Missouri has about 85,000 dairy cows. Ranks 24 out of 50 states. No change in cow numbers since 2016.

Missouri – 14,588 lbs. Ranks 47 out of 50 states.
Grass-based Dairies in Missouri

Missouri Chief Josephine "Old Jo"
Department of Dairy Husbandry, University of Missouri 1910

26,861 lbs of milk*
740 lbs fat
365 d lactation

Held the world's record for 30, 60, and 90 days' milk production
Average cow 1910
3,139 lbs per year
8.6-times average US cow

Today comparison:
197,293 lbs milk per year (US cow)

Dairy Short Course Students with "Old Jo"
c. 1910-1911

New Record!
Selz-Pralle Aftershock 3918
Selz-Pralle Dairy, Humbird, WI

78,170 lbs of milk*
3,094 lbs fat (4.0%)
2,393 lbs protein (3.1%)
365 d lactation

*3-times average US cow

"3918 is a solid, hardworking, 'blue collar' Holstein cow who lives in a free stall barn and likes to be left alone. She is the perfect cow since she causes no problems, you don't even know she's there." - Scott Pralle
Yearly averages for conception rate to artificial insemination for lactating dairy cows in either New York State (United States; Butler, 1998) or Ireland (O'Farrell and Crilly, 1999) during the past half-century.

Lucy (2001) does not mention . . .

- Ovsynch, presynch ovsynch, double ovsynch, G6G, etc.
- Resynch
- Daughter pregnancy rate
- Sire conception rate
- Cow conception rate
- Heifer conception rate
- Genomic selection
- Sexed semen
- Blood or milk pregnancy tests (PAG or ISG)
- Cloning
- Gene editing (CRISPR)

“All these things we take for granted now . . .”
In Memoriam: Ernst Knobil
(1926–2000)

Ernst Knobil died on April 13, 2000, in his 73rd year of life, after leading a remarkable career of outstanding scientific accomplishments, of leadership positions in physiology and endocrinology, and of mentorship to numerous students and fellows. He was noted for his clarity of thought, his relentless pursuit of excellence, and his lifelong interest in integrative biology.

Dr. Knobil was a visionary leader and a pioneer in many areas of endocrinology, including growth and reproduction. Dr. Knobil’s new classic contributions include the species-specific effects of LH, a model for positive and negative estrogen feedback control of the menstrual cycle, and elucidation of the hypothalamic–GnRH pulse generator. His discovery that pulsatile GnRH stimulates LH, whereas continuous GnRH downregulates pituitary LH secretion, has forever altered the field of reproductive endocrinology. This remarkable experimental observation unmasked a pivotal role for pulsatile secretion as a mechanism of hormonal control.

The elder son of an Austrian father (Jakob Knobil) and a German mother (Regina Neumann), Ernst was born in Berlin, Germany, on September 20, 1926. When Ernst was about 8 years old, the Knobil family moved to Paris due to the deteriorating political conditions in Germany. Then, in 1940, when the Germans invaded Paris, Ernst was 13, the family emigrated to New York City. Ernst entered the New York State College of Agriculture at Cornell at the age of 15. He chose Animal Science as his major due to interests developed from time spent on farms in France during the summers, and from attending the Kinderhook Farm Camp, after moving to New York. When transferring from Cornell in 1948 to...
Body condition matters! Low BCS = low reproductive rates

Progesterone profiles postpartum

Energy Balance in Postpartum Cows

EB = Feed - milk - maintenance

Nadir

Days of lactation

Milk Production (kg/day)
Dry Matter Intake (kg/day)
Energy Balance (Mcal/day)
Therefore, it appears that pulsatile LH secretion is suppressed until the negative EB nadir is reached, at which time LH pulse frequency increases stimulating FSH. Since NEFA and EB are directly related, NEFA may serve as a peripheral signal of EB to the central nervous system.

Energy Balance, Metabolic Hormones, and Early Postpartum Follicular Development in Dairy Cows Fed Prilled Lipid

Effects of GH and IGF1 on the Uterus, Ovary and Embryo

Growth hormone → Liver

Embryo

IGF1

Ovary

Uterus

College of Agriculture, Food and Natural Resources

UNIVERSITY OF MISSOURI
The three fates of the postpartum dominant follicle

1. Anovulatory or anestrus
   - Low IGF1
   - Low GnRH and LH Pulse Frequency

2. Cystic
   - High LH Pulse Frequency
   - No LH surge

The IGF System in Ovarian Cells

- LH or FSH Receptor
- Steroidogenesis
- Ovarian Steroids
- IGF-I
- GH Receptor
- IGFBP
- IGFBP Protease
- Type I IGF Receptor
- IGFBP-1 or -1C

Turnover
The three fates of the postpartum dominant follicle

High IGF1 → 3. Ovulation

LH Surge

Estradiol

CL

Estradiol

LH

Plasma growth hormone (GH) concentrations in postpartum dairy cows

Kobayashi et al. (1999)
Endocrinology 140:3947-3954

GH, GHR, and IGF1 in postpartum cows

IGF1

Liver

GH

Hypothalamus

Pituitary

Stimulatory action

Inhibitory action

Nutrient Partitioning

Milk Production

Insulin restores GH responsiveness during lactation-induced negative energy balance in dairy cattle: effects on expression of IGF-I and GH receptor 1A

S T Butler, A L Marr, S H Pelton, R P Radcliffe, M C Lucy, and W R Butler
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Requests for offprints should be addressed to W R Butler (email: wbutler@cornell.edu)

Journal of Endocrinology 180: 375–387
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GH/Insulin Antagonism

Hypothalamus

Pituitary

Liver

IGF-I

GH

Adipose

Insulin

Pancreas

Glucose

Mammary

NEFA

IGF-I

Stimulatory action

Inhibitory action


Rumen and intestine

Carbohydrates -> glucose -> VFA

Muscle

Adipose

Propionate

Amino acids

Glycerol

Liver

Glucose

Muscle

Adipose

Glucose

Mammary

Reproduction

Milk

Lucy 2004 (NISAP Proceedings)
Thank you Ron!