

Experiences of a Veterinary Reproductive Management Service to Achieve Reproductive Success in Large Herds

Alyn M. McClure
Herd Health Management, LP; Gilbert, AZ

INTRODUCTION

In the 1970's my partner, John M. Woods, DVM (an early pioneer in large dairy herd management) and I were able to work closely with very bright and dedicated dairymen, managers, and breeder/herdsmen on herds of over 1000 cows in the Phoenix, Arizona area. We achieved days open under 110 d, calving intervals less than 12.5 mo, and annual herd removal rates less than 30 %. Our programs included:

- eradicating venereal disease through complete conversion to artificial insemination (**AI**) breeding and herd vaccinations,
- grouping cows for twice-a-day visual detection of estrus and tail striping,
- strict voluntary waiting periods (**VWP**),
- weekly veterinary palpation,
- record keeping systems to monitor 24-d detection of estrus trials and monthly conception rates (**CR**),
- quarterly herdsmen lunch meetings,
- semiannual breeding schools, and
- early methods of heat abatement.

During my 33 years as a dairy veterinarian, I found it increasingly difficult to improve reproductive efficiency of large dairy herds in the face of prolonged high summer heat stress. Potential contributors to this decline in reproductive efficiency include:

- the implementation of procedures that increase milk yield (3X milking, improved nutrition, TMR rations, rbST, genetic progress, shortened dry periods),
- increases in herd size,
- more cows per breeder/herdsman,
- scarcity of skilled AI technicians,
- employee turnover,
- return to more natural service breeding,
- owners being distanced from day-to-day tasks, and
- more cows per veterinarian.

The advent of programs to synchronize ovulation has provided a tool to overcome these challenges.

When prostaglandins first became commercially available we utilized them for synchronization of estrus; however, only a limited portion of treated cows were inseminated. Early adoption of Ovsynch, then later with pre-synchronization prostaglandins, was of limited help; because it was employed only after failure of current methods to detect estrus. If a cow had been bred by AI prior to Ovsynch, cows missed that opportunity. Detection of estrus after AI and following Ovsynch and Timed AI (**TAI**) often met with low or erroneous detection of estrus in open cows and the insemination of pregnant cows. When the EAZI-BREED™ CIDR® (**CIDR**) became available, they were used in cows having no palpable corpus luteum at the start of the Ovsynch protocol.

Recently some of our clients, whose herds were totally bull bred, started raising their own replacement heifers because of the skyrocketing cost to purchase them. Their desire to improve the genetics for milk yield of these home-raised replacements led them to limited use of AI, either by breeders they employed or by route breeders employed by national AI organizations. In most of these herds, pregnancy rates (**PR**) were below 14 % in the cooler seasons of the year and annualized PR were below 10 % because of the summer heat stress. Herd genetic progress was delayed by the use of semen from young sires or lower net merit sires aimed at minimizing the semen blend price; and because of the low number of AI-sired pregnancies.

Poor PR, compliance failure in existing synchronization programs for estrus and ovulation, errors in detection of estrus, employee turnover, and unavailability of skilled AI technicians caused us to explore the feasibility of providing complete reproductive programs for some of our clients. They considered our proposal because of their desire to improve overall farm profitability through genetic progress in the long-term and increased PR in the nearer term to reduce reproductive culls and average days in milk (**DIM**), as well as to increase average daily milk yield. They also needed to re-direct their labor force to other critical and often underserved

tasks (caring for maternity, fresh, lame and sick cows; vaccinating; injecting rbST; moving cows; and preparing for moves to new facilities and herd expansions) in the immediate term.

PLANNING CONSIDERATIONS

A protocol was needed to completely eliminate detection of estrus and on-farm AI technicians (except for breeding heifers). Dr. William Thatcher, University of Florida, and I developed such a protocol and implemented it on 2 large herds for 2 years utilizing on-farm employees, in addition to one from our veterinary practice (Figure 1). All of the reports and data entry macros were written and programmed in the on-farm cow record software.

A pro forma balance sheet was developed of probable income and expenses to determine:

1. how many herds and cows could be served,
2. how many employees would be needed,
3. a compensation package that would attract and retain employees long-term and provide incentives for high performance, and
4. capitalization required for the business.

It was evident at least 3 large herds were required to keep the breeding crew busy at least 5 ½ d/wk. All 3 herds would need to agree to start in the same month. The 2 herds interested initially had 7000 and 4000 cows. To minimize cows' lock-up time and to keep the cows/breeder under 60/d to maximize CR, the crew would have to include 4 to 6 AI technicians and 1 to 2 assistants. These 2 herds could be synchronized on Mondays and Wednesdays and bred by TAI on Thursday and Saturday mornings. This meant 2 or 3 smaller herds (2000 to 3000 cows) could be synchronized on Tuesdays and bred on Friday mornings.

Pregnancy diagnosis would be performed by experienced licensed veterinary practitioners on the synchronization mornings. Since Ovsynch programs limit the number of cows to be diagnosed, there was time to palpate 1 or 2 bull pens also. This would require team palpation with 2 veterinarians on Mondays and Wednesdays, and at least three veterinarians to palpate at the three herds on Tuesday because the herds were 30 and 80 miles apart.

A formal agreement was developed to delineate responsibilities of all parties, prescribe the costs of the service, and the means of termination. The agreement allowed us 30 d from the signing to hire

our new employees. Dr. Steve Smalley, then a technical services veterinarian for Monsanto Dairy, helped me evaluate various per cow and per pregnancy billing options. A monthly cow fee was selected because of the very cyclic nature of calvings and CR caused by extreme heat stress in our area.

A plan to transition from the current breeding program was developed for each dairy. Fresh cows were kept segregated from bulls and AI pens were designated. Until the first prostaglandins of the pre-synch program were initiated, AI breeding continued. Cows bred by AI were placed into bull pens if already pregnant, over 120 DIM, or bred multiple times.

Review of the service sires in current use revealed the likelihood of our providing better genetic improvement for an equal or lower price. Therefore several AI organizations were contacted to determine interest in selling semen through our service. Possible sires were selected based on Net Merit \$ or PTA Milk with a Reliability of 90 %+, availability, price, and freedom from known genetic defects. A source of breeding supplies and liquid nitrogen tanks was selected.

AI technicians were hired without stealing them from our clients. The Hispanic dairy community is close-knit, so wages and benefits had to be competitive without wooing away our clients' employees. Fortunately, 2 AI technicians became available from 1 of our clients who sold out. Others had been terminated by a new farm manager wanting to put his own people in place. Word spread quickly and other potential employees applied looking for an opportunity either to acquire new skills and do something different or to improve working conditions, wages, or benefits. Vehicles, coveralls with embroidered names, boots, and other equipment were ordered.

MATERIALS AND METHODS

Four clients agreed to commence the service beginning in April, 2006 and a fifth after moving to a new location and doubling in size 6 mo later for a total of almost 19,000 Holstein cows under contract. The signed agreements were for a 12-mo period; however, a clause allowed either party to terminate the agreement with 60 d written notice after a minimum of 6 mo of service. To emphasize higher PR and distinguish it from ordinary route breeding services, the new enterprise was named: Herd Health Management Pregnancy Service (**PS**).

Week	Week Starting	SUN	MON	TUES	WED	THUR	FRI	SAT	Accum Days
1	SUN 2-Apr	34	35 Lutalyse® LTP	36	37	38	39	40	7
2	9-Apr	41	42	43	44	45	46	47	14
3	16-Apr	48	49 Lutalyse® LTP	50	51	52	53	54	21
4	23-Apr	55	56	57	58	59	60	61	28
5	30-Apr	62	63 CN1+CIDR +Posilac AM	64	65	66	67	68	35
6	7-May	69	70 Lutalyse® LTBBA-CIDR AM	71	72 CN2 + TAI PM	73 CN2 + TAI AM	74 Posilac	75	42
7	14-May	76	77 hCG	78	81	82	83	84	49
8	21-May	85	86	87	88	89	90 Posilac	91	56
9	28-May	92	93 +CIDR AM	94	95	96	97	98	63
10	4-Jun	99	100 CN3 - CIDR AM	101	102	103	104 Posilac	105	70
11	11-Jun	106	107 32-33D VCK AM LTBBA if open	108	109 CN2 + TAI PM	110 CN2 + TAI AM	111	112	77
12	18-Jun	113	114	115	116	117	118 Posilac	119	84
13	25-Jun	120	121	122	123	124	125	126	91
14	2-Jul	127	128 +CIDR AM	129	130	131	132 Posilac	133	98
15	9-Jul	134	135 CN3 - CIDR AM	136	137	138	139	140	105
16	16-Jul	141	142 32-33D VCK AM LTBBA if open	143	144 CN2 + TAI PM	145 CN2 + TAI AM	146 Posilac	147 Move2 Bulls	112

Figure 1. Presynch-CIDRsynch-CIDRresynch breeding program protocol.

The PS would synchronize and breed all cows (not designated as Do Not Breeds by the dairy management) up to 3 TAI services, record all treatments and breedings, and input them into the computerized cow record system for a monthly per cow fee (total milking and dry). The PS would inventory and provide all drugs (hormones and CIDR) to the dairy, billing a drug charge for treatments actually given. The PS would select the service sires and provide semen of equal or higher genetic merit at an equal or lower blend price than that historically used by the dairy. All professional services performed by Herd Health Management, LP (HHM) veterinarians, such as pregnancy examinations and computerized reproductive analyses, would be billed at customary rates. Thus, HHM would send 4 separate invoices twice a month: the PS per cow fee, drug charge, semen charge, and professional services.

Each dairy agreed to provide and maintain AI pens with sufficient self-locking stanchions to feed and lock-up 100 % of the program cows at the designated times 3 times a week, to move fresh cows into breeding pens by 28 DIM, and keep them in these pens until custom reports selected them for removal to the bull pens. The dairy also agreed to feed, water, cool, and otherwise care for their cows to maximize fertility. The dairy would provide an all-terrain vehicle to transport semen tanks for breeding, and provide ready access to the computerized cow records. The dairy also agreed to pay all invoices twice a month within 10 business days.

The protocol used is shown in Figure 1 and might be described by the coined name Presynch-CIDRsynch-CIDRresynch. Both Presynch injections of prostaglandin (LTP) were 25 mg of Lutalyse® IM at 36 and 50 DIM. CIDRsynch consisted of 50 mcg GnRH (Cystorelin®) IM and the intravaginal insertion of a new CIDR at 63 DIM (CN1+CIDR), CIDR removal 7 d later with 25 mg of Lutalyse® IM (LTBBA-CIDR), 56 h later 50 mcg GnRH IM (CN2), followed at 72 h by TAI (after the VWP of 73 d). Four days after the first TAI cows were given 3300 IU of hCG (Chorulon®) IM. At 18 days since bred (DSB) after the first and second services, CIDRresynch consisted of intravaginal insertion of a used (1 prior use only) autoclaved CIDR (+CIDR) and its removal 7 d later with the injection of 50 mcg GnRH (CN3-CIDR). One week later at 32 DSB, cows were diagnosed for pregnancy by rectal palpation. Open cows were immediately given 25 mg Lutalyse® IM (LTBBA), then at 56 h given 50 mcg GnRH IM (CN2), and at 72 h TAI.

Since one CIDR was required for every cow for resynch anyway, the new CIDR was used at the start of Ovsynch and the used, autoclaved CIDR was used for the resynch at 18 DSB. CIDR were inserted in all cows at the start of Ovsynch because of the uncertainty of the percentage of anovulatory cows between herds and seasons. No palpation or ultrasound examination of ovaries was conducted to save veterinary time; thus offsetting the cost of the CIDR.

All pregnancy examinations, injections, and CIDR insertions and removals were performed on one morning a week (Mon, Tue or Wed) with prostaglandin injections. GnRH was given at 56 h post-CIDR removal (Wed, Thu or Fri afternoon). TAI was 16 h later (Thu, Fri or Sat morning) at 72 h post-CIDR removal and prostaglandin injection. If there were too many cows to be comfortably bred by TAI at 72 h, a portion of the TAI's were at 56 h (Cosynch), designated by appropriate data entries.

For herds supplemented with rbST, Posilac® was injected simultaneously with the start of CIDRsynch. Cows started each week were added to the half of the herd receiving their weekly dose 11 d later and every 14 d thereafter.

A specific logical letter was assigned to each task or step in the program to facilitate quick and accurate compliance, such as L for Lutalyse, I to insert CIDR and X to extract, and H for hCG. This unique letter appeared next to the control number of the cow on the find list, was used to mark the cow's forehead, and was used to activate a macro for data entry. DHI-Plus on-farm cow record software developed by DHI-Provo was extremely versatile and facilitated the printing of find lists, the recording of treatments and breeding codes, and the prevention of cows appearing on lists for the next step if an absolutely essential precursor step was missed. One client applied RFID tags in all of the cows' ears. Consequently, I programmed Pocket DHI-Plus on pocket PC's and we used scanning wands to further enhance our speed and accuracy. When a cow on the program was scanned the pocket PC would give a visual display and an audio output of the macro letter for the task, as well as auto-run the macro for all of the associated data input.

RESULTS

The PS program is ongoing. The data is being analyzed and will be presented at the conference. Data from 19 mo of the pilot study in a 3000 cow Holstein dairy herd is included. Table 1 shows that

Table 1. TAI conception rates by service number and breeding code.

Service Number	Total Number Services	48h Cosynch CR % (no.)	56h Cosynch CR % (no.)	72h Cosynch CR % (no.)	56h GnRH 72h TAI CR % (no.)	Total CR % (no.)
1	3454	34 (55)	35 (321)	32 (129)	41 (798)	38 (1303)
2	1815	26 (150)	24 (241)	36 (24)	26 (40)	25 (455)
3	803	31 (95)	30 (119)	30 (9)	32 (19)	30 (242)
Total	6072	29 (300)	29 (681)	32 (162)	40 (857)	33 (2000)

our highest CR for all services (40 %) was when GnRH was given at 56 h followed 16 h later with TAI at 72 h post-prostaglandin. Table 2 demonstrates that compliance to all steps of the protocol produced the highest first service (FS) CR, with a 4 % advantage to giving both Presynch LTP and a 9 % advantage to giving hCG at 4 DSB. Pregnancy diagnosis by experienced veterinary practitioners at 32 DSB using rectal palpation was both accurate and safe. This was supported by only a 9.6 % fetal loss at pregnancy confirmation over 90 DSB. First lactation heifers had CR over 8 % less than lactation 2 cows and over 4 % less than lactation 3 cows. There was no significant difference in CR by AI technician. Overall the program was successful with a 33 % CR for all services for 19 mo and 58 % of cows became pregnant to TAI with 3 services or less. The summer heat stress reduced CR to a low of 9 % in July, 2004. The drug treatment costs were \$25/cow/lactation and \$37.22/pregnancy.

Generally, compliance to each step of the protocol was high. The PS crew was diligent in

finding all of the cows in the AI pens, as well as with careful and accurate administration of the correct treatments. The compliance in breeding the first TAI at 63 to 70 DIM varied between herds from 89 % to 98 %. The number one cause for failure was unwarranted movement of cows out of the AI pens by cow pushers, milkers, hoof trimmers, and hospital crew; and secondarily, by herdsmen or managers. Our crew would check the hospital pens and often the bull pens next in milking order after the AI pens to find missing cows. None of these herds had electronic ID's and panel readers in the milking parlors to detect these mixed-up cows. Usually they were lost to the program.

Our clients have been pleased with the results of the PS in general. They have more cows pregnant to proven AI sires at a much higher PR than ever before. They have no cows getting pregnant too early (which has been reported to reduce lifetime profitability), no pregnant cows being inseminated by mistake (which causes a high rate of abortion), and fewer reproductive culls. They have been able to get rid of

Table 2. Effect of Compliance on First Service (FS) Conception Rates (CR).

Protocol Steps:	Pregnant	Total	%CR, FS
On Protocol First Service	934	2422	38.6%
Missed LTP1	30	86	34.9%
Missed LTP2	26	75	34.7%
Missed LTP1 & LTP2	7	14	50.0%
Missed HCG	84	286	29.4%
Total	1081	2883	37.5%

half of their clean-up bulls. The wide swings in monthly calving are somewhat reduced. They don't have to lock up their cows 7 d a week for extended periods for breeding. They don't have to worry about the breeding anymore. Their herdsmen have time to accomplish other important tasks better. They appreciate having their veterinarian on-site weekly instead of once-a-month marathon herd checks. On the other hand, their costs for their breeding program are higher and more apparent than their costs and losses before. Also, the only young sire credits they might be receiving now are from heifer breedings.

The heat stress of the 2006 and 2007 summers has been perhaps the most extreme in the last 20 yr, as attested to by reductions in milk yield and CR. Our clients with the best facilities and best management for heat abatement have enjoyed significantly higher CR and PR than the others. One of our clients on the program discontinued it in July because of lower PR until he can solve some of these issues, including the discovery of numerous animals persistently infected with BVD virus (**BVD PI**).

HHM veterinarians appreciate being able to implement a scheduled routine program that has positively impacted PR, perhaps more than anything else they have ever done. They also enjoy avoiding unnecessary palpation and marathon herd checks. Two of our clients reneged on their agreement to buy their semen from us. Since the pro forma included a narrow margin on the semen, we should have slightly increased our per cow monthly fee to compensate.

Our PS employees enjoy working for us and being part of our team. They enjoy working with dairy cows and, especially, the opportunity to learn cutting edge technology. They do arise early and

work some long days, but they have some short days also and never work on Sunday. They have respectable working conditions, monogrammed uniforms, health insurance, a 401(k) retirement plan, paid vacation, and the flexibility of sick and personal leave. They enjoy pleasing our clients with excellent results, and can hardly wait for the negative effects of the summer to pass. One down side is that we all had to check cows last Christmas morning.

CONCLUSIONS

The PS of HHM has utilized a novel synchronized ovulation program to successfully manage the reproduction of almost 19,000 Holstein cows in 5 different dairies located in the arid area of Phoenix, Arizona.

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