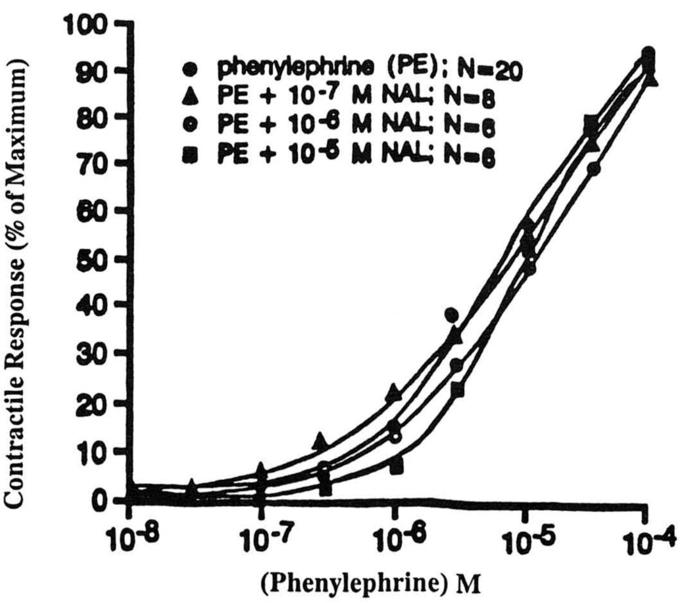
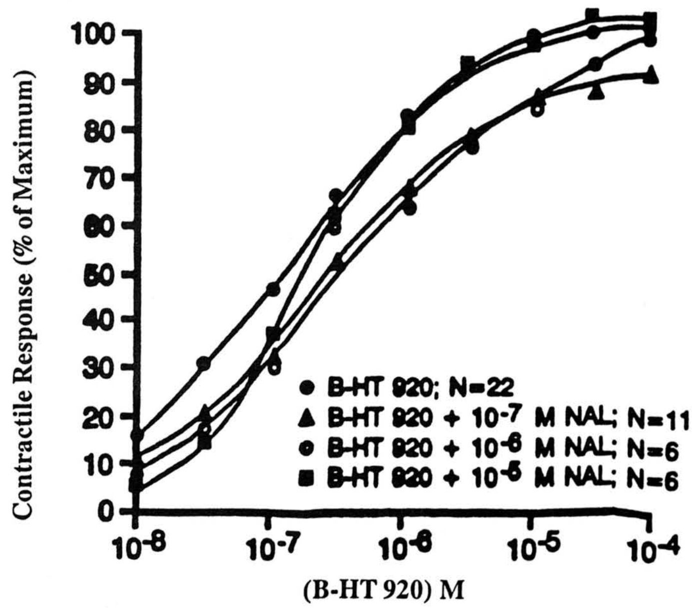
Effect of N-acetyl loline (NAL) on phenylephrine-induced contraction of the lateral saphenous vein (cranial branch) of cattle



Effect of N-acetyle loline (NAL) on B-HT 920-induced contraction of the lateral saphenous vein (cranial branch) of cattle



Projected Days Open – Fact or Fallacy

Patrick J. Hady, *DVM*
Population Medicine Center
Michigan State University
East Lansing, MI 48823-1314

The study is designed to compare four reproductive indexes which attempt to evaluate "current" reproductive performance of the active breeding group by comparison to Actual Days Open. The four indexes are: *(1) JMR/Projected Days Open (2) Michigan DHIA Average Days Open (3) Projected Minimum Days Open (4) Heat Detection/Conception Rate Average Days Open.* Simple linear regression was used on a small data base to measure accuracy of the predictions versus Actual Days Open. A Lotus 123r3 spread sheet was designed to compile preliminary data from reproductive information in eleven Holstein dairy herds. Each herd was monitored for 16 months with herd size ranging from 33 to 187 cows (Median = 61). Total cow numbers is estimated at 700. Preliminary results suggest that the predictive power of these indexes is not extremely accurate. However, their accuracy improves when farm is added as a variable in the multiple regression model. Culling due to reproductive inefficiency artificially depresses Actual Days Open and is a critical factor which may effect the accuracy of these four indexes. In conclusion, it appears that these four indexes which are used as "leading indicators" of current reproductive performance, must be adjusted by some factor which can account for reproductive culling in dairy herds. Practical and economical implications will be discussed.

Introduction

To maintain economic viability, dairy producers must be capable of meeting the broad array of challenges presented by the dynamic technical, political, and economic environments in which they exist. In that regard, economically efficient animal health management while assuring animal welfare has become a top priority; effective diagnostic, therapeutic, and preventive methods for application at the population level have become critically important. Specifically, the reproductive health and performance on a dairy farm are essential to the economic survival of that business (Louca and Legate, 1968 and Holmann *et al.*, 1984). A high reproductive rate maximizes yearly milk flows, provides more replacements and allows for greater selection for milk production (Britt, 1985 and Weller *et al.*,1985). To achieve efficient reproduction, a current and reliable measure of reproductive disease status is necessary as a monitoring tool to assist management decision-making. Evaluation using up-to-date and dependable information for disease monitoring is imperative. It is the animals in the active breeding group that are economically important and at risk of most reproductive diseases that affect profitability of the dairy farm. *Average Days Open, a measure used commonly to evaluate reproductive health and performance in a dairy herd, is actually an estimate of the "past" reproductive disease status. The goal of this research is to establish an index that reflects the current reproductive disease status in a dairy herd.* Such an index will allow for more timely investigations, successful diagnoses, and economically efficient interventions, especially when a change in disease status has occurred. When completed, this research will impact the dairy industry by providing an index that will be a "leading indicator" of the reproductive disease status and performance of the current active breeding group and thus will contribute to improved and more economical reproductive health management.

Literature Review

Common reproductive diseases, such as metritis, retained placenta, cystic ovarian degeneration, and repeat breeder syndrome reduce the reproductive performance on dairy farms by delaying conception (Erb, 1984). As a result, the interval between calving and conception is increased for affected cows. The mean length of this interval for all cows, commonly referred to as days open (James and Esselmont, 1979), provides a useful measure of reproductive health and performance in the dairy herd. Average Days Open (ADO) is defined as the mean number of days from calving to conception for all pregnant cows. This index is useful, but because it includes only pregnant cows, it measures the status of reproductive disease and performance in the dairy herd at the past time period when those pregnant cows were being bred (Klingborg, 1987 and Britt, 1985). Thus ADO, which may contain data up to 9 months old in a typical Michigan dairy herd, does not allow evaluation of the current reproductive disease status of the herd; it provides little information on the reproductive health of those cows currently being bred. For timely management, a dairy producer prefers knowledge about the herd's current reproductive status over an evaluation of how the herd did several months ago.

To remove this historical bias, four different indexes are being used as leading indicators to measure the current reproductive disease status in dairy herds. These indexes attempt to remove the *historical nature of ADO* and measure the current status of reproductive disease and performance in the dairy herd. The four indexes are:

1. Projected Days Open: This index is an extension of a concept developed in Canada called JMR (Jours Moyen Retard), which in English means Average Penalty Days. Average Penalty Days is defined as the number of days past the Voluntary Waiting Period (VWP). *Projected Days Open is the sum of penalty days accumulated by the active breeding group divided by the number of cows in that group **plus** the VWP.* The active breeding group is defined as cows past the VWP but not yet inseminated, and cows inseminated but not yet diagnosed pregnant (Martineau and Cardyn, 1990; Rawson, 1990).

2. Michigan DHI Average Days Open: Michigan DHI Average Days Open is the number of days from last calving to last breeding, pregnancy or culling. Cows less than 60 days in milk or coded for culling are excluded in the calculation because they are not considered part of the active breeding group. *Pregnant cows are included in the calculation* (Ferris,1987).

3. Projected Average Minimum Days Open: This index estimates the best possible reproductive performance for a dairy herd, given its current status. The index is calculated across three cow groups; (1) pregnant cows; (2) cows inseminated and not yet diagnosed pregnant, but assumed pregnant at last breeding; and (3) open cows past VWP, whether inseminated in this lactation or not (it is assumed that these animals will be seen in estrus, and will be inseminated and *will conceive on the average of 10 days after test date*--Fetrow *et al*, 1990).

4. HDR-CR Days Open: This index is a simulation of the herd's reproduction. *It takes the heat detection rate (HDR) and conception rate (CR) of the herd and predicts ADO by estimating both the percentage of non-pregnant cows seen in estrus and the percentage of animals inseminated that become pregnant.* In this manner, Average Days Open is predicted in a dairy herd (Nussbaum *et al*, 1991).

These four indexes are being used as initial diagnostic measures to detect changes in the incidence of reproductive diseases and management changes in a dairy herd. If effective, the predictive nature of these indexes will signal a change in reproductive health much sooner than it would be indicated by ADO. This should allow investigators and managers to evaluate disease as it is occurring and not after the fact, thereby facilitating further diagnostics and timely interventions. Presently, there is no scientifically sound evidence to determine which of the four indexes is accurate in predicting changes in ADO. *The overall goal of this research is to establish an index which can be used to indicate change in reproductive disease and performance representative of the current situation on a dairy farm.*

Objectives

The objectives of this study are contained in two phases. Phase one will evaluate how well the four indexes of current reproductive performance are able to predict ADO. Phase two will use this index in an on-farm situation to investigate its usefulness to the veterinary practitioner. Specific hypotheses to be tested in Phase One include:

H_1: ADO = Projected Days Open

H_2: ADO = Michigan DHI Average Days Open

H_3: ADO = Projected Ave Min Days Open

H_4: ADO = HDR-CR Adjusted Days Open

Methods

Preliminary Study

A preliminary investigation into the usefulness of these four indexes was obtained using a relatively small database of eleven Holstein dairy herds (Average size = 61.5 cows: SD = 13.0;676 total cows). Cow identification, lactation number, voluntary waiting period, fresh date, first breeding, last breeding and number of services were collected in these herds over a sixteen month period. The animals' reproductive status (0=open/1=bred/2=pregnant) was monitored through this period to "isolate" the active breeding group in each month. The four indexes were calculated for each month and those animals in the active breeding group were followed through their lactation until confirmed pregnant or culled. In this manner, the *"Actual" days open* of the animals in the active breeding group in that month was calculated to compare with the *"Projected" days open* computed for that group.

Principal Investigation

Michigan DHI monthly records from the years 1987-1991 inclusive, will be used in the study. The experimental unit for the study will be the Holstein dairy herd; no live animals will be used in the project. The sample size required in the study was computed by using the standard deviations of gestation (Halverson and Knoble, 1989) and ADO (Hansen, 1990) in the following Student T test formula:

	t	=	$X_1 - H_2 / [SD/(n^{.5})]$,
where	$X_1 - X_2$	=	desired detectable difference in ADO, using the standard deviation of gestation (5 days) as a guide;
	SD	=	standard deviation of ADO (46 days);
	n	=	required sample size;
and	t	=	1.96 ($p < .05$).

These calculations resulted in a sample size estimate of 340 Holstein dairy herds. Currently about 2000 Holstein herds are enrolled with Michigan DHI. Thus, the desired sample should be attainable. The specific information to be collected for each individual animal will be the following: fresh dates, last service dates, days to first service, milk production level, and number of times bred for each lactation. Additional information needed to complete the database are heat detection rate and conception rate of the herd and the recorded VWP. Using standard methods, these will be calculated from available DHI data (Ferris, 1987). Data quality is paramount to this analysis. Therefore, the Michigan DHI database will be edited by the following three procedures:

(1) Herds whose **CONCEPTION RATE** for the period of interest lies outside two SD of the mean CR for Michigan DHI herds will be excluded from the data.
(2) The accuracy of the reported last service critical to the calculation of the four projections. As an initial screen, **GESTATION LENGTHS** will be calculated for all cows as the difference between the calving date of the current lactation (FDAT2) and the last service date of the previous lactation. Herds with over 10% calculated gestations outside two SD of the mean bovine gestation will be excluded from the database.
(3) Remaining herds will have their **ACTUAL CALVING INTERVAL (CI)** compared to a **CALCULATED CI.** The actual CI is determined by subtracting the calving date of the previous lactation (FDAT1) from the current calving date (FDAT2). The Calculated CI will be computed by adding the mean bovine gestation to the difference between last service and FDAT1.

Simple linear regression analysis will be employed to evaluate the strength of approximation and herds with R^2 values below .90 will be excluded from the database. Editing with these three methods will select for accurately recorded data on the remaining farms in database. The accuracy of data is essential to the calculations and results of the four indexes.

Each of the four indexes will be calculated for the first DHI test date in the months of February, May, August and Novemer 1988. These parameters will also be re-calculated for the same herds in the same months of 1989. Every animal in the active breeding group on those dates will be identified. The active breeding group will be defined as all cows that have freshened at least once and have not been either confirmed pregnant or identified for culling, and whose DIM exceeds the VWP. Each animal in this group will then be tracked during that lactation until pregnant or culled. In this manner, ADO accumulated in the group will be calculated and compared to the four computed indexes. ADO accumulated by the group will be the "gold standard" of comparison used in the study.

A simple linear regression model will be used to compare the four indexes to the ADO amassed by the active breeding group. The basic model format will be: $y = a + bx + e$, where y = gold standard (ADO); a = intercept; x = one of the calculated indexes; b = regression coefficient; and e = error. Regression will be performed for each of the four indexes and analyses will be evaluated for efficiency and accuracy of the projections. The "best" index for projecting Actual Days Open in a breeding group will be selected by using the following criteria: (1) Efficiency will be judged using R^2 statistic generated from the regression analysis. If two or more indexes fall within the same range, the "best" index will be chosen by selecting for the one which is easier to calculate from on-farm data. (2) Accuracy will be evaluated by testing the hypothesis, H_o: b = 1. In addition, the quality of prediction will be compared between seasons within each year and between years. In this manner the consistency of the prediction will be assessed.

Results - Preliminary Study

Ninety-seven complete observations were collected from the database in the sixteen month period. Simple linear regression was used to analyze the data to compare the accuracy of the four projections of the actual days open in each active breeding group. *R^2 statistics from the simple regression model for the four indexes are as follows: Projected Days Open (R^2 = .568); Michigan DHIA Average Days Open (R^2 = .523); Heat Detection/Conception Rate Days Open (R^2 = .371) and Projected Average Minimum Days Open (R^2 = .569).* Appendix I contains a complete summary of the simple regression analysis. A multiple linear regression model was used to investigate the association of farm in the ability of the indexes to predict actual days open in the active breeding group. The dependent variable in ths analysis was Actual Days Open with the independent variables as each individual index and farm. R^2 statistics from the multiple regression model are as follows: *Projected Days Open (R^1 = .778); Michigan DHIA Average Days Open (R^2 = .723); Heat Detection/Conception Rate Days Open (R^2 = .752) and Projected Average Minimum Days Open (R^2 = .753).* Appendix II contains a complete summary of the general regression analysis.

Discussion

The results from the preliminary study using the simple regression model suggest that the predictive power of the four indexes is not extremely accurate in predicting the Actual Days Open of the active breeding group under investigation. However, the accuracy of the prediciton can be improved if the regression model uses farm as a variable in the analysis. This improvement reveals individual farm characteristics are related to the accuracy of the prediction. Culling for reproductive performance plays a critical role in determining Actual Days Open in the active breeding group. Economical culling is an efficient method in the management of Actual Days Open. However, excessive reproductive culling will artifically lower Actual Days Open, obscuring changes in reproductive performance on the farm. To increase the predictive power of these indexes, farm specific culling practices should be integrated into this model.

References

Britt, J.A. 1985. Enhanced reproduction and its economic implications. *J Dairy Sci* 68:1586. Britt, J.H. and L.C. Ulbert, 1970. Changes in reproductive performance in dairy herds using the herd reproductive status system. *J Dairy Sci* 53:752-756. Erb, H.N.; Smith, R.D.; Hillman, R.B. (1984) Rate of diagnosis of six diseases of Holstein cows during the 15-day and 21-day intervals. *Am J. Vet. Res.* 45:333-335. Fetrow, J.D., D. McClary, R. Harman, K. Butcher, L. Weaver, J. Ehrlich, W. Guterbock, J. Reneau, and N. Williamson. 1990. Calculating selected reproductive indices: Recommendations of the American Association of Bovine Practitioners. *J Dairy Sci* 73: 78. Ferris, T. 1987. Michigan DHI records manual: Guide to record use, herd evaluation and explanation of report forms. Cooperative Extension Service, Michigan State University, E. Lansing. Halverson, H.W. and K.H. Knoble. 1989. Class I alleles of the bovine major histocompatibility system and their association with economic traits. *J Dairy Sci* 72: 2115. Hansen, T.J. 1990. Relationship between reproductive traits, age, body weight at calving and days dry in first lactation. *J Dairy Sci* 73:835-842. Holmann, F.J., R.C. Shumway, R.W., R.W. Blake, R.B. Schwart, and E.M. Sudweeks. 1984. Economic value of days open in Holstein cows of alternative milk yields and varying calving intervals. *J Dairy Sci* 67:636-643. James, A.D. and R.J. Esselmont. 1979. The economics of calving intervals. *Anim Prod* 29:157. Klingborg, D.J. 1987. Normal reproductive parameters in large "California-style" dairies. *Vet. Clinics of N.A.: Food Animal Practice.* Vol. 3 No. 3. Louca, A. and J.E. Legate. 1968. Production losses in dairy cattle due to days open. *J Dairy Sci* 51:573-576. Martineau, R. and P. Cardyn. 1990. JMR: A current reproductive monitor. Proceedings of the Annual Meeting, Society for Theriogenology and American College of Theriogenologists. August 10-11, Toronto, Ontario, Canada. Nussbaum, M.M., V.M. Lane, and B.C. Hepner. 1991. Dairy enterprise analysis model, Part 1. Theory. *Compend Contin Educ Pract Vet*, Jan.: 149-159. Rawson, C.L. 1990. Application of JMR in Wisconsin dairies. Proceedings of the Annual Meeting, Society for Theriogenology and American College of Theriogenologists. August 10-11, Toronto, Ontario, Canada. Weller, J.H., R. Bar-Anan, and K. Osterkorn. 1985. Effects of days open on annualized milk yields in current and following lactation. *J Dairy Sci* 68:1241-1249.

APPENDIX I

SIMPLE REGRESSION MODEL - ANALYSIS

PROJECTED DAYS OPEN:	R Squared Value	= .568
	# of Observations	= 97
	Degrees of Freedom	= 95
	X coefficient	= .836
	Std Err of Coeff.	= .074
MIDHIA DAYS OPEN:	R Squared Value	= .523
	# of Observations	= 97
	Degrees of Freedom	= 95
	X coefficient	= 1.416
	Std Err of Coeff.	= .139
HD/CR DAYS OPEN:	R Squared Value	= .371
	# of Observations	= 97
	Degrees of Freedom	= 95
	X coefficient	= .576
	Std Err of Coeff.	= .078
PAMDO:	R Squared Value	= .570
	# of Observations	= 97
	Degrees of Freedom	= 95
	X coefficient	= 1.290
	Std Err of Coeff.	= .115

APPENDIX II

MULTPILE REGRESSION MODEL - ANALYSIS

PROJECTED DAYS OPEN ANALYSIS - RESULTS : Dependent Variable: ADO

R-Square	F Value	Pr>F
0.778174	27.11	0.0001

Source	DF	F Value	Pr > F
PDO	1	217.68	0.0001
FARM	10	8.05	0.0001

MICHIGAN DHIA AVERAGE DAYS OPEN ANALYSIS - Dependent variable: ADO

R-Square	F Value	Pr>F
0.723318	20.20	0.0001

Source	DF	F Value	Pr > F
MIDHIA	1	160.73	0.0001
FARM	10	6.15	0.0001

PROJECTED AVERAGE MINIMUM DAYS OPEN ANALYSIS - Dependent variable: ADO

R-Square	F value	Pr>F
0.753066	23.57	0.0001

Source	DF	F Value	Pr > F
PAMDO	1	196.20	0.0001
FARM	10	6.30	0.0001

HEAT DETECTION/CONCEPTION RATE AVERAGE DAYS OPEN ANALYSIS - RESULT

R-Square	F Value	Pr>F
0.752329	24.00	0.0001

Source	DF	F Value	Pr > F
HDCRPDO	1	118.48	0.0001
FARM	9	13.50	0.0001

Dry Cow Therapy and Mastitis Control, An Observational Study

W.M. Sischo
Department of Veterinary Science
Penn State, University Park, PA
G.Y. Miller
L.E. Heider
Department of Veterinary Preventive Medicine
The Ohio State University, Columbus, OH

A cross-sectional study involving 1032 dairy farms in Ohio was conducted with the objective to evaluate the effectiveness of mastitis control measures in a contemporary dairy environment. Recently published observational studies have found varying effectiveness of common mastitis control practices, particularly nonlactating cow therapy (dry cow therapy, DCT). Miller and Bartlett reported that DCT was not an economically advantageous practice. Howard *et al.* reported a negative marginal value product for DCT. Dargent-Molina *et al.* reported that not using DCT increased the risk for herds having mastitis associated with *Streptococcus agalactiae* (Strep ag) but did not increase the risk for a herd having mastitis caused by *Staphylococcus aureus* (Staph aureus). These findings seem to contradict the experimental results reported by Kingwill *et al.* and Smith *et al.* that support the use of DCT. The design and conduct of our study was aimed at explaining the apparent discrepancy between the findings of the observational studies and those of the experimental studies. To this end we designed the study to minimize information, confounding and response bias and to develop a parsimonious statistical model that would accurately describe the biologic implications of mastitis control.

Many of the routine practices used to control mastitis were developed when the major contagious pathogens (Strep ag and Staph aureus) were prevalent. We felt that this situation may have changed, especially for Strep ag, and that these pathogens currently were less prevalent. It was hypothesized that the effectiveness of certain mastitis control practices would be conditional on the presence of the major contagious pathogens. A primary focus of our study design was to classify study herds on the basis of the presence or absence of contagious pathogens and on herd somatic cell count (SCC). This constraint required that our sampling frame include only herds enrolled in the SCC option of Dairy Herd Improvement Association (DHIA) and also belonging to Milk Marketing Inc. (MMI), an Ohio-based milk cooperative.

The detection of contagious pathogens in a herd was based on culturing these pathogens from the herd's bulk tank milk which was provided to us by MMI. Complete microbiological information was obtained from 802 herds. To complement the microbiological data, SCC data were obtained from DHIA on 741 of the study herds. As a result of these data, four mutually exclusive outcome categories were created: 1) herds with low SCC (geometric mean SCC <150,000 cells/ml) without contagious pathogens, 2) herds with mid-level SCC (150,000-300,000 cells/ml) without contagious pathogens, 3) herds with coagulase-positive staphylococci in their bulk tank milk (CPS), and 4) herds with esculin-negative, CAMP-positive streptococci (ENCPS) in their bulk tank milk.

Herd owners were surveyed by mail concerning their