	**7/25/2004**	**47**	**1**	**1,131,000**	**29**	**19,000**
5702	3	6/15/2004	13,000	8/9/2004	55	14	31,000	46	20,000
5734	3	7/7/2004	13,000	8/28/2004	52	27	27,000	62	17,000
5751	3	6/21/2004	19,000	8/9/2004	49	14	66,000	46	29,000
5741	3	5/4/2004	20,000	6/16/2004	43	9	152,000	40	87,000
5689	**3**	**5/18/2004**	**20,000**	**7/12/2004**	**55**	**14**	**373,000**	**42**	**348,000**
5723	3	4/27/2004	22,000	6/21/2004	55	4	71,000	35	35,000
5195	**3**	**5/4/2004**	**22,000**	**6/29/2004**	**56**	**27**	**6,860,000**	**55**	**115,000**
5411	**3**	**7/13/2004**	**22,000**	**9/4/2004**	**53**	**20**	**400,000**	**55**	**22,000**
5659	3	6/27/2004	25,000	8/14/2004	48	9	87,000	41	152,000
5386	3	6/7/2004	27,000	7/30/2004	53	24	71,000	56	20,000
5743	3	4/27/2004	29,000	6/7/2004	47	18	19,000	49	15,000
5520	3	4/27/2004	29,000	6/19/2004	53	6	62,000	37	19,000
5641	3	4/27/2004	29,000	6/22/2004	56	3	162,000	34	17,000
5692	3	6/7/2004	29,000	7/10/2004	32	16	50,000	44	23,000
5800	3	8/17/2004	29,000	10/11/2004	55				
5352	**3**	**5/18/2004**	**31,000**	**6/22/2004**	**35**	**3**	**400,000**	**34**	**13,000**
5117	3	7/7/2004	31,000	9/7/2004	62	17	23,000	52	13,000
5653	3	7/13/2004	31,000	9/1/2004	50	23	57,000	58	22,000
5727	**3**	**7/7/2004**	**35,000**	**8/21/2004**	**45**	**2**	**1,300,000**	**34**	**1,838,000**
5822	3	8/2/2004	35,000	10/1/2004	60	28	19,000	56	27,000
5349	3	5/23/2004	38,000	7/5/2004	43	21	13,000		
4836	3	7/26/2004	38,000	9/17/2004	53	7	44,000		
4513	**3**	**6/27/2004**	**41,000**	**8/22/2004**	**56**	**1**	**650,000**	**33**	**29,000**
5557	3	8/11/2004	41,000	10/2/2004	52	27	13,000	55	23,000
4867	3	5/4/2004	44,000	6/9/2004	36	16	81,000		
5757	3	6/20/2004	50,000	8/12/2004	53	11	62,000	43	22,000
5621	3	7/27/2004	50,000	9/24/2004	59	35	38,000	63	35,000
4499	3	6/15/2004	54,000	7/30/2004	45				
4045	**3**	**7/13/2004**	**57,000**	**8/20/2004**	**38**	**3**	**492,000**	**35**	**187,000**
5051	3	8/17/2004	62,000	9/26/2004	40	33	123,000	61	141,000
4854	3	5/23/2004	66,000	7/31/2004	69	23	44,000	55	22,000
5567	**3**	**6/20/2004**	**66,000**	**8/11/2004**	**52**	**12**	**985,000**	**44**	**566,000**
3623	**3**	**5/11/2004**	**76,000**	**6/23/2004**	**43**	**2**	**1,600,000**	**33**	**985,000**
5620	3	7/20/2004	81,000	9/6/2004	48	18	27,000	53	19,000
5106	3	6/15/2004	87,000	8/3/2004	49	20	29,000	52	27,000
4866	**3**	**7/27/2004**	**87,000**	**9/9/2004**	**44**	**15**	**746,000**	**50**	**123,000**
5268	3	7/26/2004	100,000	9/4/2004	40	20	50,000	55	87,000
4813	3	5/18/2004	115,000	6/29/2004	42	27	22,000	55	27,000
5159	3	7/19/2004	123,000	9/3/2004	46	21	27,000	56	14,000
5817	3	7/26/2004	123,000	9/16/2004	52	8	57,000	43	20,000
4757	**3**	**8/24/2004**	**123,000**	**12/7/2004**	**105**	**24**	**3,200,000**		
5339	3	5/18/2004	141,000	6/23/2004	36	2	141	33	13,000
5271	3	7/19/2004	141,000	10/14/2004	87	15	22,000	43	17,000
4939	3	5/4/2004	152,000	5/10/2004	6	15	66,000	46	38,000
4987	**3**	**5/11/2004**	**152,000**	**7/4/2004**	**54**	**22**	**132,000**	**50**	**348,000**
4958	**3**	**8/11/2004**	**152,000**	**9/27/2004**	**47**	**32**	**123,000**	**60**	**264,000**
3943	3	8/17/2004	162,000	10/4/2004	48	25	29,000	53	14,000
4919	3	8/24/2004	174,000	10/9/2004	46	20	25,000	48	62,000
5367	3	5/24/2004	187,000	7/12/2004	49	14	31,000	42	44,000
5266	3	8/17/2004	187,000	10/5/2004	49	24	41,000		