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RESYNCHRONIZATION: ON THE RIGHT TRACK

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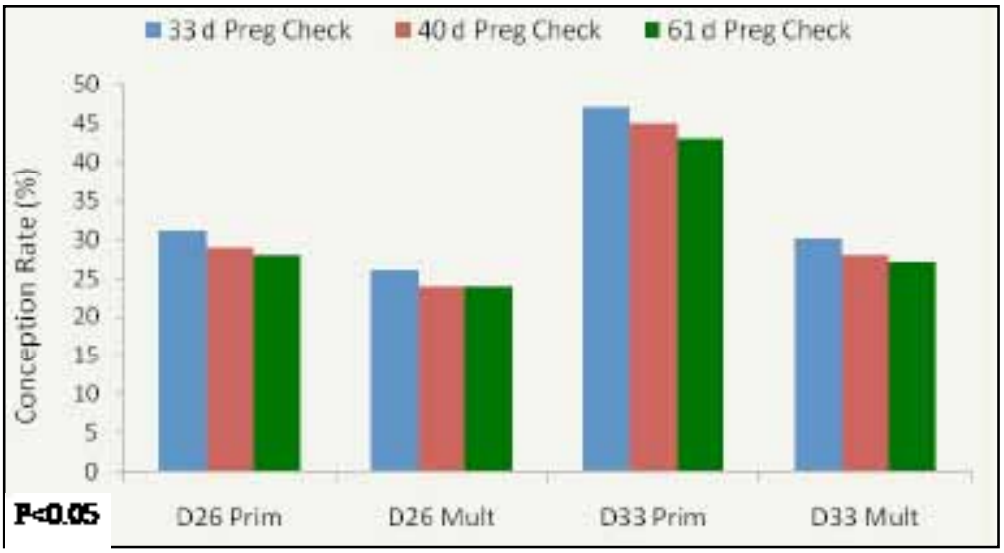
Despite the amount of research that has been done on Synchronization programs for fixed time AI (TAI), many producers still struggle to set a good resynchronization program. Such concern is a big issue, mainly due to two reasons: about 66% of the cows submitted to first postpartum TAI will be open to this service (assuming 34% conception rate) and the normal variation in the length of estrus cycle (18-25 d) dictates that is virtually impossible to target the ideal day of the cycle for the initiation of a Resynchronization program. As a result, after the first service, dairy producers have more than half of the cows open, without a good tool to rebreed them to TAI. A valid approach to target a known day of the estrus cycle is to Presynchronize cows prior to the initiation of resynchronization. Presynchronizing a cow to start a resynchronization program makes physiological sense, however it doesn't bring the highest economic return because of the overextended insemination interval that this practice would cause. Let's review some of the options that researchers have developed to resynchronize cows for TAI with acceptable fertility results.

FIRST RESYNCH STUDIES

One of the first studies (Fricke et al., 2003) tested the effect of different intervals from a previous TAI to the initiation of resynchronization at 19, 26, or 33 d after first TAI in lactating Holstein cows (n=711); on fertility to first and resynchronized insemination. For both TAI services, a modification of Ovsynch (Cosynch 48) was implemented. Overall pregnancy rate per artificial insemination (PR/AI) to first TAI assessed 68 d after TAI was 31% and did not differ among treatment groups. Bottom line of this study, PR/AI for resynchronization initiated on d 19 (23%) was discouraging compared to D26 (34%) and D33 (38%) cows. Based in previous studies (Sartori et al., 2002) reporting a 23 d estrus cycle of high producing dairy cows; this observation might be explained by a more favorable stage of the estrus cycle (day 10 of the cycle) for open cows beginning resynch on D33 (23 + 10 = 33) compared to D19 (23 - 4 = 19) and D26 (23 + 3 = 26).

Sterry et al., 2006 tested the D26 vs D33 strategies using 763 lactating cows at different stages of lactation; and using Cosynch 48. At pregnancy diagnosis, open cows had ovaries evaluated for presence or absence of corpus luteum (CL). Interestingly, this study also concluded that D33 is a better option than D26, basically due to a treatment by parity interaction, which is nicely depicted in the Fig 1. Primiparous cows starting Resynch on D33 had significantly higher fertility than all other groups. Delaying the first injection of GnRH for Resynch until 33 d after initial TAI yielded more pregnancies for all treated cows, and this occurred because of a greater PR/AI for primiparous with a CL at the not-pregnant diagnosis. Although it is desirable to reinseminate cows as soon as possible after pregnancy status is known, programming cows to receive the first GnRH of Resynch 26 d after the initial TAI resulted

Figure 1. *PR/AI for primiparous and multiparous cows starting resynchronization on D26 or D33 after previous TAI (Sterry at al., 2006)*



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in fewer pregnancies in primiparous cows compared with delaying initiation of Resynch by 7 d to 33 d after TAI. These researchers concluded that initiating Resynch 33 d after TAI may group primiparous, but not multiparous cows at a stage of the estrous cycle (d 5 to 12) that may explain the greater PR/AI observed for primiparous cows on D33 group.

PRESYNCHRONIZATION FOR RESYNCHRONIZATION

Moreira et al (2001) and other research Moreira et al (2001) and other research groups have demonstrated the benefits of presychronizing cows for first postpartum TAI using a series of prostaglandin F2α (PGF2α) injections 12-14 days apart, in a program that places a majority of the cows around day 5 to 10 of the estrous cycle for better synchronization response. Although successful, this program takes 36 to 38 days from the first injection to TAI, which makes it unpractical for second and greater inseminations under field conditions. With this idea in mind, Silva et al., 2007 used 527 lactating Holstein cows to test if a Presynchronization strategy consisting of a single injection of PGF2α administered by open diagnoses and 12 d before the initiation of Resynch (PGF+RES) could increase reproduction outcomes compared to a Resynch (RES) initiated at the time of open diagnosis (day 32) (see design below, days at the onset of treatment don't match because farm routine was set to do pregnancy diagnosis and TAI on the same day of the week). Although Presynch with PGF2α, improved PR/AI compared to regular Resynch initiated on d 32 (35.2% vs 25.6%; respectively), there was a suspected economic disadvantage. In this type of program, time elapsed between inseminations plays an important role, as interbreeding interval is extended to 56 days when using this strategy, whereas regular Resynch can reinseminate cows by 42 days (see figure 2). Thereby using PGF2α to presynchronize resynchronization can yield good fertility but extended days to conception (and days open) due to low insemination rate.

INCLUSION OF PROGESTERONE

Dewey et al. (2010) used a shorter Presynchronization approach using a GnRH injection one week before the onset of Resynch. Cows (n=1,059) were submitted to GnRH on d 32 and initiation of resynch on d 39 at the open diagnosis (GGPG group); regular Resynch on d 39 at the open diagnosis (Control group), or the same as control with the addition of a CIDR inserted between days 39 and 46 (CIDR group) (see figure 3). All cows were bred using a Cosynh 72 approach. At 39 d after resynchronized AI, pregnancy per AI (P/AI) was increased in GGPG (33.6%) and CIDR (31.3%) cows compared with control (24.6%) cows. At 67 or 120 d after resynchronized AI, P/AI of GGPG and CIDR cows was increased compared with control cows (31.2, 29.5, and 22.1%, respectively). Presynchronizing the estrous cycle of lactating dairy cows with a GnRH 7 d before the start of the resynchronization protocol or use of a CIDR insert within the resynchronization resulted in greater P/AI that control Resynch cows. GGPG cows may have had better synchronizing of the follicular wave, thus, increasing the ovulatory response to the first GnRH of resynchronization. In the case of CIDR inserts, they drastically reduced (<0.3%) or virtually eliminated the proportion of cows displaying estrus during resynchronization program, and concentrated more heats at the end of the protocol even if cows were bred to TAI . CIDR inserts have demonstrated improved fertility compared to regular Ovsynch protocol in other studies (Chebel, 2006.), however, the cost of a CIDR program needs to be considered to make a wise economic decision at a farm level.

An alternative Presynchronization program to GGPG may be replacing the GnRH by HCG to induce ovulation. Giordano et al (2010) combined this strategy with early initiation of Resynch on d 25 post TAI and Ovsynch 56. In this study, HGPG cows (n= 346) received hCG 18 d after previous TAI, GGPG cows received GnRH instead on hCG on the same day (n=361), and control cows (n=375) didn't receive any hormonal treatment until onset of Resynch on d 25. Cows diagnosed not pregnant at 32 d after prior TAI received the PGF2α injection of Resynch and continued the protocols. Based on logistical regression analysis, treatment tended (P = 0.07) to affect P/AI 32 d after TAI (HGPG = 33.0%; GGPG = 30.8%; C = 25.3%). By statistical contrasts, HGPG cows had more (P = 0.02) P/AI than Control cows, whereas P/AI for GGPG vs. Control cows tended (P = 0.10) to differ and HGPG vs. GGPG cows did not (P = 0.53) differ. Researchers concluded that presynchronization with hCG or GnRH 7 d before initiation of Resynch did not affect synchronization rate, but that hCG increased fertility compared to Ovsynch initiated 25 d after a prior TAI.

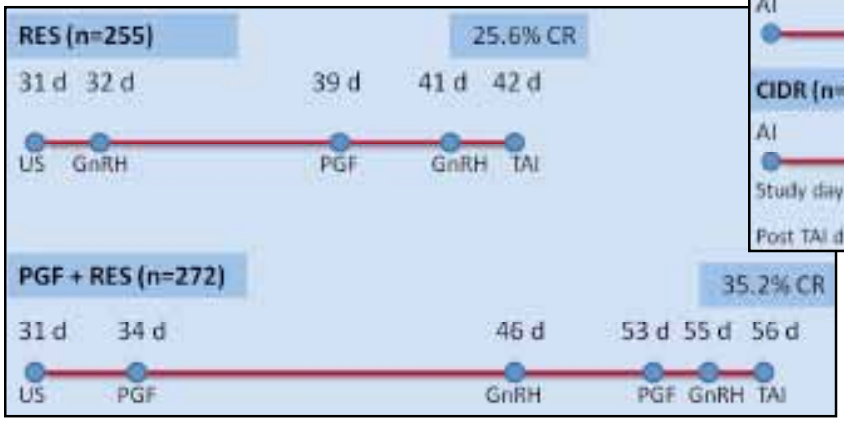

Figure 2. Experimental design for Silva at al., (2007). PGF+RES had better PR/AI than RES, but interbreeding interval was too long.

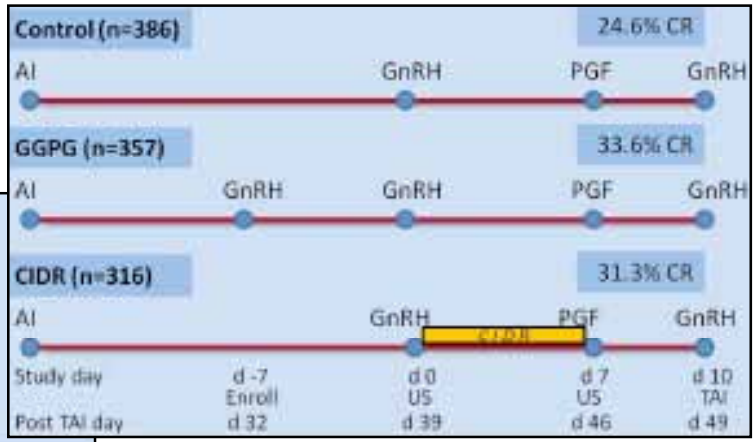

Figure 3. Experimental design for GGPG Resynch (Dewey et al, 2010). Exogenous progesterone, either by induced accessory CLs or CIDR insertion, resulted in higher fertility.

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Currently, resynchronization programs are focused on effective ways to gain time and fertility to maximize pregnancy rates. McArt et al. (2010) evaluated a new program called Ultrasynch, which makes the decision on the treatment to follow based on evaluation of Corpus Luteum (CL) at pregnancy diagnosis on d 28-32 for open cows. Cows in Ultrasynch (n=366) with more that 23mm CL were treated with PGF2α and inseminated after heat detection; and cows with CL ≤23mm were submitted to Ovsynch. Cows in the Ovsynch group (n=379) were submitted to Ovsynch regardless of the CL diameter. As already mentioned in this article, the beauty of a successful TAI protocol is increasing submission rate without deleterious effect ton fertility, and in many cases, by eliminating heat detection form the equation. In this study, Ultrasynch cows had to be subjected to estrus detection after PGF injection, thereby; heat detection rate was less than optimal. In fact, interval form calving to conception was 97 days for Ultrasynch and 87 for Ovsynch. In addition Ultrasynch estrus detection rate was only 49%.

In an effort to reduce interinsemination interval, improve fertility to resynchronized service, as well as looking to decrease pregnancy loss to previous insemination, Thompson et al. (2010) compared 2 resynchronization programs in 1,578 Holstein cows that were presynchronized with PGF2α and bred to Ovsynch 56 for the first post partum AI. Cows in the control group received regular Resynch initiating GnRH on 32 d after TAI at the open diagnosis. Resynch-treated cows received an intravaginal progesterone insert from d 18 to 25, GnRH on d 25, and pregnancy diagnosis on d 32, and nonpregnant cows

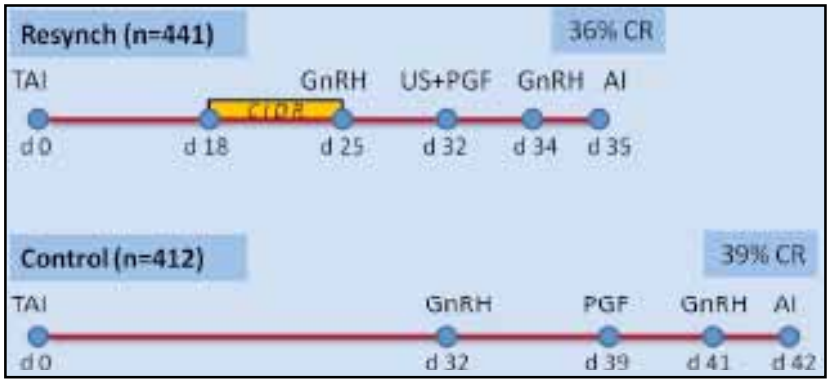

Figure 4. *Experimental design for early Resynch with CIDR (Thompson et al, 2010). Exogenous progesterone did not improve fertility results, but time to reinsemination was shortercompared to control, resulting in higher reproduction efficiency.*

received PGF2α. Supplemental progesterone from d 18 and GnRH on d 25 did not improve PR/AI compared to control (36% vs 39%, respectively) or decreased pregnancy loss to first insemination or greater service. However, time to reinsemination was quicker in Resynch (35 d) than control (42 d), which had impact on days open after 2 AI services in favor of Resynch (96 d vs 99 d, respectively). This study also raises the question of the stage of follicular development at the initiation of Resynch, regardless of the presence or absence of exogenous progesterone.

From these studies, supplemented progesterone seems to be a common factor in successful Resynch protocols. A program that is gaining popularity for resynchronization in dairy cows is the 5 day CIDR Synch, already tested in heifers (see ReproConnections Insider vol. 2 Issue 1). Bisinotto et al., 2010 studied the effect of resynchronization for 5 d CIDR vs. 5 d Resynch protocols on fertility. On d 32 after TAI, open cows received either an intravaginal P4 insert (RCIDR, n=341) or no P4 (RCON, n=334) from the GnRH to the first PGF of the resynchronization with Ovsynch 56. Keep in mind the double injection of PGF that has been recommended for dairy cows in this type of programs (see Fig 5. below). Pregnancy rate per AI was greater ($P < 0.05$) for RCIDR than RCON on d 32 (RCIDR=51% vs. RCON=43%) and d 60 after Resynch TAI (RCIDR=46% vs. RCON=38%). Results indicate that supplementation with P4 during resynchronization improves P/AI compared to no P4. Also, results from the first TAI (not shown here) indicate that administration of the final GnRH simultaneously with AI does not impair fertility of cows subjected to a 5-d timed AI protocol (Ovsynch 56 or Cosynch 72). This may open the door for using Cosynch 72 along with 5 d CIDR in Resynchronization.

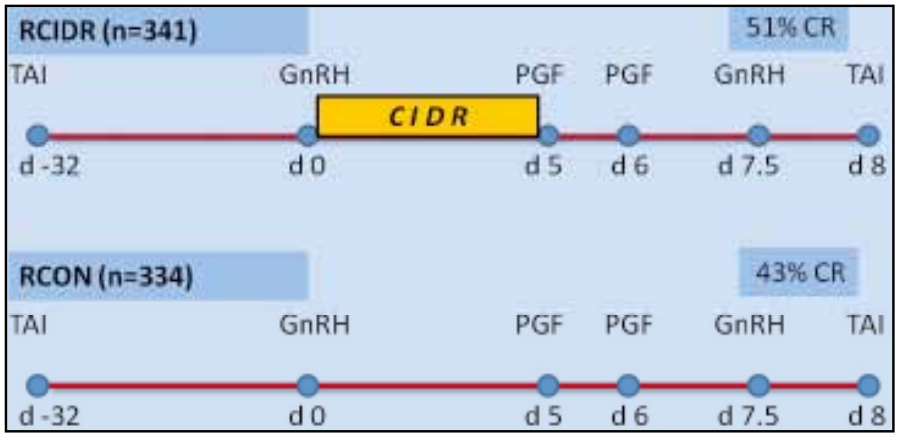

Figure 5. *Experimental design for Resynchronization with 5 d CIDR in dairy cows (Bisinotto et al., 2010). Short exogenous progesterone allows for acceptable fertility and 40 d interbreeding interval.*

OTHER AGGRESSIVE STRATEGIES

Silva et al, (2009) tested a strategy to rebreed open cows early after first TAI comparing D25 Resynch to D32 Resynch. Although a similar design to the one used by Sterry et al., 2006, this one included the implementation of blood test for pregnancy associated glycoprotein (PAG; n=262) to determine pregnancy status by 27 days after TAI; whereas group D32 cows were evaluated for pregnancy by ultrasonography on day 39 (RES; n=226). In this study, fertility results were similar for both treatments (28.3% vs. 30.9%, for PAG and RES, respectively), but clearly, PAG cows had shorter interbreeding interval and conceived quicker than RES group. Therefore, this study was more oriented to account for efficient use of time

in a resynchronization program using an accurate pregnancy diagnosis tool that can be used earlier than ultrasound. An additional advantage of this test is the possibility of doing early pregnancy checks for aggressive Resynch programs in places or circumstances where the veterinarian cannot be at the dairy on the intended day of the week, or where ultrasound equipment is not unavailable.

CONCLUSION

In conclusion, Presynchronization of open cows prior to Resynchronization and/or inclusion of progesterone seem to be a critical factors to be included in any resynchronization program to achieve acceptable conception. How such programs may affect interbreeding interval is something that must be considered before its implementation. In contrast, if your heat detection is very good, pushing too soon on resynch might reduce number of cows detected in returning heats and increase expenses in vet checks as more cows will end up for pregnancy check. ReproConnections can help producers to decide the best approach. Finally, an economic analysis must put all factors in balance to make the right management decision. Research community has come a long way in less than 10 years of work on resynchronization programs, yet, there is a long way to go before we get a refined resynchronization program that allows for timely reinsemination with high fertility, and economic justification.

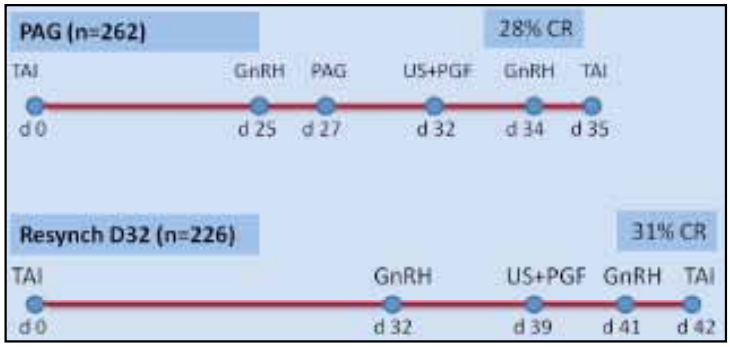

Figure 6. *Experimental design for early Resynchronization with PAG (Silva et al., 2009). No difference in conception rate was reported, but PAG allowed for shorter interinsemination interval.*

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