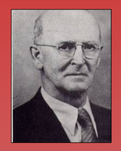
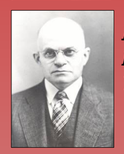
The Ohio State University Commemorates 100 Years of Dairy Science

D.L. Palmquist, H.R. Conrad, M.L. Eastridge, and J.L. Firkins

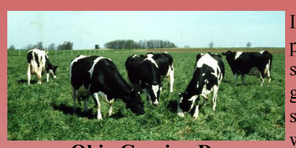
Oscar Erf
First OSU dairy professor
1906



C.C. Hayden
Chief of dairy research
1912
Charter member of ADSA

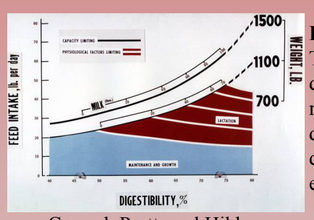


A.E. Perkins
Dairy chemist
1913



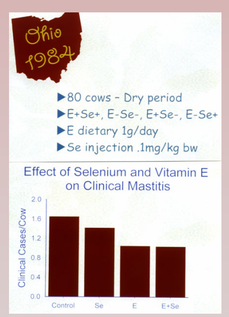
Ohio Grazing Days
C.C. Hayden, C.F. Monroe, A.D. Pratt, H.R. Conrad, and D.L. Zartman
1914-1998

Improving permanent pastures, rotational grazing, small paddock short-term grazing, single crop grazing, strip grazing, strip grazing with seasonal dairying.



ISI highly cited paper.
The first quantitative development of relationships among dry matter intake, digestibility, and energy requirement.

Conrad, Pratt, and Hibbs
1964



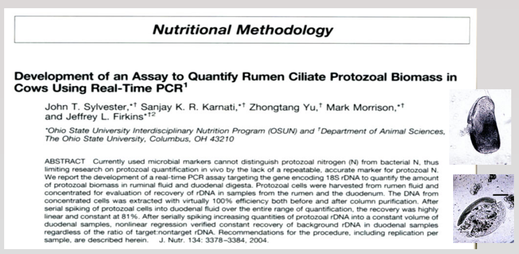
K.L. Smith, J.H. Harrison, J.S. Hogan, W.P. Weiss, H.R. Conrad, K.H. Hoblet, P.S. Schoenberger, and D.A. Todhunter
1984

The Ohio State University TDN Equation

TDN (at maintenance intake)= CP* $e^{-0.019*ADIN}$ + 0.98*(100-NDF-CP-Ash-EE) + 2.25*(EE-1) + 0.75*(NDF-L) [1-(L/NDF)$^{0.67}$]=7

Where:

CP = crude protein, ADIN = acid detergent insoluble N, NDF = neutral detergent fiber, EE = ether extract, and L = lignin.



Nutritional Methodology

Development of an Assay to Quantify Rumen Ciliate Protozoal Biomass in Cows Using Real-Time PCR[1]

John T. Sylvester,*† Sanjay K. R. Karnati,*† Zhongtang Yu,† Mark Morrison,*† and Jeffrey L. Firkins*†2

*Ohio State University Interdisciplinary Nutrition Program (OSUN) and †Department of Animal Sciences, The Ohio State University, Columbus, OH 43210

ABSTRACT Currently used microbial markers cannot distinguish protozoal nitrogen (N) from bacterial N, thus limiting research on protozoal quantification in vivo by the lack of a repeatable, accurate marker for protozoal N. We report the development of a real-time PCR assay targeting the gene encoding 18S rDNA to quantify the amount of protozoal biomass in ruminal fluid and duodenal digesta. Protozoal cells were harvested from rumen fluid and concentrated for evaluation of recovery of rDNA in samples from the rumen and the duodenum. The DNA from concentrated cells was extracted with virtually 100% efficiency both before and after column purification. After serial spiking of protozoal cells into duodenal fluid over the entire range of quantification, the recovery was highly linear and constant at 81%. After serially spiking increasing quantities of protozoal rDNA into a constant volume of duodenal samples, nonlinear regression verified constant recovery of background rDNA in duodenal samples regardless of the ratio of target:nontarget rDNA. Recommendations for the procedure, including replication per sample, are described herein. J. Nutr. 134: 3378–3384, 2004.

THE EARLY YEARS—1882-1920

Dairy Science established at The Ohio State University as a part of Animal Husbandry in the inaugural year of ADSA. Oscar Erf was the first professor in the dairy program. It became an independent Department of Dairy Science in 1948. Professor Erf used the Babcock milk fat test to develop relationships between the University and dairy farmers. The Ohio testing program was very strong and contributed to the development of many outstanding registered purebred herds; the Department also played a key role in Brucellosis eradication in the State. The dairy research program was part of animal production from initiation of the experiment station in 1882 until C.C. Hayden arrived in Wooster in 1912 to be the Chief of Dairy Industry. A.E. Perkins was the Chemist and Assistant. Forage research was the first coordinated program, continuing to the present; topics include grazing, silage preservation, forage digestibility, and forage harvesting systems. Dairy Day initiated as an outreach to farmers. This became highly popular, attended by as many as 7500 people in the 1920's to 1930's. C.C. Hayden was one of three charter members of ADSA who were associated with Ohio; the others were J.W. Decker and E.S. Guthrie. Guthrie became head of the dairy industry, which became Dairy Technology in 1929.

1920-1940

Nutritional value of milk, focusing on vitamins, initiated (1926) with hiring of W. E. Krauss. Vitamin A and carotene in nerve degeneration; roles of iron and copper in neonatal anemia. Second Borden award, 1938. Forage work continued—first published measures of rumen pH, 1939.

1940-1960

Vitamin D in Ca and P metabolism in parturient paresis; 40,000 IU vitamin D optimized Ca absorption in early lactation. Hibbs Borden Award, 1952. Iodine metabolism in thyroid function. High forage diets for young calves; establishment of rumen function in young calves.

1960s

Increased research on forages—pastures, harvesting; first large square bales introduced. Classic publication by H.R. Conrad (1964) - pioneering research on regulation of feed intake, quantifying relationships between diet digestibility and dry matter intake (DMI) as functions of energy requirement. At low DM digestibility, DMI is regulated by the flow of undigested material through the gut; whereas, DM is regulated by energy concentration/requirement at high digestibility. Conrad Borden Award, 1966. Continued research on Ca and P metabolism.

1970s

Hormone-induced lactation; role of lactoferrin in mastitis and other biological systems; epidemiology of environmental mastitis. Selenium supplements decrease retained placenta in dairy cows. Metabolism of polychlorinated biphenyl (PCB) in dairy cattle; development of methods to control and eliminate environmental contaminants from dairy farms. Research on lipid metabolism and milk fat synthesis; fat supplements for dairy cows.

1980s

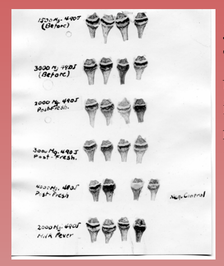
Roles of vitamin E and selenium to increase immunity and decrease incidence of mastitis in cows established. Treatment during the dry period decreased mastitis at parturition by 1/3, saving $20/cow per year ($200 million annually for the US dairy industry). Calcium soaps developed and patented as a rumen-inert fat supplement. Current US market approximates 200,000 tons annually. Statistical model to measure economic value of variations in feed composition.

1990s

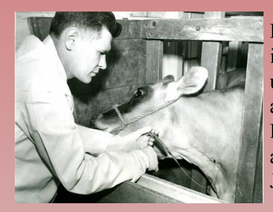
Environmental management practices developed to decrease incidence of mastitis. Evaluation of feed energy by relating its chemical composition to surface ratio of lignin/NDF (Weiss TDN equation); equation is valid across a wide range of feedstuffs; used by most major feed evaluation laboratories and feed companies for commercial energy evaluation. Quantitative studies of rumen N metabolism with 15^N; development of low starch diets with feed by-products; evaluation of fat digestibility. Increased emphasis on relationships between cow's diet and milk composition; initiation of research on conjugated linoleic acid (CLA) and the role of vaccenic acid as a precursor for CLA synthesis. Statistical programs and modeling for farm management. Immune cells and the cytokines; they produce and regulate ovarian function. J.L. Pate was the first to report expression of major histocompatibility molecules that can regulate immune cells in the ovary, as well as functional effects of cytokines on ovarian steroidogenesis.

2000-

Supplemental biotin improves foot health and milk yield. Desaturation of vaccenic acid in humans doubles the amount of CLA available to tissues. First use of molecular techniques to quantify ruminal and duodenal flow of protozoa. K.L. Smith received the Land'O'Lakes (Borden) Award.

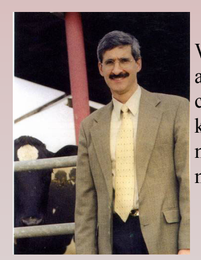


J.W. Hibbs and Associates. The rate tibia line test was used to measure vitamin D in cow plasma and market milk.
1932-1965

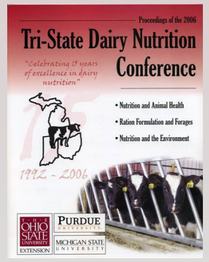


Radiocalcium (Ca^{45}) injected into the cow to determine utilization, turnover rate, and metabolic losses. H.R. Conrad, S.L. Hansard, and J.W. Hibbs. J. Dairy Sci. **1956**

K.L. Smith and F.L. Schanbacher Hormone-induced lactation.



W. Harvey, F. Allaire, and N. St-Pierre contributed fundamental knowledge on statistical models for research and management decisions.

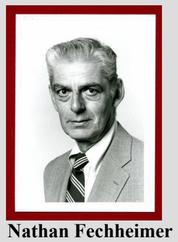


Organized and edited by Maurice Eastridge. Tristate Dairy Nutrition Conference is attended by over 450 professionals annually.

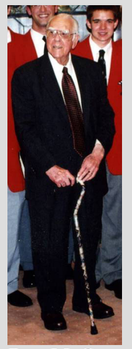
Don Palmquist and Tom Jenkins developed calcium soaps that have become a widely used energy supplement.

Maudine Ormsby
(cow)
1926 OSU Homecoming Queen accompanied by
(runner-up)
Rosalind Morrison

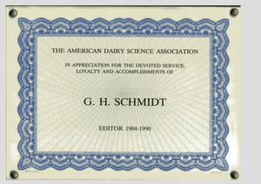
Highly successful OSU dairy judging teams were coached by Harold Kaeser *(left)* and Peter Spike *(right)* both of whom were nationally recognized dairy cattle judges and instrumental in development of the student affiliate division of ADSA.



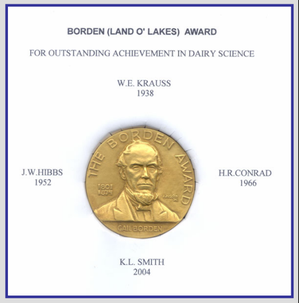
Nathan Fechheimer
Distinguished University Professor
Chromosomal Aberrations



Dan McGrew
Professor/ Extension Dairy Specialist
101 Years Old and still going!



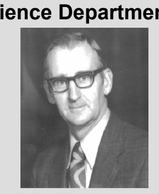
T.S. Sutton, G.H. Schmidt, and W.P. Weiss were *Journal of Dairy Science editors*



Dairy Science Department Chairs

W.E. Krauss

Fordyce Ely
ADSA President
1947-48



N.L. Vandemark

Glen Schmidt

David Zartman

Accomplishments include:

- 20 ADSA awards by faculty
- 3 ADSA Fellows