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TROUBLESHOOTING REPRODUCTIVE RECORDS TO DETERMINE POTENTIAL PROBLEMS

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THE NUTS AND BOLTS

Reproductive records can either be the easiest or the hardest to analyze because they are influenced by so many factors such as producer goals, environment, nutrition, inseminator competency, heat detection abilities, disease, and more. Analysis is made harder because of the significant time lag between the reproductive event and the determination of the results of that event. For example, it may be 35-45 days after insemination before you know whether the cow is pregnant.

In order to determine what the problem might be, it is necessary to know where to look. This means that you should be looking at numbers that you can control. If you can't control the number, you can't change it. Of all the numbers monitored for reproduction, there are only three that can be directly controlled by the manager: **voluntary wait period, heat detection rate** and **conception rate**. From these come all of the other variables such as days open, days to first service, and, ultimately, calving interval (a number which you *can't* control directly).

The **voluntary wait period (VWP)** is the point after calving at which you will breed a cow if she comes into heat. Many producers set this value for 60 days, but if cows are on feed, gaining weight and healthy, moving it back to 50 days will provide you with more opportunities to get a cow bred back. Regardless, once you set a voluntary wait period, stick to it! The calculation and interpretation of many reproductive parameters monitored on a dairy are influenced by this value.

Heat detection rate (HDR) is one of the hidden problems on most herds. There are several ways to calculate this number. I have included the two that I use. Equation *a.* is calculated for you every month on your herd summary; equation *b.* is not. The big difference between the two equations is that one measures what you plan to do (eq. a), the other what you actually did (eq. b). The two values should be reasonably close if you are adhering to your VWP.

a) $$\frac{\text{SPC} \times 21}{(\text{DO} - \text{VWP}) + 10.5}$$

b) $$\frac{\text{SPC} \times 21}{(\text{DO} - \text{DFS}) + 21}$$

In the equations, SPC = services per conception; DO = days open; VWP = voluntary wait period; and DFS = days to first service. The results of these calculations will tell you how many

of the potential breedings you actually caught and serviced. Heat detection rates often run as low as 30% or as high as 75%. A reasonable goal is to catch at least 65 to 70% of your breedable cows in heat.

Conception rate (CR) can be affected by many things such as nutrition, sanitation, temperature, timing of insemination, disease, etc. Usually when there is a conception rate problem, it is very evident from the records. The goal here is to maintain at least a 50% conception rate or better (2.0 SPC; CR = 1/SPC).

The following table illustrates how these three control points affect each other. In order to maintain a 12.5-month calving interval for 90% of the cows when conception rate is 50% and heat detection rate is 70%, the voluntary wait period must be set at 51 days. Using the same conception rate, but a 40% heat detection rate, the voluntary wait period would have to be 18 days, a ridiculous goal. Therefore, heat detection must be improved to achieve your goal of a 12.5-month calving interval. Recognize that Days Open is controlled by these three factors. Likewise, the calving interval is just Days Open + 283 days.

Table 1. Voluntary wait period at which breeding must begin in order to have 90% of the cows averaging a 12.5 month calving interval.

Heat Detection Rate	Conception rate (5)			
	40	50	60	70
	Voluntary wait period (DIM)			
80	47	57	64	69
70	40	51	59	65
60	31	44	52	59
50	18	34	44	51
40	-1	18	31	40

Finally, it is useful to reemphasize that the goal of ***any*** dairy is to get cows pregnant. While that seems like a given, it is important to restate it because sometimes we lose sight of that fact when looking at reproductive records. This value is actually computed for you each month on your herd summary and is a measure of the proportion of heats (detected and undetected) that result in pregnancy. The calculation is straight-forward and is as follows:

Pregnancy rate (PR) = CR x HDR.

For example: using average values of herds in the U.S., a herd with a 50% CR and a 50% HDR would have a PR of 25%. It is therefore a reasonable goal to have a PR of at least 25%. Provo-DHI has also developed a spreadsheet that analyzes pregnancy rates in more detail. For more information contact Provo-DHI or myself.

Set reasonable goals for a voluntary wait period, heat detection rate, and conception rates. Make a chart of these two indices and plot them each month to monitor your progress toward goal achievement. Post the chart in a conspicuous place where everyone will know what the goal is and how close you are to achieving it. You'll probably find that more people will contribute toward making that goal a reality.

ANALYSIS OF A CASE HERD

Determining heat detection efficiency and accuracy

Table 1, from the Provo-DHI Herd Summary, displays the % heats detected on your dairy. The equation used by DHI is equation (a) below. Equation (a) is based on the voluntary waiting period (VWP) that you specified. Equation (b) is what you are actually doing based on the average days to first service or breeding (DFS; Table 2). If you are not adhering to your stated VWP, which is the value at the head of the column labeled "opt & <" of Table 2, then there will be a discrepancy as shown below. This producer is missing about 50% of the heats and is typical of dairies in the U.S. Catching 50% of your heats means you are seeing 1 out of every 2. Good heat detection should be up around 75% or more. Research would suggest that almost all of these animals are cycling, but are showing heat when no one is around to catch it or are not being recorded.

A. (SPC x 21) / ((DO - VWP) + 10.5)

Example: (2.27 x 21) / ((137-51) + 10.5) = 49.4%
Note: This number differs from that in Table 1 due to rounding.

B. (SPC x 21) / ((DO - DFS) + 21)

Example: (2.27 x 21) / (137-83) + 21) = 63.6%

NOTE: The values for the equations come from Tables 2, 3, and 4. Multiply the final answer by 100 to get the percentage. Numbers shown on your herd summary may differ a little from the formula due to averaging and round off.

The second thing to check related to heat detection is the interval between breedings (Table 1). A typical cow shows a heat every 18-24 days, with an average of 21-days. Therefore, if you were catching 100% of the heat periods in your herd, and you were accurately identifying those animals that are truly in heat, you should have 100% of the animals in the column labeled 18-24 of Table 1 (obviously the ideal) and an average of approximately 21-days. If you are accurate in identifying those animals truly in heat, but were only catching 50% of the heats, then the animals should be dispersed between column labeled 18-24 and 36-48 of Table 1 with an average of approximately 42-days. Your goal is to have 65% of your animals in the 18-24 day column. Factors that can affect this distribution (increase numbers in columns other than the two stated above) are poor heat detection accuracy and efficiency, use of estrous synchronization, or a reproductive disease that is causing early embryonic abortions. In this herd, estrous synchronization is being used in some of the older animals.

A final heat detection check is to look at the number of cows in column labeled "opt + 11" of Table 2. If you were catching 100% of your heats starting on the day of your VWP, you would have 100% of your animals in the column labeled "opt + 11" days. The goal is to have over 70% of the animals in this column. The above example used whole-herd data; however, it is useful to calculate these same values for each lactation group.

Conception Rate

Conception rate is the inverse of the services per conception. Average conception rates for the U.S. are 50% or 2.0 SPC. In our example, the conception rate is 1/2.27 = 44% (Table 4, labeled Serv / Conc; contains those animals that are confirmed pregnant or assumed pregnant). The ideal goal would be about 60-65% conception rate (1.5 - 1.7 SPC), but 48-56% (1.8 to 2.1 SPC) might be more attainable. Also, if 1st service conception rate is low you should seriously

evaluate your early lactation nutrition program to see if it is adequate to support reproduction. When considering conception rate spend time looking at the values and data variability for days open (DO; Table 3) rather than calving interval (CI). The reasoning is that CI cannot be managed, but DO can. In fact, DO determines the CI. For example, an average of 85-115 DO translates into a 12-13 month CI.

Pregnancy Rate

The ultimate goal is to get animals pregnant. This value is calculated and given in Table 1 under the heading % Clv (calving). Multiplying the heat detection % by the conception rate % derives this number. In our example, multiple 52 x 0.44 to get 23%. An average dairy with 50% heat detection and 2.0 SPC (50% conception rate) will have a pregnancy rate (% Clv) of 25%. This should be a minimum goal. Because you have two numbers that go into this calculation, it is possible to be high in one and low in the other and still get 25%. Again, the pregnancy rate spreadsheet from Provo-DHI is a very useful tool to supplement these numbers from the Herd Summary.

Summary of Example Herd

The example herd has been used to show how to calculate the various reproductive values. Let's review those numbers:

Heat detection rate:	49% based on VWP; 64% actual
Conception rate:	44%; 1st service conception was 38%
Pregnancy rate:	23% based on VWP; 28% actual
Lactation groups:	1st lactation cows had the lowest S/C, highest % 1st service conception rate and highest % calving (pregnancy). Second lactation cows had the highest S/C.

This herd is doing well on heat detection rate, average to below on conception rate, and a little above average on pregnancy rate; especially with 1st lactation cows. Conception rates of second and older lactation cows needs to be worked on because they are too high.

Conclusions

The Herd Summary contains several more pieces of information related to reproduction. One area to monitor is the historical values for your herd. If you see your numbers slipping, take action now because it can affect your herd for a long time. Finally, if you are using a bull (some day I'll tell you why you shouldn't be), take extra care to keep your records current in regards to which animals become pregnant and an approximate conception date. If you don't it may be impossible to accurately diagnose reproductive problems. For more information, contact your local extension office.

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Table 1.

Lact	Interval Between Breedings (days)							Heat		Calving Interval (months)	
	<18	**18-24**	25-35	36-48	>48	Avg	Total	% Det	% Clv	Last	Next
1	5	**44**	3	21	28	45	39	50	25	-	13.5
2	9	**27**	20	14	30	41	44	54	22	13.4	14.2
3+	13	**31**	14	21	20	36	98	52	22	14.3	13.8
T	11	**33**	13	19	24	39	181	52	23	14.0	13.8

Table 2.

Lact	DIM at First Breeding			
	Avg	**51** Opt & <	61 Opt + 11	71 Opt & >
1	81	2	18	23
2	80	3	11	17
3+	86	4	19	47
T	**83**	9	48	87
		6%	33%	60%

Table 3.

Lact	% PG **80** DIM	Days Open			
		Avg	99 & Less	120 Opt	141 & Over
1	54	130	23	6	13
2	52	141	14	3	14
3+	51	139	26	25	28
T	52	**137**	63	34	55
			41%	22%	36%

Table 4.

Cows Over 75 Days Since Last Bred or Pregnant								
Lact	Number of Times Bred				Total Times Bred	Serv / Conc.	Number 0 Pg Cows	% 1st Conc.
	1	2	3	4&+				
1	10	7	2	3	45	2.05	22	45
2	6	5	2	3	39	2.44	16	38
3+	14	14	7	5	93	2.33	40	35
T	30	26	11	11	177	**2.27**	78	38
	38%	33%	14%	14%				