



Pregnancy Rates in Natural Service and Artificially Inseminated Dairy Herds

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PDHGA Southeast Regional Meeting, October 28, 2004

Overview

- Use of AI vs. NS bulls
- Reproductive efficiency
 - Florida study
 - Other studies
- Other considerations



Use of natural service (NS) bulls on cows

- Florida survey (1984): 50% of dairies use mostly AI, 12% mostly NS bulls, 38% mixture (Chenoweth and Larson, 1992)
- National survey (2002): “Most (55%) operations used bulls as a component of their breeding program and 89% of these bulls were dairy bulls” (NAHMS, 2002)
- Eastern US (2002): 26% use only AI, 62% use some bulls, 12% use mostly bulls (Smith et al., 2004)

Use of natural service (NS) bulls on heifers

- Pennsylvania survey (1987) (Heinrichs et al., 1987)
 - 329 Pennsylvania dairy farms
 - 11.2% of heifers bred 1x by AI, then by NS bull
 - 8.5% of heifers bred 2x by AI, then by NS bull
 - 20.7% of heifers bred by NS bulls only
- 1997 Hoard's Dairyman continuing market study
 - 50% of dairies use a bull for breeding dairy heifers
 - 42% of dairies use a bull for breeding cows

Motivation for use of NS bulls

- “Bull does better job detecting heats”
 - Lack of well trained personnel
 - Perception is that reproductive performance may improve because more cows are detected in estrus and serviced (Risco, 2000)
- “Bulls are cheaper”
- “Bulls are genetically adequate”
- Replacement heifers are purchased

Florida study: Overview

de Vries, Steenholdt, Risco, 2004

1. Calculate pregnancy rates in DHIA herds
2. Determine if herds use AI, bulls (natural service; NS) or both (mixed)
3. Compare pregnancy rates in AI, NS, mixed herds



Cow Data

- DHIA Lactation records
 - 8 years: 1995-2003, herds located in FL + GA
 - 2 seasons: Winter (November - April)
Summer (May - October)
 - → $8 \times 2 = 16$ periods
 - Pregnancy rates calculated per herd, per season (16 periods maximum per herd)

Pregnancy rate

= # cows pregnant / # cows eligible to get pregnant, in a 21- day period

~ heat detection rate x conception rate

E.g. 50% x 40% = 20% pregnancy rate

PCDART

126 9-Month Pregnancy Rate Summary by Days in Milk (No Exclusions)

UNIV FLA DAIRY RESEARCH - 58010029
Ref:10-26-04 VWP:70 PgCk:45

DIM	----- Heats -----			----- Pregnancies -----		
	#Eligible	#Observed	%Obs	#Eligible	#Reported	Rate
1--28	18	18	100	0	0	
29--49	53	42	79	4	1	25
50--70	116	72	62	49	11	22
71--91	250	159	64	196	37	19
92-112	230	62	27	182	18	10
113-133	223	82	37	178	19	11
134-154	203	99	49	166	28	17
155-175	174	67	39	151	13	9
176-196	165	79	48	144	20	14
197-217	146	58	40	120	11	9
218-238	124	43	35	97	11	11
239-259	104	32	31	68	4	6

Herd Data

- DHI Herd Summary 202 records
 - Genetic profile of service sires
 - **% OF HERD BRED TO**
 - Proven AI sires: → AI bred
 - AI young sires: → AI bred
 - All other sires: → Natural Service (bull bred)

HERDCODE	DATE TESTED	BREED	STRING
55-99-9993	7-14-02	H	

STAGE OF LACTATION PROFILE

NUMBER MILKING	STAGE OF LACTATION	STAGE OF LACTATION DAYS					TOTAL OR AVERAGE
		1-30	31-60	61-90	91-120	121-150	
1ST LACT	3	6	25	27	24	85	
2ND LACT	9	3	17	8	14	51	
3+ LACTS	6	6	13	10	8	43	
ALL LACTS	18	15	55	45	46	179	
AVERAGE DAILY MILK PRODUCTION	1ST LACT	77	83	89	74	69	78
	2ND LACT	108	106	90	74	54	82
	3+ LACTS	73	106	92	82	50	81
	ALL LACTS	91	97	90	76	61	

IDENTIFICATION AND GENETIC SUMMARY

AGE GROUP	NUMBER ANIMALS	AVG. AGE YR-MO	NUM. IDENTIFIED BY		NUMBER IN CHARGE	NO. ANIMALS WITH MERIT \$	AVERAGE MERIT \$	
			SRM	DAIRY			ANNUAL	SRM
0-12	82	0-06	68	82		73	+119	+187
13+	68	1-07	63	65		66	+90	+148
REPLACE HEIFERS	150	1-00	131	147		136	+110	+156
1ST LACT	97	2-01	94	94	4	82	+83	+127
2ND LACT	60	3-05	60	60	6	60	+83	+112
3+ LACTS	50	5-05	50	47	5	50	+81	+97
ALL LACTS	207	3-04	204	201	15	192	+82	+115
IDENTIFIED (PRODUCE/MALES)			99	97				

HERD MERIT \$ OPTION	GENETIC PROFILE OF SERVICE Sires		
	PROVEN ALL Sires	ALL YOUNG Sires	ALL OTHER Sires
NM	82	17	1
% OF HERD BRED TO	13	13	1
AVERAGE MERIT \$	+187	+191	
AV. DEPENDENT RANK (NET MERIT)	79		

PRODUCTION BY LACTATION SUMMARY

1ST LACT	NUMBER OF COWS	AVG. AGE MON	PEAR MER	SUMMIT MILK	PROJ ME 305 DAY			DIFFERENCE FROM HERDMATES			BODY WEIGHT	% COWS SOC SCORE				
					MILK	FAT	PROTEIN	MILK	FAT	PROTEIN						
97	25	87	81	24735	844	719	+2578	+57	+60	1210	61	8	13	13	5	
										+50	1330	70	6	6	8	10
										+25	1460	38	23	16	9	14
										+49	1310	58	11	12	11	8

CURRENT GENOMIC CELL COUNT SUMMARY

HERD PRODUCTION	7,679
LOST IN SOC	942

GENETIC SUMMARY

HERD MERIT \$ OPTION	GENETIC PROFILE OF SERVICE Sires		
NM	PROVEN ALL Sires	ALL YOUNG Sires	ALL OTHER Sires
% OF HERD BRED TO	82	17	1
NUMBER OF BILLS USED	13	13	1
AVERAGE MERIT \$	+187	+191	
AV. DEPENDENT RANK (NET MERIT)	79		

COWS ENTERED AND LEFT THE HERD

HY. MOD.	EFFG.	MAST	UDDER	FEET & LEGS	INJURY OR OTHER	DIS-EASE	DWB	NOT RPTD
	2	1	4	1	8	2	11	
1	3	4	5	1	2	1		
	4	5	3	5	3	2	7	
1	9	10	7	11	12	6	19	

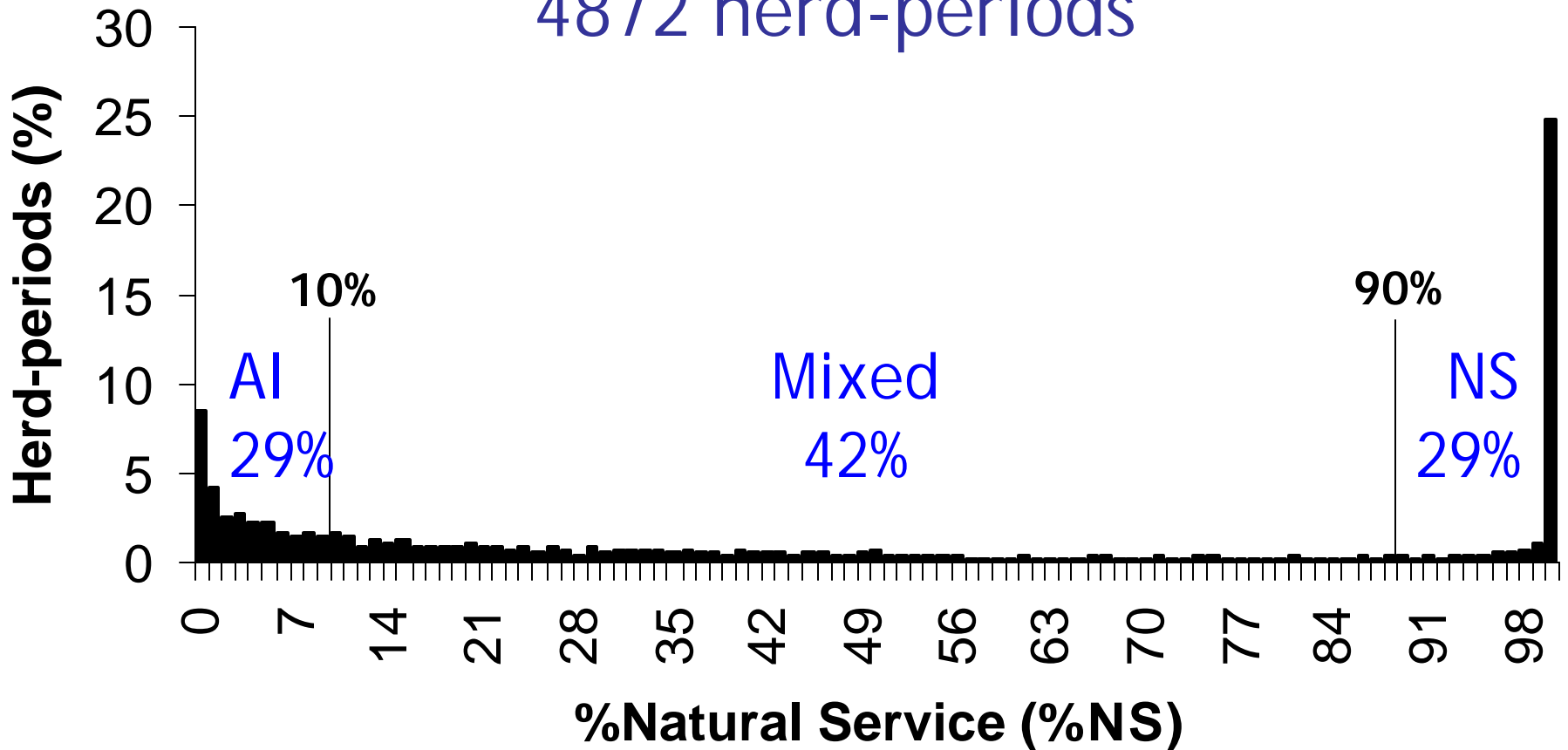
FAT & PROT.	1ST LACT	FAT %		PROT. %	
		3.0	2.7	2.9	3.4
	2ND LACT	2.6	2.7	3.0	3.1
	3+ LACTS	2.7	2.8	3.0	3.1
	ALL LACTS	3.8	3.0	3.3	3.3
	ALL LACTS	3.4	2.9	3.0	3.0
	ALL LACTS	3.2	3.0	2.9	2.9
	ALL LACTS	2.9	2.8	3.0	3.0

DATE OF TEST	DAYS IN TEST PERIOD	NUMBER COWS IN HERD ON TEST DAY	TEST PERIOD	RESULTS CELL COUNT SUMMARY										NUMBER LEFT HERD								
				% BVD POSITIVE	% BVD NEGATIVE	% BVD POSITIVE	% BVD NEGATIVE	% BVD POSITIVE	% BVD NEGATIVE	% BVD POSITIVE	% BVD NEGATIVE	% BVD POSITIVE	% BVD NEGATIVE	ENR	SOLD							
NORTH DROPPED	28	191	214	73.9	83.1	104	90	66.5	3.5	3.0	23858	858	744	66	10	8	7	9	2.8	331		3
8-12-01	28	192	225	66.8	77.0	94	93	61.8	3.5	3.0	23873	862	744	62	11	6	8	13	3.1	459	1	3
9-16-01	35	198	214	66.4	76.5	102	92	60.9	3.5	3.1	23858	864	742	64	13	5	8	10	2.8	336		5
10-14-01	28	204	213	67.9	78.3	108	90	61.1	3.6	3.2	23892	866	742	62	9	9	7	13	3.1	428	2	4
11-11-01	28	211	207	65.9	75.5	98	90	59.3	3.8	3.2	23861	868	741	68	10	7	8	7	2.8	312	1	4
12-16-01	35	211	210	69.6	78.4	105	87	60.6	4.0	3.1	23730	868	737	67	14	7	5	7	2.7	261	4	5
1-13-02	28	208	210	71.6	80.3	101	89	63.8	4.0	3.1	23603	871	734	63	10	11	7	9	2.9	321	3	5
2-17-02	35	208	208	75.8	82.7	103	92	69.5	3.7	3.1	23510	872	731	64	13	10	7	6	2.5	233	2	8
3-17-02	28	213	211	79.5	87.1	107	94	74.5	3.4	3.1	23616	873	735	65	13	11	6	5	2.4	211		7
4-16-02	30	214	225	78.3	86.3	102	94	73.9	3.5	3.1	23758	872	738	67	12	10	5	6	2.5	253	1	3
5-12-02	26	215	232	81.2	92.0	105	90	73.2	3.5	3.1	23893	871	741	66	12	7	7	8	2.7	279		3
6-18-02	37	213	234	77.4	88.6	97	87	67.4	3.5	3.1	24052	872	746	59	11	11	10	9	3.2	410	2	5
7-14-02	26	207	241	79.5	91.3	105	86	68.6	3.0	3.1	24084	868	747	58	11	12	11	8	3.1	347	3	4
AVERAGES	30	208	219	73.3	82.8	102	90	66.2	3.6	3.1				64	12	9	7	8	2.8	321	19	56

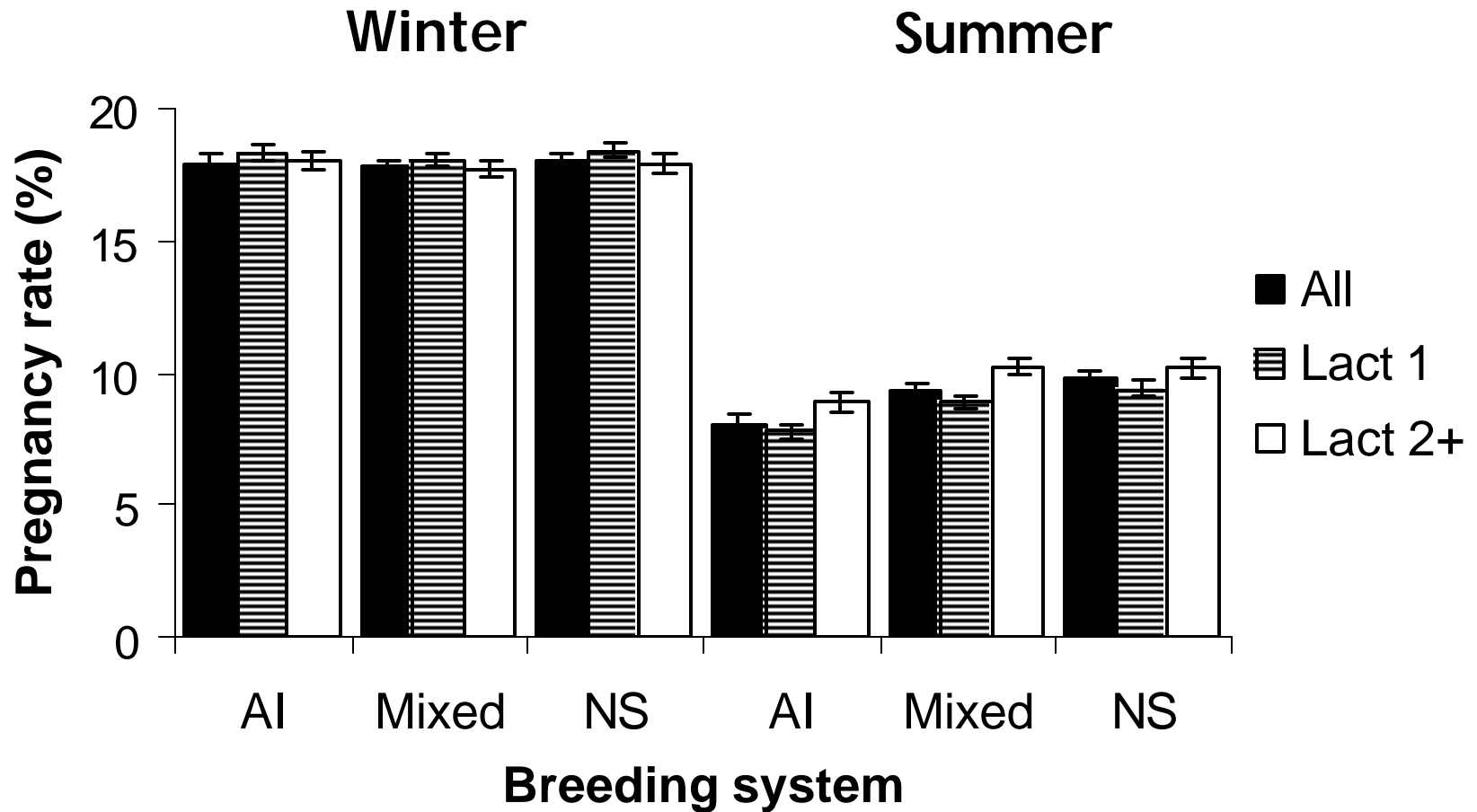
TEST PERIOD AV. MILK LBS. ADDED 68.1 TEST PERIOD AV. MILK LBS. DROPPED 67.0

Results

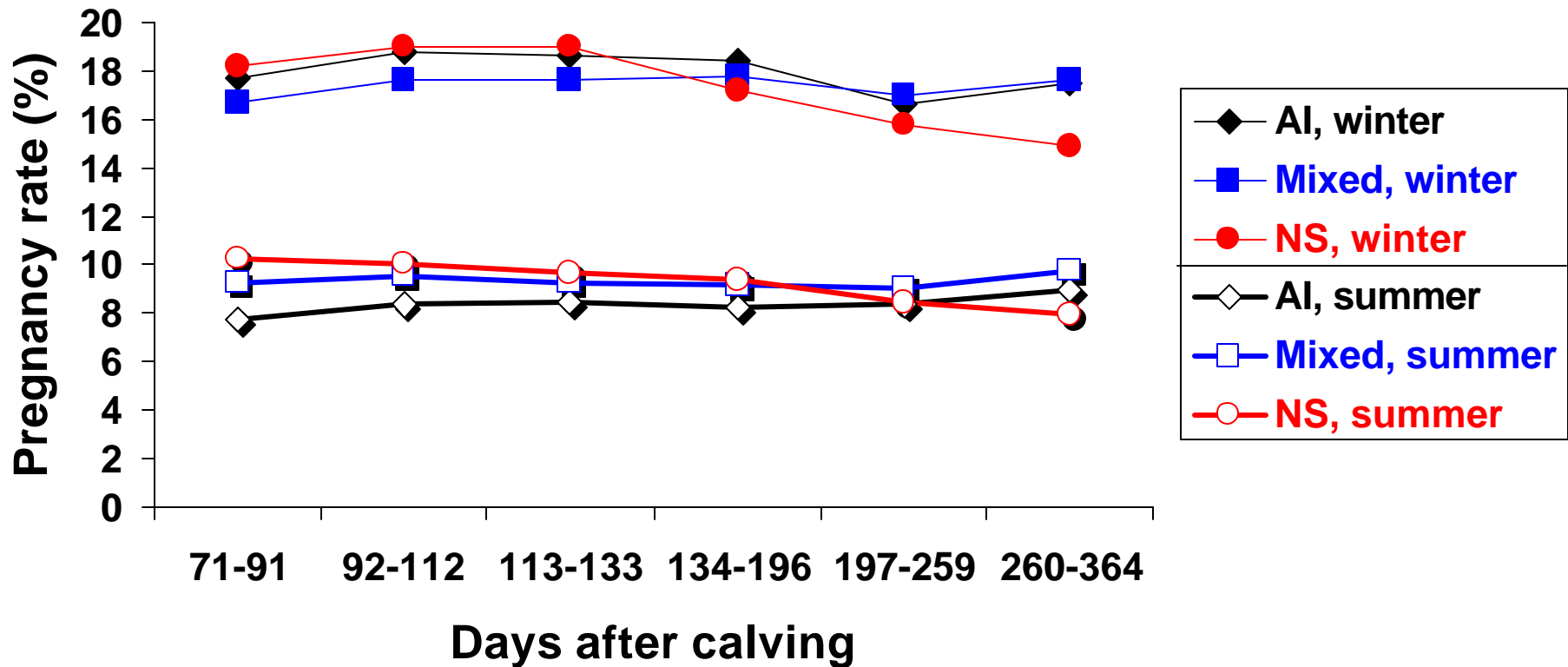
488 herds
4872 herd-periods



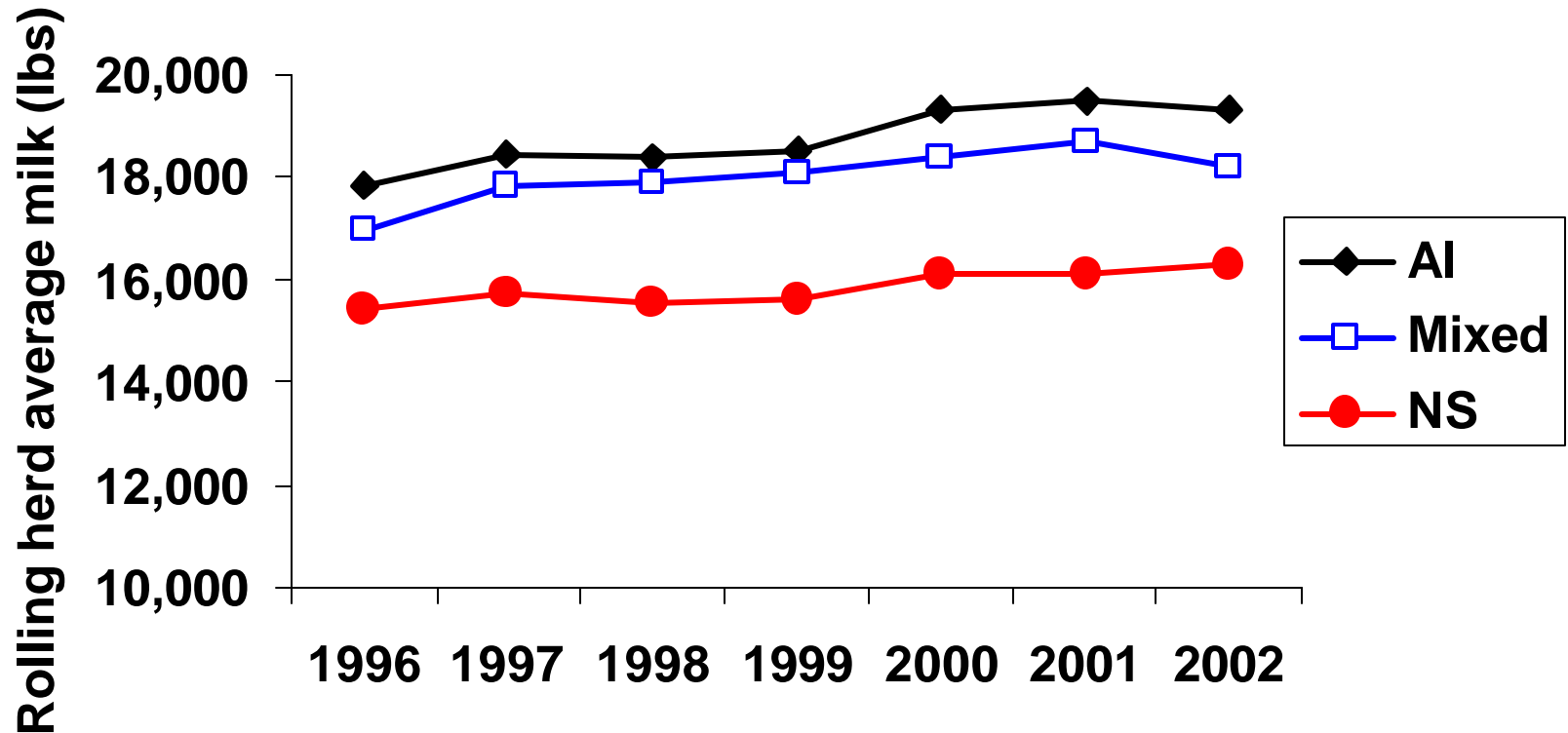
Effect of lactation number



Effect of stage of lactation



Milk production over time



The change in milk production from year to year was not significantly different between the AI, mixed, and NS breeding systems.

Other studies (I)

- 96 Australian herds (1973, 1974), (Williamson et al., 1978)
 - Some herds used only AI, some used only NS, some used a mixture.
 - Conception rates of cows bred by AI or NS were not different (both 58%).
 - Conception rates in herds that used NS bulls were more variable.

Other studies (II)

- 3 herds in California (Niles et al., 2002)
 - NS bulls used as “clean up” bulls (cows open = 110 to 130 days in lactation)
 - Pregnancy rates (%):

Season	AI	NS
Winter	18.3 ± 1.8	23.2 ± 1.8
Spring	22.1 ± 2.1	23.2 ± 2.1
Summer	14.8 ± 1.5	14.5 ± 1.5
Fall	22.3 ± 2.1	21.2 ± 2.1

- Differences not significant.

Other studies (III)

- Eastern US DHI Summary Reports (Smith et al., 2004)
- Breeding system determined from genetic profile of service sires

	AI	Mostly AI	Mostly NS	NS	SEM
Calving interval (months)	14.1	14.2	14.3	13.5	0.02
Days dry	65.1	67.1	68.9	68.8	0.16
% Dry 40 to 70 days	70.3	67.2	59.5	49.9	0.26
% Dry > 70 days	22.6	25.3	30.3	34.8	0.22
% Dry < 40 days	7.2	7.6	10.3	15.3	0.17
% Cows leaving herd	34.3	34.4	34.2	33.4	0.18
% Left for repro reasons	7.6	7.0	6.4	5.5	0.09
% cows in milk	87.5	87.0	86.4	85.0	0.05

Different colors in a row indicate statistical significant differences ($P < 0.05$)

Conclusions

- In FL and GA, pregnancy rates in the winter were twice as great as in the summer.
- No meaningful differences between the AI, NS and mixed breeding systems in either season.
- Natural-service herds produced less milk, but the change in milk production was not significantly different from the other breeding systems.

Other Considerations

- Number of bulls (~1:25)
- Feed cost (~\$2 / day)
- Health care (breeding soundness exam, vaccinations)
- Extra facilities needed
- Danger

“To my knowledge no one has ever been killed by an AI technician”

- unknown

Thank you!

