Harvesting Milk Crop

Amin Ahmadzadeh, Larry Fox
University of Idaho, Washington State University

Factors affecting milk production

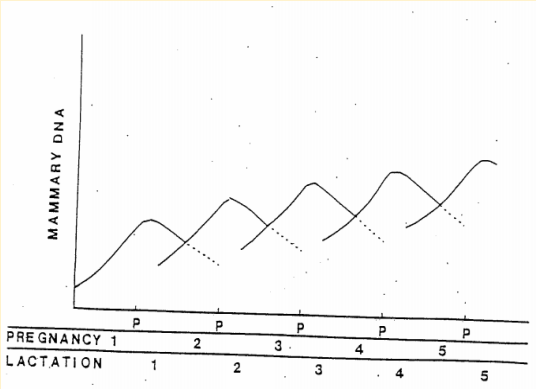
- Milk synthesis is dependent on:
  - no. secreting cells
  - blood supply
  - supply of milk precursor
  - endocrine support for lactogenesis
  - milking frequency

- No. secreting cells is dependent on:
  - genetics
  - endocrine support for mammogenesis
  - nutrition
  - disease (mastitis)

Mammary Gland Development and Mature Equivalent

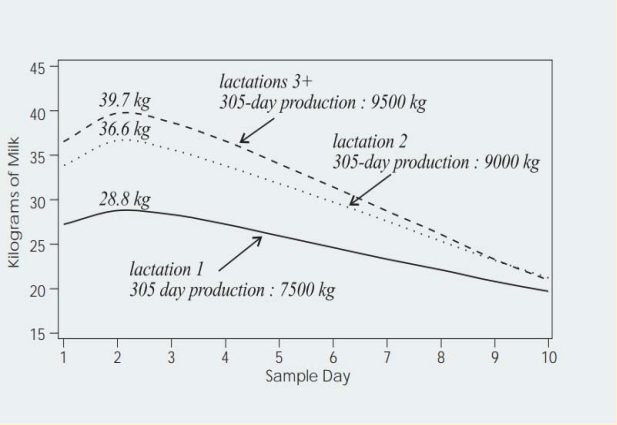
Mature equivalent = Production records have been adjusted for age at freshening, frequency of milking and season of the year at calving.

Mature equivalent records estimate how much a cow would have produced if she was of mature age, calved during an average month, and were milked twice a day

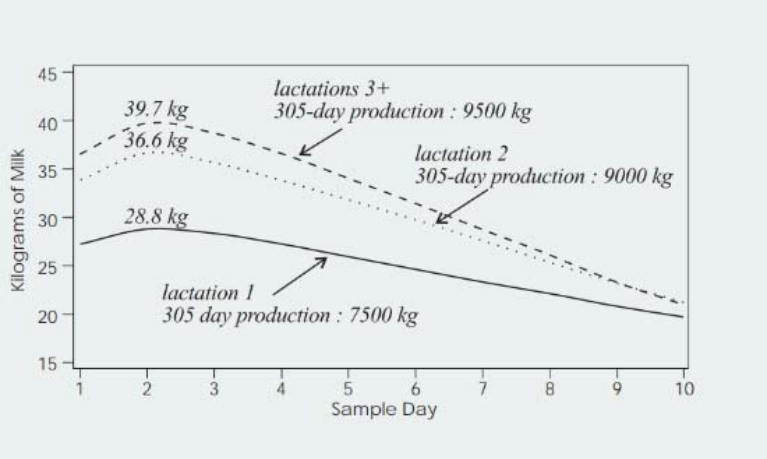


Comparison of lactation curve for different parity

- ✓ **• 1st lactation peak : 70-73% of peak for mature cows;**
- ✓ **• 2nd lactation peak : 92-93% of peak for mature cows**
- ✓ **1st lactation cows peak later, but are more persistent after peak**



Adapted from W. Canadian DHI services



1st lactation " 80% of mature cows
2nd lactation = 85-90% of mature cows
3rd lactation = 90-95% of mature cows
4th lactation=95-98% of mature cows

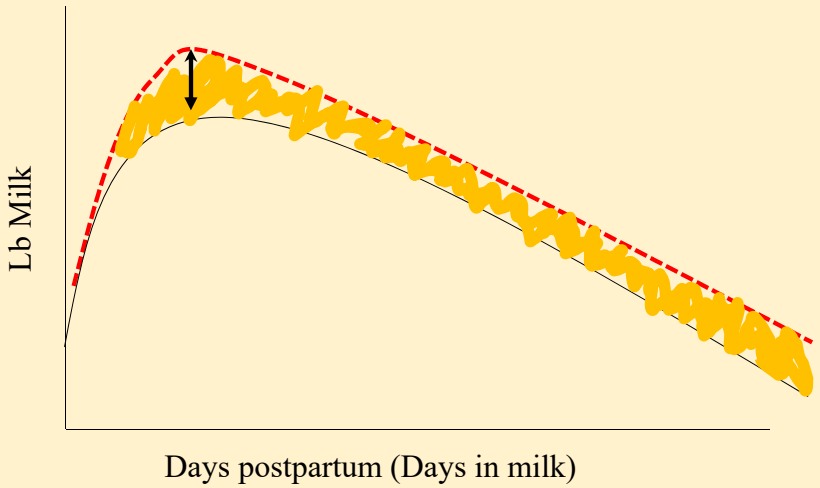
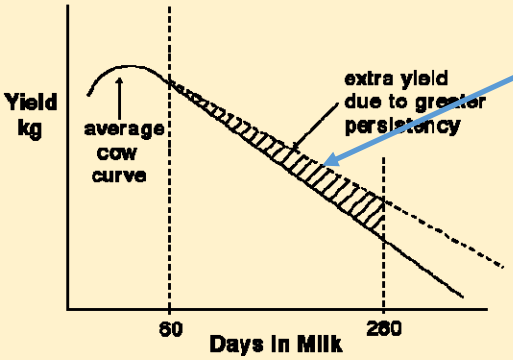


Figure 1



Normal post-peak persistency

7 to 8% decrease in milk per month after peak

- ✓ **Lower than normal persistency post-peak may be due improper nutrition of health.**
- ✓ **In general, high post-peak persistency give an opportunity to improve production**

Managerial Practices and Milk production

Milk Frequency

Milk Interval

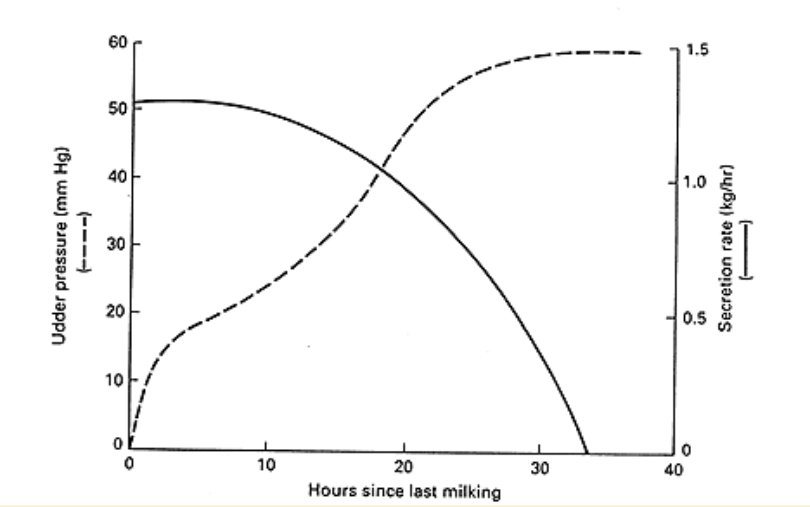
Use of Hormones

Photo Period

Effect of Increased Milking Frequency (IMF) on Milk Production

Milking Frequency Change	Increased Milk Production
1X - 2X	13.6 lb.
2X - 3X	7.7 lb.
2X - 4X	10.8 lb.

IMF: Effect of Udder Pressure on Milk Secretion



Early Lactation IMF & Changes in milk yield

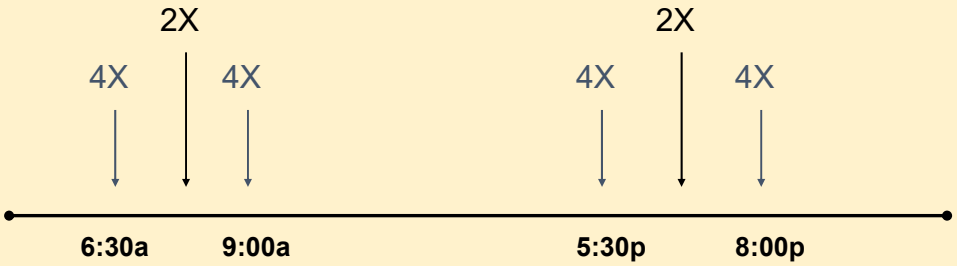
Study	Times Milked	Length of Trt	"Earned Milk" Trt Diff.	"Free Milk" Carryover Effects
Poole, 1982	3X vs. 2X	20 wks	8.8 lb/d	4.8 lb/d
Bar Peled et al., 1995	6X vs. 3X	6 wks	16.0 lb/d	11.2 lb/d
Sanders et al., 2000	6X vs. 3X	6 wks	9.0 lb/d	5.5 lb/d
			~11 lbs/d	**~7 lbs/d**

IMF Results Depend on Timing

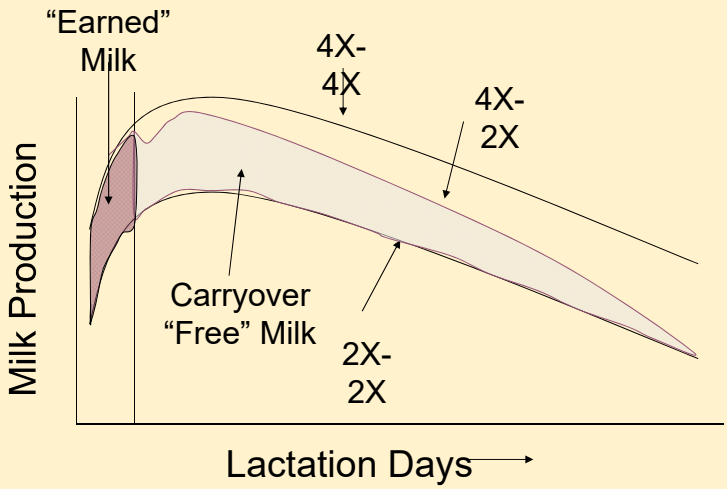
- IMF initiated during mid lactation
  - Increases milk production during IMF
  - Milk production declines to pre IMF level after IMF ceases
  - All extra milk is "Earned"

- IMF initiated during early lactation
  - Increases milk production during IMF
  - Milk production does not decline to pre IMF level after IMF ceases
  - A large portion of the extra milk is "Free"

IMF Milking Interval



- IMF cows milked before and after the normal 2X milking
- ~2 ½ hours between 2 AM and 2 PM milkings
- 8 ½ hours between AM and PM milkings



Profitability

8 cents/cow/day at 3 lb response

32 cents/cow/day at 6 lb response

Endocrine Support of Established Lactation; Photoperiod Effects

Photoperiod (length of time cattle are exposed to light)

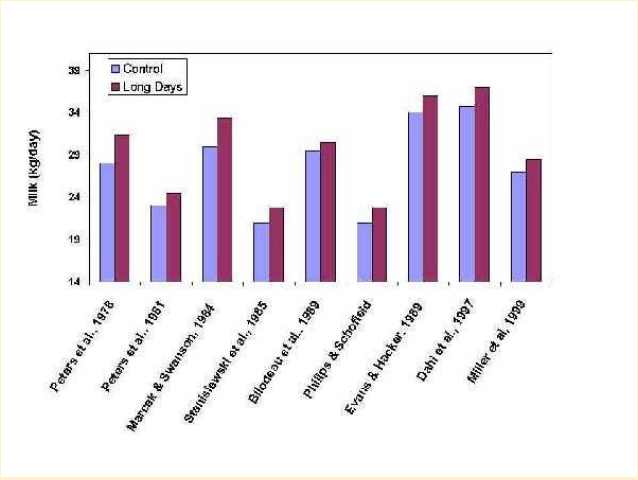
- **affects lactation yield**
- **18hr light/ 6hr dark**
  (long day-length) is best for maximum yields during lactation

Endocrine Support of Established Lactation Photoperiod Effects

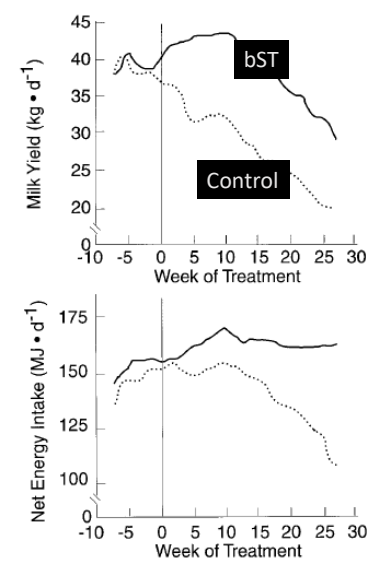
- **Long day-length suppresses melatonin (from pineal gland)**
  - **melatonin apparently regulates (suppresses?)**
  - **IGF-1 release from liver**
  - **IGF-1 increases milk synthesis**
  - **long day-length allows greater IGF-1 stimulation of milk synthesis**
    (~ 5 lbs/cow/day = ~ 7 %)

Photoperiod Management of Dairy Cattle

Cows exposed to long days, i.e. 16 to 18 hours of light and a 6 to 8 hour period of darkness, daily milk production increases an average of 2 liters/cow (4.4 lb/day)



Effect of bST on milk yield and feed intake

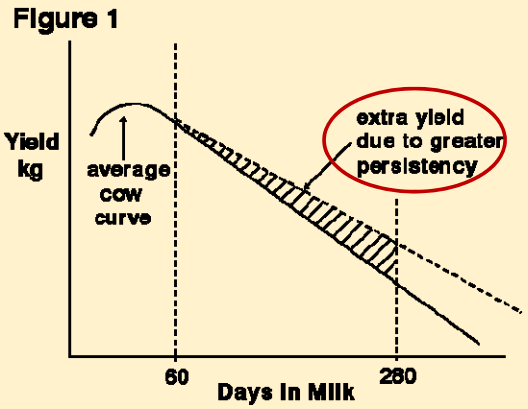


Location	Increase in Milk Yield (%)	Increase in Feed Efficiency (%)
Arizona	8.3	2.7
Cornell University	11.5	5.3
Missouri/Monsanto	21.8	8.2
Utah/Utah State U.	14.6	5.3
France	17.8	9.3
Germany	16.6	4.9
Netherlands	18.5	7.1
United Kingdom	19.2	5.4

10-15% **6%**

Milk from rbST-Treated Cow vs Conventional Milk

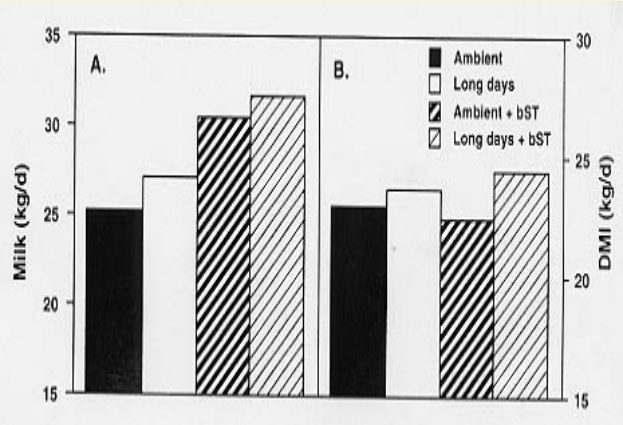
Milk Composition	rbST	Conventional
Water	87%	87%
Carbohydrates	4.9%	4.9%
Fat (Lipid)	3.7%	3.7%
Protein	3.2%	3.2%
Vitamins & Minerals (Holstein)	1.2%	1.2%



https://ansci.cals.cornell.edu/sites/ansci.cals.cornell.edu/files/shared/documents/Recombinant%20Bovine%20Somatotropin_v3.pdf

Endocrine Support of Established Lactation; Photoperiod Effects

- **Milk yield and DMI**
  (dry matter intake) are elevated in response to long day-length
  (18hr light/6hr dark)
- **Milk yield and DMI are further elevated in response to long**
  day-length + bST
  (additive effect)



Take Home Messages

- **Increasing peak and persistency**
  - ✓**Taking care of transition period, health and nutrition**
  - ✓**Increase milk frequency overall**
  - ✓**Increase milk frequency early postpartum**
  - ✓**Use of galactopoetic hormone: bST**
  - ✓**Photoperiod: 16 hr ligh;8 hr dark**