

PRESENTERS

John Ambrosius is Extension Farm Management Specialist at UW-Platteville. He teaches farm personnel management as part of his extension duties, and has initiated an effort to conduct regular farm employee compensation surveys.



Ron Eberhard is an author and humorist from Grove City, Ohio, who calls himself a "people planner." Through his company, Business and Estate Planning Services, Unlimited, he works on business, estate, and tax planning for over 600 family farm businesses.



Thomas J. Fuhrmann is a veterinary practitioner and consultant to dairy farmers and the dairy industry internationally. His practice, Dairy Services of Arizona, is located in Tempe, Arizona.



Gary Maas is president of AgriCareers, Inc., Massena, Iowa, which recruits employees for farms and agricultural businesses. He is also a professional speaker, consultant, and writer on human resource issues in agriculture.

Program Committee: For further information about this program, call program committee chairman Dennis Cooper, UW-River Falls, at (715) 425-3704. Other members of this committee are: Joe Conlin, U of MN, Stan Smith, U of IL, Ron Orth, IA State, John Ambrosius, UW-Platteville, and Terry Smith, UW-Madison.

MAIL TO:
Dairy Personnel Workshop
Dept. of Animal and Food Science
UW-River Falls
410 S. Third St.
River Falls, WI 54022-5001

Non-Profit Organization
U.S. Postage
PAID
Permit #155
Minneapolis, MN.

DAIRY FARM PERSONNEL MANAGEMENT WORKSHOP

December 13-14, 1995

Radisson LaCrosse
LaCrosse, WI

Four State Extension Services

Iowa State University
University of Illinois
University of Minnesota
University of Wisconsin

Labor La

50A

DAIRY FARM PERSONNEL MANAGEMENT WORKSHOP

REGISTRATION INFORMATION

Date: December 13-14, 1995
(Wednesday & Thursday)

Location: Radisson La Crosse in La Crosse, WI

Registration: Fees include workshop participation, printed proceedings and handouts, four meals, and refreshments during breaks. Discounts are provided for early registration (postmarked by December 1, 1995) and for participation by more than one person from a single family or business (e.g. a spouse, partner, or employee).

Participants from one farm business:

First	Additional
By Dec. 1, 1995	\$150 \$100
After Dec. 1, 1995	\$175 \$125

Early registration is encouraged because of the need to limit number of participants. Registrations will be confirmed by mail.

Hotel/Lodging: Participants are responsible for their own hotel reservations. If you choose to stay at the Radisson, use the name "Dairy Personnel Workshop" when registering to get the appropriate rate. Room reservation number for the Radisson is 1-800-333-3333

PROGRAM AGENDA

Wednesday, Dec. 13
Moderator, Stan Smith

- 9:30 Registration and Coffee/Milk
- 10:00 Welcome, Dennis Cooper
- 10:15 Total Quality Management: Principles and Practices in Dairy Management, Tom Fuhrmann
 - Basic Components of TQM.
 - Practical implementation on dairy farms.
 - Management & worker activities focused on TQM.
- 11:40 Styles and Values Training, Gary Maas
 - Importance of personal styles and values on the job.
 - Audience members will fill out assessment instrument and get individual printouts back the next day. Registration fee includes cost of personalized individual styles-values assessment, a \$45 retail value.
 - Practical application of results will be discussed in Mr. Maas' sessions on Thursday.
- 12:00 Lunch
- 1:00 TQM, continued, Tom Fuhrmann
- 2:00 People Planning: How to Get the Most Out of Me and More Out of Those Around Me, Ron Eberhard
 - Improving communication, especially listening.
 - Preparing for change certain to come.
 - Goal-setting and "getting."
- 3:00 Milk break
- 3:30 Monitoring Performance: People versus Cows, Tom Fuhrmann
 - Practical management schemes for dairy herds
 - Improving worker performance
 - Troubleshooting animal performance problems
- 5:00 Free time

6:00 Social hour and refreshments

6:30 **BANQUET AND PROGRAM:**
Field of Dreams Ron Eberhard

9:00 Adjourn
Thursday, Dec. 14
Moderator, Ron Orth

- 8:00 Family Employment on the Dairy Farm, Gary Maas
 - Dealing with family issues in the business
 - Authority and decision-making
 - Creating a win-win situation for everyone
- 10:00 Milk break
- 10:30 Labor Law Clinic: Basics of Workers' Compensation Law, State Labor Depts.
 - Application of state laws to the dairy farm business.
- 12:00 Lunch
- 1:00 Compensation Survey Report, John Ambrosius
 - Presentation and distribution of results of compensation surveys filled out on Wednesday by participants.
- 1:15 Precision Hiring, Gary Maas
 - Successful hiring when potential workers are scarce.
 - Precision hiring techniques and qualitative issues.
 - Marketing the dairy farm to potential employees.
- 3:15 Wrap up, Dennis Cooper
- 3:30 Adjourn

REGISTRATION FORM

Please register the following people from my farm:

Name: _____
 Registration \$ _____
 Name: _____
 Registration \$ _____
 Name: _____
 Registration \$ _____

Your Mailing Address:

Farm Name: _____
 Box/Route/Street: _____
 City/Town: _____
 State & Zip Code: _____
 Area code and phone number: _____

Mail registration to:

NOTE CHANGE IN ADDRESS FROM PREVIOUS YEARS!

Dairy Personnel Workshop
 Dept. of Animal and Food Science
 UW-River Falls
 410 S. Third St.
 River Falls, WI 54022-5001
 Telephone: (715) 425-3704
 FAX: (715) 425-3785

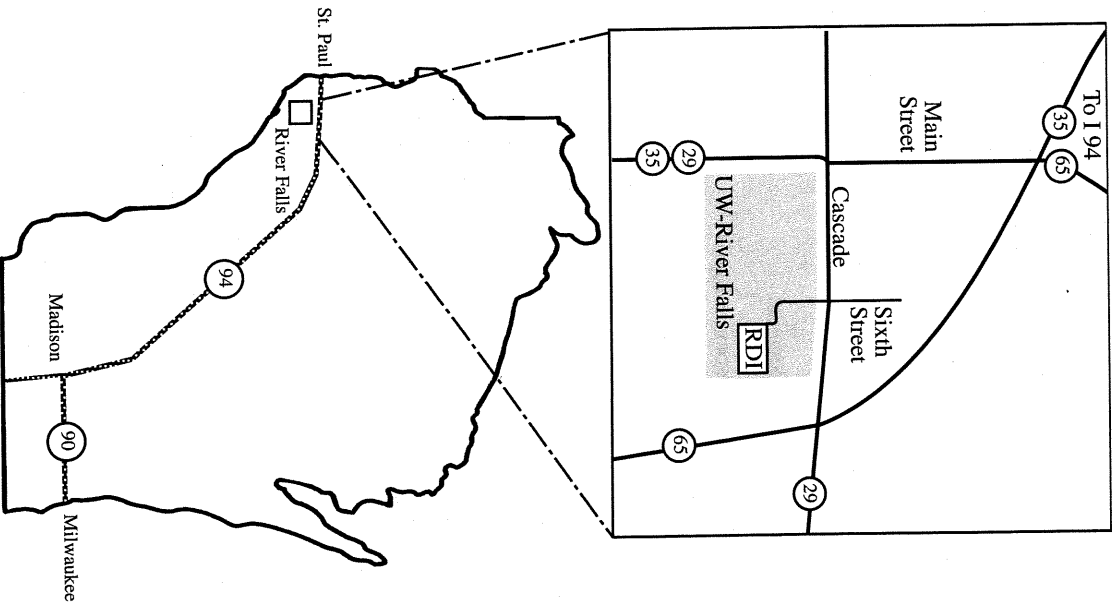
Please make checks payable to:

Dairy Personnel Workshop

Location

The University of Wisconsin at River Falls is organized into three colleges — Agriculture, Arts and Sciences, and Education. Majors are offered in 45 areas and minors in an additional 26 areas. The current University enrollment is approximately 5,200 students.

**Bulk Rate
Postage & Fees
Paid — USDA
Permit # G268**



Agricultural Resource Center - RDI
University of Wisconsin-River Falls
410 South 3rd Street
River Falls, WI 54022-5001

Agricultural Resource Center



UNIVERSITY OF WISCONSIN - RIVER FALLS

University of Wisconsin-Extension • Cooperative Extension

“Working With Rural Wisconsin”

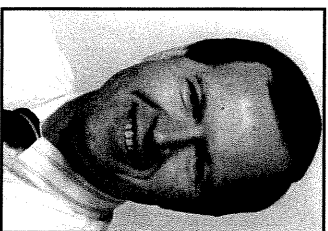
The Agricultural Resource Center is located in the Rural Development Institute at the University of Wisconsin-River Falls campus. The Center is staffed with four Cooperative Extension specialists who hold faculty appointments in the College of Agriculture and have complementary interests and expertise. The Center's efforts encompass the entire state of Wisconsin.

Specialists at the Center are available for consultation on specific questions, continuing education, or training programs. The modern facilities at the Rural Development Institute offer an ideal setting for those interested in continuing education, short-term training or an instructive retreat. Conference/class rooms of varying sizes, a full complement of audio/visual equipment with satellite down-link, and access to computer facilities provide full support for extension and outreach programs.

- For more information, contact us through your county Cooperative Extension agent or directly at:
- Phone (715) 425-0640
 - Fax (715) 425-4479
 - Agricultural Resource Center-RDI
University of Wisconsin-River Falls
410 South Third Street
River Falls, WI 54022-5001

Animal Health

Larry Baumann, DVM, PhD
Phone (715) 425-3187



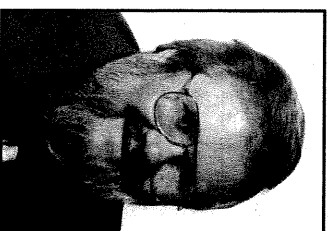
Dr. Baumann is a veterinarian specializing in the health of dairy cattle. He has a strong background in preventing disease and managing conditions that influence the productivity and profitability of dairy herds. Dr. Baumann is available for consultation on dairy herd productivity concerns.

Program areas include:

- mastitis and milk quality
- herd reproductive problems
- nutrition and metabolic diseases
- herd health programs

Community Economic Development

Larry B. Swain, PhD
Phone (715) 425-3083



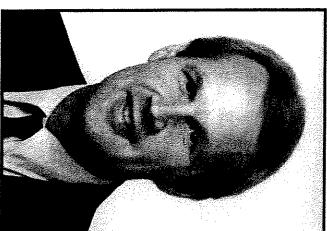
Developing people in Wisconsin communities is a primary focus for Dr. Swain. He feels that helping individuals develop “tools” for managing the many changes they face is of utmost importance for the survival of Wisconsin communities.

Program areas include:

- strategic planning for communities, businesses, and individuals
- leadership development
- team building
- community economic analysis
- added value agriculture

Financial Management

Nate Splet, PhD
Phone (715) 425-3188



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- financial record systems for farm businesses
- analyzing financial performance of farm businesses
- evaluating capital investments
- analyzing structural changes of dairy farm businesses

Cooperatives and Marketing

David Trechter, PhD
Phone (715) 425-3129



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- member, manager, or director education/training

LEGISLATIVE HEARING TENTATIVE AGENDA

THURSDAY, FEBRUARY 22, 1996

- 11:00 - 11:30 - Lunch in President's Room Student Center
- 11:30-3:00 - Legislative Hearing, Student Center Ballroom
 - Welcome - Vice Chancellor Virgil Nylander
 - Review Agenda & Information on College of Ag.- Dean Gary Rohde
 - Testimony - Students, Graduates
 - Testimony - Faculty, Staff, Industry
- 3:00 - Tour - Ag Science Building, Greenhouse, Pilot Plants, Farms
- 6:00 - Dinner - Room 139 Rodli Commons
- 7:00 - 8:30 Presentation - Rural Development Institute

FRIDAY, FEBRUARY 23, 1996

- 8:30 - 12:00 Rodli Commons, Yellow Room
Testimony, Cooperatives, Rural Development, And Value Added
Agriculture



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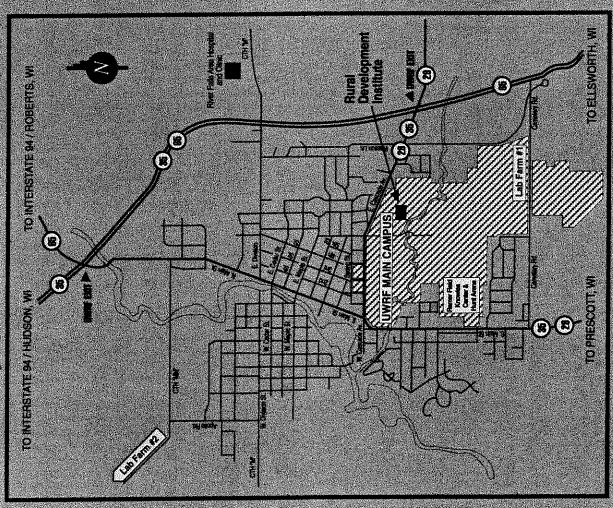
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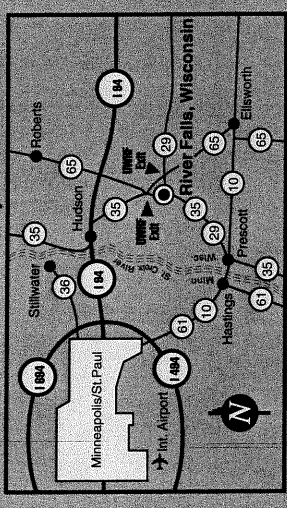
RURAL DEVELOPMENT INSTITUTE
 UW-RIVER FALLS
 410 S. THIRD ST.
 RIVER FALLS, WI 54022-5001
 PHONE (715) 425-3751
 FAX (715) 425-4479



RIVER FALLS, WI / UWRF CAMPUS



TWIN CITIES / RIVER FALLS, WI



RDI SELECT MISSION



CONFERENCE ROOM A

RDI is designed as a service center for issues affecting current and future development of rural Wisconsin.

RDI assists in bringing institutional and inter-institutional resources to bear on regional public/private needs, and serve as a problem solving facilitator.

I supports the roles and responsibilities of UW-Extension and the university addressing the current and changing needs of the citizens of Wisconsin.

I reports directly to the Chancellor and is considered an independent university institute tied to the service mission of the university.

ADMINISTRATIVE INITIATIVES

I hosts and facilitates public and private conferences, workshops and seminars that assist in the resolution of problems relevant to Wisconsin.

I participates in computer fiber optic networking, institutional and inter-agency informational sharing, regional networks and development of regional nographic data.

I works with University Administrators, Deans, Departments and invited faculty in the initiation and development of cooperatively designed programs which are co-sponsored and supported through the Rural Development Institute.

RDI CONFERENCE ROOMS SPECIFICATIONS

CONFERENCE ROOM A

- 240 square feet
- seating capacity 10
- overhead projector
- VCR and television

CONFERENCE ROOM B

- 450 square feet
- seating capacity 12-16
- slide projector and screen
- overhead projector/ audio/ tape/disc
- VCR and television/ satellite downlink

CONFERENCE ROOM C

- 950 square feet
- seating capacity 30-35
- laser slide projector and screen
- overhead projector/ computer hookup/ IBM/ Apple
- VCR/ audio/ tape
- 2 data/ TV monitors/ satellite downlink

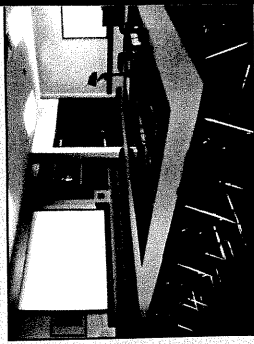


CONFERENCE ROOM B



RURAL DEVELOPMENT INSTITUTE INTER-AGENCY COLLABORATION ACTIVITIES

- Wisconsin Rural Development Council
- Western Wisconsin Area Agency on Aging
- Cooperative Educational Service Agency 10, 11 & 12
- Regional Planning Commissions
- Indianhead Community Education Planning and Assessment Council
- Bremer Foundation Rural Youth Retreats
- Wisconsin Federation of Cooperatives
- Department of Public Instruction - Center for Program Excellence in Community Education
- Dairyland Rural Electric Cooperative
- Wisconsin Indianhead Technical College
- Pierce County Economic Development Corp.
- National Future Farmers of America Foundation
- WestWING Fiber Optic Network - CESA II
- Agriculture Resource Center - College of Agriculture and UW System Cooperative Extension - Service
 - Wisconsin Veterinary Update Newsletter
 - Wisconsin Emerging Leadership Development Program
 - Dairy Farm Business Summary
 - Cooperative Development Initiative



CONFERENCE ROOM C



Agricultural Resource Center

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UNIVERSITY OF WISCONSIN - RIVER FALLS

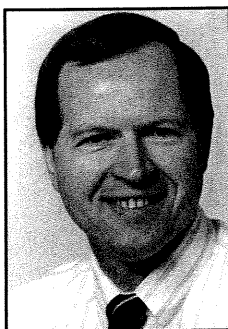
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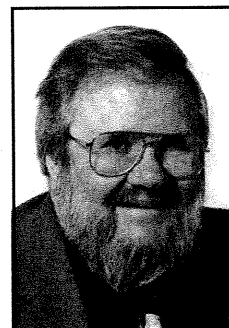
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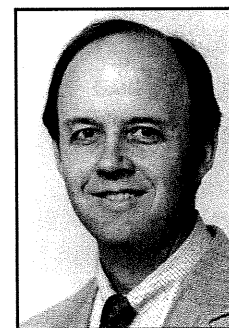
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DIRECTORY
RURAL
DEVELOPMENT
INSTITUTE
1995-1996

Rural Development Institute	Phone	Room
Jim Stewart - Director	715-425-3751	115
Pat Anderson - Program Assistant	715-425-3751/59	103
FAX	715-425-4479	
Pierce County Economic Development Corporation (PCEDC)		
Bill Warner - Director	715-425-3881	105
Kellogg Cooperative Initiative		
Linda Jacobson	715-425-0671	109
Community Education/Department of Public Instruction (DPI)		
Stan Potts	715-425-3759	111
(NASSP) Assessment Center		
Florence Monsour	715-425-3759	111
RDI Associates		
Charles Mullenax	715-425-3751	152A
Kris Allen	715-425-3751	113
Incubation Center		
Kinnickinnic River Land Trust		
Peg Kohring	715-425-5738	119
Robert Chambers		
47 Software, Incorporated		
Eric Level	715-425-0675	117
RDI Faculty Associate		
Jan Hillard - Political Science	715-425-3318	So. Hall
College of Education - Community Education Development Center (CEDC)		
James Stewart	715-425-3759	115

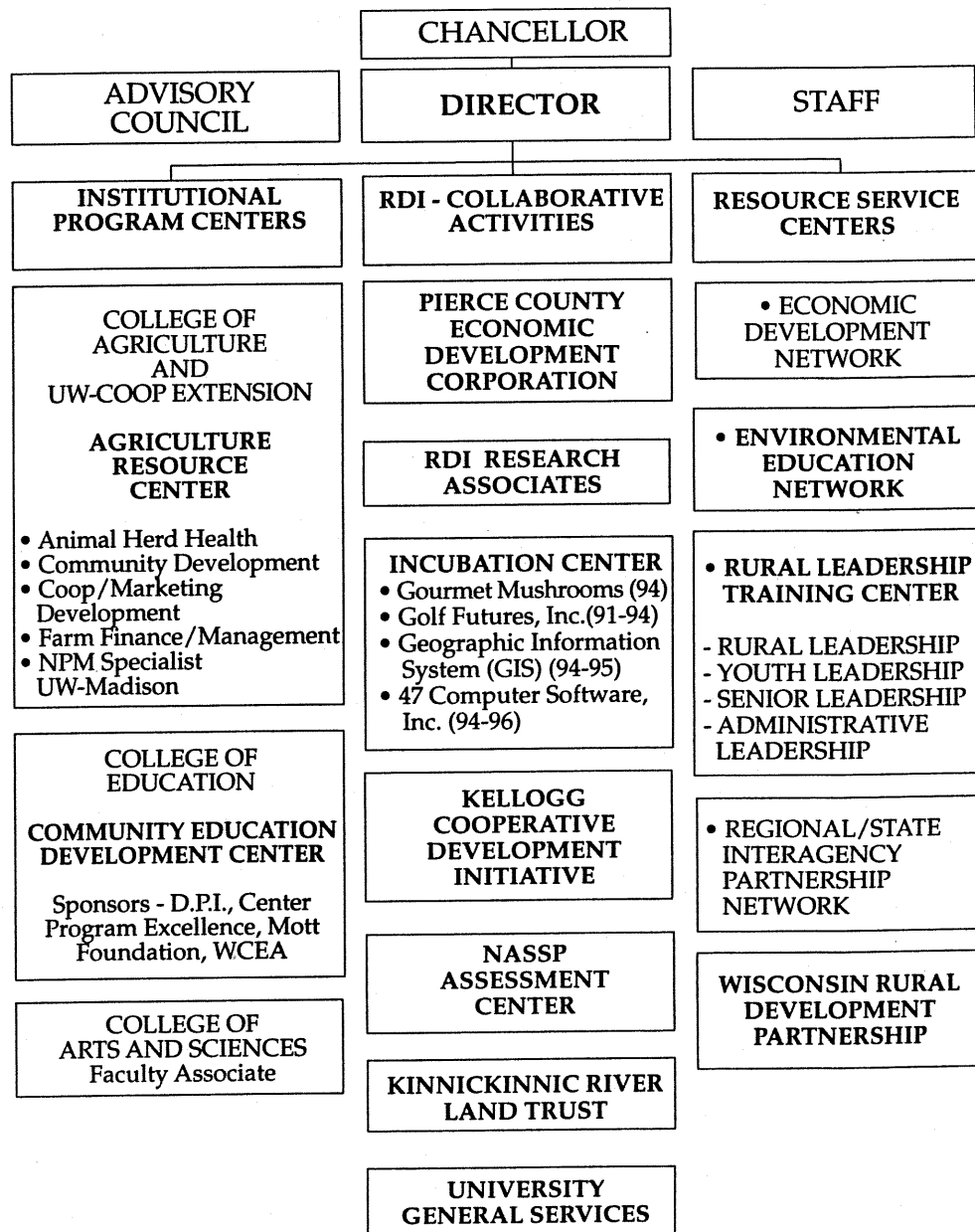
DIRECTORY
COLLEGE OF AGRICULTURE/COOP EXTENSION
AGRICULTURAL RESOURCE CENTER

	Phone	Room
C. Chris Vorwald - Program Assistant	715-425-0640	123A
	FAX 715-425-4479	
Coop/Marketing Development		
David Trechter - Specialist	715-425-3129	123C
Animal/Herd Health		
Larry Baumann - Specialist	715-425-3187	123D
Nutrient/Pest Management (NPM)		
Paul Kivlin - Specialist	715-425-3112	123E
Madison-Based UWEX Faculty		
Farm Finance Management		
Nate Splett - Specialist	715-425-3188	123F
4-H Youth Development		
Melanie Miller - Specialist	715-425-0641	123H
Madison-Based UWEX Faculty		
Community Development		
Larry Swain - Specialist	715-425-3083	123J

DIRECTORY
GENERAL SERVICES

	Phone	Room
Gregg White - Director	715-425-3111	135B
Sharon Lind - Program Assistant	715-425-3099	135
	FAX 715-425-4487	
Parking		
Pat Anderson - Program Assistant	715-425-3333	143
Safety/Inventory		
Mark Kimball	715-425-3344	135C
Hazardous Substance Specialist		
Henry Grote	715-425-3331	135A

RURAL DEVELOPMENT INSTITUTE CURRENT PROGRAM SERVICE CENTERS





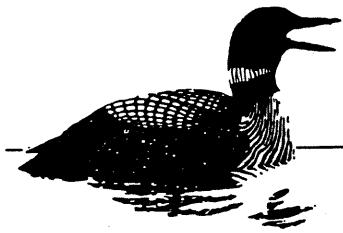
In 1994, the University of Wisconsin at River Falls was awarded a four-year grant of nearly \$300,000 from the W.K. Kellogg Foundation. The Cooperative Development Initiative works with local communities in Minnesota and Wisconsin to apply the cooperative model to issues that they face and works at a national level to expand the capacity of rural universities to help create and sustain cooperatives.

Within Minnesota and Wisconsin, the Cooperative Development Initiative works with groups of people interested in helping to form and lead cooperative efforts designed to address problems that they have identified. Project proposals are solicited by the Cooperative Development Initiative, and from these projects two are selected each year for implementation. The Cooperative Development Initiative provides projects that are selected with ongoing technical assistance and training custom designed for the group's needs.

On the national level, the Cooperative Development Initiative will provide training to staff at the University of Pittsburgh at Bradford and Alabama A&M University so they may implement similar projects in Pennsylvania/New York and Alabama respectively. Faculty at other universities will also be offered similar training on a workshop basis in the summers of 1996-97.

For more information, Contact David Trechter at:

- David Trechter.....715/425-3129, RDI Room 123C
- Linda Jacobson....715/425-0671, RDI Room 109.



COMMUNITY EDUCATION
DEVELOPMENT CENTER

UNIVERSITY OF WISCONSIN - RIVER FALLS

Established in 1986 with a modest support grant from the MOTT Foundation, the Community Education Development Center has developed a comprehensive array of services that supports the community education philosophy through school districts and communities statewide.

The CEDC provides technical assistance, continuing education, inservice, conferencing and long-range planning associated with the statewide plan. The center is one of three that provides services statewide in collaboration with the Department of Public Instruction and the Wisconsin Community Education Association.

The center at River Falls is located in the Rural Development Institute and is supported by the College of Education. The CEDC is recognized by the Department of Public Instruction as a center for program excellence and maintains membership in the Indianhead Community Education Planning Assessment Council (ICEPAC), Wisconsin Community Education Association (WCEA), National Community Education Association (NCEA) and via CENET is part of the Nation CE Network, sponsored by the MOTT Foundation.

Annually, the Center sponsors a national INTACT training program through the National Center in Flint, Michigan, with Wisconsin having provided opportunity for over 400 professional educators and citizens with leadership training.

In recent years, the center has assisted the following Wisconsin communities in establishing CE programs at Hurley, Baldwin-Woodville, Ashland, Ellsworth, Prescott, Webster and Siren. The center also provides continuous regional support in collaboration with WITC/ICEPAC to the following established programs in northern Wisconsin: Hudson, New Richmond, Somerset, Osceola, St. Croix Falls, Superior, Ladysmith, Tony, Flambeau, Birchwood, Amery, Balsam Lake, Shell Lake, Clear Lake, Clayton, Cumberland, Frederic, Luck, Grantsburg, Spring Valley, Turtle Lake, Bayfield, Bloomer, Boyceville, New London, Washburn, and Wisconsin Rapids.

The CEDC maintains the statewide leadership Academy for recognition, through the WCEA, of community education leaders at the community level. The Center was active in the preparation of the Department of Public Instruction "Community Education Resource and Planning Guide" and provides leadership training statewide.

**RURAL DEVELOPMENT INSTITUTE
UNIVERSITY OF WISCONSIN-RIVER FALLS
SCHEDULED CONFERENCE ROOM USE**

Year	Month	Room A	Room B	Room C	TOTAL	YEAR TO DATE TOTALS
1991	Jan - June	77	286	740	1,103	----
1991	July - Dec	318	600	1419	2,337	----
					Yr. Total	3,440
1992	Jan - June	607	910	1112	2,629	----
1992	July - Dec	320	514	1762	2,596	----
					Yr. Total	5,225
1993	Jan - June	361	803	830	1,994	----
1993	July - Dec	530*	35*	318*	883*	----
					Yr. Total	2,877
1994	Jan - June	259*	733*	587*	1,579*	----
1994	July - Dec	112	604	1000	1,726	----
					Yr. Total	3,305
1995	Jan - June	370	612	1011	1,993	----
1995	July - Dec	337	1191	1647	3,175	----
					Yr. Total	5,168
TOTALS		3,291	6,288	10,426	CUM. TOTAL	20,015

* Conference room use limited or interrupted due to remodeling.

Figures reflect the number of individuals using the

RDI conference rooms.

Figures DO NOT include off-campus programming or service.




WISCONSIN VETERINARY UPDATE

A Publication of the University of Wisconsin-Extension, Cooperative Extension Service. Vol. 3, No. 1 & 2, January-June 1995



Bovine

NUTRITION TOPICS

Heat Stress & Feeding

Cows that were subjected to hot environmental temperatures yielded 6.8 lbs (3.1 kg/d) less milk on a diet high in crude protein (CP=18.4%) and of medium degradability (65%) than on diets high in CP of low degradability (59%) or medium in CP (16.1%). The high CP diets were associated with decreased DMI and higher water intake, ruminal NH₃, and blood urea. Negative effects on yield from the high CP, medium degradability diet were not observed at moderate temperatures. Supplementation of 2 to 2.5% fat to diets fed under hot summer conditions resulted in less yield response than when fat was added at moderate temperatures. Fungal cultures (3 to 5 g/d) in the diet decreased body temperatures and respiration rates in hot, but not cool, weather. Increased milk yields and cellulose digestibility also resulted from dietary fungal cultures. "Heat Stress Interactions with Protein, Supplemental Fat, and Fungal Cultures." Huber, JT, et al, *Journal of Dairy Science* 77(7):2080-2090, Jul 1994.

Effective NDF

The effectiveness of NDF from non-forage fiber sources was evaluated in two trials using midlactation Holsteins. Dietary NDF was added to the basal diet using either alfalfa silage or a nonforage high fiber feed. In trial 1, four amounts of alfalfa were fed. Basal milk fat percentage was 2.61% at 144 gm of alfalfa NDF/kg of diet and increased linearly by .066 for each additional 1% alfalfa NDF added, up to 22.8 gm of added alfalfa NDF/kg of diet. Based on one amount of added nonforage fiber, the ratio of fat test increase to NDF

added was .014 for brewers grains, .040 for oat hulls, and .047 for corn gluten feed. In trial 2, one amount of added alfalfa and each nonforage fiber source was used. The ratio of fat test increase to added NDF was .094 for alfalfa, .043 for brewers grains, .067 for oat hulls, .038 for corn gluten feed, .041 for beet pulp, and .044 for malt sprouts. When added to low fiber diets, NDF from the non-forage fiber sources elevated milk fat concentration approximately one-half as effectively as did NDF from alfalfa. "Quantitative Evaluation of Fiber from Nonforage Sources Used to Replace Alfalfa Silage." Swain, SM and LE Armentano, *Journal of Dairy Science* 77(8):2318-2331, Aug 1994.

Fat Feeding Decreases Milk Protein

Results from fat feeding trials during the past two decades have been compiled concerning the influence on milk protein levels. Data show that increasing fat content of diets has generally increased milk yields but decreased milk protein concentrations. The decrease in protein concentration has been hypothesized to be due to decreased glucose availability, development of insulin resistance, increased efficiency of milk production, or reduced plasma somatotropin. In this review, data are presented which attribute the decrease in milk protein to a lack of increase in amino acids available to the mammary gland for protein synthesis as milk yield increases during fat supplementation.

"Relationship Between Dietary Fat Supplementation and Milk Protein Concentration in Lactating Cows - A Review." Wu, Z, et al, *Livestock Production Science* 39(2):141-155, Jul 1994.

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Fat Feeding

Fat increases energetic efficiency in lactating cows by increasing total energy intake, by generating energy more efficiently than volatile fatty acids or protein, by direct incorporation into product, and by promoting nutrient partition toward milk production. The caloric value of fat is changed little as it passes through the rumen, but the greater concern is the possible negative effects of lipid in the rumen. Factors that limit utilization of large amounts of fat by ruminants include inhibitory effects on ruminal fermentation, lower intestinal absorption at high intake, low contribution to total oxidation of nutrients, and sensitivity to nutrient imbalance, causing reduced energy intake.

"The role of dietary fats in efficiency of ruminants." Palmquist, DL, *Journal of Nutrition* 124(8Suppl.):S1377-

S1382, Aug 1994. and "Regulation of lipid metabolism in the rumen." Jenkins, TC, *Journal of Nutrition* 124(8 Suppl.):S1372-S1376, Aug 1994.

Added Fat

A feeding trial involving 30 cows yielding 66-77 lbs (30-35 kg) of milk/day during the first 14 weeks of lactation found no benefit of adding fat in excess of 2.5% of dry matter intake. "Effects of Calcium Salts of Long-Chain Fatty Acids Added to a Diet Containing Choice White Grease on Lactation Performance." Salfer, JA, et al, *Journal of Dairy Science* 77(8):2367-2375, Aug 1994.

Pasture Intake

The study measured the intake of pasture and total dry matter intake (DMI) in 16 high producing cows (68 lbs of 4% FCM/day) grazing grass pastures from April until October. Total daily DMI increased from 47 lbs (21.3 kg) in early spring to 49 lbs (22.4 kg) in late spring and then decreased as lactation progressed. DMI exceeded NRC recommendations during most of the grazing season. Daily pasture DMI varied with season, ranging from 26 lbs (11.6 kg) in the summer to 34 lbs (15.6 kg). Estimated NE(L) intakes were lower than NRC recommendations in early spring. During the grazing season, pasture ranged from 39 to 48% NDF and from 22 to 30% CP with 15 to 20% ruminally degradable protein on a dry matter basis. Grazing cows consumed adequate dry matter from pasture except in early spring. Although nutrient composition of pasture varied with season, quality remained high. "Estimation of Intake in High Producing Holstein Cows Grazing Grass Pasture." Holden, LA, et al, *Journal of Dairy Science* 77(8):2332-2340, Aug 1994.

Milk Fever

Most dairy cows experience some degree of hypocalcemia during the periparturient period. There are a group of dairy cows that experience a breakdown in their ability to maintain plasma calcium and, consequently, suffer, from severe hypocalcemia (milk fever). The precise metabolic lesions responsible for the onset of milk fever have not yet been defined. Research has shown that milk fever is not the result of inadequate production of calcitropic hormones (parathyroid hormone and 1,25-dihydroxyvitamin D), but rather is more likely a result of inadequate receptor numbers or receptor dysfunction in the target cell of these hormones. This report reviews vitamin D and calcium metabolism, giving emphasis to 1,25-dihydroxyvitamin D receptor regulation and function as related to the periparturient dairy cow. The report also focuses on providing insights into nutritional (anionic diets) and endocrine strategies that

have proved useful in milk fever management. "Calcium and Vitamin-D in the Dairy Cow." Horst, RL, et al, *Journal of Dairy Science* 77(7):1936-1951, Jul 1994.

Linseed Meal

This study evaluated the nutritive value of expeller linseed meal (ELM) and solvent linseed meal (SLM) as protein supplements for lactating dairy cows. Linseed meals contained 37.8 and 35.4% crude protein (CP); 22.6 and 25.9% neutral detergent fiber (NDF); and 12.9 and 7.1% crude fat for ELM and SLM, respectively. Ruminant escape of ELM protein was higher than for SLM protein. The proportion of ruminant escape protein for SLM was similar to soybean meal. Total tract CP digestibilities of SLM and ELM were similar. Results indicated that SLM did not have any deleterious effect on digestion of other components of the diet. SLM has the potential as a replacement for soybean meal in diets of dairy cattle. "Evaluation of Solvent and Expeller Linseed Meals as Protein Sources for Dairy Cattle." Khorasani, GR, et al, *Canadian Journal of Animal Science* 74(3):479-485, Sep 1994.

Heifer Growth

Six-month-old Holstein heifers were fed on a low-energy (LE) diet during the 4 months of summer, followed by a high-energy, high-protein diet for compensatory growth during the 2 months of autumn. During the same period a control group was fed a recommended diet, and had an average daily gain of 1.43 lbs/day (0.65 kg/d). During the LE phase, the mean daily gains in heart girth, body weight and hip height were 51-67% lower than those of the control group. During the compensatory phase, mean daily gains in body weight, hip height and heart girth group were 197-225% times greater than in the control group. By the end of the compensatory phase the experimental group had the same mean body weight as the control group, but the mean hip height of the heifers was 0.8 inches (2 cm) shorter. Puberty was attained by the experimental group one month later than in the control group, but at the same body weight. Milk production after calving was similar in the two groups.

"Effects of Low-Energy Diet Followed by a Compensatory Diet on Growth, Puberty and Milk Production in Dairy Heifers." Barash, H, et al, *Livestock Production Science* 39(3):263-268, Aug 1994.

Carotene Feeding

An experiment was conducted with 12 heifers to determine the effects of dietary carotene on plasma carotene concentrations (PCC). Pellets were fed with 500 mg added carotene/kg,

250 mg added carotene/kg, and 0 added carotene/kg. Blood samples were taken every 2-4 days and analyzed for PCC. The PCC levels reflected the carotene feeding levels. Nine heifers developed clinical signs of acidosis, and their PCC dropped to very low levels despite receiving pellets with added carotene. In conclusion, PCC reflected the carotene intakes of the heifers, and rumen acidosis may interfere with carotene absorption.

"Effects of Dietary Carotene Content on Mean Values and Rankings of Heifers for Plasma Carotene Concentrations." Knight, TW, et al, *New Zealand Journal of Agricultural Research* 37(2):159-165, 1994.

Vitamin E

Vitamin E is essential for a properly functioning immune system. Dairy cattle that receive suboptimal amounts of Vitamin E have increased incidence rates of mastitis and reproductive disorders. The amount of Vitamin E needed to maintain proper immune function is greater than the amount needed to prevent overt deficiency (i.e., white muscle disease), but the actual requirement has not been established. This report discusses methods of assessing Vitamin E adequacy with respect to immune function in dairy cattle.

"Use of alpha-tocopherol concentrations in blood components to assess vitamin E status of dairy cows." Weiss, WP, et al, *Agri-Practice* 15(7):5-8, Jul 1994.

Sweetness Preferred

A trial was conducted to test the effects of primary tastes on the preference of TMR diets by six early lactation (8-21 DIM) Holstein cows. Diets tasting sweet (sucrose, 1.5% of dietary DM), sour (HCl, 1.25%), bitter (urea, 1%), and salty (NaCl, 4%) were tested. Four of the cows preferred the sweet diet, and DMI of that diet averaged 13% more than for the control, which was next preferred. Another experiment tested were anise, monosodium glutamate, dehydrated alfalfa meal flavor, and molasses flavor. Control and monosodium glutamate were preferred. Of the additives tested, only sucrose seemed to have the potential to increase intake.

"Dietary Preferences in Early Lactation Cows as Affected by Primary Tastes and Some Common Feed Flavors." Nombekela, SW, et al, *Journal of Dairy Science* 77(8):2393-2399, Aug 1994.

MUN Levels

Milk urea concentration between 4.0 and 5.5 mmol/l should be regarded as normal when cows are fed conventional feedstuffs.

"The Influence of the Dietary Balance Between Energy and Protein on Milk Urea Concentration - Experimental Trials Assessed by 2 Different Protein Evaluation Systems." Carlsson, J and B Pehrson, *ACTA Veterinaria Scandinavica* 35(2):193-205, 1994.

Body Condition Scoring

This study evaluated the ability of observers to assess the body condition of dairy cows. Four observers independently assigned a body condition score (a five-point scale with .25 increments) and described the appearance of seven body regions of 225 Holstein cows. An absolute body condition score was designated for each cow based on the modal or mean body condition score for all observers. Descriptions of body regions were highly correlated across all absolute body condition scores. Analysis of the results indicated that body condition could be separated into .25 units between 2.5 and 4.0, inclusively. Below 2.5 and above 4.0, body condition could only be separated by .5 units. Distinct changes in specific body regions were associated with change in absolute body condition score. Observers agreed with the absolute score 58.1% of the time, deviating by .25 units 32.6% of the time.

"Principal descriptors of body condition score in Holstein cows." Ferguson, JD, et al, *Journal of Dairy Science* 77(9):2695-2703, Sep 1994. also: "Body Condition of Lactating Cows. 3. Discussion." Ferguson, J, et al, *Agri-Practice* 15(6):29-33, Jun 1994, and "A Computer-Based Body Condition Management System - Case Example." Hady, PJ, et al, *Compendium on Continuing Education for the Practicing Veterinarian* 16(10):1383, Oct 1994.

Additional References

"Feeding Broiler Litter to Beef Cattle." Pugh, DG, et al, *Veterinary Medicine* 89(7):661-664, Jul 1994. and "A Survey on the Incidence of Disease in Cattle Fed Broiler Litter." Pugh, DG, et al, *Veterinary Medicine* 89(7):665-667, Jul 1994.

"Forage quality and nutrition .1." Hutjens, M, et al, *Agri-Practice* 15(7):9-12, Jul 1994. and "Forage Quality and Nutrition. 2." Hutjens, M, et al, *Agri-Practice* 15(8):31-34, Sep 1994.

"Predicting Copper Status in Beef Cattle Using Serum Copper Concentrations." Vermunt, JJ, et al, *New Zealand Veterinary Journal* 42(5):194-195, Oct 1994.

"Effect of dietary copper, iron, and molybdenum on growth and copper status of beef cows and calves." Gengelbach, GP, et al, *Journal of Animal Science* 72(10):2722-2727, Oct 1994.

REPRODUCTION TOPICS

Cystic Ovaries

Cystic ovarian degeneration is a common reproductive problem in dairy cattle. The cause of this condition is multifactorial, and an understanding of follicular development is necessary to appreciate the mechanisms involved. The progression of a primordial follicle to an

antral follicle is characterized by proliferation of granulosa and thecal cells and accumulation of follicular fluid. Follicle-stimulating hormone and luteinizing hormone play a major role in the progression of these events. Follicular fluid contains components which suppress folliculogenesis such as inhibin and follistatin, and components which promote folliculogenesis such as activin. These components are influenced by the systemic levels of follicle-stimulating hormone. The ovaries produce oxytocin and angiotensin II but their role in folliculogenesis is unclear. It is hypothesized that oxytocin may induce contractility of the follicular wall during ovulation and may be released from the corpus luteum to stimulate release of uterine prostaglandins. Angiotensin II may enhance angiogenesis in developing follicles and corpora lutea. Most growing follicles never ovulate, but instead become atretic, due to decreased systemic levels of follicle-stimulating hormone. Derangements that occur during ovulation can contribute to the development of cystic ovarian condition in cattle. Impairment of the preovulatory surge of luteinizing hormone is widely accepted as a factor that leads to cystic ovarian condition and failure of estrogen to normally induce the surge of luteinizing hormone seems to contribute to this abnormality. The release of corticotropin and/or cortisol is also associated with cystic ovarian condition and may exert its effects through inhibition of the preovulatory surge of luteinizing hormone. Decreased release of gonadotropin-releasing hormone from the hypothalamus may contribute to the formation of ovarian cysts, but this defect has not been documented. Increased levels of follicle-stimulating hormone do not seem to be associated with the condition. An insufficient number of luteinizing hormone receptors in the ovary may lead to the formation of ovarian cysts. "Cystic Ovarian Condition in Cattle. 1. Folliculogenesis and Ovulation." Woolums, AR, et al, *Compendium on Continuing Education for the Practicing Veterinarian* 16(7):935, Jul 1994. and "Cystic Ovarian Condition in Cattle. 2. Pathogenesis and Treatment." Woolums, AR, et al, *Compendium on Continuing Education for the Practicing Veterinarian* 16(9):1247, Sep 1994.

Synchronization of Estrus with GnRH & PGF2-alpha

A GnRH analogue, buserelin, was used to synchronize ovarian follicular development prior to an injection of PGF2-alpha for the synchronization of estrus in lactating Holstein cows. On Day 12 (estrus = Day 0) of the experimental cycle, cows (n=8) were injected with 8 mug buserelin (BUS group), followed by 25 mg PGF2-alpha 7 days later (Day 19).

Control cows (n=7) received PGF2-alpha on Day 12 (PGF group). Ovaries were scanned daily and follicles studied. Between Days 12 and 16 of the cycle, the number of large follicles in PGF cows remained unchanged (1.2), whereas in the BUS group, the number of large follicles decreased from 1.3 on Day 12 to 0.5 on Day 15. Only 4 of 7 PGF cows ovulated a dominant follicle. In the BUS group, 7 of 8 cows ovulated a GnRH analogue induced dominant follicle that was first identified on Day 15. During the follicular phase, plasma progesterone declined in association with CL regression in both groups, and estradiol concentrations increased, reaching higher preovulatory peak concentration in BUS cows than in PGF cows (14.0 vs 10.4 pg/ml). On the day of estrus, the size of the ovulatory follicle (16 vs 13 mm) and the size difference between the ovulatory and second largest follicle (11 vs 6 mm) were both larger in BUS cows than in PGF-treated cows, suggesting a more potent dominance effect of the ovulatory follicle in the BUS cows. This study suggests that a GnRH analogue can alter follicular development prior to synchronization of estrus with an injection of PGF2-alpha in lactating dairy cows. A related study found that a buserelin-induced ovulation in all cows except those with progesterone concentrations > 8 ng/mL. The emergence and selection of a large growing follicle occurred in all buserelin treated cows within 6 days of treatment. This follicle became the preovulatory follicle following PGF-induced luteolysis.

"The effect of a GnRH analogue on the dynamics of follicular development and synchronization of estrus in lactating cyclic dairy cows." Wolfenson, D, et al, *Theriogenology* 42(4):633-644, Sep 1994. related study: "Influence corpus luteum and induced ovulation on ovarian follicular dynamics in postpartum cyclic cows treated with buserelin and cloprostenol." Twagiramungu, H, et al, *Journal of Animal Science* 72(7):1796-1805, Jul 1994.

2 Doses of PGF2-alpha

Lactating dairy cows (n=335) were used to determine the effect of PGF2-alpha or oxytocin given 8 hrs after treatment with a luteolytic dosage of PGF2-alpha on the percentage of cows exhibiting estrus within 7 days after treatment, and the pregnancy rate to a single insemination at this time. On the initial day of treatment (Day 0), cows with a palpable corpus luteum on the ovary were treated with 25 mg, IM of PGF2-alpha. At 8 hrs later, the cows were divided into 3 groups. Cows in Group 1 (n=112) were treated with oxytocin (0.33 IU/kg BW IM); cows in Group 2 (n=112) were treated with 25 mg, IM of PGF2-alpha; and cows in Group 3 (n=111) served as the un-

treated controls. Cows in all 3 groups were continuously observed for estrus visually or by way of an activated heatmount detector for 7 days after treatment, and were inseminated within 12 hrs of the observed estrus. Plasma progesterone (P4) concentration was determined on Day 0 and Day 2. Of the cows with P4 greater than 1 ng/ml on Day 0, the percentage of cows observed in estrus within 7 days after treatment was 75% for cows in group 1, 89% for cows in group 2 and 72% for cows in Group 3. When all cows were evaluated, the percentage of cows observed in estrus within 7 days after treatment was 60% for cows in group 1, 70% for cows in group 2 and 55% for cows in Group 3. In both instances, the value for cows in Group 2 was significantly higher than that for either cows in Group 1 or Group 3. The pregnancy rate for cows inseminated within 7 days was similar for cows in all 3 groups. The results of this study demonstrate that treatment of dairy cows with 2 luteolytic dosages of PGF2-alpha at an 8-hr interval resulted in more cows being observed in estrus within 7 days than with 1 PGF2-alpha treatment, or with oxytocin given at an 8-hr interval after a luteolytic dosage of PGF2-alpha.

"Effect of sequential treatment with prostaglandin F2 alpha and/or oxytocin on estrus and pregnancy rate of lactating dairy cows." Archbald, LF, et al, Theriogenology 42(5):773-780, Oct 1994.

RPs & Vit E

Possible relationships among dietary antioxidants, oxidative status, and placental retention were investigated in periparturient dairy cows. During 6 weeks prepartum, 16 cows each were given daily by capsule 1000 IU of vitamin E, 3 mg of Se, both vitamin E and Se, or neither (control). Alpha-tocopherol in serum and fast-acting antioxidants in plasma increased, but, in red blood cells, thiobarbituric acid-reactive substances decreased during the last 6 weeks before parturition in cows given vitamin E. These measurements were unaffected by supplementation of Se. Cows that had retained placenta ≥ 12 hrs had lower fast-acting antioxidants in plasma and glutathione peroxidase in red blood cells up to 2 wk before calving than did cows that shed their fetal membranes in < 12 hrs. Results suggest that inadequate dietary antioxidants may increase oxidative stress, production of lipid peroxides, and incidence of retained fetal membranes in dairy cows.

"Antioxidant status of dairy cows supplemented prepartum with vitamin E and selenium." Brzezinska-Stebodzinska, E, et al, Journal of Dairy Science 77(10):3087-3095, Oct 1994.

Dystocia & RP

A total of 445 Holstein cows that had experienced dystocia, retained fetal membrane, or both at parturition were used to determine the effects of GnRH, PGF2-alpha, or both on various reproductive measurements. Cows treated early postpartum with GnRH at 12 days postpartum or followed 14 days later with PGF2-alpha did not have improved reproductive performance. Cows treated with PGF2-alpha at 12 and 26 days postpartum had higher conception rates after first AI.

"Effect of hormonal treatment on fertility in dairy cows with dystocia or retained fetal membranes at parturition." Risco, CA, et al, Journal of Dairy Science 77(9):2562-2569, Sep 1994.

Postpartum Disorders

Postpartum ovarian activity, uterine involution and plasma concentrations of calcium and 15-keto-13,14 dihydro-prostaglandin F2 (PGFM) were assessed in dairy cows with retained fetal membranes (n=10) and milk fever (n=10) at parturition. In addition, calcium and PGFM were evaluated in dairy cows affected with uterine prolapse (n=10) and pyometra (n=14). Cows with retained fetal membrane averaged 24+/-4 days until their first postpartum ovulation, while controls averaged 29+/-4 days. Cows with milk fever had an average of 31+/-3 days until their first postpartum ovulation, while control cows had an average of 20+/-3 days. The mean diameter of the uterine horns in cows with milk fever was greater compared with that of the controls between Days 15-32 postpartum. Concentrations of plasma calcium were lower in cows with retained fetal membranes within 24 h after parturition and during the first week postpartum than in the controls (6.27 vs 7.40 mg/100ml). Concentration of calcium was lower in cows with milk fever prior to treatment (4.68 vs 5.8 mg/100ml) than in control cows; however, the calcium (Ca) level was not different during the subsequent 7 days postpartum after treatment. Cows with uterine prolapse had lower concentrations of Ca during the first 7 days postpartum than the controls (6.10 vs 7.33 mg/100ml). Cows with pyometra had higher concentrations of plasma PGFM than the controls (208 vs 138).

"Effects of calving-related disorders on prostaglandin, calcium, ovarian activity and uterine involution in postpartum dairy cows." Risco, CA, et al, Theriogenology 42(1):183-203, Jul 1994.

Reproductive Diseases

Interrelationships among parity, twinning, retained placenta, abortion, metritis, cystic ovaries, milk fever and postpartum reproductive events were investigated using 6565 lactation

records from a large commercial Holstein dairy herd in Mexico. The most important cause and effect relationships among the periparturient diseases were twinning causing retained placenta and retained placenta causing metritis. Most reproductive disorders and twinning increased the days from parturition to first estrus by 4.4 to 9.2 days, the days from parturition to conception by 14.3 to 21.4 days, the services per conception by 0.28 to 0.5 and the calving interval by 14.7 to 21.3 days.

"Associations between periparturient disorders and reproductive efficiency in Holstein cows in northern Mexico." Mellado, M, et al, Preventive Veterinary Medicine 19(3-4):203-212, Jun 1994.

Induced Parturition

Pretreatment with triamcinolone acetonide 7 days prior to induction of parturition with dexamethasone and cloprostenol resulted in a reduced incidence of retained placenta, apparently by advancing placental maturation.

"Induction of Parturition in Cattle - Effect of Triamcinolone Pretreatment on the Incidence of Retained Placenta." Nasser, LF, et al, Canadian Veterinary Journal 35(8):491-496, Aug 1994.

Estrous Behavior

During proestrus in the dairy cow, gonadotropins induce final follicular maturation, resulting in increased secretion of estradiol. Estradiol, in the relative absence of progesterone, acts on the hypothalamus to induce estrous behavior. The mean duration of estrus is 12 to 16 hrs and ranges from 3 to 28 hrs. The effects of estradiol appear to be "all or none". That is, once a threshold of estradiol is achieved, estrus is induced, and additional amounts of estradiol above threshold do not further enhance the estrous response (duration and intensity of estrus). Also, progesterone can block the estrus-inducing actions of estradiol. Prior exposure to progesterone does not potentiate the estrus-inducing actions of estradiol except in the early postpartum period. In dairy cows, the first postpartum ovulation is often "silent". In other words, ovulation is not preceded by estrous behavior. High levels of estradiol during late gestation apparently induce a refractory state such that the brain cannot respond to the estrus-inducing actions of estradiol at the first postpartum ovulation. Progesterone can "reset" the brain, allowing it to respond to subsequent estradiol exposure. In the case of the postpartum cow, the corpus luteum formed after the first ovulation provides the progesterone that resets the brain. As a consequence, the second postpartum ovulation is preceded by estrous behavior. Finally, stress has been shown to delay, shorten, or inhibit completely the expression of estrus.

"Endocrine and neural control of estrus in dairy cows." Allrich, RD, *Journal of Dairy Science* 77(9):2738-2744, Sep 1994.

Heat Detection Calculations

The ability to detect estrus accurately in cows and heifers influences the reproductive performance and profitability of dairy herds. Routine estimates of estrous detection are important to monitor reproduction in a herd. Heat detection efficiency is usually expressed as the percentage of possible estruses that were observed over a given time period. Eight methods of calculating heat detection efficiency using estrus and insemination dates are presented and reviewed in this report.

"Measuring efficiency and accuracy of detection of estrus." Heersche, G, et al, *Journal of Dairy Science* 77(9):2754-2761, Sep 1994.

Heat Detection

The single most important problem limiting high reproductive efficiency in the national dairy herd is poor detection of estrus. Failure to detect estrus or erroneous diagnosis of estrus results in an estimated annual loss of over \$300 million to the dairy industry in the US. New technologies for the solution of this problem must be more effective than visual observation and aids currently used to detect estrus. Ideally, technologies that provide the solution for detection problems should provide the following: continuous (24 h/d) surveillance of the cow, accurate and automatic identification of cows in estrus, operation for the productive lifetime of the cow, minimized labor requirements, and high accuracy in identifying the appropriate physiologic or behavioral events that correlate highly with ovulation. New approaches are aimed at providing automation of detection of estrus using electronic technology. Pedometry, implantable impedance sensors, and surface-applied and implantable pressure sensors are in various stages of development and use.

"The estrus detection problem: New concepts, technologies, and possibilities." Senger, PL, *Journal of Dairy Science* 77(9):2745-2753, Sep 1994.

Once Daily vs AM-PM AI

Nonreturn rates for professional technicians performing 7240 first AI Holstein cows were calculated to evaluate differences between once daily vs A.M.-P.M. AI.

	once daily	A.M.-P.M.
60-day NR rate	64.6%	65.6%
75-day NR rate	60.1%	60.6%
90-day NR rate	58.4%	57.8%

Nonreturn rate was highest, 63.4%, when cows were in standing estrus. Nonreturn rates were lowest, 36%, when cows were bred after

treatment with PGF₂-alpha, without being detected in estrus or bred strictly on veterinary advice based on palpation. Nonreturn rates were similar for different times of the day when once daily AI was practiced. However, AI in the midmorning may have some advantages. The highest nonreturn rate for a 3-hr period was 68.2% for 0800 and 1100 hr; the lowest was 54.7% for 1300 to 1600 hr. Once daily AI can be used effectively with no difference in conception rates from the traditional A.M.-P.M. system. The best results were obtained when AI was based on standing estrus and AI was performed between 0800 and 1100 hr.

"Timing of artificial insemination of dairy cows: Fixed time once daily versus morning and afternoon." Nebel, RL, et al, *Journal of Dairy Science* 77(10):3185-3191, Oct 1994.

BST & Reproduction

The reproductive performance of 156 cows treated with recombinant bST (Somavubove®) for two consecutive lactations was evaluated. Cows received daily intramuscular administration of 17.2, 51.6, and 86 mg of bST per cow starting at 70 days postpartum and ending at drying-off or culling. Breeding also began at 70 days postpartum. During the first lactation study, multiparous cows treated with bST had significantly decreased pregnancy rates, increased behavioral anestrus, increased anestrus confirmed by palpation, and significantly longer intervals from calving to conception. Treated primiparous cows in first lactation had shorter mean days to first standing estrus. In the second lactation study, cows treated with bST had an increased rate of delayed uterine involution, cystic ovarian condition, behavioral anestrus, and anestrus confirmed by palpation. Cows treated with 51.6 or 86 mg of bST during one lactation had longer intervals from calving to conception. Cows treated during the previous lactation, but not during the second lactation, had significantly shorter intervals from calving to conception. No differences were observed in progeny from the first lactation cows which were evaluated for rates of growth, morbidity, mortality, and for reproductive performance.

"Interval from calving to conception in high producing dairy cows treated with recombinant bovine somatotropin." Esteban, E, et al, *Journal of Dairy Science* 77(9):2549-2561, Sep 1994. and "Reproductive performance in high producing dairy cows treated with recombinant bovine somatotropin." Esteban, E, et al, *Journal of Dairy Science* 77(11):3371-3381, Nov 1994.

Luteal Cells

The transition of a preovulatory follicle into a corpus luteum is a complex process involving

many different mechanisms. Corpora lutea are a continuation of follicular maturation and form from granulosa and theca interna cells. In ruminant species the granulosa cells differentiate into the large luteal cells and the theca interna cells differentiate into the small luteal cells of the corpus luteum. Luteinization involves the transition of a preovulatory follicle into a highly vascular corpus luteum capable of secreting large quantities of progesterone. A related article reviews the literature on the different luteal cell types and their regulation in the mid-cycle corpus luteum of ruminants. Steroidogenesis in the ruminant corpus luteum manifests both dependence on and independence from the actions of LH. Initial luteinization, growth, and development of the corpus luteum is dependent on LH action, but progesterone production by the mid-cycle corpus luteum of ruminants is relatively independent of acute LH stimulation. This apparent enigma may be due to distinct functional properties of the two cell types in the corpus luteum. Progesterone production by the large luteal cells is relatively independent of LH action, but the small luteal cells respond to LH stimulation. Much of the progesterone produced by the mid-cycle corpus luteum is produced by the large luteal cells and is not dependent on LH stimulation.

"Mechanisms associated with corpus luteum development." Smith, MF, et al, *Journal of Animal Science* 72(7):1857-1872, Jul 1994. related article: "Cell types and hormonal mechanisms associated with mid-cycle corpus luteum function." Wiltbank, MC, *Journal of Animal Science* 72(7):1873-1883, Jul 1994.

Milk Yield & Reproductive Disorders

The association between milk yield and five reproductive disorders in 56,772 Finnish Ayrshire cows was evaluated. The 5 reproductive disorders studied and their incidences were: early metritis (2.4%), late metritis (1.1%), silent heat (5.4%), ovarian cyst (6.6%), and other infertility (2.1%). The risk of early metritis decreased with increasing 37-day milk yield. The risk of silent heat, ovarian cyst, and other infertility increased with increasing 60-day milk yield; 60-day milk yield had no effect on late metritis. The 305-day herd milk yield increased the risk of early metritis, ovarian cyst, and other infertility; it had no effect on late metritis or silent heat. Parity had an effect on all disorders, except late metritis.

"Effect of early lactation milk yield on reproductive disorders in dairy cows." Grohn, YT, et al, *American Journal of Veterinary Research* 55(11):1521-1528, Nov 1994.

Season & Yield Influence on Reproduction

Effects of season of calving and milk yield and their potential interaction on days from calving to last breeding were investigated in 2000 North Carolina Holstein cows that calved during 1989 and 1990. The interval from calving to last breeding ranged from 40 to 570 days. Compared with cows that calved in fall, cows that calved in summer were two-thirds as likely to become pregnant. Conversely, cows calving in winter or spring were more likely to become pregnant. Milk yields beyond approximately 17692 lbs (8025 kg) lowered the likelihood of pregnancy. The interaction of season and yield was nonsignificant, suggesting that these factors may act independently to affect reproduction. Lower pregnancy rates associated with high yield were detected earlier postpartum than were lower rates associated with calving in summer.

"Effects of Calving Season and Milk Yield on Pregnancy Risk and Income in North Carolina Holstein Cows." Farin, PW, et al, Journal of Dairy Science 77(7):1848-1855, Jul 1994.

Prostaglandin Use

A total of 228 clinically normal cows with a palpable corpus luteum at 20 to 40 days postpartum from one large dairy were used in a reproductive field trial. Half the cows were given PGF₂-alpha and half served as untreated controls. Subsequent reproductive performance was measured and compared for the two groups. PGF₂-alpha treatment reduced the median time to first breeding by 4.5 days from 57.0 to 52.5 days. The median time to conception was not significantly different between the treatment and control cows (87.0 vs 88.5 days). The conception rate by 110 days after parturition was not significantly different the two groups (64.7 vs 69.6%). Use of prostaglandin was associated with a significant decrease in conception rate at first breeding from 42.0 to 29.3%. The use of prostaglandin treatment in cows with a normal reproductive tract and a palpable corpus luteum at 25 days postpartum did not enhance the reproductive performance in this herd and thus is was not cost-effective.

"Effect of exogenous prostaglandin F-2 alpha in clinically normal postparturient dairy cows with a palpable corpus luteum." Gay, JM, et al, Journal of the American Veterinary Medical Association 205(6):870-873, Sep 15, 1994.

Prostaglandins Compared

Holstein cows (n=301) in a commercial free-stall dairy farm, were randomly assigned to 1 of 3 prostaglandin treatment groups or a pla-

cebo group. The prostaglandins were fenprostalene, dinoprost and cloprostenol. The treatments were administered between Days 24 and 31 postpartum. Double blind techniques were used in administering treatments and in assessing the response to treatment. Cows receiving fenprostalene, dinoprost or cloprostenol had a decreased calving-to-conception interval compared with that of the placebos. In the herd studied, treatment with any of the 3 commercially available prostaglandin products between Days 24 and 31 postpartum improved reproductive performance.

"Reproductive performance of dairy cows following treatment with fenprostalene, dinoprost, or cloprostenol between 24 and 31 days post partum: A field trial." Eitherington, WG, et al, Theriogenology 42(5):739-752, Oct 1994.

Milk Progesterone Test Program

This study evaluated the effectiveness of the cow-side ELISA milk progesterone test in improving postpartum reproductive performance. In a single dairy herd, 22 cows were evaluated by ELISA test every 7 days beginning on day 27 postpartum (treated group) and the remaining 20 cows served as controls. A sequence of 2 high progesterone tests and 1 low test indicated the cows were cycling normally. Cows that had low milk progesterone levels (<5 ng/ml) for 3 consecutive tests were assumed to have follicular cysts and were treated with 2 ml GnRH (Cystorelin®, 50 mug/ml). Cows that had 3 consecutive high tests (>5 ng/ml) were assumed to have persistent corpora lutea (CL) and were treated with 5 ml PGF₂-alpha (Lutalyse®, 5 mg/ml). Treated cows had higher pregnancy rates by Day 210 than the untreated controls (60 vs 40%). The days open were reduced for the treated animals by 42 days compared with the controls. The treated cows produced a net savings of \$70.42 per cow assuming a \$3.00 savings/day open.

"Use of cow-side progesterone tests to improve reproductive performance of high-producing dairy cows." Bajema, DH, et al, Theriogenology 42(5):765-771, Oct 1994.

Early Superovulation

Because cow ovaries do not contain a dominant follicle before Day 3 of the estrous cycle, the response to gonadotropin treatment early in the estrous cycle for inducing superovulation was investigated. Cows (n=16) were treated with FSH-P beginning on Day 2 of the estrous cycle and ovaries were examined on Day 5. All cows responded to gonadotropin treatment by exhibiting a large number (approximately 19) of estrogen-active follicles greater than or equal to 6 mm. A separate

group of cows received FSH-P treatment from Day 2 to Day 7, and fenprostalene treatment on Day 6, 11 of 15. These cows exhibited estrus and had a mean ovulation rate of 24. A third group of cows received an FSH-P treatment regimen either on Day 2 (n=14) or Day 10 (n=11) of the estrous cycle. Twelve of 14 Day-2 cows and all Day-10 cows exhibited estrus after fenprostalene treatment. Day-2 cows exhibited 34.3 +/- 7.0 ovulations, which was less than that exhibited by Day-10 cows (48.3 +/- 4.4). However, the proportion of embryos recovered per corpus luteum was about 2-fold greater for Day-2 cows than for Day-10 cows (0.49 vs 0.27). These data indicate that beginning gonadotropin treatment early in the estrous cycle, when a dominant follicle is not present, provides an efficacious means to induce growth of multiple follicles and superovulation in cows.

"Studies of FSH-P induced follicular growth in cows." Fricke, PM, et al, Theriogenology 42(1):43-53, Jul 1994.

Superovulation

To determine whether follicular development, superovulation and embryo production were affected by the absence or presence of a dominant follicle, cows were administered injections of FSH twice daily in the early (Days 2 to 6, estrus = Day 0) or middle stage (beginning on Day 10 or 11) of the estrous cycle. When early treated cows were compared with cows treated in the middle of the cycle, no differences were observed in the proportion of cows with > 2 ovulations (31 vs 20%), ovulation rate (26.0 vs 49.6), production of ova/embryos (13.3 vs 14.4), or the number of transferable embryos (8.0 vs 5.4). The proportion of the total number of embryos collected that were suitable for transfer was greater in cows treated early in the cycle (60%) than at midcycle (37.5%). These results demonstrate that superinduction of follicular development is highly consistent after FSH treatment at Days 2 to 6 of the cycle and that superovulation and embryo production are not less variable than when FSH is administered during the middle of the cycle. Superovulation in the early stage of the cycle may increase the proportion of embryos suitable for transfer.

"Follicular development and superovulation response in cows administered multiple FSH injections early in the estrous cycle." Roberts, AJ, et al, Theriogenology 42(6):917-929, Nov 1994.

Superovulating Beef Cows

A single, bolus subQ injection of 400 mg NIH-FSH-P1 of Follitropin-V was found to be as efficacious as the 4-day, twice daily IM treatment protocol for inducing superovulation in

beef cows. The amount of subcutaneous fat and site of injection appeared to affect the efficacy of the injection. A single bolus subQ injection of Folltropin-V behind the shoulder resulted in the most predictable superovulatory response.

"Superovulatory response to a single subcutaneous injection of Folltropin-V in beef cattle." Bo, GA, et al, *Theriogenology* 42(6): 963-975, Nov 1994. also: "Superovulation of beef cows and heifers with a single injection of FSH diluted in polyvinylpyrrolidone." Suzuki, T, et al, *Veterinary Record* 135(2):41-42, Jul 9, 1994.

Ultrasound

The use of ultrasonography in a bovine practice can be profitable to veterinarians and clients. Ultrasonography has effectively been used in diagnosing fetal gender, early pregnancy, early embryonic death, multiple pregnancies, and abnormal ovaries and uterus. Ultrasonography has also been used in donor management, recipient management, and transvaginal oocyte collection. Cattle producers are becoming more exposed to ultrasonographic technology and requesting this service from a skilled practitioner. Understanding and learning how to accurately use an ultrasound unit is time-consuming and requires a time commitment as well as an investment of a high-quality ultrasound unit.

"Clinical Applications of Bovine Reproductive Ultrasonography." Stroud, BK, *Compendium on Continuing Education for the Practicing Veterinarian* 16(8):1085, Aug 1994. also: "Clinical and Research Applications of Real-Time Ultrasonography in Bovine Reproduction - A Review." Rajamahendran, R, et al, *Canadian Veterinary Journal* 35(9): 563-572, Sep 1994.

Rompun®

The effects of xylazine (Rompun®) on early pregnancy in cattle were measured in 39 beef heifers during the first trimester of gestation. There was a decrease in fetal and maternal heart rate at 3 minutes after injection. The fetal heart rate returned to pretreatment values within 60 minutes, whereas maternal heart rate was still depressed at 120 min after treatment. Uterine contractility was markedly increased at 3 minutes after xylazine administration, but returned to normal within 120 min. The changes in uterine contractility and fetal heart rate caused by a single injection of 20 mg xylazine in heifers during the first trimester of gestation did not have any adverse effects on pregnancy.

"Effects of Xylazine on Early Bovine Pregnancy." Dobrinski, I, et al, *Animal Reproduction Science* 36(1-2):25-36, Jul 1994.

MGA Synchrony

Beef heifers (n=231) were fed 0.5 mg MGA/head/day for 14 days and given a 25 mg

injection of PGF2-alpha IM 17 days after the final day of MGA feeding. Heifers in the timed AI group were inseminated at 72 hrs after the prostaglandin injection independent of whether or not they were observed in estrus. Heifers in the AI by estrus group were inseminated 12 to 18 hrs after the onset of estrus. Three trials were done and the pregnancy rates are given in the table below.

Trial	timed AI	AI by estrus
1	29%	57%
2	37%	35%
3	61%	58%

The lower pregnancy rate of timed AI heifers in Trial 1 appeared to be due to the low degree of estrous synchrony in this trial. The results indicate that using timed insemination with the 14-day MGA-prostaglandin system will give similar synchronized pregnancy rates as inseminating by estrus when the degree of synchrony is high.

"Comparison of timed insemination with insemination at estrus following synchronization of estrus with a MGA-prostaglandin system in beef heifers." King, ME, et al, *Theriogenology* 42(1):79-88, Jul 1994.

MGA-PGF Synchronization

Yearling beef heifers (n=193) were used to evaluate reproductive performance following two MGA-PGF2-alpha synchronization plans. Both treatments were compared with an untreated control group. The 14-d MGA heifers were synchronized by feeding 0.5 mg MGA/h/d for 14 days. At 17 days after the last MGA feeding, these heifers were injected with PGF2-alpha (25 mg, IM). Heifers in the 7-d MGA treatment group were fed 0.5 mg MGA/h/d for 7 days and received a 25-mg, im injection of PGF2-alpha on the last day of the MGA feeding period.

	14-d MGA	7-d MGA	control
estrus response	75%	56%	17%
conception rate	65%	42%	45%
pregnancy rate	55%	32%	15%

The mean day of conception within the breeding season was 11.5 and 9.3 d shorter in the 14-d MGA heifers than in the 7-d MGA and control heifers, respectively. These results indicate that using the 14-d MGA system to synchronize estrus in beef heifers results in better reproductive performance than that attained in heifers synchronized with the 7-d MGA system or in control heifers.

"Comparison of two MGA-PGF(2)alpha systems for synchronization of estrus in beef heifers." Mauck, HS, et al, *Theriogenology* 42(6): 951-961, Nov 1994.

Gossypol Reduces Bull Fertility

Eight young reproductively normal bulls (age=20 months, Wt=1100 lbs (500 kg)), received either cottonseed meal delivering 8.2 g free gossypol/bull/day (treated bulls) or soybean meal (control bulls) for 12 weeks. Treated bulls did not differ from controls in scrotal circumference or the percentage of live spermatozoa. Sperm motility differed at Weeks 9, 10 and 11. Treated bulls had fewer normal spermatozoa at Weeks 5, 6 and 7 thru 11. Beginning from Week 3, treated bulls showed an increased proportion of sperm midpiece abnormalities which stabilized at 52 to 62.5% between Weeks 5 and 11. Treated bulls also had lower sperm production than untreated bulls, both on a daily and per gram testicular parenchyma basis. A cottonseed supplement providing 8.2 g of free gossypol per bull per day had adverse effects upon both sperm morphology and spermatogenesis in young bulls, with first evidence starting 3 to 4 weeks of cottonseed meal feeding.

"Effects of dietary gossypol on aspects of semen quality, sperm morphology and sperm production in young Brahman bulls." Chenoweth, PJ, et al, *Theriogenology* 42(1):1-13, Jul 1994.

Calf Viability

The time from birth to attaining sternal recumbency (T-SR) was recorded for 219 newborn calves in order to evaluate its use as a parameter for diagnosing vitality. Calves were defined as vital if they received routine care without medical treatment and survived seven days from birth without any illness (n=192). Ten calves were born spontaneously and the others were delivered either by caesarean section (n=105), normal extraction (n=78) or forced extraction (n=26). The mean T-SR values of the vital calves in these delivery groups were: 4.0, 4.5, 5.4 and 9.0 minutes, respectively. The forcefully extracted calves had longer T-SR, more serious acidosis, recovered more slowly from acidosis, died more, and exhibited trauma more frequently. A T-SR of at least 15 minutes had a predictive value of 84% non-vitality. It is concluded that T-SR determination is a valuable, practicable and objective diagnostic tool for estimating the condition of newborn calves during the first 15 minutes of life.

"The interval between birth and sternal recumbency as an objective measure of the vitality of newborn calves." Schuijt, G and MAM Taverne, *Veterinary Record* 135(5):111-115, Jul 30, 1994.

Red Clover Estrogens

The influence of phytoestrogens in red clover silage was studied in 3 ovariectomized dairy heifers fed 44 lbs (20 kg) of silage per heifer/

day for 14 days. Clinical effects of the red clover silage included edema and mucous discharge in the vulva, the presence of milky fluid in the mammary gland, increases in teat size and increases in the cross-sectional distance of the uterus. Fluid accumulation in the uterus, visualized by means of ultrasonography, had still not disappeared 30 days after the red clover silage had been completely withdrawn.

"Effects of Oestrogenic Silage on Some Clinical and Endocrinological Parameters in Ovariectomized Heifers." Nwannenna, AI, et al, *ACTA Veterinaria Scandinavica* 35(2):173-183, 1994.

Additional References

"Retrospective analysis of the management of 78 cases of postpartum metritis in the cow." Pugh, DG, et al, *Theriogenology* 42(3):455-463, Aug 1994.

"Relationships between administration of GnRH, body condition score and fertility in Holstein dairy cattle." Hewwieser, W, et al, *Theriogenology* 42(4):703-714, Sep 1994.

"Pregnancy attrition associated with pregnancy testing by rectal palpation." Thompson, JA, et al, *Journal of Dairy Science* 77(11):3382-3387, Nov 1994.

"The Relationship Between Estimates of Ovarian Size in Live Cattle and Subsequent Measurements Postmortem." Morris, CA, et al, *New Zealand Veterinary Journal* 42(5):185-186, Oct 1994.

"Neospora Abortion Storm in a Midwestern Dairy." Yaeger, MJ, et al, *Journal of Veterinary Diagnostic Investigation* 6(4):506-508, Oct 1994.

"Neospora-associated abortions in cattle." Soulsby, *Veterinary Record* 135(17):415, Oct 22, 1994.

"Neospora Abortion Epidemic in a Dairy Herd." Thornton, RN, et al, *New Zealand Veterinary Journal* 42(5):190-191, Oct 1994.

"Transmission of bovine viral diarrhoea virus by rectal examination." Langree, JR, et al, *Veterinary Record* 135(17):412-413, Oct 22, 1994.

"Conception rates. 1. Derivation and estimates for effects of estrus detection on cow profitability." Pecsok, SR, et al, *Journal of Dairy Science* 77(10):3008-3015, Oct 1994. and "Conception rates. 2. Economic value of unit differences in percentages of sire conception rates." Pecsok, SR, et al, *Journal of Dairy Science* 77(10):3016-3021, Oct 1994.

MASTITIS

Staph aureus Vaccines

No one procedure or product has been credited with being the answer for control of *Staphylococcus aureus* mastitis. However, it appears that the new *S. aureus* vaccines may be a useful tool in helping to control *S. aureus*

mastitis. The *S. aureus* bacterins have been effective as a preventive aid in keeping chronic *S. aureus*-infected cows at a minimum and lowering SCC in the herd.

"What About *Staphylococcus aureus* Vaccine - Review." Widel, PW, *Agri-Practice* 15(6):26-28, Jun 1994, and "Effect of whole *Staphylococcus aureus* and mode of immunization on bovine opsonizing antibodies to capsule." Guidry, AJ, et al, *Journal of Dairy Science* 77(10):2965-2974, Oct 1994.

Staph aureus Ecology

This study identified sources of *Staphylococcus aureus* on dairies to determine whether *S. aureus* colonization of heifer body sites increases the risk of *S. aureus* intramammary (IMI) at parturition. In herds with high (>10%) or low (<3%) prevalence of *S. aureus* IMI, *S. aureus* was isolated from heifer teat skin, heifer external orifices, housing, feedstuffs, humans, nonbovine animals, air, and equipment. Additionally, in herds with high prevalence, *S. aureus* was isolated from bedding, insects, and water. The predominant sources of *S. aureus* for both groups were other IMI and heifer body sites. Heifers with prepartum lacteal secretions with *S. aureus* were at greater risk of *S. aureus* IMI at parturition than were prepartum heifers with lacteal secretions that were negative for *S. aureus*. Heifers with teat skin colonized by *S. aureus* were 3.3 times more likely to have *S. aureus* IMI at parturition than were noncolonized heifers. Overall, 35% of 700 heifers were colonized with *S. aureus* on at least one body site. Although colonizations of most body sites appeared to be transient, a few heifers were colonized on the same site for 1 year. Persistently colonized heifers may represent the primary reservoirs of *S. aureus* for other heifers.

"Ecology of *Staphylococcus aureus* isolated from various sites on dairy farms." Roberson, JR, et al, *Journal of Dairy Science* 77(11):3354-3364, Nov 1994.

Existing IMI

The influence of pre-existing *Staphylococcus* spp. intramammary infection (IMI) on development of new IMI after experimental challenge with *Staphylococcus aureus* and *Streptococcus agalactiae* was studied. Percentage of new *Staph. aureus* IMI in uninfected quarters was 3-fold that of quarters already infected with *Staphylococcus* spp. Of quarters that were initially uninfected, 13.2% acquired new *Staph. aureus* IMI, and 4.5% of quarters infected with *Staphylococcus* spp. became infected. Conversely, the percentage of new *Strep. agalactiae* IMI in quarters infected with *Staphylococcus* spp. was 1.5-fold that of uninfected quarters (8.38 vs. 5.52%). The

percentage of clinical *Staph. aureus* IMI in uninfected quarters was higher than for quarters infected with *Staphylococcus* spp., but percentages of clinical *Strep. agalactiae* IMI were similar among IMI statuses. Somatic Cell Counts (SCC) prior to challenge were 87,000/ml for uninfected quarters and 260,000/ml for quarters infected with *Staphylococcus* spp. Quarters infected with *Staphylococcus* spp. were less susceptible to *Staph. aureus* IMI, but more susceptible to *Strep. agalactiae* IMI.

"Effect of naturally occurring coagulase-negative staphylococcal infections on experimental challenge with major mastitis pathogens." Nickerson, SC, et al, *Journal of Dairy Science* 77(9):2526-2536, Sep 1994.

IM OTC not for Staph aureus

To determine the efficacy of intramuscular oxytetracycline as a supplemental dry cow treatment for *Staphylococcus aureus* mastitis, 37 Holstein cows were randomly assigned to two treatment groups. Group 1 received an intramammary infusion of a commercial preparation of cephapirin benzathine at drying off (20 cows) and group 2 received an infusion of cephapirin benzathine at drying off plus intramuscular oxytetracycline at 11 mg/kg once daily on days 7, 8, 9, and 10 after drying off (17 cows). The rate of cure by 30 days after calving for infected quarters was 29% for systemic oxytetracycline (in combination with cephapirin treatment) and 28% for the cephapirin treatment only. Cure rates at 60 days after calving were 21% and 23%, respectively, for combination therapy and cephapirin therapy only. Systemic oxytetracycline, in combination with intramammary dry cow treatment, did not improve the rate of cure for *S. aureus* mastitis.

"Efficacy of intramuscular oxytetracycline as a dry cow treatment for *Staphylococcus aureus* mastitis." Erskine, RJ, et al, *Journal of Dairy Science* 77(11):3347-3353, Nov 1994.

Cephapirin Treatment

Intramammary infusion of a dry-cow antibiotic preparation containing 300 mg of cephapirin benzathine into 18 Jersey heifers, 10-12 weeks prepartum, resulted in cure rates of 100% (4/4) for *Streptococcus* species, 96% (24/25) for *Staphylococcus aureus*, and 90% (28/31) for *Staphylococcus* species. Dry-cow cephapirin benzathine was detectable in 94% of treated quarters at 1 week after infusion, in 80% after 2 weeks, in 68% after 3 weeks, and in 61% after 4 weeks. At parturition, 24% of treated quarters were positive for antibiotic, however, no quarters remained positive for antibiotic at 5 days postpartum. Cure rates of intramammary infections (IMI) that had been

treated with a lactating-cow therapy containing 200 mg cephapirin benzathine at parturition were 100% (22/22) for *Streptococcus* species, 62.5% (15/24) for *Staphylococcus aureus*, and 100% (3/3) for *Staphylococcus* species.

"Prepartum Antibiotic Therapy with a Cephapirin Dry-Cow Product Against Naturally Occurring Intramammary Infections in Heifers." Owens, WE, et al, *Journal of Veterinary Medicine Series B - Infectious Diseases Immunobiology Food Hygiene Public Health* 41(2):90-100, Apr 1994.

Pili Shield®

The efficacy of a commercial *Escherichia coli* bacterin (Bovine Pili Shield®, Grand Labs) in controlling coliform mastitis after *E. coli* challenge was evaluated in 39 pregnant Holstein heifers. Results indicated that vaccination of cows with this bacterin was effective in reducing the clinical signs of *E. coli*-induced mastitis. This reduction suggests that vaccination can be economically significant.

"Efficacy of an *Escherichia coli* Bacterin for the Control of Coliform Mastitis in Dairy Cows." Clark, P, et al, *Agri-Practice* 15(6):19-25, Jun 1994.

Salm Vaccine Against Coliform Mastitis

A total of 646 Holstein cows from two Arizona dairies were vaccinated injected during the third trimester of pregnancy with an Re-17 mutant *S. typhimurium* bacterin vaccine, and compared with 646 nonvaccinated control cows in the same dairies. Vaccinated cows had significantly fewer clinical cases of coliform mastitis with positive coliform cultures and had lower culling rate from coliform mastitis than control cows during the first 5 mo of lactation. During the same period, the mortality rate from clinical coliform mastitis was 75% less in the vaccinated clinical coliform mastitic group than in the control group. Incidence of mastitis increased with advancing parity. The Re-17 mutant *Salmonella typhimurium* bacterin toxoid provided cross-protection against coliform mastitis and the incidence and severity of clinical coliform mastitis were significantly lowered during the first 5 months of lactation.

"Effect of Re-17 Mutant *Salmonella typhimurium* Bacterin Toxoid on Clinical Coliform Mastitis." McClure, AM, et al, *Journal of Dairy Science* 77(8):2272-2280, Aug 1994.

Quarter Milking

Compensatory changes in daily milk production between quarters within an udder were investigated. Two quarters per cow were left un milked for 2 days (Group 1, n=4) or for 4 days (Group 2, n=4), and then all quarters of

all cows were milked twice daily for the next 16 days. The milk yield per cow fell 50% during the period of milking two quarters. Milk yield for cows in Group 1 decreased significantly only during the treatment period and the first 4 days post-treatment, whereas the milk yield for Group 2 was significantly reduced during the entire post-treatment period. The cell count for all continuously milked (control) quarters was stable during the experiment, but increased in the treated quarters during the first 4 days of the post-treatment period.

"Effects on milk yield, somatic cell count and milk conductivity of short-term non-milking of lactating quarters of cows." Hamann, J, and P. Gyodi, *Journal of Dairy Research* 61(3):317-322, Aug 1994.

SCC

Inflammation of the mammary gland that results from the introduction and multiplication of pathogenic microorganisms in the mammary gland is a complex series of events leading to reduced synthetic activity, compositional changes, and elevated SCC. Because the elevation of SCC is a response to an insult to the mammary gland and is modulated by inflammatory mediators, the major factor influencing SCC is infection status. The effects of stage of lactation, age, season, and various stresses on SCC are minor if the gland is uninfected. Except for normal diurnal variation, few factors other than infection status have a significant impact on milk SCC.

"Physiology of Mastitis and Factors Affecting Somatic Cell Counts." Harmon, RJ, *Journal of Dairy Science* 77(7):2103-2112, Jul 1994.

Genetics of SCC

Genetic selection for increased milk yield may be accompanied by increases in susceptibility to clinical mastitis and somatic cell counts. Selection against high somatic cell scores should decrease the incidence of clinical mastitis and provide direct economic benefits through higher milk quality premiums. Genetic evaluation for linear somatic cell scores has been implemented by USDA and parallels that for yield traits. Approximately 80% of all DHIA cows currently have somatic cell records. Because genetics account for only about 10% of differences in somatic cell scores among cows, reliabilities of somatic cell evaluations are smaller than those for yield traits. Current progeny test designs will produce lower reliabilities for somatic cell score evaluations than for milk yield because of lower heritability. Greater emphasis on somatic cell scores would tend to decrease the genetic gain in yield traits, which are economically more

important. However, in a related study, results indicate that selection for improved udder conformation will reduce the increase in SCC and clinical mastitis associated with selection for production.

"Genetic Evaluation of Somatic Cell Scores for United-States Dairy Cattle." Schutz, MM, *Journal of Dairy Science* 77(7):2113-2129, Jul 1994. and "Using Somatic Cell Score Evaluations for Management Decisions." Cassell, BG, *Journal of Dairy Science* 77(7):2130-2136, Jul 1994. related study: "Genetic Relationships Between Clinical Mastitis, Somatic Cell Count, and Udder Conformation in Danish Holsteins." Lund, T, et al, *Livestock Production Science* 39(3):243-251, Aug 1994.

Once a Day Milking

Six pairs of monozygous Friesian twin cows during late lactation were used to assess the effect of once daily milking and bST treatment on milk yield. For 7 days all cows were milked twice daily; on day 8 through 21, all cows were milked once daily, but one cow of each twin pair was treated daily with 20 mg of bST on day 13 through 21; and, finally, during day 22 through 28, all cows were again milked twice daily. Once daily milking resulted in a small (7%) but significant decrease in milk yield. Treatment with bST increased milk yield by 19%, thereby exceeding the milk yield loss from once daily milking.

"Effect of once daily milking and concurrent somatotropin on mammary tight junction permeability and yield of cows." Stelwagen, K, et al, *Journal of Dairy Science* 77(10):2994-3001, Oct 1994.

Oxytocin & Milk Out

Oxytocin levels and milk removal from the mammary gland were studied in 23 dairy cows. Exogenous oxytocin was injected IV before milking and 49% of the total milk was removed. When plasma oxytocin decreased, milk flow stopped. A second injection of oxytocin removed 30% of the milk, and a third injection removed 7% of the milk. The remaining milk was removed with a final large dose of oxytocin. If oxytocin was continuously infused during milking, milk flow lasted until the udder was completely emptied. This study found that continuously elevated oxytocin concentrations such as those during infusion or during normal milking are necessary for complete milk removal.

"Continuously elevated concentrations of oxytocin during milking are necessary for complete milk removal in dairy cows." Bruckmaier, RM, et al, *Journal of Dairy Research* 61(3):323-334, Aug 1994.

Chlorhexidine PreDip

A 15 month study was conducted to evaluate a 0.35% chlorhexidine teat dip as a premilking teat disinfectant. Predipping was compared with a negative control using a split-udder

experimental design and based on a reduction of naturally occurring new intramammary infections. All teats were dipped after milking with the same 0.35% chlorhexidine teat dip. Most new major pathogen intramammary infections were caused by *Streptococcus* species, primarily *Streptococcus uberis* and *Streptococcus equinus* and gram-negative bacteria, primarily *Escherichia coli*. Percentage of quarters newly infected by major mastitis pathogens was 31% lower in quarters with teats predipped and postdipped in chlorhexidine than in quarters with teats postdipped only. New infections by coagulase-negative *Staphylococcus* species were significantly lower in quarters with teats predipped and postdipped than in mammary glands with teats postdipped only. When all mastitis pathogens were combined, percentage of quarters newly infected by major and minor mastitis pathogens was significantly lower in the predipped and postdipped group than in the postdipped only group. No differences in incidence of clinical mastitis between treatment groups were observed. No chapping or irritation of teats was observed and no adverse effects were detected using chlorhexidine as a premilking and postmilking teat disinfectant. Results of this study suggest that premilking teat disinfection with chlorhexidine in association with good udder preparation and postmilking teat disinfection can reduce the occurrence of new intramammary infections.

"Evaluation of Chlorhexidine as a Premilking Teat Disinfectant for the Prevention of Intramammary Infections During Lactation." Oliver, SP, et al, *Journal of Food Protection* 57(7):614-618, Jul 1994.

Blot-Dry vs Ointment

A study was conducted to determine whether postmilking teat treatment with ointment before exposure to cold and wind resulted in better skin health than standard teat dip. Teat treatments tested were 1% iodine and 10% glycerin teat dip, 1% chloroxylenol ointment, .3% 8-hydroxyquinoline sulfate ointment, and no treatment (control). A broth culture of *Staphylococcus aureus* was applied once to teats after chapping was established. Treatments were applied after milking for 11 days following *S. aureus* application. Ointment and control teats had significantly better skin condition than teats treated with Iodine teat dip. Colonization of *S. aureus* was greatest on ointment treated teats. A second part of the study was conducted to determine whether teat condition of cows receiving postmilking Iodine solution treatments would be improved if teats were blotted dry before exposure to wind and cold ambient conditions. Two mam-

mary quarters of each cow received the Iodine solution treatment, but teats were blotted dry prior to exit from the milking parlor. The teat condition scores were similar to the ointment and control teats in the first study. Results of these studies indicate a possible disadvantage to treating teats with ointments after milking, as evidenced by increased *S. aureus* colonization. The best postmilking teat treatment prior to exposure to cold, windy conditions may be blot-drying teats after disinfectant solution application.

"Staphylococcus aureus Colonization of Teat Skin as Affected by Postmilking Teat Treatment When Exposed to Cold and Windy Conditions." Fox, LK and RJ Norell, *Journal of Dairy Science* 77(8):2281-2288, Aug 1994.

UDDERgold® Teat Dip

Two postmilking teat dips were tested for efficacy against *Staphylococcus aureus* and *Streptococcus agalactiae* using experimental challenge procedures recommended by the National Mastitis Council. Both dips contained chlorous acid as the primary germicidal agent (UDDERgold®, Alcide) and lactic acid or mandelic acid as the chlorous acid activator. The dip activated with mandelic acid significantly reduced new intramammary infections (IMI) by *Staph. aureus* and *Strep. agalactiae*. The IMI rate was reduced 69% for *Staph. aureus* and 56% for *Strep. agalactiae*. The dip activated with lactic acid significantly reduced new *Staph. aureus* IMI by 69% but did not significantly reduce new *Strep. agalactiae* IMI (35% reduction) through the full 11-wk study period. Teat skin condition did not change from pretrial status after using either teat dip during the study.

"Efficacy of two barrier teat dips containing chlorous acid germicides against experimental challenge with Staphylococcus aureus and Streptococcus agalactiae." Boddie, RL, et al, *Journal of Dairy Science* 77(10):3192-3197, Oct 1994.

BST & Mastitis

Effect of bovine somatotropin (somatotribove) on mastitis in 15 full lactation trials (914 cows) in Europe and the US and 70 short-term studies (2697 cows) in eight countries was investigated. In full lactation studies, somatotribove (500 mg/2 wk) was given for 252 days, commencing 60 days postpartum. Although herds varied considerably, incidence of clinical mastitis within a herd was similar for control cows and cows receiving somatotribove treatments. Relative risk analyses indicated no treatment effect, and percentage of mastitis during treatment was similar for control and somatotribove groups. A positive linear relationship existed between peak milk yield and mastitis incidence and somatotribove treat-

ment did not alter this relationship. Increases in mastitis related to milk yield increase from somatotribove or related to genetic selection were similar. Overall these studies represented a wide range of research and commercial situations demonstrating that somatotribove had no effect on incidence of clinical mastitis during the lactation of treatment. Furthermore, somatotribove did not alter typical relationships between milk yield or herd factors and incidence of clinical mastitis.

"Clinical Mastitis in Cows Treated with Somatotribove (Recombinant Bovine Somatotropin) and Its Relationship to Milk Yield." White, TC, et al, *Journal of Dairy Science* 77(8):2249-2260, Aug 1994. also: *"The Effects of a Sustained-Release Recombinant Bovine Somatotropin (Somidobove) on Udder Health for a Full Lactation."* McClary, DG, et al, *Journal of Dairy Science* 77(8):2261-2271, Aug 1994. and *"An international perspective on bovine somatotropin and clinical mastitis - Forum."* Willeberg, P, *Journal of the American Veterinary Medical Association* 205(4):538-541, Aug 15, 1994.

Bovine Herpes Mammillitis

One hundred and fourteen single serum samples and 49 paired serum samples, collected during 19 outbreaks of bovine herpes mammillitis (BHM), were examined for neutralizing antibodies to bovine herpesvirus-2 (BHV-2). High antibody titers were detected in 78% of the single samples. Antibody was present in all samples collected from 10 outbreaks. Much higher antibody titers were detected in cattle with BHM compared to their unaffected herd-mates. Examination of the paired serum samples demonstrated that antibody titers had already peaked at the time of first sampling, and that titers declined quickly. The results demonstrate that a clinical diagnosis of BHM can be confirmed by the detection of high antibody titers to BHV-2 in the vast majority of cases.

"Serological Investigation of 19 Outbreaks of Bovine Herpes Mammillitis." O'Connor, M, et al, *Irish Veterinary Journal* 47(4):168-170, Aug 1994.

Additional References

"Bovine Mammary Gland - Structure and Function - Relationship to Milk Production and Immunity to Mastitis - Review." Nickerson, SC, *Agri-Practice* 15(6):8, Jun 1994.

"Recent Progress in Treatment and Control of Mastitis in Cattle." Kirk, JH, et al, *Journal of the American Veterinary Medical Association* 204(8):1152-1158, Apr 15, 1994.

"Modeling the Impact of Mastitis on Milk Production by Dairy Cows." Lescourret, F and JB Coulon, *Journal of Dairy Science* 77(8):2289-2301, Jul 1994.

"Efficacy of dry cow therapy and a Propionibacterium acnes product in herds with low somatic cell count." Hogan, JS, et al, *Journal of Dairy Science* 77(11):3331-3337, Nov 1994.

DRUG THERAPY AND RESIDUES

Clenbuterol: Uses And Abuses

A lot of press has been given to the drug clenbuterol in the last year. What is this drug and what is the issue? What can you tell your clients about the ramification of the use of this drug?

The Drug—Clenbuterol is a beta-2-adrenoceptor agonist. Its primary action is in relaxing smooth muscle; e.g. uterine, bronchial. It also has anabolic effects and has been named a "repartitioning" agent. It can mobilize energy substrates by increasing fat breakdown (lipolysis) and can down-regulate lipogenesis while promoting muscle growth.

The Issue—Some producers of veal, beef, and lamb, and owners of show lambs and cattle (including 4-H) have used this drug to improve gain and muscling of their animals, like an anabolic steroid. The dose to induce the anabolic effects is 5 to 10 times higher than doses used for therapy of bronchial diseases. The drug is illegal in the US; and if meat is tainted with its residues, people eating this meat can develop immediate and severe flu-like reactions, sometimes requiring hospitalization.

In Spain, 135 people were hospitalized within 1 to 6 hours after eating liver tainted with clenbuterol. They developed cardiac arrhythmias, accelerated heart rates, and muscle tremors in addition to flu-like symptoms. In 1990, 22 people in France were poisoned by clenbuterol-contaminated veal liver. They had symptoms including tremor, headache, tachycardia, dizziness, and palpitations. In a few people, muscle pains developed. The signs occurred 1 to 3 hours after consuming the liver and resolved within 2 to 3 days. The use of this drug is apparently widespread in the veal industry in Europe, although illegal in most countries for use in food animals.

Last year in Ohio, use of clenbuterol in fair animals was discovered. At the Tulsa State Fair in Oklahoma, 6/38 animals tested were positive for clenbuterol. The grand champion and reserve champion steers at the Denver show were also positive. Recently, the drug has been smuggled into the US from the Netherlands for use in veal and lambs. Anecdotal information leads us to believe that the use is fairly widespread throughout the US, particularly for show animals.

This issue is not a new one, the USDA:FSIS announced in 1991 that meat which tests positive for clenbuterol would be condemned.

FDA is already alerting customs officials about illegal importation and was taking steps to investigate the distribution, sale, and use of the drug. Why is this illegal drug still an issue? Prizes for winners at shows as well as commercial uses and lack of large-scale testing may have led to more widespread use.

Use in Veterinary Medicine—Clenbuterol is not approved for any use in the US and is not approved for use in cattle in Canada. In Europe, the drug has been used as a bronchodilator in horses and in cases of obstructive pulmonary disease. In 1989, it was legal to use it in veal calves in the Netherlands for a maximum of 14 days for "clinical indications of respiratory disease." At certain dosages, it can increase muscle mass and decrease fat deposition and has been given orally for this purpose. The economics of the grading system in the European Union rewards lean carcasses and provides an incentive to use clenbuterol illegally.

Clenbuterol's smooth muscle relaxant effect has been used as an aid in bovine dystocias when manual correction was necessary by reducing myometrial activity. It has also been used in cases of equine uterine torsions. An experiment in Japan showed that the drug was effective at eliminating night-time calving and lowering incidences of dystocia and retained placenta in treated cows.

There may be some negative effects on animals treated with clenbuterol. If fed to increase muscle mass, it can actually have a negative influence on body growth and feed efficiency if the animals are fed low protein diets. Side effects such as tachycardia, vasodilation, and muscle tremor have been seen in calves after an anabolic dose was given. When fed to cattle over a period of two days, the drug caused the heart rate to increase by 92 to 117 percent. When fed to veal calves in milk replacer, use was associated with higher liver condemnations due to abscesses and hepatitis. In an experiment with gilts fed 1 ppm clenbuterol for 40 days, the treated animals developed cystic ovaries, had uterine atrophy, and a reduction in progesterone concentrations. This suggested a change in the hormonal activity of treated animals. When given to sexually vigorous male rats, clenbuterol reduced sexual activity; but when given to sexually sluggish rats, it resulted in increased activity.

Use in Human Medicine—Beta 2-adrenoceptor agonists, like clenbuterol, have use in human medicine as bronchodilators, to relax bronchial smooth muscle and for treatment of bronchial spasm. It may also suppress the

release of leukotrienes and histamine from lung mast cells and may enhance mucociliary function. Clenbuterol has been used in human patients with chronic productive cough, asthma, and chronic obstructive pulmonary disease. It can be administered subcutaneously, via inhalation, or orally and is readily absorbed.

Current research is focussed on its use, and the use of a similar drug—salbutamol (albuterol), to reduce or restore skeletal muscle losses in catabolic states, such as during clinical hyperthyroidism. There may even be a potential use in certain orthopedic conditions where muscle-wasting is an issue.

Clenbuterol is abused not only by some animal-owners but also by some athletes. Some body-builders use this drug to increase muscle mass; and if abused, the individuals may present to a physician with heart palpitations. Adverse side effects may occur even with therapeutic doses and include contact dermatitis, restlessness, skeletal muscle tremors, apprehension, anxiety, and tachycardia. Large doses given to lab animals have resulted in myocardial necrosis.

FDA/USDA Response—The FDA has declared that use of clenbuterol is illegal in the US and has set a zero tolerance. The FDA is very concerned about the use of this drug and is currently working on cases for prosecution. Testing for clenbuterol has relied on detecting residues from body fluids or tissues. Depending on the dose, residues in the liver have been detected up to 56 days after the last feeding of clenbuterol. Analysis of retinal extracts extends the detection time beyond the time it can be detected in liver, urine or bile. This sample source is currently approved and advocated by the FDA. Analyses include ELISA and gas chromatography/mass spectrometry.

The Bottom Line—Clenbuterol is illegal and poses a significant health risk to the consuming public. Show officials and judges, animal owners and producers should be made aware of this issue. Veterinarians can make their clients aware and help them avoid contaminating the food supply and risking prosecution.

"Clenbuterol: Uses and Abuses." Moore, DA, Pennsylvania State University - Herd Health Memo, p. 2, May 1995, and "Clenbuterol Use - A Growing Problem?" University of Kentucky - Herd Health Memo, 1994-1995, No. 11, p. 108.

Micotil® for Calf Pneumonia

A total of 63 calves that were diagnosed with a chronic or subacute bronchopneumonia were either treated once with Tilmicosin (Micotil®) or received five daily treatments with

enrofloxacin (Baytril®) or procaine penicillin G-dihydrostreptomycin. The single administration of Tilmicosin was found to be as effective as repeated treatment with enrofloxacin or penicillin-dihydrostreptomycin.

"Treatment of Chronic Bronchopneumonia in Calves with the Macrolid Antibiotic Tilmicosin (Micotil®)." Winter, T, et al, *Praktische Tierarzt* 75(4):302, Apr 1, 1994.

Micotil® Toxicity

Tilmicosin (Micotil®) is a new veterinary antibiotic that has significant cardiovascular toxicity when administered in large doses. Over 30 months there were 36 cases of accidental human exposure to Micotil® reported in Toronto. Analysis of the cases revealed that 75% of the patients were exposed to probably less than 1 ml of tilmicosin, that 72% of exposures resulted from needle punctures, and that local symptoms predominated. Based on the information gathered, it is recommended that patients with accidental exposures of less than 1 ml of tilmicosin be treated symptomatically and do not need to be evaluated in a hospital setting.

"Human Exposures to Tilmicosin (Micotil®)." McGuigan, MA, *Veterinary and Human Toxicology* 36(4):306-308, Aug 1994.

Additional References

"Effects of xylazine on humans: A review." Fyffe, JJ, *Australian Veterinary Journal* 71(9):294-295, Sep 1994.

"Problems associated with compounding in dairy practice." Ferry, JW, *Journal of the American Veterinary Medical Association* 205(2):285-286, Jul 15, 1994.

CALVES

Bypass Protein for Young Calves

Three feeding trials, two with calves and one with yearlings, were conducted to evaluate supplementing dry rolled corn-based diets with either urea or a combination of urea and bypass protein. The results indicate that young (7-10 months of age) calves may gain faster and more efficiently when supplemented with a combination of bypass protein and urea compared with urea alone. Urea supplementation alone is adequate for rapidly gaining yearling cattle.

"Urea vs Urea and Escape Protein for Finishing Calves and Yearlings." Sindt, MH, et al, *Animal Feed Science and Technology* 49(1-2):103-117, Sep 1994.

UIP in Heifers

Thirty-five 3-month-old 331 lbs (150 kg) Holstein heifers were fed diets containing two nonstructural carbohydrate sources (corn or barley) with two quantities of undegradable

protein (soybean meal or extruded soybean meal) for 9 weeks to evaluate the NRC guidelines. The results from this study suggest that the current NRC recommendations of 50% undegraded intake protein (UIP) for 3-6 month old dairy heifers are too high, and that diets containing 35 to 40% undegraded intake protein should be sufficient for this age animal.

"Nonstructural carbohydrate and undegradable protein sources in the diet: Growth responses of dairy heifers." Casper, DP, et al, *Journal of Dairy Science* 77(9):2595-2604, Sep 1994.

Calf Starter Protein Level

Holstein calves (n = 110) were fed calf starters containing 15, 16.8, 19.6, or 22.4% crude protein from day 4 to 56. Prewaning daily gain tended to increase as the protein content of the starters increased. After weaning, calves fed the 19.6% CP starter gained the most. Throughout the experiment, starter consumption tended to increase as CP content of diet increased. Under these conditions, maximum growth was supported by the 19.6% CP starter and no advantage was gained from the higher (22.4%) protein content. Calf growth was moderate when calf starters of lower protein contents (15% or 16.8%) were fed.

"Evaluation of Calf Starters Containing Different Amounts of Crude Protein for Growth of Holstein Calves." Akayezu, JM, et al, *Journal of Dairy Science* 77(7):1882-1889, Jul 1994.

Half the Calves have Crypto

Fecal samples from 7,369 calves on 1,103 farms were examined for cryptosporidia in a nationwide US survey. Cryptosporidium oocysts were found in calves from 652 (59%) of the farms and in 1,648 (22%) of the tested calves. Almost half the calves between 7 and 21 days of age had cryptosporidia in their fecal samples. Prevalence was highest during the summer. Farms with multiple-cow maternity facilities and farms with more than 100 milking cows were the most likely to have calves with cryptosporidia.

"Potential risk factors for Cryptosporidium infection in dairy calves." Garber, LP, et al, *Journal of the American Veterinary Medical Association* 205(1):87-91, Jul 1, 1994.

Overwintered Coccidia oocysts

Twelve calves were placed on the pasture and closely studied to determine the cause of diarrhea which developed shortly after turn-out. Eight days after the animals were turned out there was an almost 1000-fold increase in the numbers of *Eimeria alabamensis* oocysts in the feces. The source of this coccidial infection was found to be oocysts which had overwintered on the pastured. Most of the calves developed watery diarrhea 5 days after turn-

out, and lost 18 kg (40 lbs) of weight during the first 24 days on pasture. In a related study, 12 calves were inoculated with *Eimeria alabamensis*. The prepatent period was found to be 6-8 days, and the period during which large numbers of oocysts were excreted was 2-7 days. Two of the inoculated calves had slight softening of the feces was observed while the other ten calves developed watery diarrhea, had a poor appetite and appeared depressed. The growth rates of the infected calves were significantly reduced for 18 days, and at 71 days after infection they had not compensated for this period of reduced growth rate.

"*Eimeria alabamensis* Infection as a Cause of Diarrhoea in Calves at Pasture." Svensson, C, et al, *Veterinary Parasitology* 53(1-2): 33-43, May 1994. related study: "Experimental *Eimeria alabamensis* Infection in Calves." Hooshmandrad, P, et al, *Veterinary Parasitology* 53(1-2):23-32, May 1994.

Diarrhea in Veal Calves

Observations were made on development of diarrhea in 460 veal calves on 8 commercial farms during 2 successive 16-week production cycles. A total of 23% of the calves were affected with diarrhea with the peak number occurring during the first week. Enteropathogens were identified in 86% of these calves with the most common being cryptosporidia, coronavirus, and rotavirus. Identified potential zoonotic pathogens included *Giardia* and *Salmonella* spp and verotoxigenic *Escherichia coli*. Noncytopathic bovine viral diarrhea virus was isolated from 6 calves that had repeated bouts of illness. Only 22% of calves entering the veal facilities had adequate transfer of passive immunity. Calves with diarrhea had lower serum IgG concentration than healthy calves. All six calves that died during the first 4 weeks of production had complete failure of transfer of passive immunity.

"Enteric pathogens in intensively reared veal calves." McDonough, SP, et al, *American Journal of Veterinary Research* 55(11):1516-1520, Nov 1994.

Enteric Pathogens

Neonatal Jersey calves (n = 96) were used to evaluate the effects of housing (individual hutches vs wooden pens) and colostrum feeding (calves separated from the dam and fed 2 L of colostrum vs calves allowed to nurse the dam for 3 days) on the prevalence of selected organisms in feces. Prevalence of Cryptosporidium and *Eimeria* were reduced, and prevalence of rotavirus tended to be reduced, when calves were housed in hutches. Prevalence of coronavirus was unaffected by treatment. Weekly prevalence of *Giardia* was increased when calves were left to nurse the dam

for 3 days. The mean prevalence of the enteropathogens were: Cryptosporidia, 35%; Eimeria, 21%; Giardia, 27%; rotavirus, 16%; and coronavirus, 5%. Escherichia coli (K99 positive) were observed in 3 of 174 samples cultured. Methods of housing and colostrum feeding did influence the types of enteropathogens found in calves in this study. "Effects of housing and colostrum feeding on the prevalence of selected infectious organisms in feces of Jersey calves." Quigley, JD, et al, *Journal of Dairy Science* 77(10):3124-3131, Oct 1994.

Rotavirus Diarrhea

The results of this study indicate that rotavirus infection is widespread and a common cause of neonatal calf diarrhea. Differences in virulence among bovine rotaviruses were found. Rotaviruses originating from other species such as pigs and rabbits were antigenically related to the bovine strains and were found to cause diarrhea in calves. Feeding newborn calves colostrum from dams previously vaccinated with an inactivated rotavirus vaccine prevented the neonatal diarrhea from occurring. "A Study on Neonatal Calf Diarrhea Induced by Rotavirus." Castrucci, G, et al, *Comparative Immunology Microbiology and Infectious Diseases* 17(3-4):321-331, Aug 1994.

IBR Vaccine Induced Disease

Generalized bovine herpesvirus 1 (BHV-1) infection was diagnosed in six Salers calves from the same herd. The calves had received an intramuscular injection of modified-live infectious bovine rhinotracheitis parainfluenza-3 vaccine between birth and three days of age. The purpose of this study was to determine if the outbreak was associated with the vaccine strain of BHV-1. Analysis of epidemiological data, pathologic findings, and BHV-1 DNA confirmed the same BHV-1 virus in the vaccine and the infected calves. In a separate trial, 43 calves were vaccinated over an 11-day interval. Mortality in calves vaccinated between birth and three days of age was significantly higher than in nonvaccinated calves. These findings support the conclusion that newborn calves were susceptible to an intramuscularly injected vaccine strain of BHV-1, and that administration of an intramuscular modified-live infectious bovine rhinotracheitis parainfluenza-3 vaccine to neonatal calves may not be an innocuous procedure. "Fatal, Generalized Bovine Herpesvirus Type-1 Infection Associated with a Modified-Live Infectious Bovine Rhinotracheitis Parainfluenza-3 Vaccine Administered to Neonatal Calves." Bryan, LA, et al, *Canadian Veterinary Journal* 35(4):223-228, Apr 1994.

"Stale" Calf Law

A Wisconsin law (Act 201) requiring live-stock markets to place an identifying mark on calves up to 90 kg (198 lbs) each time they are sold went into effect in 1993. The intent of the law was to reduce the number of times calves are resold and hence become "stale." Glue-on back tags were used to track calves and implement this Stale Calf Legislation. Because of the ease with which glued-on tags can be altered, the law has lost credibility and support. This well-intended legislation is currently ineffective under the present rules and the law is likely to be repealed if the rules are not modified.

"Wisconsin's 'stale calf' issue and a study designed to resolve some of the animal welfare concerns." Friend, TH, et al, *Journal of Animal Science* 72(9):2260-2263, Sep 1994.

Additional References

"The Importance of Colostrum to the Health of the Neonatal Calf." Besser, TE, et al, *Veterinary Clinics of North America - Food Animal Practice* 10(1):107-117, Mar 1994.

"Production practices, calf health and mortality on six white veal farms in Ontario." Sargeant, JM, et al, *Canadian Journal of Veterinary Research* 58(3):189-195, Jul 1994.

"Production indices, calf health and mortality on seven red veal farms in Ontario." Sargeant, JM, et al, *Canadian Journal of Veterinary Research* 58(3):196-201, Jul 1994.

"Blood, Growth, and Other Characteristics of Special-Fed Veal Calves in Private Cooperator Herds." Wilson, LL, et al, *Journal of Dairy Science* 77(8):2477-2485, Aug 1994.

"Multidisciplinary approach to evaluating welfare of veal calves in commercial facilities." Stull, CL, et al, *Journal of Animal Science* 72(9):2518-2524, Sep 1994.

GENERAL TOPICS

Laminitis

Eleven herds with clinical laminitis problems and 11 control herds were studied for 2 consecutive years. All the claws were trimmed and photographically recorded 2 to 6 months after calving. The hemorrhages of the sole horn were evaluated and scored for each digit. Data relevant to the factors associated with an increased risk of laminitis for each herd were collected and related to these scores for sole hemorrhages. It was found that the laminitic herds were more prone to the sole lesions than the control herds, the hind claws were more prone than the front claws, and the primiparous cows were more prone than the multiparous cows. High scores were also correlated

with hard concrete floors in the stalls, with fewer than 4 daily feedings of concentrates, with a short time allocated for the cows to eat concentrates, and with feeding concentrates as the first feed in the morning.

"Haemorrhages of the Sole Horn of Dairy Cows as a Retrospective Indicator of Laminitis - An Epidemiological Study." Bergsten, C, *ACTA Veterinaria Scandinavica* 35(1):55-66, 1994.

BVD

The clinical consequences of infections with bovine virus diarrhea virus (BVD) were studied in a herd of dairy cattle, where BVD circulated for approximately 2.5 years. Of the 136 cows that were subject to a primary infection, 129 remained healthy, 5 had mild signs, and 2 became severely ill; 1 of these 2 died from a concurrent puerperal infection. In spite of the predominantly subclinical infection, a gradual decrease of 10% or more in milk production, occurring within 10 days, was observed significantly more often in cows that seroconverted than in cows that did not seroconvert over the same period. Percentages of abortion, stillbirth, and birth of weak calves were not significantly higher in cattle that seroconverted during gestation than in cattle that did not seroconvert during gestation. Abnormal return estruses after insemination, a possible sign of early embryonic death, and congenital abnormalities were not associated with the BVD infection. In calves that had ingested colostrum from their seropositive dams, respiratory disease ran a significantly milder course than in calves from seronegative dams. The results indicate that, in addition to the known losses associated with the birth of persistently viremic offspring, a 'subclinical' BVD infection in a dairy herd may also result in substantial economic losses due to decreased milk yield and more severe respiratory disease in calves.

"Clinical consequences of a bovine virus diarrhoea virus infection in a dairy herd: A longitudinal study." Moerman, A, et al, *Veterinary Quarterly* 16(2):115-119, Jul 1994.

BVD Problems in a Herd

The consequences of natural infections by bovine virus diarrhea virus (BVD) in a 60 cow dairy herd were studied over a 3 year period. The outcome of 39 pregnancies during a 4 month risk period for contracting BVD was: 9 abortions, 1 mummified fetus, 1 still-birth, 3 calves that died within 1 week of age, 12 calves persistently infected (PI) with BVD and 13 non-PI calves. Only two of the 13 dams (15.4%) of non-PI calves conceived at first insemination, which was a significantly lower conception rate than for 192 other gestations

(66.7%) during the 3 year period. The gestation length of multiparous cows (but not of heifers) was longer for five cows with PI calves (288 days) than for 53 other gestations in 35 cows (281 days). Five of the 12 dams of the PI calves had retained placentas which was a higher incidence than the seven cases of retained placenta observed after 198 other calvings. There was a 4.4-fold higher risk of treatment for diarrhea and/or pneumonia in calves and a 6.0-fold higher risk of calf mortality associated with the introduction of BVD. The mean heart girth of the PI calves was less than non-PI calves at both 80 and 180 days of age.

"Natural Infection with Bovine Virus Diarrhoea Virus in a Dairy Herd - A Spectrum of Symptoms Including Early Reproductive Failure and Retained Placenta." Larsson, B, et al, *Animal Reproduction Science* 36(1-2):37-48, Jul 1994.

Heat Stress

Hot weather causes heat stress in dairy cattle. Although effects are more severe in hot climates, dairy cattle in areas with relatively moderate climates also are exposed to periods of heat stress. The resultant decrease in milk production and reproductive efficiency can be offset by implementation of a program consisting of cooling through shades, spraying, ventilation, and fans. The economic benefit should be determined before installation of equipment to reduce heat stress.

"Heat Stress Interaction with Shade and Cooling." Armstrong, DV, *Journal of Dairy Science* 77(7):2044-2050, Jul 1994.

BST and Heat Stress

Heat stress reduces DMI and milk yield and decreases reproductive efficiency of dairy cows. Decreased DMI may help to maintain homeothermy through reduced metabolic heat production. The high yielding cow has greater metabolic activity and produces more body heat than those with lower yields; thus, greater milk yield may increase heat stress if the cause of that stress is not mitigated. Use of bST increases milk yield, and, during hot or hot and humid environmental conditions, bST increased milk yield with or without noticeable effects on heat stress, depending on the study. The use of bST does not change maintenance requirements or partial efficiencies of milk yield. Thus, the greater heat stress that occurred in some studies probably was related to the increased metabolic activity and heat production associated with milk yield and to the difficulties of cows in dissipating the additional body heat from environmental conditions. Cows that are administered bST are subject to heat stress as are other high yielding

cows if sufficient metabolic heat is not dissipated.

"Interactions of Energy and Bovine Somatotropin with Heat Stress." West, JW, *Journal of Dairy Science* 77(7):2091-2102, Jul 1994.

BST & Ketosis

The metabolism and health of 63 cows which had been treated with bovine somatotrophin (BST) daily in the preceding lactation and 25 control cows were evaluated for ketosis. The cows were categorized as ketonemic or non-ketonemic based on their plasma metabolite concentrations. Twelve of the control cows and none of the cows previously treated with BST were classified as ketonemic. Nine of the control cows but only two of the cows previously treated with BST had clinical ketosis. Some of the decrease in the risk of clinical ketosis was attributable to the lower body condition score of the cows previously treated with BST.

"Bovine ketosis and somatotrophin: Risk factors for ketosis and effects of ketosis on health and production." Lean, JJ, et al, *Research in Veterinary Science* 57(2):200-209, Sep 1994.

BST & 3x Milking

To determine whether bST additively increases milk production in cows milked at different frequencies per day, 118 Holstein primiparous and multiparous cows were milked two or three times daily beginning at parturition and received either 14 mg of bST or no injection beginning at day 75 of lactation. Increased milking frequency from two to three times daily increased 3.5% FCM in multiparous cows by 10.4 lbs/day (4.7 kg/day) and in primiparous cows by 9.0 lbs/day (4.1 kg/day) over 305 days. Injection of bST increased FCM 9.5 lbs/day (4.3 kg/day) in multiparous cows and 11.0 lbs/day (5.0 kg/d) in primiparous cows over 230 days. Increased milking frequency from two to three times daily reduced milk fat and protein percentages in milk, but bST generally did not affect these percentages. Injection of bST prevented increases in body condition score as lactation advanced, but increasing milking frequency from two to three times daily did not. BST and increased milking frequency additively increased FCM in multiparous and primiparous cows.

"Production responses of cows to recombinantly derived bovine somatotropin and to frequency of milking." Speicher, JA, et al, *Journal of Dairy Science* 77(9):2509-2517, Sep 1994.

DA Stress

Twenty dairy cows, aged approximately 4.4 years were used to investigate whether the surgical replacement of left abomasal dis-

placement (omentopexy) leads to typical stress changes in the energetic metabolism of dairy cows. Six blood samples were collected in order to determine concentrations of cortisol, glucose, free fatty acids, L(+)-lactate, and beta-hydroxybutyrate before, and five times after surgery. The surgical intervention led to a significant elevation in cortisol, glucose, FFA and lactate blood levels. These stress-related changes were observed over a 24 hour-period after surgery. In contrast to these parameters, serum concentration of beta-hydroxybutyrate slowly decreased over the entire observation period (72 hours). The results show that surgical correction of left abomasal displacement has a short-term stress effect on energy metabolism of dairy cows.

"Effects of Surgical Correction of Left Abomasal Displacement on Some Parameters of Energy Metabolism in Dairy Cows." Mudron, P, et al, *Deutsche Tierärztliche Wochenschrift* 101(9):376-378, Sep 1994.

Ketosis Tests

The goal of this study was to evaluate the sensitivity and specificity of a milk and a urine cow-side test for subclinical ketosis in 185 dairy cows in early lactation. Subclinical ketosis was defined by serum beta-hydroxybutyrate measurements. The sensitivity and the specificity of both tests at different beta-hydroxybutyrate levels were estimated. When subclinical ketosis was defined at beta-hydroxybutyrate levels of 1.4 mmol/L and higher, the milk test had sensitivity of 90% and specificity of 96%. The urine test lacked specificity (values <67%), but sensitivity was 100% at beta-hydroxybutyrate levels of 1.4 mmol/L upward. Both the milk and urine test can be used to monitor subclinical ketosis in a herd. Milk testing is preferred, because of the easy obtainability of milk combined with the overall better test characteristics.

"Evaluation of 2 Cow-side Tests for the Detection of Subclinical Ketosis in Dairy Cows." Nielen, M, et al, *Canadian Veterinary Journal* 35(4):229-232, Apr 1994.

Higher Production, More Health Care

In a long term genetic experiment, cows selected for high milk production, had greater health expenses than did unselected control cows. Lactational difference for genetic groups was \$28.22 from an analysis of only first lactations and \$49.44 from an analysis across parities. Expenses for mastitis accounted for most of the difference between genetic groups. Most health expense occurred during the first 20 d postpartum and increased for cows with successive lactations. During the 16-yr period, expense for selection cows increased

more than for control cows for reproduction, digestion, and ketosis, but not mastitis, udder (nonmastitis), edema, locomotion, milk fever, respiration, and other categories.

"Response of health care to selection for milk yield of dairy cattle." Jones, WP, et al, *Journal of Dairy Science* 77(10):3137-3152, Oct 1994.

Herd Monitoring

The routine monitoring of the performance of a dairy herd is an increasingly important component of production medicine services. Such monitoring alerts veterinarians and dairy managers to sources of potential economic loss, enhances client motivation, and promotes other services offered by the veterinarian. Monitoring systems should be routine, rapid, and easily expanded to allow more in-depth investigations. Systems should reflect past and current performance. The recent adoption of direct, on-farm computerized data entry by testing organizations of the Dairy Herd Improvement Association, together with the growing number of on-farm systems, has increased the availability of electronic records. The major obstacles to the widespread implementation of monitoring are the perception of excessive time commitment and the confusion with changing measures. In order to facilitate the adoption of routine monitoring programs, it is necessary to consider new approaches to monitoring that are quick and readily identify problems.

"Analysis of Current Performance on Commercial Dairies." Stewart, S, et al, *Compendium on Continuing Education for the Practicing Veterinarian* 16(8):1099-1103, Aug 1994.

Lyme Disease in WI

An ELISA test was used to measure antibody concentrations to *Borrelia burgdorferi* in dairy cattle in Wisconsin. Serum obtained from 5,060 cows in 160 randomly selected herds in the state were tested. Serum from an additional 2,600 cattle in Barron County, Wis, a county with a high annual incidence of *B. burgdorferi* infections in human beings, was also tested. Only 7% of the cows that were tested, but 66% of the herds that were tested, were seropositive for *B. burgdorferi*. Sixteen percent of the herds had a prevalence of greater than or equal to 15% seropositive cows, whereas 50% of the herds had a prevalence of 1 to 14% seropositive cows. Seropositive herds were concentrated in the west-central part of Wisconsin. An association existed between the geographic location of seropositive herds and counties in which *B. burgdorferi* infection of human beings was acquired as well as the geographic location of seropositive herds and

the geographic distribution of *Ixodes scapularis*. Barron County, in which *B. burgdorferi* infection is endemic, had a significantly higher percentage of seropositive cows (17%) than did the state of Wisconsin (7%).

"Seroepidemiologic survey of *Borrelia burgdorferi* exposure of dairy cattle in Wisconsin." Ji, BX, et al, *American Journal of Veterinary Research*, 55(9):1228-1231, Sep 1994.

Johne's Vaccine

Month-old heifer calves (n=866) were vaccinated using heat-killed *Mycobacterium paratuberculosis* in oil during a five-year period. Nonvaccinated control calves included 721 bull calves and 379 heifer calves. Two large herds were used in the study. The calves were tested by fecal culture and by serologic tests on the day of vaccination, at 3, 6, 9 and 12 months of age, at breeding and on the day of parturition. Following vaccination, the fecal shedding of bacteria was greatly reduced as determined by annual fecal microscopic tests. During the last 6 months of the experiment as few as 9 samples from 612 cattle proved positive by microscopy and/or culture. The number of seropositive animals and the antibody titers (CFT and AGID) increased during the first three years, then declined.

"The effect of vaccination on the prevalence of paratuberculosis in large dairy herds." Kormendy, B, *Veterinary Microbiology* 41(1-2):117-125, Jul 1994.

Salmonella in CA Dairies

Milk samples were collected from all lactating cows on 60 California dairies (average, 584 cows/dairy; range, 66 to 2,834). Samples were tested for antibodies against several *Salmonella* serogroups with an ELISA test. Blood samples were collected from all cows with positive results and tested for serologic evidence of exposure to *Salmonella*. Samples for bacteriologic culture were also collected from all 60 dairies. Seven (12%) of the 60 dairies each had 1 sample that yielded *Salmonella* organisms. Five of the *Salmonella* isolates came from the hospital pens and 2 came from calf pens. Thirty-three dairies did not vaccinate cattle against salmonellosis, and of these, 24 (73%) had ≥ 1 seropositive cow (titer greater than or equal to 200), and 20 (61%) had greater than or equal to 1 persistently seropositive cow (titer for each of 2 blood samples collected greater than or equal to 60 days apart was greater than or equal to 200). Of the 27 dairies that did vaccinate cows against salmonellosis, 24 (89%) had greater than or equal to 1 seropositive cow, and 21 (78%) had greater than or equal to 1 persis-

tently seropositive cow. We concluded that studies that use bacteriologic culture of fecal and environmental samples to determine the percentage of dairies with *Salmonella*-infected cows may underestimate the true percentage of *Salmonella* in the herds.

"Prevalence of *Salmonellae* in cattle and in the environment on California dairies." Smith, BP, et al, *Journal of the American Veterinary Medical Association* 205(3):467-471, Aug 1, 1994.

Intra-Abdominal Ampicillin

Wound infection and postoperative performance after a single intra-abdominal administration of 9 gm sodium ampicillin in cows operated on for caecal dilatation or torsion (n=33) were evaluated. In the 25 animals that left the clinic in good health (76% short-term survival), no wound infection occurred. Postoperative performance was normal in 21 of these animals (84%). The figures for short-term survival and postoperative performance are comparable to those from a retrospective study of 169 animals operated on between 1985 and 1990. Single intra-abdominal administration of sodium ampicillin during surgery provides good protection against infection without negative effects on the postoperative performance.

"Single intraoperative administration of antibiotic to cows with caecal torsion: Wound infection and postoperative performance. A retrospective and prospective study." Klein, WR, et al, *Veterinary Quarterly* 16(Suppl. 2):S111-S113, 1994.

Injection Site Blemishes

The occurrence of damaged muscle tissue resulting from intramuscular injections of animal-health products represents a "quality control" problem and an economic loss to the beef industry. Five individual and sequential national audits of injection-site blemishes in beef top sirloin butts have been conducted at the steak-cutter level. During the most recent audit (March 1993), the incidence of injection-site blemishes in top sirloin butts was determined to be 10.9 +/- 3%, with an average weight per blemish of 123.4 +/- 5.5 grams. A 5-point classification system used to partition the blemishes into chronological stages of the healing process suggested that the majority of the blemishes originated at the cow-calf or stocker levels, or early in the finishing period. Evaluation of blemish data by geographic location of plant-of-origin suggests that the problem occurs throughout the beef production sector.

"Incidence of Injection-Site Blemishes in Beef Top Sirloin Butts." Dexter, DR, et al, *Journal of Animal Science* 72(4):824-827, Apr 1994.

Bluetongue Reviewed

Bluetongue virus (BTV): (a) is a common infection of ruminant livestock throughout the tropics and sub-tropics; (b) infection is subclinical in most areas of the world; (c) infection occurs in temperate climates, but tends to "die out" usually within the same year; (d) is transmitted by the *Culicoides* spp vector; and (e) persistent infections in ruminants are no longer considered important in the long term perpetuation of the virus. Diagnosis of BTV relies heavily on laboratory techniques for BTV isolation and demonstration of BTV antigens, viral nucleic acids and antibodies.

"The Epidemiology of Bluetongue." Gibbs, EPJ, *et al*, *Comparative Immunology Microbiology and Infectious Diseases* 17(3-4):207-220, Aug 1994. "Bluetongue - Laboratory Diagnosis." Afshar, A, *Comparative Immunology Microbiology and Infectious Diseases* 17(3-4):221-242, Aug 1994. related articles: "The Pathogenesis and Immunology of Bluetongue Virus Infection of Ruminants." MacLachlan, NJ, *Comparative Immunology Microbiology and Infectious Diseases* 17(3-4):197-206, Aug 1994. and "The Impact of Bluetongue Virus on Reproduction." Osburn, BI, *Comparative Immunology Microbiology and Infectious Diseases* 17(3-4):189-196, Aug 1994.

Hemophilus somnus

Three field trials were conducted in a large commercial feedlot in Saskatchewan to determine the prevalence of *Hemophilus somnus* in calves and to evaluate the efficacy of prophylactic mass medication with long-acting oxytetracycline on day 17 (1990, n=1336), day 11 (1991, n=4372), or day 8 (1992, n=5632) postarrival. Hemophilosis accounted for > 40% of the mortality in feedlot calves each year. *Hemophilus somnus* was cultured from the blood of one febrile calf on day 11, but it was not cultured from nasal swabs on day 1 or day 11 or from blood samples on day 11. Similarly, it was not cultured from nasal swabs or blood samples from 219 sick calves first treated for bovine respiratory disease (BRD). Serological titers to *H. somnus* increased in unvaccinated calves from day 1 to day 96, indicating natural infection following feedlot entry. Calves that relapsed twice with BRD or died from BRD had significantly lower titers to *H. somnus* on days 1 and 96 than those that did not relapse twice or die. Postarrival mass medication with long-acting oxytetracycline did not reduce the risk of hemophilosis mortality, but it reduced the risk of BRD treatment by 14% and the risk of BRD mortality by 71%. "The Occurrence of *Hemophilus somnus* in Feedlot Calves and Its Control by Postarrival Prophylactic Mass Medication." Vandonkersgoed, J, *et al*, *Canadian Veterinary Journal* 35(9):573-580, Sep 1994.

Rest in Dairy Cows

Lying down and other behavioral activities of dairy cows were studied for three 24-hour periods in a straw yard. The cows spent a total of 13.6 hours in the straw yard and laid down for 9.7 hours. The lying down time in one observation was 10.8 hours and this period may be considered ideal because there was little disturbance during that observation. Significantly more time was spent lying down at night than in the day and significantly more time was spent lying down and ruminating than standing up and ruminating. The total time spent lying down was significantly positively correlated with the time spent lying down and ruminating. Ten hours or more spent lying down appears to be adequate for proper rest in dairy cattle.

"Behaviour of dairy cows in a straw yard in relation to lameness." Singh, SS, *et al*, *Veterinary Record* 135(11):251-253, Sep 10, 1994.

Pasteurella Vaccines Compared

Beef cattle (400-600 lbs) were vaccinated with one of two new generation *Pasteurella haemolytica* vaccines, Septimune® PH-K (Fort Dodge Labs), or One Shot® (SmithKline Beecham), and challenged intrathoracically with virulent *P. haemolytica*. Injection of either vaccine caused no adverse local or systemic reactions. In Experiment 1, cattle were vaccinated intramuscularly with either full or 1/10 doses of Septimune® PH-K. In Experiment 2, a single dose of One Shot® given by either intramuscular or subcutaneous route stimulated significant increases in serum antibodies to *P. haemolytica* surface antigens or leukotoxin. Vaccination with either Septimune® PH-K or One Shot® significantly enhanced resistance against a severe experimental *P. haemolytica* challenge.

"Testing of Two New Generation *Pasteurella haemolytica* Vaccines Against Experimental Bovine Pneumonic Pasteurellosis." Confer, AW, *et al*, *Agri-Practice* 15(8):10-15, Sep 1994.

Ivermectin Persistence

The duration of ivermectin persistence was measured by evaluating posttreatment nematocidal effectiveness. Both topical and injectable formulations of ivermectin were evaluated. Calves were grouped into injectable vs pour-on groups and treated on day 0 or day 7. All calves were subsequently given infective larvae of *Haemonchus*, *Cooperia*, *Trichostrongylus*, and *Oesophagostomum* spp on day 21. One week later, each calf was additionally administered infective larvae of *Dictyocaulus* and *Ostertagia* spp. Total nematode burdens were reduced from control group

counts by 99% and 86% for calves treated on days 7 and 0 with injectable formulations, respectively. Total nematode burdens were reduced from control group counts by 97% and 65% for calves treated on days 7 and 0 with pour-on formulations, respectively.

"Residual nematocidal effectiveness of ivermectin in cattle." Yazwinski, TA, *et al*, *American Journal of Veterinary Research* 55(10):1416-1420, Oct 1994.

BLAD

The clinical course of Bovine Leukocyte Adhesion Deficiency (BLAD) in eight Holstein cattle is described. Affected animals were presented with a history of poor thriving and recurrent bacterial infections. Five of these animals had to be killed because of severe respiratory disease shortly after admittance. Three affected animals survived calthood only as a result of frequent antibacterial treatments. At one year of age, failure to thrive and stunted growth were still evident, but infections requiring antibiotic treatments occurred only sporadically. Clinical manifestations of BLAD were found in the digestive system (gingivitis, periodontitis, alveolar periostitis, diarrhea), the respiratory system and the skin (impaired wound healing, chronic dermatitis). A leukocytosis based on a mature neutrophilia, which persisted during infection-free periods, was observed in all animals.

"Bovine leukocyte adhesion deficiency clinical course and laboratory findings in eight affected animals." Muller, KE, *et al*, *Veterinary Quarterly* 16(2):65-71, Jul 1994.

BLAD Lesions

The clinical course of Bovine Leukocyte Adhesion Deficiency (BLAD) in eight Holstein Friesian cattle included a history of poor thriving and recurrent bacterial infections. Five of these animals had to be euthanized because of severe respiratory disease. Three affected animals survived calthood only as a result of frequent antibacterial treatments. At one year of age, failure to thrive and stunted growth were still evident, but infections requiring antibiotic treatments occurred only sporadically. Clinical manifestations of BLAD were found in the digestive system (gingivitis, periodontitis, alveolar periostitis, diarrhea), the respiratory system and the skin (impaired wound healing, chronic dermatitis). A leukocytosis based on a mature neutrophilia, which persisted during infection-free periods, was observed in all animals. After a certain age, surviving animals affected with BLAD appeared able to cope with environmental agents due to compensatory mechanisms of the immune system.

In a related study, 5 female Holstein-Friesian

calves were clinically suspected of suffering from Bovine Leukocyte Adhesion Deficiency (BLAD), because of multiple recurrent infections and persistent leucocytosis. The diagnosis was established by a Polymerase Chain Reaction (PCR) technique, by which a point mutation in the DNA encoding for the CD18 allele was detected. The animals either died spontaneously or were euthanized because of incurable life threatening infections. Post-mortem examination revealed severe and extensive necrotizing lesions in the respiratory and digestive tract. These findings are discussed in relation to the pathogenesis of BLAD. "Post-Mortem Findings in Calves Suffering from Bovine Leukocyte Adhesion Deficiency (BLAD)." Vangarderen, E, et al, *Veterinary Quarterly* 16(1):24-26, Mar 1994. related study: "Bovine Leukocyte Adhesion Deficiency - Clinical Course and Laboratory Findings in 8 Affected Animals." Muller, KE, et al, *Veterinary Quarterly* 16(1):27-33, Mar 1994.

Biofinance

Biofinance combines the biology of the dairy cow with the finance of the dairy business. The dairy business is financially motivated, and appraisal of biological programs must ultimately be based on financial measures. The three major tools of biofinancial consult-

ing are financial statements, industry standards, and management strategies. Accurate statements of cash flow, income, and net worth are the core of good financial analysis. A sound business plan that monitors the progression toward goals and objectives should provide the foundation of every dairy business. In a biofinancial approach, information from the net worth statement is linked to the biology of milk production. Most dairy farm financial management is based on cash flow. The cash flow statement is generated by recording all revenues received and cash disbursements of the business. Cash flow statements can be affected by asset liquidation, infusion of outside capital, and prepurchased inputs. As a result, merging of all three financial statements is critical for accurate appraisal of the business.

"Using a Biofinancial Approach to Appraise Performance of the Dairy Business." Hady, PJ, et al, *Compendium on Continuing Education for the Practicing Veterinarian* 16(8):1075, Aug 1994.

Additional References

"Papillomatous Digital Dermatitis in a Canadian Dairy Herd - Prince Edward Island." Hanna, P, et al, *Canadian Veterinary Journal* 35(10):657, Oct 1994.

"Observations on the pathogenesis of digital dermatitis in cattle." Blowey, RW, et al, *Veterinary Record* 135(5):115-117, Jul 30, 1994.

"Bovine Digital Dermatitis." Sauvageau, R, et al, *Canadian Veterinary Journal* 35(8):522-523, Aug 1994.

"Predisposing factors of laminitis in cattle." Vermont, JJ, et al, *British Veterinary Journal* 150(2):151-164, Mar 1994.

"Left Abomasal Displacement in Cattle - Treatment with Right Paramedian Abomasopexy, Toggle Pin Fixation and Blind Suturing." Mulville, P, et al, *Irish Veterinary Journal* 47(3):111-113, Jul 1994.

"Parasitisms of dairy and beef cattle in the United States." Reinemeyer, CR, *Journal of the American Veterinary Medical Association* 205(5):670-680, Sep 1994.

"Medical Management of Common Physiologic and Metabolic Abnormalities in Anorectic Cattle." Kasari, TR, *Veterinary Medicine* 89(9):898, Sep 1994.

"*Pasteurella haemolytica* Pneumonia .1. Discussion." Smith, RA, et al, *Agri-Practice* 15(6):5-7, Jun 1994. and "*Pasteurella haemolytica* pneumonia .2." Smith, RA, et al, *Agri-Practice* 15(7):20-23, Jul 1994. and "*Pasteurella haemolytica* Pneumonia .3." Smith, RA, et al, *Agri-Practice* 15(8):40-46, Sep 1994.

"Solving Livestock Handling Problems." Grandin, T, *Veterinary Medicine* 89(10):989, Oct 1994.



Swine

NUTRITION TOPICS

Copper Stimulates Growth

In two trials, copper (Cu) was shown to have a direct influence on the growth regulatory system of weanling swine. A related study showed that Cu stimulated growth when injected intravenously, thus bypassing the gastrointestinal tract. Therefore, a mode of action that does not involve antimicrobial activity is possible.

"The role of feed consumption and feed efficiency in copper-stimulated growth." Zhou, W, et al, *Journal of Animal Science* 72(9):2385-2394, Sep 1994. related study: "Stimulation of growth by intravenous injection of copper in weanling pigs." Zhou, W, et al, *Journal of Animal Science* 72(9): 2395-2403, Sep 1994.

P Digestibility & Availability

Phosphorus (P) digestibilities of mono-sodium-phosphate, mono-calcium-phosphate and dicalcium-phosphate were 96%, 91% and 87%, respectively. Digestibilities of phosphorus in mineral feeds and protein concentrates ranged from 69-83% and from 63-73%, re-

spectively. In complete feeds they ranged from 54-56%. In a related study, supplemented microbial phytase increased P availability from 18% to 56% in corn, from 62% to 74% in wheat, and from 52% to 67% in triticale.

"Determination of the Digestibility of Phosphorus in Phosphates, Mineral Mixtures, Protein Concentrates and Complete Feeds for Pigs." Rodehutsord, M, et al, *Journal of Animal Physiology and Animal Nutrition* 71(3):169-178, Apr 1994. related study: "Effects of Supplemental Microbial Phytase on Availability of Phosphorus Contained in Maize, Wheat and Triticale to Pigs." Dungalhof, M, et al, *Animal Feed Science and Technology* 49(1-2): 1-10, Sep 1994.

Water Nitrates

A survey of water samples from 605 swine farms located in 18 states found that 53.6% (338/631) of the wells contained detectable levels of nitrate, 11.7% (74/631) had nitrate levels exceeding 45 ppm and 4.3% (27/631) exceeded 100 ppm.

"The Use of Epidemiological Concepts and Techniques to Discern Factors Associated with the Nitrate Concentration of Well Water on Swine Farms in the USA." Bruningfann, C, et al, *Science of the Total Environment* 153(1-2):85-96, Aug 15, 1994.

Water Quality

Nitrate up to 2000 ppm in drinking water had no detrimental effects on incidence of weaning diarrhea, growth rate, feed intake, feed utilization, and water consumption or on blood hemoglobin and methemoglobin content. However, pig manure (1.5 gm per liter of water) decreased water consumption and growth rate. In summary, early weaned piglets and growing pigs can tolerate at least 2000 ppm nitrate in drinking water. However, pig manure in drinking water reduces water consumption and growth rate.

"Nitrate and Pig Manure in Drinking Water to Early Weaned Piglets and Growing Pigs." Sorensen, MT, et al, *Livestock Production Science* 39(2):223-227, Jul 1994.

Fat Increases AA Digestibility

Studies were carried out with 12 pigs (Yorkshire x Landrace) to determine the effect of dietary fat content on amino acid digestibility. The apparent ileal digestibilities of most of the amino acids increased linearly with increasing dietary fat levels. There were differences in the ileal digestibilities of most of the amino acids between the diets containing 3.2 and

12.2% canola oil. The protein-sparing effect of additional canola oil inclusion results, in part, from an increase in ileal amino acid digestibility.

"The effect of dietary fat content on amino acid digestibility in young pigs." Li, S, et al, *Journal of Animal Science* 72(7):1737-1743, Jul 1994.

REPRODUCTION TOPICS

Nutrition & Reproduction

This review deals with the effects of intake of two important kinds of antinutritional factors on sow reproduction: a mycotoxin, zearalenone, and glucosinolates from rapeseed meal. Zearalenone has estrogenic properties which induce vulvovaginitis in premature gilts, anestrus in cycling females or delayed return into estrus after weaning of the sows. During pregnancy, zearalenone reduces embryonic survival when fed beyond a threshold level, and sometimes decreases fetal weight. It could affect uterine environment by decreasing LH and progesterone secretion and modifying the morphology of uterine tissues. Rapeseed meal contains glucosinolates which have anti-thyroidic properties. During pregnancy, they induce a thyroid hypertrophy in sows and fetuses. Fetuses are especially sensitive since their T4 level in plasma and their liveweight before birth decrease in relation with the glucosinolate level in maternal diet. All harmful consequences are avoided when glucosinolate level in the diet remains below 2 μ g/g. Rapeseed cultivars with a very low glucosinolate content can be fed to reproductive sows & gilts.

"Effects of zearalenone or glucosinolates in the diet on reproduction in sows: A review." Etienne, M, et al, *Livestock Production Science* 40(2):99-113, Oct 1994, also: "Relationship between nutrition and fertility." Einarsson, S, et al, *Reproduction in Domestic Animals* 29(5):340-342, Sep 1994.

Insemination Timing

The optimal time to inseminate gilts using liquid semen is 0-12 hrs before ovulation (92% fertilization rate), and 0-4 hrs before ovulation using frozen semen (88% fertilization rate).

"Effect of time of insemination relative to ovulation on fertility with liquid and frozen boar semen." Waberski, D, et al, *Theriogenology* 42(5):831-840, Oct 1994.

Boar Nutrition & Fertility

Boars receiving low energy diets had reduced weight gains, and when protein intake was also low, boars had decreased libido, semen volume, and sperm output. This reduction in libido and semen volume may be a result of a

decrease in estradiol-17 beta concentration in circulation.

"The effect of protein intake on boar libido, semen characteristics, and plasma hormone concentrations." Louis, GF, et al, *Journal of Animal Science* 72(8):2038-2050, Aug 1994, and "The effect of energy and protein intakes on boar libido, semen characteristics, and plasma hormone concentrations." Louis, GF, et al, *Journal of Animal Science* 72(8):2051-2060, Aug 1994.

Fecal Progesterin

This study found a simple fecal progesterin extraction and assay to be a feasible alternative to the standard blood progesterone assay for monitoring reproductive function in swine.

"The Development of a Simple Fecal Immunoreactive Progesterin Assay to Monitor Reproductive Function in Swine." Sanders, H, et al, *Canadian Veterinary Journal* 35(6): 355-358, Jun 1994.

Additional References

"Return to oestrus after first insemination in sow herds (incidence, seasonality, and association with reproductivity and some blood parameters)." Elbers, ARW, et al, *Veterinary Quarterly* 16(2):100-109, Jul 1994.

"The Influence of Ovulation Rate, Early Embryonic Death, and Uterine Capacity on Litter Size in Swine." Deckert, A, et al, *Compendium on Continuing Education for the Practicing Veterinarian* 16(9):1237, Sep 1994.

"Using Telazol-Ketamine-Xylazine Anesthesia for Castration of Cryptorchid Pigs." Ko, JCH, et al, *Veterinary Medicine* 89(10):999-1002, Oct 1994.

PRRS TOPICS

Controlling PRRS

One of the greatest challenges facing practitioners is how to handle operations involving seedstock infected with porcine reproductive and respiratory syndrome (PRRS) virus. The primary vector for transmission of the virus is the infected pig; however, seminal transfer and aerosol transmission may occur. Before any decisions are made regarding the status of a herd, an understanding of PRRS virus serology is required. Currently, the most commonly used test is the indirect fluorescent antibody (IFA), which measures exposure to the virus. The test cannot measure the level of immunity in animals, nor can it predict whether tested animals are carriers of PRRS virus. Most diagnostic laboratories in the United States have set up the IFA test for detection of antibodies to the American strain of the virus only. Differences between the American and European (Lelystad) strains have been reported. Serologic data from three cases are presented to demonstrate the use of the IFA

test on a practical basis. Along with monitoring previously infected animals, the use of sentinels (animals acquired from another herd that are equal in health status to the infected herd and negative for PRRS virus) can be helpful. The following criteria will be met if the virus does not actively spread within the population: titers in previously infected animals will decrease, seroconversion will not be evident in the sentinels, and all virus isolation attempts will be negative. These criteria form the basis of the noncarrier pig.

"Control of Porcine Reproductive and Respiratory Syndrome Virus Transmission - Handling Infected Seedstock." Dee, S, et al, *Compendium on Continuing Education for the Practicing Veterinarian* 16(7):927, Jul 1994.

Eradicating PRRS

An attempt was made to prevent the spread of the virus of porcine reproductive and respiratory syndrome (PRRS) on three Minnesota pig farms that had been experiencing chronic nursing pig problems, including poor growth rates and increased mortality of post weaning pigs. The PRRS virus and different bacterial pathogens were isolated from all three farms during the initial investigation, and all the farms had a high prevalence of PRRS virus-seronegative breeding animals. All the pigs tested within one week after weaning when they were 18 to 22 days old, were seronegative, whereas 80 to 100 per cent of the pigs tested at eight to nine weeks had antibody titers ranging from 1:64 to 1:1024 by an indirect fluorescent antibody method. The seroprevalence among the finishing pigs on the three farms ranged from 25 to 50 per cent. An eradication protocol was established on each farm, involving emptying the nurseries, followed by pumping out the slurry pits and cleaning, washing and disinfecting three times in 14 days. After the nurseries were repopulated there were improvements in nursery mortality and average daily weight gain, and no seropositive animals were detected in the nurseries on any of the farms; the seronegative status was maintained for the six-month testing period.

"Prevention of the spread of porcine reproductive and respiratory syndrome virus in demically infected pig herds by nursery depopulation." Dee, SA, et al, *Veterinary Record* 135(1):6-9, Jul 2, 1994.

Clinical Signs of PRRS

Sows and gilts on a breeding and finishing unit seroconverted to porcine reproductive and respiratory syndrome (PRRS) virus. The signs of the disease progressed through the breeding herd to the piglets, weaners, growers and finally the finishing pigs. The infection of the finishing pigs with PRRS virus was associated with recurrent periods of inappetence and a

decline in growth rate and performance. Natural epizootics of PRRSV-induced maternal reproductive failure often occur as problems of late-term gestation and neonatal survival. Recurrent reproductive failure is a problem particularly in first-parity sows.

"Effect of sequential porcine reproductive and respiratory syndrome and swine influenza on the growth and performance of finishing pigs." Kay, RM, et al, *Veterinary Record* 135(9):199-204, Aug 27, 1994; and "Temporal characterization of transplacental infection of porcine fetuses with porcine reproductive and respiratory syndrome virus." Mengeling, WL, et al, *American Journal of Veterinary Research* 55(10):1391-1398, Oct 1994, and "Recurrent reproductive failure associated with porcine reproductive and respiratory syndrome in a swine herd." Dee, SA, et al, *Journal of the American Veterinary Medical Association* 205(7):1017-1018, Oct 1, 1994.

PRRS Antibodies

The antibody responses of pigs to porcine reproductive and respiratory syndrome virus (isolate VR-2332) were evaluated by indirect immunofluorescence, virus neutralization, and immunoblotting. All pigs in each group were positive by indirect immunofluorescence 14-21 days postexposure (DPE), and antibodies to specific viral proteins (15, 19 or 26 kD) were initially demonstrated by immunoblotting at 7-21 days DPE. Neutralizing antibodies were detected in only 2 pigs that were inoculated intranasally and given additional parenteral injections with adjuvant. These antibodies appeared much later, 51-70 DPE, than did antibodies detected by indirect immunofluorescence. The titer of the neutralizing antibodies increased until 127 DPE, after which the titers decreased, and 1 animal became seronegative for neutralizing antibody by 262 DPE.

"Serum Immune Responses to the Proteins of Porcine Reproductive and Respiratory Syndrome (PRRS) Virus." Nelson, EA, et al, *Journal of Veterinary Diagnostic Investigation* 6(4):410-415, Oct 1994.

Additional References

"PRRS: Effect on herd performance after initial infection and risk analysis." Brouwer, J, et al, *Veterinary Quarterly* 16(2):95-100, Jul 1994.

"Porcine Reproductive and Respiratory Syndrome Virus Identification in Proliferative and Necrotizing Pneumonia Cases from Ontario." Magar, R, et al, *Canadian Veterinary Journal* 35(8):523-524, Aug 1994.

"Immunohistochemical Detection of Swine Influenza Virus and Porcine Reproductive and Respiratory Syndrome Virus in Porcine Proliferative and Necrotizing Pneumonia Cases from Quebec." Laroche, R, et al, *Canadian Veterinary Journal* 35(8):513-515, Aug 1994.

"Pulmonary Lesions in Fetuses Exposed In utero to Porcine Reproductive and Respiratory Syndrome Virus." Lager, KM, et al, *Journal of Veterinary Diagnostic Investigation* 6(4):480-483, Oct 1994.

RESPIRATORY TOPICS

Porcine Coronavirus

Porcine respiratory coronavirus is a relatively new virus in the United States. It was first discovered in swine herds in Europe in 1984 and in swine herds in the United States in 1990. Porcine respiratory coronavirus is antigenically related to transmissible gastroenteritis virus and is believed to be a mutant of that virus. Porcine respiratory coronavirus has a tissue tropism for the respiratory tract with limited to no replication in the intestinal tract.

"Significance of Porcine Respiratory Coronavirus Infection." Paul, PS, et al, *Compendium on Continuing Education for the Practicing Veterinarian* 16(9):1223, Sep 1994. and "Porcine respiratory coronavirus-mediated interference against influenza virus replication in the respiratory tract of feeder pigs." Vanreeth, K and MB Pensaert, *American Journal of Veterinary Research* 55(9):1275-1281, Sep 1994.

Pleuropneumonia Vaccines

Clinical trials have shown that currently available commercial vaccines against porcine pleuropneumonia provide inconsistent, serotype-specific protection from the disease. Serum responses of pigs receiving 1 of 4 commercial vaccines or a cell extract were evaluated after challenge exposure with virulent *Actinobacillus pleuropneumoniae* serotype 1. Pigs that received the cell extract had fewer clinical signs of pleuropneumonia than pigs in other vaccinated groups, and were significantly better protected from development of lung lesions and death. Such vaccinates were the only pigs that developed significant serum antibody titers (ie, protective immune response) to whole-cell antigens and to cytotoxin.

"Comparison of serum responses in swine after vaccination and challenge exposure with *Actinobacillus pleuropneumoniae* serotype 1." Stine, DL, et al, *American Journal of Veterinary Research* 55(9):1238-1243, Sep 1994, and "Efficacy of *Actinobacillus pleuropneumoniae* bacteria against serotype-1, serotype-3, serotype-5 and serotype-9." Tarasink, K, et al, *Canadian Veterinary Journal* 35(4):233-238, Apr 1994.

Ammonia Toxicity

Effects of atmospheric ammonia (NH₃) on the nasal mucosa and somatic growth were investigated in pigs exposed to four NH₃ concentrations (0; 25; 50; and 100 ppm) for 6 days in a specifically designed air-pollutant exposure chamber. Nasal lavage (NAL) was applied to quantify the ammonia-induced inflammatory response by measuring the number of neutrophils and the albumin concentration in the NAL liquid. In control pigs, these variables remained unchanged throughout the exposure period. In all other groups, an important ammonia

concentration-related increase was recorded. The increase in the neutrophil count was significant at NH₃ concentrations as low as 25 ppm. In exposed pigs, a concentration-related depression of somatic growth was observed. The decrease in the somatic growth was significant at concentrations as low as 25 ppm. This study found that biochemical and cytologic analysis of NAL fluid is a good tool for quantifying the effects of atmospheric pollutants in pigs, and that a 6-day exposure to ammonia induces nasal irritation and depression of somatic growth at concentrations as low as 25 ppm.

"Quantitative assessment of aerial ammonia toxicity to the nasal mucosa by use of the nasal lavage method in pigs." Urbain, B, et al, *American Journal of Veterinary Research* 55(9):1335-1340, Sep 1994, and "Ammonia Concentrations in Pig Houses with Different Types of Floors." Hoy, S, et al, *Tierärztliche Umschau* 49(7):414-420, Jul 1994.

GENERAL TOPICS

Swine Dysentery

The effectiveness of commonly used antimicrobial agents against *Serpulina hyodysenteriae* was tested. The growth of 90% of isolates was inhibited by tiamulin at 8 mug/mL. Lincomycin was less effective than these antimicrobial agents, with 90% of isolates requiring a concentration of 128 mug/mL for inhibition of growth, and 54% being susceptible at 64 mug/mL. Tylosin did not prevent the growth of the majority of *S. hyodysenteriae* isolates tested, and 90% were resistant to concentrations of \geq 128 mug/mL.

"Antimicrobial Susceptibility Testing of *Serpulina hyodysenteriae*." Buller, NB, et al, *Australian Veterinary Journal* 71(7):211-214, Jul 1994.

Coccidiosis in Piglets

Forty-seven piglets were inoculated with doses of 100 to 50,000 sporulated oocysts of *Isospora suis*. After 5-7 days oocysts were found in feces. The patent period extended from 8 to 16 days. The shedding of oocysts showed a cyclic pattern with 2-3 peaks separated by intervals of approximately 5 days.

"Shedding of Oocysts in Piglets Experimentally Infected with *Isospora suis*." Christensen, JPB and SA Henriksen, *Acta Veterinaria Scandinavica* 35(2):165-172, 1994.

Rotavirus

Group A, B, and C rotaviruses were identified in 9% (96/1048) of pig fecal specimens submitted to the Iowa State University Veterinary Diagnostic Laboratory during 1987 and 1988. The incidence of diarrhea decreased rapidly among all pigs from birth to 3 weeks of age. The peak incidence for piglet diarrhea oc-

curring in February, and a moderate rise occurred in August-September.

"Evaluation of Rotavirus Infection and Diarrhea in Iowa Commercial Pigs Based on an Epidemiologic Study of a Population Represented by Diagnostic Laboratory Cases." Will, LA, et al, *Journal of Veterinary Diagnostic Investigation* 6(4):416-422, Oct 1994.

Wasting Pig Syndrome

After weaning, pigs may develop a wasting syndrome characterized by slow growth, decreased disease resistance, and increased mortality. This study was conducted to determine whether differences in immune indices exist between wasting and normal pigs of a common age. Cortisol concentrations and hematological values were measured, and functional immune assays were conducted on blood samples from all pigs. Body weight was lower for wasting pigs at the start of the study. Wasting pigs had fewer white blood cells, lymphocytes, and monocytes than normal pigs. Differences in numbers of lymphocytes and monocytes in wasting pigs may result from chronic stress and contribute to the decreased disease resistance and increased mortality seen in these pigs.

"Immunological and Hematological Characterizations of the Wasting Pig Syndrome." Morrowtesch, J, et al, *Journal of Animal Science* 72(4):976-983, Apr 1994.

EEE

Infection with eastern equine encephalomyelitis (EEE) virus can cause major financial losses to swine producers. During epizootics of EEE, infection should be considered in the differential diagnosis in swine with signs of CNS disease or histologic lesions of encephalitis and myocarditis.

"Eastern equine encephalomyelitis virus infection in swine." Elvinger, F, et al, *Journal of the American Veterinary Medical Association* 205(7):1014-1016, Oct 1, 1994.

BVD & BDV in Swine

Congenital infections of pigs were induced with two ruminant-type pestiviruses isolated from pigs. One of the viruses was bovine viral diarrhea (BVD) virus and the other border disease virus (BDV). Both produced symptoms similar to those observed with low virulence strains of classical swine fever virus. An effect of persistent virus infection in post-natal life was stunting in viremic animals. It was also shown that a congenitally infected pig shed virus for 2.5 years and in sufficient quantity to infect other pigs, even by indirect contact. Unlike ruminants, congenitally infected pigs sometimes had persistent viremia but eventually eliminated the virus. Clearance of virus from the blood was related to the appearance of neutralizing antibodies. However,

clearance from the tissues sometimes took as much as 5 months longer than from the blood.

"Congenital infection of pigs with ruminant-type pestiviruses." Paton, DJ and SH Done, *Journal of Comparative Pathology* 111(2):151-163, Aug 1994.

Fostering Piglets

Forty-eight pigs were fostered at 2-9 hrs or at 2, 4, or 7 days of age to determine age-related differences in the behavioral interactions between fostered pigs, resident pigs, and the sow during the first 6 hrs after fostering. Pigs were fostered in pairs to sows with litters of comparable age. Eleven of 12 pigs fostered at 2-9 hrs of age met the criterion for successful suckling within 6 hrs of fostering. Suckling success at the three older ages (2, 4, and 7 days) was much lower. The behavior of pigs fostered at 2-9 hrs was similar to that of the resident pigs at all ages, whereas the pigs fostered at 2, 4, or 7 days showed a greater reluctance to engage in suckling, higher rates of ambulation, and more frequent vocalizations. Sows tended to be more aggressive toward older fostered pigs. Therefore, fostering pigs older than 1 to 2 days of age will slow the rate at which they integrate into the new sow-litter environment and engage in suckling behaviors.

"Fostering in swine as affected by age of offspring." Price, EO, et al, *Journal of Animal Science* 72(7):1697-1701, Jul 1994.

Clipping Teeth

A study was done on 796 newborn piglets to test the method of canine and lateral incisor teeth resection on the first day of life. The resection was carried out either with side-cutter pliers or with a teeth grinder (Pigmatic 110®). An opening of the pulp cavity was seen when the crowns of teeth were ground, 48% of those reacted with an inflammation of the pulp. The clipping of the crowns of teeth with side-cutter pliers caused pulpitis in 92% of the teeth. Gingival inflammation was seen around clipped teeth. Splinters occurred only at teeth that had been clipped with side-cutter pliers. Gingivitis and pulpitis extended along the splinters to the apex of the root.

"The Effect of Different Methods of Tooth Resection in Piglets." Hutter, S, et al, *Revue de Medecine Veterinaire* 145(3):205-213, Mar 1994.

Ellipsoid Farrowing Crate

The ellipsoid crate allowed the sow to turn around and have more freedom to move. Behavioral observations showed that the ellipsoid farrowing crate permitted easier visual and tactile contact of dams with their pigs and offered pigs better access to the sow's teats.

"An ellipsoid farrowing crate: Its ergonomical design

and effects on pig productivity." Lou, ZS, et al, *Journal of Animal Science* 72(10):2610-2616, Oct 1994.

Zoonotic Parasites

Swine parasitism exerts a significant economic impact worldwide. In the United States, the greatest losses are due directly or indirectly to the costs of zoonotic parasitisms. Three of the six most common foodborne parasitic diseases of humans in the United States are associated with pork consumption. These include toxoplasmosis, cysticercosis (caused by the pork tapeworm *Taenia solium*), and trichinellosis. Toxoplasmosis is of particular concern because of the fulminating disease that occurs in immunocompromised people.

"Swine immunity to selected parasites." Baker, DG, et al, *Veterinary Immunology and Immunopathology* 43(1-3):127-133, Oct 1994.

Pseudorabies

"Piglet serology: A method of monitoring herd Aujeszky's disease status." Kavanagh, NT, *Veterinary Record* 135(14):336, Oct 1, 1994. and "A research feasibility assessment of regulatory information systems capacities for investigation of epidemiologic factors in pseudorabies." Miller, LE, et al, *Journal of the American Veterinary Medical Association* 205(8):1133-1139, Oct 15, 1994.

Proliferative Enteropathy

"A diagnostic dilemma: Detecting proliferative enteritis in pigs at slaughter." Holyoake, PK, et al, *Australian Veterinary Journal* 71(9):308-309, Sep 1994. and "Polymerase chain reaction for diagnosis of porcine proliferative enteropathy." McOrist, S, et al, *Veterinary Microbiology* 41(3):205-212, Aug 1, 1994. and "Swine Proliferative Enteropathy. I." Gebhart, C, et al, *Agri-Practice* 15(8):6-9, Sep 1994.

Osteochondrotic Lesions

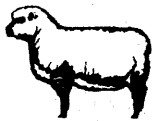
"Radiological Aspects on the Course of Development of Porcine Epiphyseal Osteochondrosis (OCD) from 42 Up to 147 Days of Age." Bitegeko, SBP, et al, *Journal of Veterinary Medicine Series A - Physiology Pathology Clinical Medicine* 41(5):369-376, Jun 1994. and "The Sequelae of Distal Ulna Physeal Dyschondroplasia (Osteochondrosis) Lesions in Breeding Swine - A Radiological Investigation in Danish Landrace Pigs." Bitegeko, SBP, et al, *Journal of Veterinary Medicine Series A - Physiology Pathology Clinical Medicine* 41(5):377-384, Jun 1994.

Additional References

"Special issue: Porcine immunology." Lunney, JK, *Veterinary Immunology and Immunopathology* 43(1-3):1-3, Oct 1994.

"Factor Analysis of Swine Farm Management Practices on Prince-Edward-Island." Humik, D, et al, *Preventive Veterinary Medicine* 20(1-2):135-146, Jul 1994.

"Types of Farm Management as Risk Factors for Swine Respiratory Disease." Humik, D and IR Dohoo, *Preventive Veterinary Medicine* 20(1-2):147-157, Jul 1994.



Small Ruminants

NUTRITION TOPICS

Digestion Rate

A trial was done to determine the effect of forage moisture content on intake and digestion kinetics in sheep. Forage was harvested at two maturities in early spring from a naturalized pasture composed of grass and legume species. Mean particulate retention times (MRT) were shorter for high-moisture forage (23 hrs) than for hay (31 hrs) diets. Early-harvested forages had a MRT value of 24 hours and late-cut forages had a MRT value of 30 hours. Passage times were faster for frozen forages and increased with an increase in specific gravity. Nitrogen retention was greater for the hay than for the high-moisture forage. Dry matter digestion rates showed no differences among the forages. The results of this study indicate that differences in digestibilities between hays and high-moisture forages are most likely due to differences in digesta passage rates.

"Influence of moisture content of forage diets on intake and digestion by sheep." Pasha, TN, et al, Journal of Animal Science 72(9):2455-2463, Sep 1994.

Vitamin E Availability

The comparative disposition (absorption, plasma disposition, tissue distribution) of D-alpha-tocopherol and of D-alpha-tocopheryl succinate was investigated in 10 wethers. It was shown that there was a large difference in the relative bioavailability of the two compounds with a four times higher relative availability of D-alpha-tocopherol than of D-alpha-tocopheryl succinate. This was explained in terms of incomplete hydrolysis of tocopheryl succinate before absorption.

"Metabolism of tritiated D-alpha-tocopherol and D-alpha-tocopheryl succinate in intraruminally dosed sheep." Hidirolou, M van, et al, Journal of Animal Science 72(8):2124-2130, Aug 1994.

Vit E/Se Injections

Eighteen ewes were injected with vitamin E, selenium, or served as controls. Vitamin E injections were given by intramuscular injection at the rate of 2000 IU per ewe at lambing and at 6 wk after lambing. Selenium supplementation was given by intramuscular injection at the rate of 12 mg sodium selenite at lambing and at 5 wk after lambing. Milk

samples from all ewes in the three groups were collected to determine vitamin E and selenium 0, 1, 2, 7, 14, 21, 28, 35, 42, 49, and 56 days after lambing. Ewes injected with vitamin E or selenium at lambing increased the concentration of these nutrients in milk during the first 14 days of lactation. Therefore increased amounts of vitamin E and selenium were available to suckling lambs during their early days of life. Milk levels of selenium but not vitamin E were increased by subsequent injection of selenium or vitamin E. Colostrum contained higher concentrations of both vitamin E and selenium than did whole milk.

"Vitamin-E and Selenium in Milk of Ewes." Meneses, A, et al, Canadian Journal of Animal Science 74(3):567-569, Sep 1994.

REPRODUCTION TOPICS

Transcervical AI

A transcervical technique (the Guelph System for transcervical AI) was used to inseminate 2060 ewes on 65 farms in Ontario, using previously frozen semen. Only ewes in which the cervix could be penetrated were inseminated with 150 million spermatozoa per insemination. A total of 1809 were penetrated and inseminated (penetration rate 87.8%). Success of penetration increased from 76.3% in the first 500 ewes to 97.9% in the last 500. Cervical penetration was more successful in ewes in the accelerated lambing program (92.3%, average 3.1 mo since the previous lambing) than those in the annual lambing program (82.4%, average 7.0 mo since the previous lambing). The average time required for handling and insemination decreased from 8.62 min in the first 500 ewes to 3.62 min in the last 500 ewes. The Guelph System for Transcervical AI was found to be successful for cervical penetration in most ewes. Penetration success was affected by period since the last lambing and by inseminator experience. The lambing rate was higher for ewes bred during the traditional Fall breeding seasons than during other times of the year.

"Further development of a transcervical technique for artificial insemination in sheep using previously frozen semen." Buckrell, BC, et al, Theriogenology 42(4):601-611, Sep 1994.

Epidural Rompun®

Epidural xylazine injected at the sacro-coccygeal site 40 to 150 min prior to surgery (at a dose of 0.05 to 0.10 mg/kg) provided good analgesia during scrotal skin incision in all 20 experimental rams but in only 10 rams (50%) at incision and separation of tunica vaginalis, and 6 rams (30%) during ligation of the spermatic cord. There was no significant correlation between the presence of surgical analgesia and the dosage of epidural xylazine. Pelvic limb ataxia was still evident in 12 rams (60%) at 8 hrs after epidural xylazine injection. Epidural xylazine provided good somatic analgesia during open castration of 20 rams but visceral analgesia was unpredictable.

"Assessment of xylazine hydrochloride epidural analgesia for open castration of rams." Scott, PR, et al, Theriogenology 42(6):1029-1034, Nov 1994.

Service Shortens Estrus

Twenty Nubian goats were used to study the effects of different stimuli of service on estrus duration. The 4 groups were: service (SER), mechanical stimulation of vagina (MES), accessory gland fluid insemination (AGF), and control (CON). All treatments were performed only once within the first 12 hours of estrus. Estrus duration for the SER, MES, AGF and CON groups was 23 hrs, 28 hrs, 37 hrs and 42 hrs.

"Effects of different stimuli of service on estrus duration in dairy goats." Romano, JE, Theriogenology 42(5):875-879, Oct 1994.

Ultrasound of Does

The use of a transabdominal or a transrectal scanning technique to visualize the uterus in goats is discussed. The results of sonographic imaging of normal (non-pregnant, pregnant, postpartum) and abnormal (endometritis, hydrometra, fetal death) uterine structures are reviewed. In the goat, special attention must be paid to distinguishing between the sonographic image of hydrometra and early pregnancy. Under field conditions, transabdominal scanning of goats, performed between days 40 and 70 after mating, yields information about pregnancy, fetal viability and single or multiple pregnancy, while at the same time making possible a reliable differential diagnosis of pregnancy and hydrometra.

"Ultrasonography of the Uterus of the Goat." Hesselink, JW, et al, Veterinary Quarterly 16(1):41-45, Mar 1994.

Wisconsin Veterinary Update

Editor, Dr. Larry Baumann

Veterinarians who serve a portion of their appointment as
UW-Extension Veterinarians:

Dr. John Andersen (beef & dairy) Dr. Larry Baumann (dairy)
UW-Madison, 608/262-2503 UW-River Falls, 715/425-3187

Dr. Lennart Backstrom (swine) Dr. Sue Price, (dairy & goats)
UW-Madison, 608/263-7434 UW-Platteville, 608/342-1452

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**PIERCE COUNTY
ECONOMIC DEVELOPMENT
CORPORATION**

**1995
ANNUAL REPORT**

**Industrial Development
Business Expansion & Assistance
Tourism Promotion
Community Preparation
Workforce Development**

**Annual Meeting
January 24, 1996
Hager City, Wisconsin**

January 24, 1996

To the Board of Directors, supporters, partners, and friends of the Corporation:

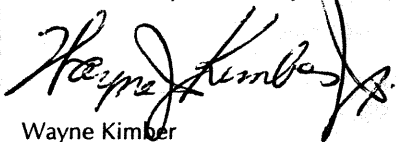
Our record of service and development assistance continued to grow during 1995, due in large part to the effectiveness of partnerships at several levels. Groundwork that had been laid in previous years paid dividends last year in many ways, and the Corporation and its local partners made significant progress on many longstanding objectives that should generate benefits across Pierce County for years to come.

Spring Valley and Ellsworth completed industrial land acquisitions that will provide site options for new prospects well into the future. Prescott completed an engineering and financial feasibility study for potential industrial park expansion, assisted by its utility company partners. Our Welcome & Heritage Center renovation project in Prescott finally neared completion at the end of 1995, providing a major focus of attention for our tourism promotion activities.

We welcomed the start of several construction projects for employers new to the area, including Minnesota Best Maid Cookie Company in River Falls and completion of a land sale to IBP Equipment's new facility in Prescott. We will also realize some future value in our efforts of 1995 that did not result in new projects, most notably the pursuit of a Fortune 500 company represented by the Towle Real Estate Group from Minneapolis, which was considering Spring Valley and Ellsworth as sites for a major warehouse/distribution center project. However, the combination of lower wage rates, free land, and a property tax abatement package in South Dakota proved too significant to overcome. While this project occupied a great deal of our time in 1995, the exercise in preparing rather extensive local development proposals in both Villages proved valuable in gaining consensus on incentive strategies and in mobilizing local 'teams' to focus on the client's needs. Data and proposals generated by this process will be readily transferable to other prospect situations in the future.

The Corporation also continued its significant efforts on behalf of local businesses as well. During 1995, we celebrated expansions and new facilities for Goggins-Berg Farms in Isabelle Township and K&R Farm Systems in Martell Township. The Tile Shop, Inc. opened a new stonecutting operation in their building off of Highway 63, also in Martell Township. Federal Foam Technologies leased the Worth Investment Group's speculative industrial building in the Ellsworth Industrial Park. Northwest International Truck and Cleary Building Systems Inc. also completed new facilities in Trimbelle Township on new sites prepared by the Pierce-Pepin Electric Cooperative.

It is impossible to summarize the entire range of Corporation activities and projects in the course of one small Annual Report. Please feel free to join us in our work during the coming year, since situations across Pierce County calling for our involvement will continue to expand. Many thanks for your continued partnership!



Wayne Kimber
President

INDUSTRIAL DEVELOPMENT

1

The EDC was involved in two Forward Wisconsin-sponsored trade shows during 1995: the National Design & Engineering Show in Chicago (March) and the Advanced Productivity Expo in Minneapolis (May). Both proved to be excellent learning experiences about trade show selling and produced a total of 23 leads for future relationship building. An additional nine leads were generated immediately by the Forward Call Trip to the Twin Cities metro area, conducted in October. Forward Wisconsin continues to be the primary source of leads and prospects for the Corporation.

Several significant projects were completed or begun during 1995. Minnesota Best Maid Cookie Company closed a land purchase with the City of River Falls and began construction of a 35,000 sq. ft. production facility in the Industrial Park. IBP Equipment, a Wabasha, Minnesota-based importer and customizer of industrial machinery, closed a land purchase in the Prescott Industrial Park and will begin construction of a new 15,000 sq. ft. building in the spring of 1996. We also witnessed the commencement of operations for projects started during 1994, namely the leasing of the 14,000 sq. ft. Ellsworth Industrial Park spec building to Federal Foam Technologies and the start of QMR Plastics' operations in the new Whitetail Ridge Corporate Park in River Falls.

QMR's experience in organizing their new venture illustrated the value brought to the industrial development arena by several Pierce County organizations. The University of Wisconsin-River Falls once again proved to be a key partner by providing space for QMR human resource staff for interviewing job candidates in addition to allowing the use of the Agricultural Engineering building, with its loading dock and three phase electric service, as a training site for QMR employees in the summer prior to the new building's availability. This allowed the company to 'hit the ground running' by the time of the company's grand opening in October. In addition, the Pierce County Job Center served as the lead employment recruiting contact point for QMR, and the company participated in the Work Not Welfare program's Job Fair and community training event in April. QMR was also able to hire several employees from the ITW Deltar plant in Prescott, which closed in June.

The Corporation also assisted local efforts to increase the supply of available industrial space, namely the completion of a financing package and the commencement of construction of the River Falls Enterprise Center II, a 20,000 sq. ft. spec building in the River Falls Industrial Park. The three local commercial lending institutions in River Falls participated in the loan for this project, which will be available for lease in April of 1996.

Several prospects with which we spent a significant amount of time and effort during 1995 eventually selected other site options. For example, the Villages of Ellsworth and Spring Valley were contenders in a Fortune 500 company's search for a warehouse/distribution center site, only to be trumped by a significant package from Vermilion, South Dakota. However, the local effort will pay dividends in the future since these communities did expand their base of data and proposal scenarios for use in other recruitment situations. The Corporation assisted in each of these projects by working on tax increment financing scenarios, development covenants, requests for proposals, and development guidelines so that these municipalities know precisely what kind of development value needs to be generated to justify a land sale and improvement incentive package.

The Corporation was involved in many business expansions and new startups over the course of 1995, several of which were undertaken by firms that we had worked with in the past. This is a valuable indication that company owners and managers continue to derive tangible value from our presence in Pierce County, and also suggests that the commonly held view that most new jobs are created from local firm expansions can also find support in our Pierce County situation.

Two companies that previously received technical assistance from the Corporation and financial assistance from the Pierce-Pepin Electric Cooperative continued to expand operations during 1995. The Tile Shop, Inc. created a stonecutting and decorative tile manufacturing operation within their Martell Township warehouse facility, further adding to the dramatic growth scenario that the company has navigated over the past several years. In Isabelle Township, Goggins-Berg Farms completed a private financing package from Goodhue County National Bank that enabled a major greenhouse expansion & upgrade of material handling facilities that also continues a pattern of dramatic growth.

Other situations of note include the establishment of a new facility for K&R Farm Service, also in Martell Township, managed by John & Monica Robey and financed through the Bank of Spring Valley. This highly visible location on U.S. 63 should generate additional sales and profitability along with greater operating efficiency for this important local agricultural service and equipment business. The Corporation also assisted with financing program options for Jim Kariesch and Jerry Voss, who completed the purchase of the former St. Croix Heights motel in Prescott and are pursuing a major renovation project that will enhance our visitor amenities. LG Seeds began construction of a new 17,000 sq. ft. warehouse in the Prescott Industrial Park following a multi-party land transfer that we assisted with the Prescott Industrial & Economic Committee.

Citizens State Bank of Elmwood also completed a financing package with Western Wisconsin Dried Products on the outskirts of Elmwood, allowing owner Bob Merker to proceed with his business expansion plans. The EDC also worked on preparation of loan proposals with Dwight Regelman of Hager City in order to improve his yacht hauling business, now operating nationwide.

One of the more interesting situations of the year arose when we received a call from a startup research company seeking a small amount of laboratory space. Once again, the University of Wisconsin-River Falls responded creatively and quickly, and Midwest Biologicals is conducting product development research for immunodeficiency disease diagnostic kits on the local campus.

Assistance to local businesses took many forms in 1995. Typical situations included research on taxes and regulations for Dan Stewart and his new Jimmy's Pizza location in Ellsworth; letters of support for Rush River Produce's application for research funding from the state Department of Agriculture; information on county zoning for Michael Draeger's attempt to re-start the Trumpeter Valley project in Oak Grove Township; and development of a resource list and business startup guide for new ventures in the River Falls area, undertaken with the River Falls Area Chamber. The latter project can be a prototype for other communities in the County.

The EDC's Visitor's Committee and Tourism Coordinator continued to progress on their ambitious and varied agenda despite extremely limited resources. By the end of 1995, our Welcome & Heritage Center project was almost completely renovated, bringing to completion the major goal of the Committee for the past several years. Several local and county businesses and individuals gave generously to provide the local matching funds for this project, with a only a small amount remaining to be secured. The Center will be the centerpiece of the Committee's visitor service agenda, providing a focal point for distributing information about County events, attractions, and businesses.

The Center itself was relocated for several months during the renovation and generously housed in Matt Putzier's building on Broad Street in Prescott. Despite the dislocation, we received over 900 visitors during the year, slightly above comparable figures for 1994! With an aggressive public relations campaign and special events hosted by the Welcome & Heritage Center, we expect 1996 to see a significant increase in this number. In addition, our toll-free 1-800-4PIERCE telephone number logged over 1,300 calls for information during the year, and our local number received over 1,300 calls. With a very minimal promotional budget, our reputation as a point of contact for County and regional visitor information has grown dramatically!

The Committee also completed a Tourism Assessment with the assistance of the state's Division of Tourism consultant Ruth Goetz. This report, published and distributed to local businesses and public officials, will serve to expand the awareness of our tourism-based economy's importance to the County and the region as a whole. The Committee also publicized data on tourism's economic impact on the County prepared by Wisconsin's impact consultant, Davidson/Peterson Associates Inc.. Key figures included over 500 jobs created, over \$10 million in travel-related expenditures, and over \$1 million in local government revenues generated through Pierce County's tourism-based economy.

We were also proud to host a visit by Richard "Moose" Speros, administrator of the Division of Tourism, in September. With the elevation of the division to Cabinet level status in 1996, these investments in familiarizing key state officials with our area and our development potential will be very useful.

The Picturesque Pierce County tourism booth traveled to six community festivals and, for the first time, the Pierce County Fair during 1995. The display was also seen at the Governor's Conference on Tourism in Oshkosh and the Visitor Information Center along I-94 in Hudson.

The Committee also participated in a new "Great River Road CD-ROM" project that was finalized in December. This compact guide to the Mississippi River spotlights several area attractions and is available for viewing from the Welcome & Heritage Center.

Other promotional activities included the organization of familiarization tours (fam tours) for tour planners considering western Wisconsin routes for future group visits. In addition, a pilot audio cassette tour of the County, focusing on our unique geological features and history, was produced by Professor William Cordua and students at UW-River Falls.

Several Pierce County communities completed projects that represent significant investments in the infrastructure necessary to achieve future economic development success. Spring Valley and Ellsworth both completed land acquisitions for future industrial use, Ellsworth adding 45 acres on the southeast end of town and Spring Valley creating the 75-acre Westland Meadows Business Park.

This Park represents achievement of a longstanding Spring Valley goal of providing site alternatives for local manufacturing companies that are constrained by their downtown locations. The Towle Real Estate client search provided an excellent opportunity for Spring Valley and their marketing agency, Red Hawk Development, to organize local resources and showcase the assets of both the Park and the Village.

The Ellsworth East End project recognized the fact that only one lot of 3.5 acres remained in the existing Industrial Park and that the innovative municipal biosolids composting facility project would require a readily buildable site with direct access to municipal wastewater facilities. This project was underway by the end of 1995. Pierce County also began construction of a new recycling facility in Ellsworth during this past year, which may present marketing opportunities for companies seeking sources of recyclables as raw materials.

In addition, the City of Prescott retained Orr, Schelen & Mayeron of Eau Claire to conduct an engineering and development feasibility study of several properties adjacent to the existing Industrial Park as a first step towards developing a Phase II industrial area. This study was co-funded by the Pierce-Pepin Electric Cooperative and Northern States Power Company, and gave the City and its Industrial & Economic Committee several development scenarios to consider and some parameters for determining the level of development necessary in order to make a future tax increment district cash flow properly.

The Corporation also was, and continues to be, involved in remarketing available industrial and commercial buildings across the County. Examples include the former CESA building in Elmwood, the ITW/Deltar molding operation Prescott, and several small businesses available for sale.

We also provided comments and suggestions as part of the County's Comprehensive Land Use planning process, along with input on amendments to the County's zoning code that relate to light industrial uses and home-based occupations, in cooperation with Zoning Administrator Jim Kleinhans and Land Management Administrator Mark Schroeder. The County did adopt an amendment to expand the definition of permitted home-based occupations in the agriculture zone, a change that brought many existing small operations into compliance with the code.

We also began work with local partners on options for beginning a planning and development process for the Village of Maiden Rock, which will be continued through 1996. The Corporation also assisted the Village of Ellsworth in looking at proposals for using tax increment financing for new housing developments, and the Village did retain the Mississippi River Regional Planning Commission to work on a comprehensive housing and zoning strategy for the Village.

A major labor market survey was conducted in 1995 through Ed Hass' Pierce County Extension office, University of Wisconsin specialist Gary Green, and UW-River Falls community development specialist Larry Swain. Major funding support for this project was provided by the First National Bank of River Falls/Prescott. While the completion of this study took much more time than first anticipated, the results confirmed the informal comments of many local employers and provided a useful spotlight on the wage differentials between local jobs and those held by Pierce County residents commuting to other areas for work. The results of this study will be useful both for local employee recruiting purposes and as support material for our proposals to new industrial prospects.

EDC Executive Director Bill Warner also served on Pierce County's Work Not Welfare Community Steering Committee and the West Central Wisconsin Private Industry Council's Board of Directors as its economic development representative. Major changes in both programs were proposed during the course of 1995, and EDC input in responding to these proposals was facilitated through our involvement in these programs. We also welcomed the opening of the new Job Center in Ellsworth with its computerized Job Net system to enhance the job search process for local individuals.

Over the course of the year, it became apparent that several key segments of the area labor force can be identified and profiled as likely sources of employee recruitment, and the pursuit of greater connections with each segment in 1996 will be a logical extension of our workforce development initiatives. These include vocational/technical college graduates; Work Not Welfare and other public assistance recipients; interns, cooperative education students, and graduates of UW-River Falls and UW-Stout; and the commuter population.

PARTNERSHIPS & EVENTS

The Corporation was actively involved in several partnership-building activities and special events over the course of the past year. Our Pierce County Loan Pool's lone outstanding loan was closed by the lead bank, M&I Community State Bank, and the participating lenders agreed to continue participating in the Pool along with expanding the range of situations that would be eligible for consideration. We assisted in planning and conducting a highly successful Arts and Business seminar in April and a Business Assistance Workshop with the West Central Community Action Agency in November.

The EDC also assisted with the formation of UW-River Falls' new Office of Cooperative Education and Internships, through contacts with area employers and facilitation of focus group discussions. Class projects for a galvanizing facility feasibility study and design options for the River Falls spec building were completed through UW-Stout and Professor Sameer Kumar. We spoke to the Wisconsin Rural Development Partnership's summer meeting in River Falls on the changing nature of rural economic development, and worked with the Metropolitan Council in organizing a bus tour of western Wisconsin for Twin Cities metro area planning staff. While the EDC's primary focus is and continues to be direct client service, there will also be opportunities to develop events-based outreach programming with local and regional partners.

The Corporation ended 1995 with a much more comfortable fund balance than the previous year, an increase of over \$9,000 to \$17,826 due largely to a significant increase in contributions requested and received from the County's banks, some major new contributions from clients, and collection of the fourth quarter 1994 Pierce County contribution in 1995. We completed a major fundraising mailing late in the year, but the lack of time for followup meant only scattered results.

Actual expenditures of \$78,000 were significantly below budget of \$99,000 and below budget in almost all spending categories except for operating expenses such as postage, telephone, and travel reimbursements which were almost exactly on budget.

Pierce County's Board of Supervisors, acting on the recommendation of the Industrial Development Committee, made a significant increase in the County's investment for 1996. A total contribution of \$45,040 was recommended and adopted, including specific appropriations for an administrative assistant for the EDC, tourism interns, and capital costs for the Welcome & Heritage Center renovation. The County also increased its match formula to 45% from the previous level of 43%.

We greatly appreciate this vote of confidence from the County Board, the Finance Committee, and the Industrial Development Committee (George Petaja, Dick Truax, and Rob Chambers). We hope that the County, and our partner municipalities, continue to recognize the value of our work and the return that we aim to provide in terms of job creation and retention; expansion of the local tax base; diversification of the local economy; and generation of additional sales tax revenue.

At its October meeting, the Board of Directors voted to extend the employment contract of the Executive Director for an additional three years. A retirement benefit and three month termination notice requirement was also added to the contract, providing both the Board and Executive a measure of confidence that this key staffing function will have a strong measure of continuity for the future.

Paul Schwebach of the First National Bank of River Falls/Prescott continued to serve as Corporation Secretary/Treasurer, and the Corporation continued to use the services of Accupay, Inc. for payroll tax administration and processing. The Audit Committee did not meet during 1995 and is due for a review of the EDC's financial records early in 1996. All required reports, including the Annual Report to the Secretary of State, the annual Sales Tax report and payment, and the Internal Revenue Service Form 990 tax return were filed in a timely manner and accepted as presented.



Bill Warner
Executive Director

PIERCE COUNTY ECONOMIC DEVELOPMENT CORPORATION

INCOME & EXPENSES

INCOME	December	Year	Checking account balance	\$17,826.44
Receipts	3,465.75	\$88,464.12	Change from previous	(3,978.61)
Interest	36.36	\$621.72	Change from 12/31/94	9,179.06
	3,502.11	\$89,085.84		

			Loan repayment account	\$4,332.78
			Visitor Center exp. receivable	6,275.00

HYBRID BASIS [receipts/cash, expenses/accrual]

	EXPENDITURES			BUDGET		
	December	Previous	Year	Total	12 mos.	Balance
STAFF						
Wage: Exec	3,410.50	37,515.50	40,926.00	40,926.00	40,926.00	0.00
Wage: Admin.	0.00	0.00	0.00	3,774.00	3,774.00	3,774.00
Interns	0.00	683.38	683.38	1,728.00	1,728.00	1,044.62
Taxes	508.15	4,195.39	4,703.54	4,359.43	4,359.43	(344.11)
Fringes	966.45	911.03	1,877.48	2,500.00	2,500.00	622.52
Education	0.00	234.56	234.56	250.00	250.00	15.44
WC/other	462.00	644.00	1,106.00	766.00	766.00	(340.00)
Consultants	0.00	461.89	461.89	2,000.00	2,000.00	1,538.11
subtotal	5,347.10	44,645.75	49,992.85	56,303.43	56,303.43	6,310.58
OPERATING						
Postage	214.57	1,480.25	1,694.82	1,500.00	1,500.00	(194.82)
Phone	215.30	817.81	1,033.11	1,500.00	1,500.00	466.89
Copying	127.46	1,598.22	1,725.68	1,500.00	1,500.00	(225.68)
Supplies	10.29	610.58	620.87	600.00	600.00	(20.87)
Travel/Ent.	83.67	1,516.05	1,599.72	1,800.00	1,800.00	200.28
Periodicals	132.00	357.95	489.95	440.00	440.00	(49.95)
Memberships	145.00	796.00	941.00	650.00	650.00	(291.00)
Publications	0.00	59.25	59.25	250.00	250.00	190.75
Insurance/misc.	356.50	1,309.21	1,665.71	1,520.00	1,520.00	(145.71)
subtotal	1,284.79	8,545.32	9,830.11	9,760.00	9,760.00	(70.11)
PROMOTIONS						
Recruiting	0.00	1,677.65	1,677.65	3,750.00	3,750.00	2,072.35
Printing	0.00	0.00	0.00	2,500.00	2,500.00	2,500.00
Postage	0.00	0.00	0.00	1,800.00	1,800.00	1,800.00
Advertising etc.	0.00	211.00	211.00	2,000.00	2,000.00	1,789.00
Events	450.00	100.00	550.00	750.00	750.00	200.00
subtotal	450.00	1,988.65	2,438.65	10,800.00	10,800.00	8,361.35
TOURISM						
Coordinator	813.12	10,254.73	11,067.85	10,558.00	10,558.00	(509.85)
Operating	195.83	3,306.65	3,502.48	3,396.00	3,396.00	(106.48)
Promotions	0.00	621.72	621.72	2,500.00	2,500.00	1,878.28
Visitor Center	50.00	1,076.50	1,126.50	3,600.00	3,600.00	2,473.50
Projects	0.00	85.00	85.00	250.00	250.00	165.00
subtotal	1,058.95	15,344.60	16,403.55	20,304.00	20,304.00	3,900.45
Equipment	0.00	84.00	84.00	500.00	500.00	416.00
Contingency	0.00	0.00	0.00	2,000.00	2,000.00	2,000.00
TOTALS	\$8,140.84	\$70,608.32	\$78,749.16	\$99,667.43	\$99,667.43	\$20,918.27

1995 FINANCIAL SUPPORTERS

Ameritech
Arneson Insurance Agency
Baldwin Telecom
Bank of Spring Valley

City of River Falls
City of Prescott
County of Pierce
Derrick Construction Company, Inc.

Durand Builders Service, Inc.
Federal Foam Technologies
First National Bank of River Falls/Prescott
First National Bank of Hudson

Foley Wood Products
Helmer Printing, Inc.
Hiawatha National Bank
Java Hut

M&I Community State Bank
Northern States Power Company
George Petaja
Pierce-Pepin Electric Cooperative

Prescott Area Chamber of Commerce
River Falls State Bank
Ross & Associates
Snuffers Panel Systems, Inc.

St. Croix Electric Cooperative
Town of Spring Lake
Town of Hartland
University of Wisconsin-River Falls

Village of Ellsworth
Village of Spring Valley
Village of Elmwood
Village of Maiden Rock

Wadia Digital Corporation
Bill Warner
Worth Investment Group, Inc.

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Business Strategy Resource Center
First National Bank of River Falls
City of River Falls
Hager City Express
Village of Spring Valley
General Plastics

Midtown Staffing Services
Hager Telecom
Ellsworth Dairy Queen
MFB Corporation
UW-River Falls
Gavic Law Office
Village of Plum City
UW-Extension
M&I Community State Bank
First National Bank of Hudson
Hiawatha National Bank
Prescott Insurance
Lost Creek Communication Services
St. Croix Valley Natural Gas Company
The Virginian Supper Club
Citizens' State Bank of Elmwood
Village of Elmwood
Northern States Power Company
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Jan Pusledzki, *Data Resources Intern*
Chad Hart, *Marketing Intern*

Riverfront Lands Conserved

Another 68 acres Permanently Protected A total of 3/4 mile of Streambank Open to Public

By Mary Caton-Rosser

At the KRLT's December Director's meeting, board members were presented with a proposal of a donation of a conservation easement by KRLT members, Greg Erickson and Jamie McNaughton. The agreement was finalized and signed on December 27. This is the second conservation easement donated to the KRLT so far.

"This whole process has been a great experience for us," said Greg. "We not

"We not only have learned a lot about our land, but it has forced us to think about what really is forever.

Once this document is signed, this land is protected permanently."

Greg Erickson

only have learned a lot more about our land, but it has forced us to think about what really is forever. Once this document is signed, this land is protected permanently. We will comply with the management plan which provides guidelines for the land's use in the years to come."

Greg and Jamie are residents of the Kinnickinnic Valley, and own several parcels of land along the river. Their easement donation includes 68 acres of a 90 acre piece of land. Greg purchased the parcel in 1983 and built a home where they live.

"The 68 acres is really the most beautiful, rugged, and pristine part of the total parcel," he explains. "There are areas of oak savanna and two goat prairies that contain rare plant species on both sides of the river. On the south side there is a rocky point with an 100 foot drop straight down to the river. On the north side has a steep slope and a 150 foot precipice."

Jamie, who is a Twin Cities native, said, "Based on this document, the land will stay just as it is today, always. It is secure for generations to come."

"In deciding to give the easement, Greg and I wanted to be good stewards, and give others the opportunity to be exposed to the beauty that is there — the serenity of the forest and the medicinal sound of running water. My heart told me to share it," said Jamie.

Greg and Jamie have donated to the public the right to walk along their river banks to fish or sight-see.

Greg, who also serves as Chairman of the KRLT Finance Committee, said there are financial benefits to donating a conservation easement. "It is similar to making any kind of gift to a charitable organization, whether it is land, cash, or appreciated stock. But for Jamie and me, this was really beside the point. Whoever inherits this land or ends up buying it is bound by the conservation restrictions. The easement is a binding document, and the land will be preserved forever."

Greg and Jamie encourage other KRLT members and fellow landowners to

consider making an easement donation.

"This exercise of creating an easement has clarified for us the mission of the Kinnickinnic River Land Trust, and the importance of its work." Greg who works as a corporate executive for Hudson, Wisconsin, based Erickson's Diversified, added that his background and experience in real estate related issues, and involvement in other envi-

"We want to be good stewards, and give others the opportunity to be exposed to the serenity of the forest and the medicinal sound of running water. My heart told me to share it."

Jamie McNaughton

ronmental causes, has underscored his commitment to the mission of KRLT.

"It is our intention to conserve additional land we own in the valley, and we urge others to get behind the business of considering easements, as well. To become active and involved in the cause—this is how things get done. This is where the rubber meets the road."





THE KINNI KEEPER

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Newsletter of The Kinnickinnic River Land Trust

Riverfront Lands Conserved

Two Parcels Permanently Protected 3/4 mile of Streambank Now Open to Public Use

By Mary Caton-Rosser

“Think Globally, Act Locally” is the current buzzword when it comes to preserving the environment, and the KRLT is largely founded on that concept. Three charter members of the group, Florence, Clarke, and Robert Chambers, are living up to the slogan. The family has donated a conservation easement on the 22 acres they own on the banks of the Kinnickinnic River. It is one of two easements negotiated by the KRLT before the end of the year.

“We are very grateful to the Chambers for this,” said Peg Kohring, the KRLT’s Senior Project Manager. “We hope that other landowners will consider the benefits of either donating or selling a conservation easement.”

Conservation Easement is an agreement

A conservation easement is a legal agreement between a landowner and a land trust. It allows the landowner to protect their land permanently without giving up

“Conservation has been a family commitment, and giving this easement just makes us feel good.”

Clarke Chambers

ownership or their ability to sell the land, if they so desire.

The agreement permanently limits use of the property for current and future owners. Landowners usually continue to live on their land, and can sell it, or pass it on to heirs. Florence and Clarke, longtime environmentalists, are St. Paul residents who bought the land with their son, Robert, back in the

1980’s. They were captivated by the beauty, the bird and animal life, and general peace and quiet of the river valley.

Globally Endangered Oak Savanna is Protected

“This is such a lovely part of the country, and we feel our gift is an agreement in perpetuity,” says Clarke. “One of the most impressive features is an area of oak savanna—a rare combination of tall, spreading oaks and prairie grasses and flowers that has never been farmed.” According to the Wisconsin Scientific Areas Council, there are only 29 significant oak savannas in the entire state.



Florence and Clarke on their rare oak savanna

Read about the other property on page 3.

... continued on page 2