

# Dale Elton Bauman: DEB

Brown City, MI

Family dairy farm



4-H activities



# Dale Elton Bauman: DEB



# MSU Softball Champs 1966

Dick Aurelich

Dale Bauman

John Benson

Don Beitz



Bill Thatcher

Wayne Askew

# Little Known Fact: DEB Likes Fancy Vehicles

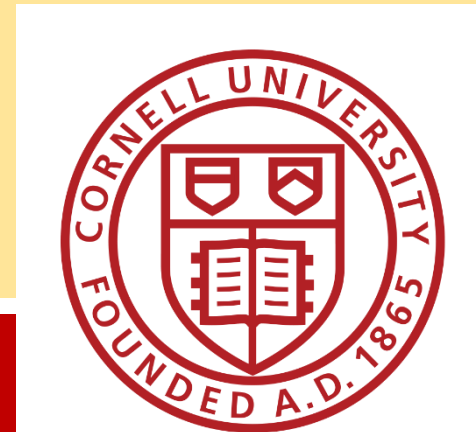




# Dale E. Bauman

Liberty Hyde Bailey Professor  
Department of Animal Science  
and Division of Nutritional Sciences  
Cornell University

***Dr. Dale Bauman: Scientific impact on  
dairy, animal and human nutrition and  
metabolism***



# DEB's Education

Michigan State University

Dr. J. William Thomas

1964 B. S. Agricultural Sciences

1968 M. S. Nutrition

The Net Absorption and Secretion of Dry Matter, Water, Sodium, Potassium, Calcium, Magnesium, and Zinc Throughout the Gastrointestinal Tract of Sheep.

**MICHIGAN STATE**  
UNIVERSITY

University of Illinois

Dr. Richard D. Brown / Dr. Carl Davis

1969 Ph. D. Nutritional Biochemistry

Fatty Acid Synthesis in the Bovine Mammary Gland





- Lactation Biology

- Milk fat synthesis and milk secretion- bovine growth hormone!

- Regulation of metabolism and nutrient partitioning

- Animal-derived functional foods

- Environmental impact of animal production

# Scientifically Creative

- Sure things
  - Chip away at a problem
- “Simple experimental designs”
  - Answer one primary objective at a time
- Imagination
- Data Perspective
- Techniques didn't define him
- “Throw a dart” – or pave the road but know where you planted your flag and why...
  - Take a risk
  - Likelihood of success is low
  - Potential impact is huge

# “Owning an Area”

- Academic AND Industry relevant

**“Dale has is a genius with Passion for Science Application”**

**Dr. Dean Boyd**

- Didn't tinker around
  - 100% focused on the primary research objective
- Read EVERYTHING pertinent to the area..everything
  - Not constrained by species, *in vivo* vs. *in vitro* or history
- Understood the biological context
  - Knew what to get excited about

# Father of a Scientific Field

Most scientists don't become one

Lucky to be considered a global authority in one area!

Dale is the Grand-Father of at least 5 Scientific Fields

1) Lipid Synthesis (ruminant vs monogastrics)

2) Somatotropic Axis

rbST, rpST

3) Homeorhesis

4) Conjugated Linoleic Acid

Origin of *cis*-9, *trans*-11

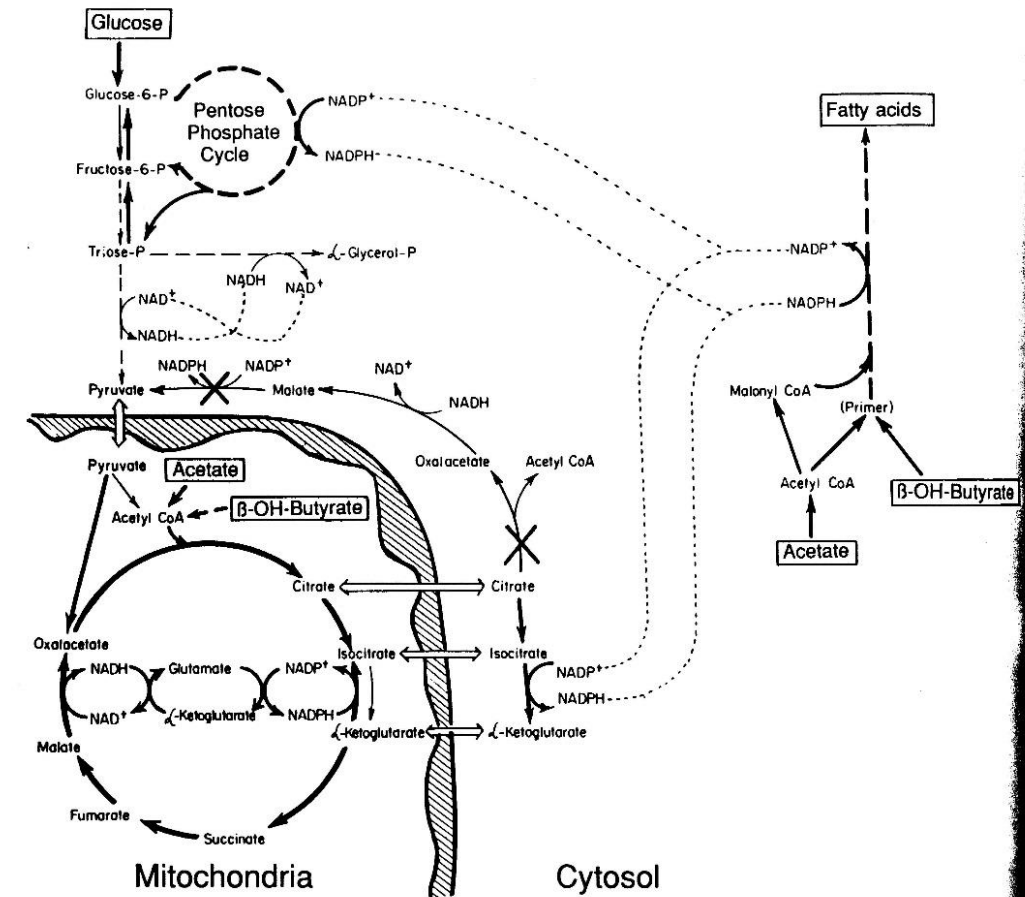
Milk fat depression (MFD): *trans*-10, *cis*-12 and others

5) Environmental Impact of Modern Animal Agriculture

# Bauman: 1970's

- Adipose is the site of lipogenesis in the ruminant
- Why glucose is not a C-source for fatty acid synthesis in ruminants
  - Limiting enzymes
    - Citrate lyase
    - Malate dehydrogenase
  - Use of glucose for fat synthesis
    - Supply NADPH
    - Synthesis of glycerol
  - Induced Lactation
  - Established his National and International Reputation

320 Nutritional Ecology of the Ruminant



**Figure 19.6.** Pathways of fatty acid synthesis in ruminant adipose tissue (modified from Bauman and Davis, 1975). Negligible activity of ATP citrate lyase and NADP-dependent malate dehydrogenase in the cytosol is denoted by X. Ruminant tissue is not efficient at converting glucose into acetyl-CoA for fatty acid synthesis in the cytosol. Utilization of glucose for fatty acid synthesis that occurs in nonruminants and infant ruminants requires a translocation of mitochondrial acetyl-CoA to the cytosol as citrate. Citrate crosses the mitochondrial membrane and is cleaved to acetyl-CoA and oxaloacetate in the cytosol. NADPH for fatty acid synthesis must also be generated in the cytosol, and the sources for adult ruminants are the pentose phosphate cycle and isocitrate. The impairment of glucose carbon utilization for fatty acid synthesis and the generation of a portion of the reducing equivalents from acetate via isocitrate represent a means for ruminants to conserve glucose.

# Crystallizing Homeorhesis

Reprinted from the *Journal of Dairy Science*, Vol. 63, No. 9, September 1980. Pages 1514-1529.

## Partitioning of Nutrients During Pregnancy and Lactation: A Review of Mechanisms Involving Homeostasis and Homeorhesis

**DALE E. BAUMAN and W. BRUCE CURRIE**

Department of Animal Science  
Cornell University  
Ithaca NY 14853

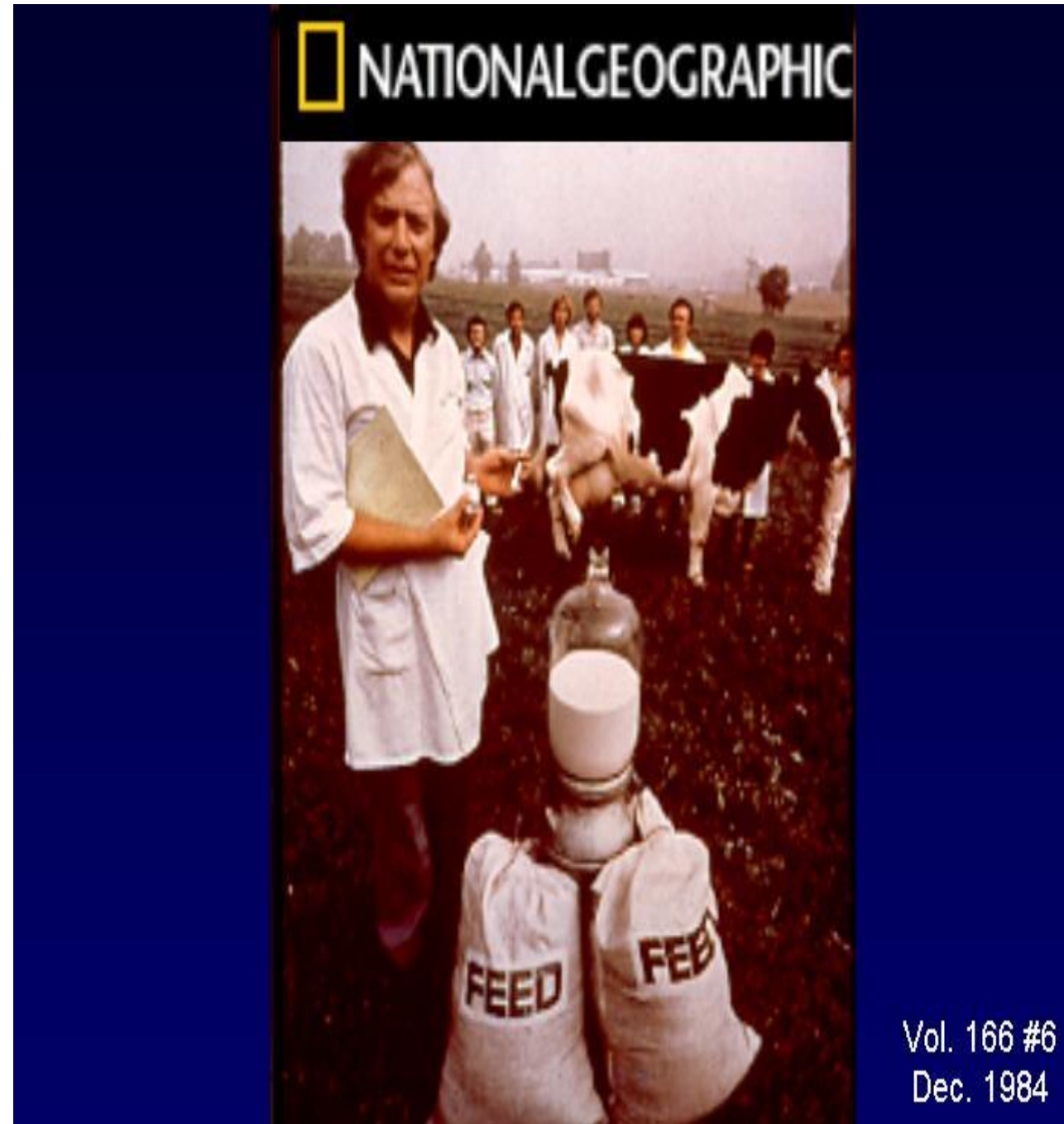
### ABSTRACT

Control of metabolism during pregnancy and lactation involves two types of regulation—homeostasis and homeorhesis. Homeostatic control involves maintenance of physiological equilibrium or constancy of environmental conditions within the animal. Homeorhesis is the orchestrated or coordinated control in

tions and physiological processes in which food is transformed into body tissues and activities. In a broad sense the chemistry of life can be considered a cycle (Figure 1). Food is consumed, and, following digestion in the gut, nutrients are absorbed. These nutrients are utilized by body tissues and, in turn through several possible mechanisms, play a role in regulating food intake (4), thus completing the

# Somatotropin

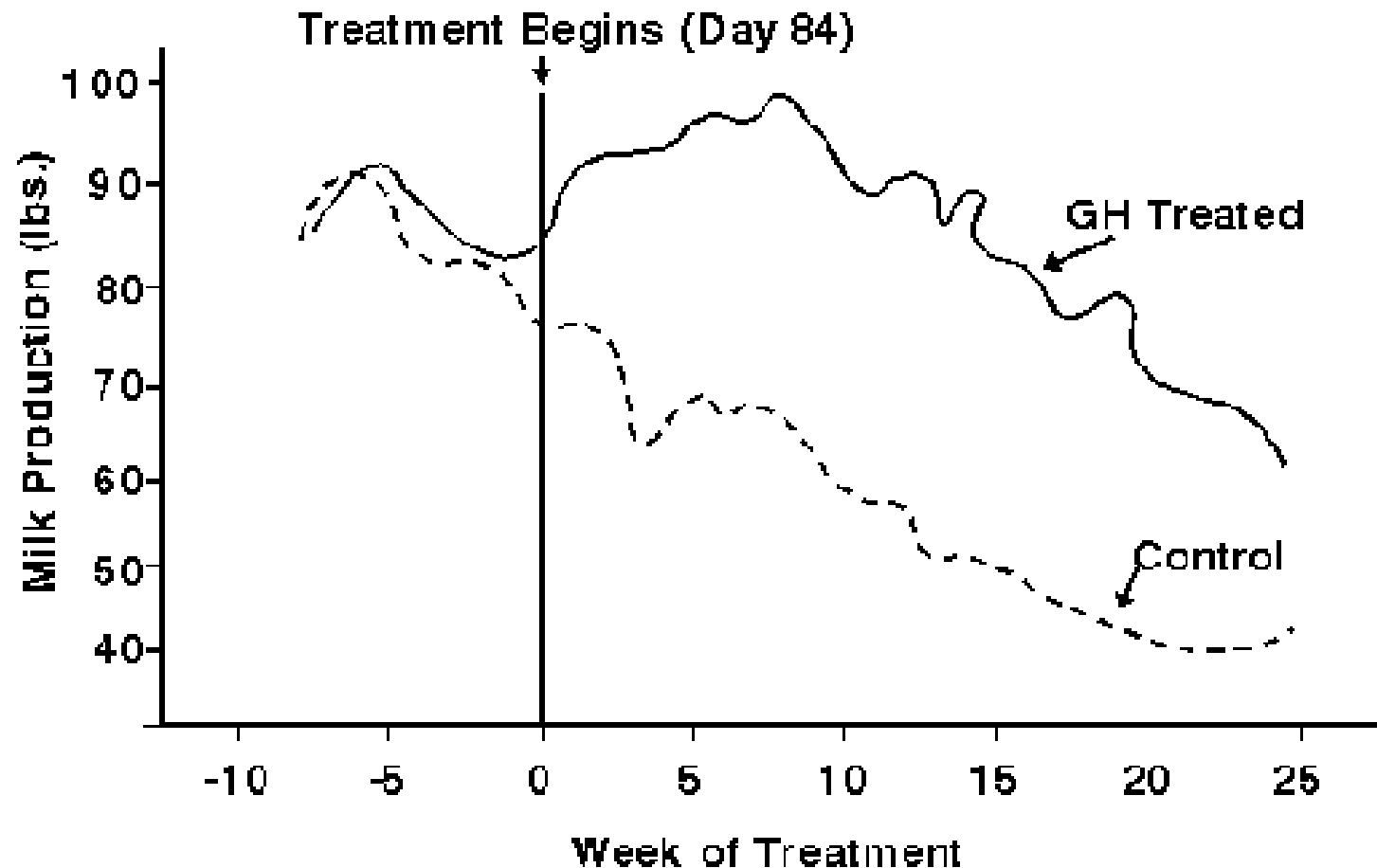
“homeorhetic”  
control is  
regulated by in  
part by  
somatotropin



Vol. 166 #6  
Dec. 1984

# GRAPH 1. Effect of GH on Milk Yield (Bauman et al., 1985)

---



Partitioning of nutrients during pregnancy and lactation: A review of mechanisms involving homeostasis and homeorhesis; JDS 1980

Mammary	↑	Synthesis of milk
	↑	Uptake of nutrients
	↑	Activity per secretory cell
	↑	Number and/or maintenance of secretory cells
	↑	Blood flow
Liver	↑	Basal rates of gluconeogenesis
	↓	Ability of insulin to decrease gluconeogenesis
	φ	Glucagon effects on glucose metabolism
Adipose	↓	Basal lipogenesis if positive energy balance
	↑	Basal lipogenesis if negative energy balance
	↓	Ability of insulin to stimulate lipogenesis
	↑	Ability of catecholamines to stimulate lipolysis

Homeorhesis -  
“orchestrated changes for priorities of a physiological state”  
925 citations-Web of Sci.  
1477 citations-Google Scholar

Dale used simple examples to help others understand complex metabolic regulation

## The Concept of “Push vs Pull”

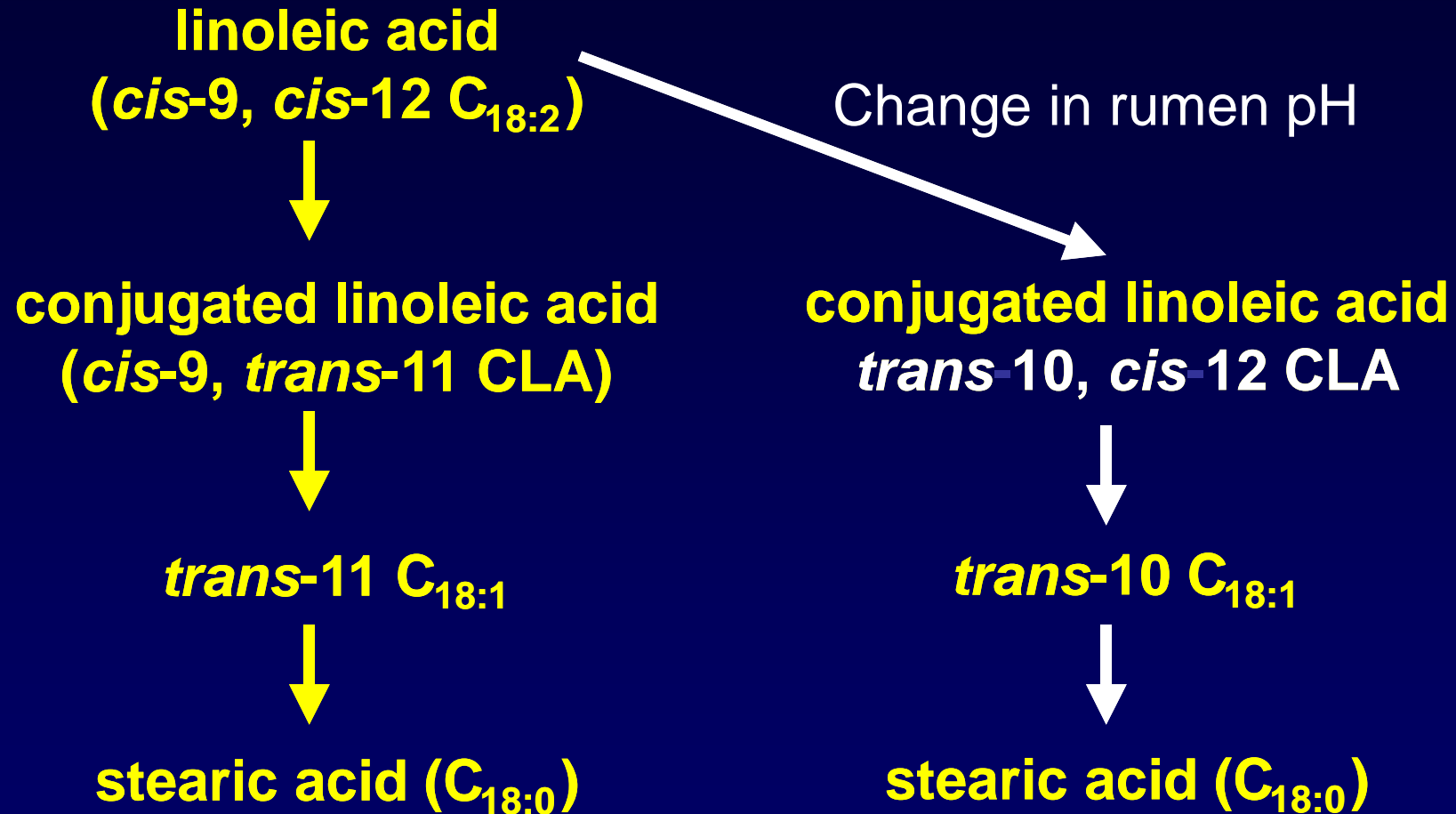
If you eat the diet of a marathon runner, you still can't run a marathon (push), but if you run a marathon, you will eat a lot to replenish your energy expenditure (pull)

# Hypothesis

- Rumen derived CLA or related metabolites containing a *trans*-10 double bond inhibit milk fat synthesis

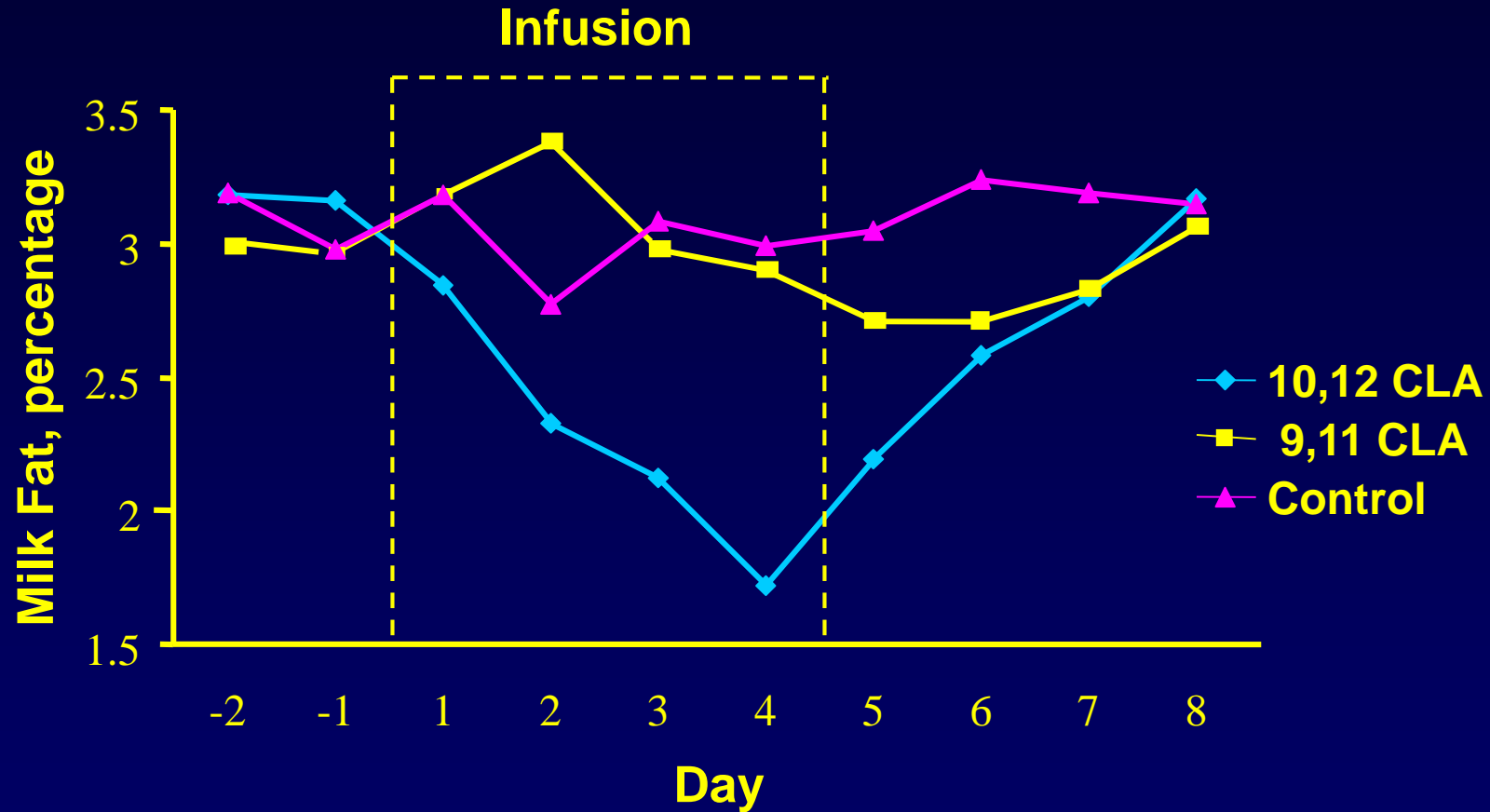
# Rumen Biohydrogenation

---



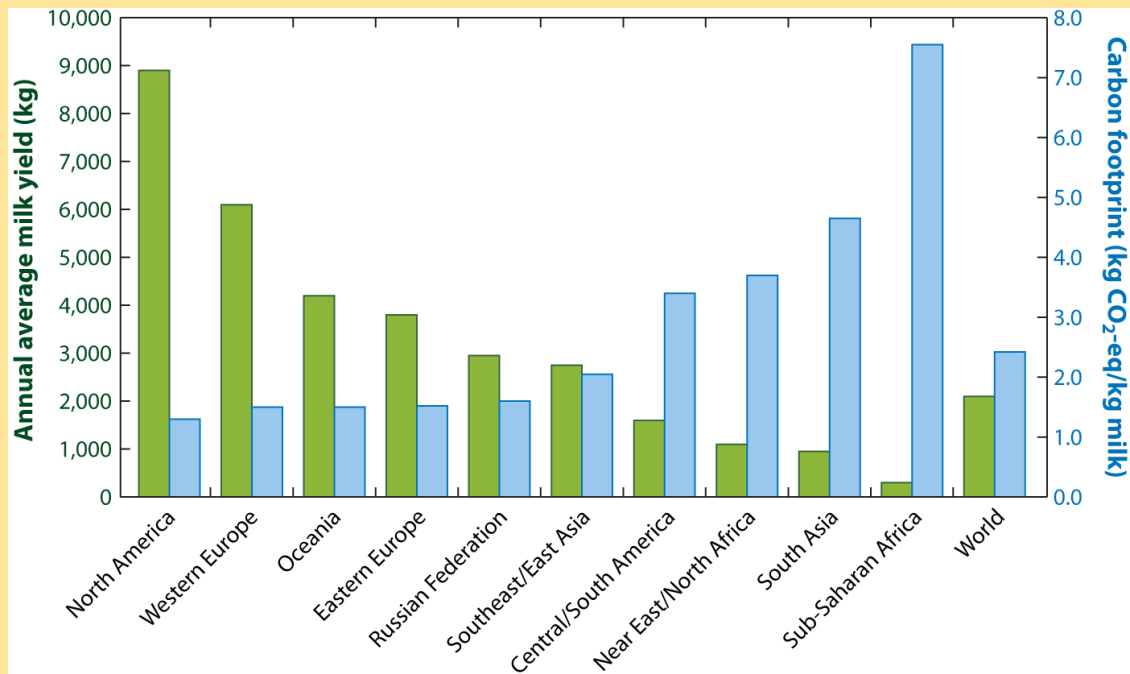
Griinari and Bauman, 1999

# Effects of CLA Isomers on Milk Fat %

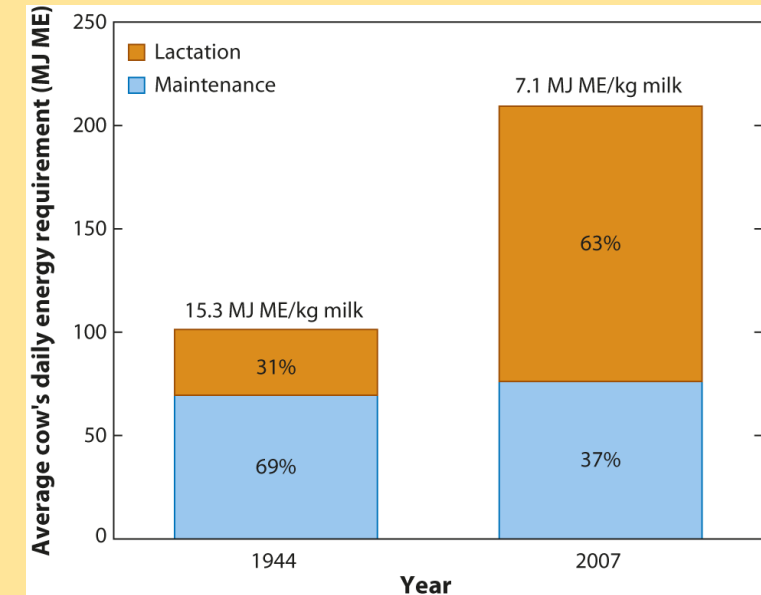


Productivity gains through advances in genetics, nutrition, management, preventative medicine, and animal welfare have improved milk yields in dairy cattle and led to reductions in resource use and GHG emissions per unit of milk.

## ENVIRONMENTAL IMPACT



Capper JL and Bauman DE. 2013.  
Annu. Rev. Anim. Biosci. 1:469–489



Capper JL and Bauman DE. 2013.  
Annu. Rev. Anim. Biosci. 1:469–489

## LIST OF GRADUATES, POST DOCs & VISITING PROF.

Agergaard, N. (Visiting Prof. 1984-85)  
Barney, C.A. (M.S. 1976)  
Baumgard, L.H. (Ph.D. 2001)  
Bernal-Santos, G. (M.S. 1982; Visiting Prof. 2008)  
Boisclair, Y. (Ph.D. 1991)  
Capper, J. (Post-Doc. 2006-2009)  
Castaneda-Gutierrez, E. (M.S. 2003; Ph.D. 2007)  
Chouinard, Y. (Post-Doc. 1997)  
Cohick, W.S. (Ph.D. 1989)  
Collier, R.J. (Ph.D. 1976)  
Corl, B.A. (Ph.D. 2003)  
Crooker, B.A. (Post-Doc. 1886-87)  
Croom, W.J. (M.S. 1975; Ph.D. 1978)  
Dunshea, F. (Post-Doc. 1987-89)  
de Veth, M.J. (Ph.D. 2004)  
Eisemann, J.H. (Ph.D. 1982)  
Eppard, P.J. (Ph.D. 1985)  
Etherton, T.J. (M.S. 1974)  
Foote, M.R. (Post-Doc. 2007-2010)  
Fronk, T. (Post-Doc. 1980-81)  
Griinari, J. (Ph.D. 1996)  
Harrel, R. (Ph.D. 1998)  
Harris, D. (Ph.D. 1995)  
Harvatine, K. (Ph.D. 2008)  
Hassan, M.H. (Ph.D. 2011; Post-Doc 2012)  
Houseknecht, K. (Ph.D. 1994)  
Ingle, D.L. (Ph.D. 1971; Post-Doc. 1972-73)  
Ingvartsen, K.L. (Visiting Prof. 1996-97)

Kelly, M.L. (M.S. 1998)  
Kensinger, R.S. (M.S. 1979)  
Kitessa, S. (Visiting Prof. 2000)  
Lanna, D.P.D. (Ph.D. 1993)  
Leung, T.T (Ph.D. 1974)  
Lock, A.L. (Post-Doc. 2003-2006)  
Lord, A. (Post-Doc. 1993-95)  
Mackenzie, D. (Visiting Prof. 1996)  
Mackle, T.R. (Ph.D. 1999)  
Madron, M.S. (M.S. 2001)  
Matitashvili, E. (Post-Doc. 1994-2003)  
McConnell (Walsh), C. (M.S. 2004)  
McCutcheon, S.N. (Post-Doc. 1982-84)  
McGuire, M.A. (Ph.D. 1994; Post-Doc. 1995)  
McNamara, J.P. (M.S. 1978)  
Mellenberger, R.W. (Ph.D. 1973)  
O'Donnell (Megaro), A. (Ph.D. 2010)  
Peel, C.J. (Ph.D. 1982)  
Perfield, J.W. (M.S. 2003; Ph.D. 2005)  
Peterson, D. (Ph.D. 2003)  
Plaut, K. (Ph.D. 1989)  
Sandles, L.D. (Post-Doc. 1987-88)  
Sechen, S.J. (Ph.D. 1988)  
Segoale, N. (M.S. 1997)  
Scott, R.A. (Ph.D. 1975)  
Soloman, R. (Visiting Prof. 1998-99)  
Steinhour, W.D. (Ph.D. 1985)  
Tyburczy (Sringley), C. (M.S. 2008)



Dale E Bauman

Liberty Hyde Bailey Professor, [Cornell University](#)

Verified email at cornell.edu

[animal agriculture](#) [dairy](#) [nutrition](#) [environment](#) [CLA](#)

 FOLLOW

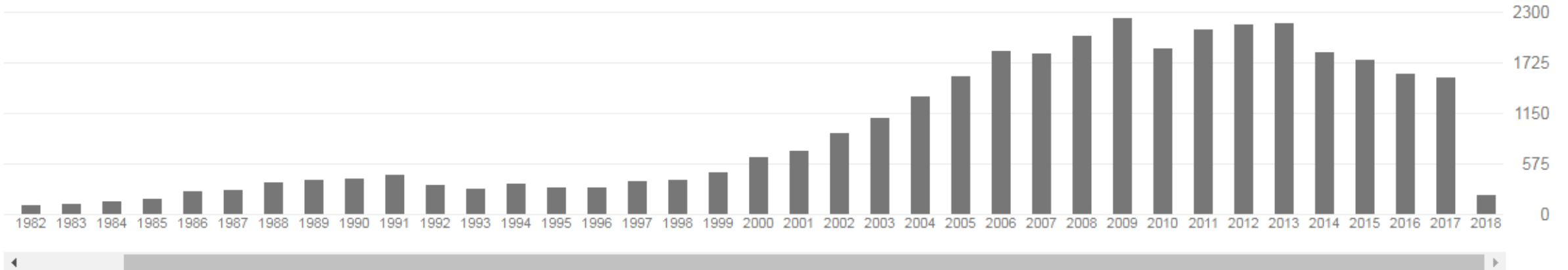
Cited by

[VIEW ALL](#)

	All	Since 2013
Citations	36444	9173
h-index	99	47
i10-index	299	164



Citations per year



- Web of Science
  - 18,000+ citations to works

- Google Scholar
  - 36,444+ citations to works

# Bauman's Publications

- Journal Articles: 251
- Invited reviews and book chapters: 97
- Conference proceedings: 102
- Abstracts: 325
  
- Total: 775

# Bauman Citations/Impact

- H-Factor: 95
- I-10 Index: 297
- I-100 index: 99
  - The number of publications that have been cited at least 100 times
- Homeorhesis: J. Dairy Sci. 1980. cited >1500 times
- 2<sup>nd</sup> Most Cited Author in Agricultural Sciences. 1996-2006: ISI, Science Watch (2006)
- Science Watch Most Highly Cited Paper in Agr Sciences (Ann. Rev. Nutr. 23:203) (2008)
- The average times an agriculture paper is cited is 17

# Highly Cited Authors in Agricultural Sciences, 1996-2006

VOL. 17, NO. 4

JULY/AUGUST 2006

Rank

# SCIENCEWATCH®

Citations

1

2,026

2

1,729

3

1,647

4

1,509

5

1,460

6

1,361

7

1,311

8

1,300

9

1,248

10

1,166

TRACKING TRENDS AND PERFORMANCE IN BASIC RESEARCH

## What's Inside...

MIT's Max Tegmark Likes  
His Universe Clumpy . . . . . 3

Which Device Works Best  
for Heart-Failure Patients? . . . . 5

Physicists Keep Spinning  
New Aspects of Hall Effect . . . . 6

Organic Semiconductor  
Research Goes to Seed(s) . . . . . 7

Vive La Genomic Difference!  
Sorting Out Variation in LCVs . . 8

Research Services Group

Science Watch:

Christopher King, Editor

## Cream of the Crop: Food Science Flavors High-Impact Ag Research

### Agricultural Sciences: Institutions Ranked by Citations and Citation Impact

(among those that published  $\geq 500$  papers, 1996-2006)

Rank	Institution	Citations 1996-2006	Rank	Institution	Impact 1996-2006
1	U.S. Dept. of Agriculture	41,204	1	University of Helsinki	9.05
2	INRA (France)	22,847	2	Cornell University	8.47
3	Wageningen University	16,370	3	University of Wisconsin	8.47
4	CSIC (Spain)	16,069	4	University College Cork, Ireland	8.16
5	Univ. Calif., Davis	13,554	5	Univ. Calif., Davis	7.89
6	CSIRO (Australia)	11,958	6	CSIRO (Australia)	7.71
7	Cornell University	11,261	7	University of Massachusetts	7.63
8	University of Wisconsin	10,929	8	INRA (France)	7.60

# Awards and Recognitions – partial list



National Sustainable Agriculture Advisory Council, USDA (1994-1996)

National Academy of Sciences (Elected 1988)

USDA Superior Service Award (1986)

Alexander von Humbolt Award for U. S. Agriculture Research (1985)

Board on Agriculture – longest serving chair since created by Lincoln

# The Dale E. Bauman Lectureship



**Honoring Dale E. Bauman for  
his Distinguished Career,  
Outstanding Scholarship,  
and Exceptional  
Contributions to Animal  
Biology, Food Science,  
and Nutritional Biochemistry  
at Cornell University and  
around the World.  
May 2, 2017**



**Guest of Honor  
Dale E. Bauman  
Liberty Hyde Bailey Professor  
Emeritus**

# Acknowledgments

Dr. Alan Bell

Dr. Ron Butler

Dr. Dean Boyd

Dr. Bob Collier

Dr. Adam Lock

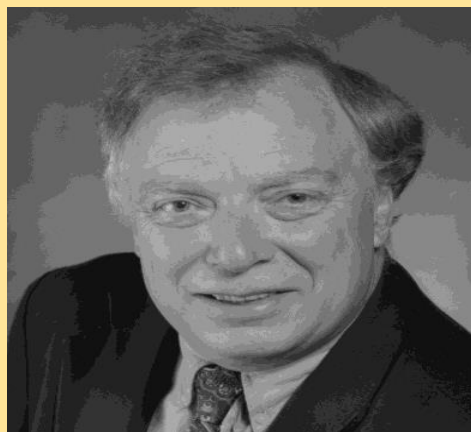
Dr. Jim Perfield

Dr. Ben Corl

Dr. Lance Baumgard



# ***2018 NEAFA Distinguished Service Award***



## **Dale E. Bauman**

**Liberty Hyde Bailey Professor  
Department of Animal Science  
and Division of Nutritional Sciences  
Cornell University**