

Improving Efficiency

- $[\text{Dam Weight} \times \text{Lean Value of Dam} + \text{No. Progeny} \times \text{Progeny Weight} \times \text{Lean Value of Progeny}] - [\text{Dam Feed} \times \text{Value of Feed for Dam} + \text{No. Progeny} \times \text{Progeny Feed} \times \text{Value of Feed for Progeny}]$.
- By simply increasing number of progeny per dam through either selection, heterosis from crossing, or better management, we will increase efficiency of production.

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Reproduction is the single most important factor for profitable beef production.

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Time of Calving Affects Feedlot Performance

	Period of calving, 21 day periods		
	1 st	2 nd	3 rd
Steer calves (n = 661)			
Weaning weight, lb	515	483	435
Feedlot ADG, lb/day	3.61	3.62	3.63
Carcass weight, lb	816	800	771
Marbling score	574	554	527
Yield grade	3.0	2.8	2.6
Choice, %	84	83	73
≥ Average choice, %	30	17	12
Carcass value	\$1632	\$1600	\$1542

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Time of Calving Affects Heifer Progeny

	Period of calving, 21 day periods		
	1 st	2 nd	3 rd
Heifer calves (n = 1019)			
Prewaning ADG, lb	1.83	1.83	1.90
Weaning weight, lb	483	470	434
Prebreeding ADG, lb	.86	.90	.90
Prebreeding weight, lb	653	644	609
Cycling, %	70	58	39
Breeding ADG, lb	1.59	1.63	1.70
Pregnancy rate, %	90	86	78
Calved in 1 st 21 d	81	69	65

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Importance of Beef Females Conceiving Early in the Breeding Season

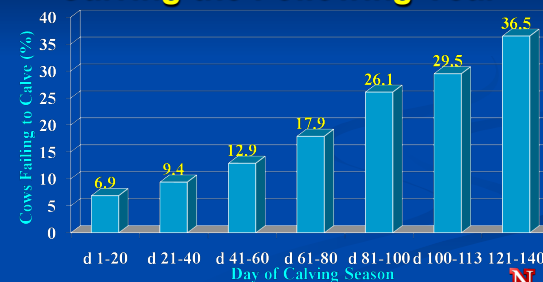
Steer Progeny	Heifer Progeny
↑ Weaning weight	↑ Weaning weight
↑ Hot carcass weight	↑ Prebreeding weight
↑ Marbling score	↑ Precalving weight
↑ % Average choice or greater	↑ % Cycling before breeding
↑ Carcass value	↑ Pregnancy rate

Larson and Funston, 2009

Funston et. al., 2011

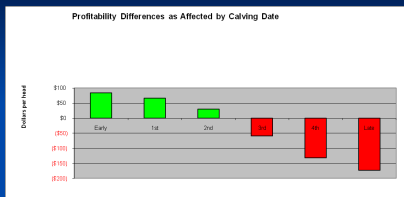
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Effect of Calving Date on the Number of Cows Calving the Following Year



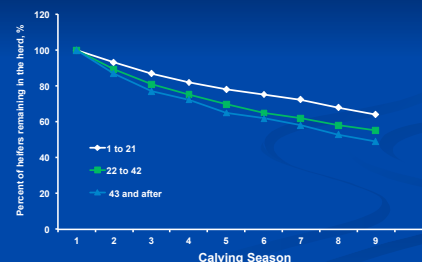
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Actual Profit Differences are Large



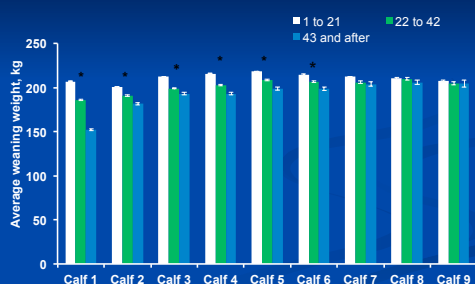
- It takes the profit from two early-calving cows to cover the loss from one late-calver.
- A cow that calves in the first 21-day calving interval her entire 8 or 9-year life, will produce the weaning weight equivalent of 1 ½ to 2 ADDITIONAL calves in her lifetime compared to one that starts late and stays late.

Advantages of calving early as a heifer



Cushman et al., 2013, JAS 97:4486

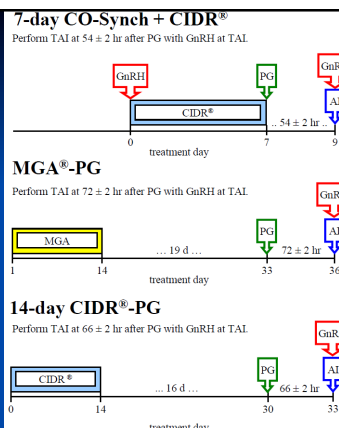
Advantages of calving early as a heifer



Cushman et al., 2013, JAS 97:4486

2017 Heifer Protocols-Fixed Time AI (TAI)

beefrepro.info

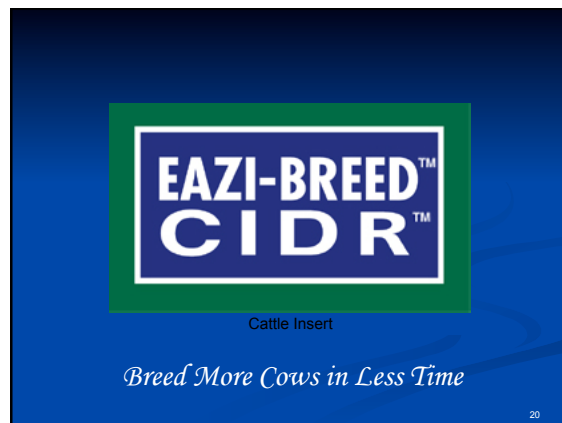
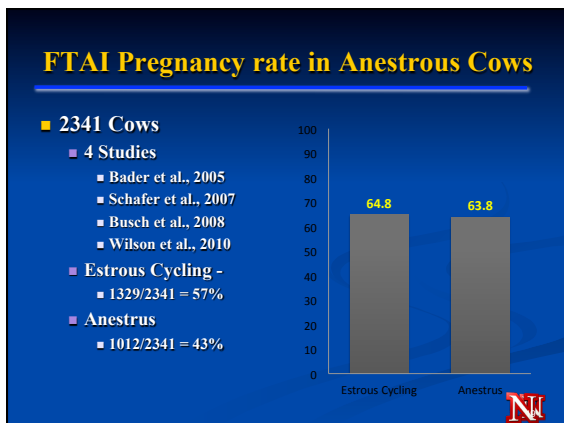


Potential Advantages of Estrous Synchronization with Natural Service

- ✓ Start cows/heifers cycling with some estrous synchronization protocols
- ✓ Increase pregnancy rates by allowing more opportunities to conceive
 - ✓ Reduce replacement rates
- ✓ Earlier average conception and calving date
 - ✓ Heavier calves at weaning

Hughes, 2005

- Opportunities for increasing profits lie in moving females from the later calving periods forward toward the first and second calving periods.
- High production herds see 61% of the calves born by day 21, 85% by day 42 and 94% by day 63.



Factors affecting pregnancy rate

- Pregnancy rate = estrous detection rate x conception rate.
- Estrous detection rate = number detected in estrus/number exposed to breeding.
- Conception rate = number pregnant/number detected in estrus.

What pregnancy rate can I expect?

Estrous Detection Rate x Conception Rate = Pregnancy Rate

Estrous detection rate	Conception rate	Pregnancy rate
95	70	67
75	70	53
95	50	48
75	50	38

Types of Anestrus?

- ✓ Seasonal – Hot environmental (Silent Heat)
- ✓ Prepubertal – Not reproductively mature
- ✓ Nutritional – Lack of adequate energy to provide for reproductive systems.
- ✓ Lactational - Suckled animals or negative energy balance
- ✓ Pathological – Reproductive problems (pyometra, metritis, endocrine dysfunction)

Identifying Anestrous Cows/Heifers

- ✓ Age & Weight for Heifers
- ✓ Days Postpartum
- ✓ Body Condition Score
- ✓ Number Cycling on a given day



Embryonic Mortality

- Fertilization rate in beef cattle has been estimated to be between 90-100%.
 - (Sreenan and Diskin, 1983)
- Embryo death accounts for more than 30% of overall reproductive failure.
 - Diskin and Sreenan (1980)
- Embryonic loss occurs throughout pregnancy in cattle, but mainly in the first 40 d after breeding.
 - Goeseels (2000)



Factors Affecting Embryonic Loss

- | | |
|---|--|
| GENETIC <ul style="list-style-type: none"> • Expression of lethal genes • Abnormal chromosomal numbers • Inbreeding | ENVIRONMENT <ul style="list-style-type: none"> • Heat stress • Transport • Handling/chute work |
| NUTRITION <ul style="list-style-type: none"> • BW&BCS at breeding • Excess protein • Toxins | MISCELLANEOUS <ul style="list-style-type: none"> • Low progesterone production • Age of dam • Semen quality • Infectious agents |

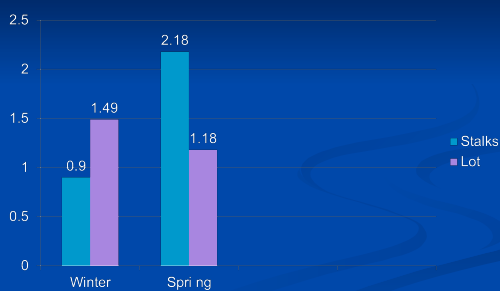


Heifer Development

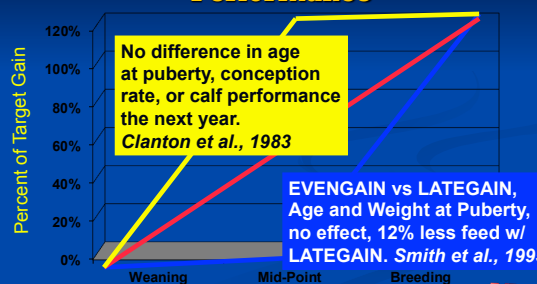
	Stalks	Dry Lot
■ Weight, lb	665	727
■ ADG Wean -> Pre.84		1.23
■ AI Pregnancy rate, %	65	55
■ WHY ?		
■ ADG Pre	1.4	2.14
■ ADG Post	1.27	.81



Development Stalks vs Dry Lot



Effect of Time of Gain From Weaning to Breeding on Heifer Performance

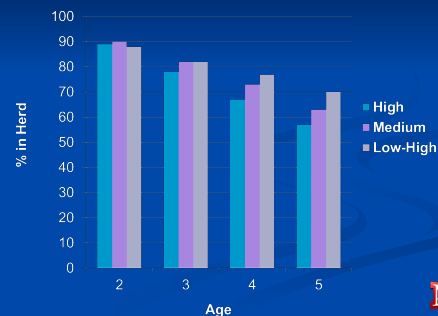


Timing of Gain and Reproductive Performance

Item	Even Gain	Late Gain
FSCR	56.4	71.1
Overall	87.5	87.5



Longevity and Heifer Development System



THE CALF LEARNS FROM THE COW?



Time of Calving



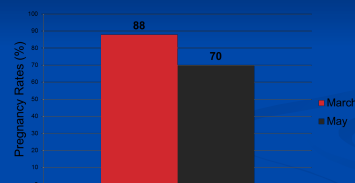
TOC Pregnancy Rate

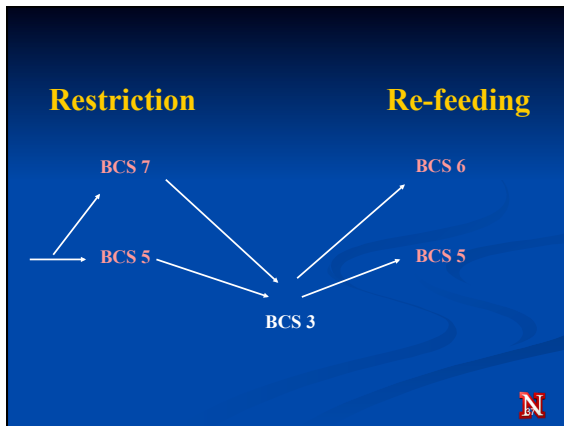
Trait	March	June	August
% Pregnant	93.5	93.0	90.3
	May		
2010 3s	65		
Older	93		
2011 3s	75		
Older	93		
Heifers		High 64	Low 52



March vs. May Pregnancy

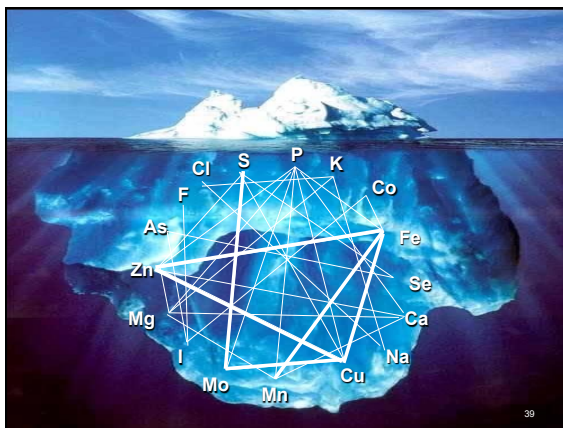
March vs. May Pregnancy Rates





Fat Supplementation

- Safflower
- Sunflower
- Cottonseed
- Rice Hulls
- Soybeans
- Canola
- Flax
- Fish Meal
- Ca Salts of FA
- Tallow, Yellow Grease



Effect of Rumensin on Puberty and Conception Rates

Group	No. heifers	% Cycling	% Bred
Rumensin	24	92	55
Control	26	58	47

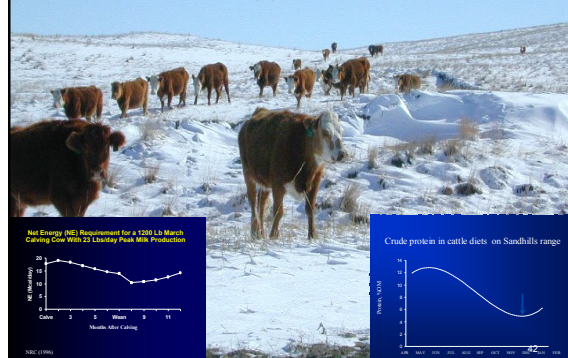
Treatment	Age @ Puberty	% Pregnant
High Roughage	383	83
Rumensin +90% HR	369	96
Rumensin +100% HR	369	96

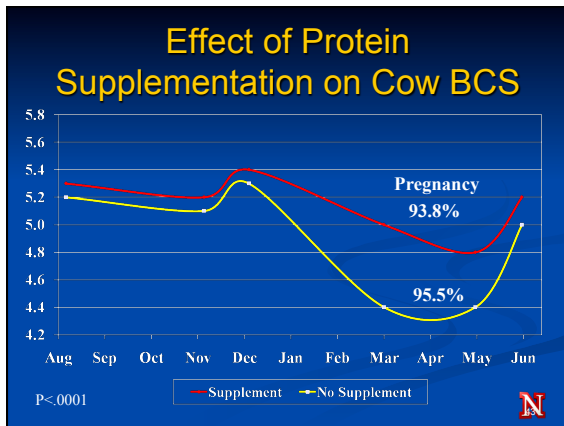
BALANCED NUTRITION: KEY TO OPTIMIZING PRODUCTION

- ✓ Protein
- ✓ Energy
- ✓ Minerals
- ✓ Vitamins
- ✓ Water



Winter Supplementation





Heifer Pregnancy Diagnosis and Weights

Treatment	BW	Pregnancy (%)
Range S	810	91
Range NS	783	77
Stalks S	808	88
Stalks NS	826	83

45 day breeding season



Effect of sire on pregnancy rates

Sire	TAI	Pregnancy
A	70	
B	43	
C	65	
D	60	

Where should I purchase semen for FTAI?

- Semen from one of the four major AI companies.
 - 4127/6749 (61%; 31 sires, 3 were below 50%)
- Semen from a custom collection site
 - 134/276 (49%; 16 sires, 7 were below 50%)

Technician Effects



Tech	Preg Rates
1	67
2	44
3	61



Artificial Insemination Technique

- Cervical deposition occurs in > 20% of inseminations.
- There is a 10% decrease in conception rate when semen is deposited in the cervix compared to the uterus.
- No advantage to depositing semen in the uterine horns compared to the uterine body.



What to do if a storm is going to hit?



What to do if a storm is going to hit?

- Fixed-time AI – breed at the scheduled time.
- Estrous detection:
 - Breed according to estrus and perform a cleanup AI.
 - Breed according to estrus and 9 to 11 days later inject females not inseminated with PG.
 - Switch to FTAI.



When should I administer prebreeding vaccines?

- Is there adequate time for the vaccine to provide immunity at breeding and during early gestation?
- Will the vaccine (e.g. MLV-IBR) reduce pregnancy rates following AI?



Prebreeding Vaccination Recommendations

- Replacement heifers should be vaccinated before and at weaning.
- Both heifers and cows should be vaccinated 30 days before breeding.
- Animals that have not been previously vaccinated should not receive prebreeding vaccinations near the time of breeding.



Facilities for Fixed-time Artificial Insemination



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Facilities for Fixed-time Artificial Insemination

Large's Portable AI Barns



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Stress and AI?

♀ + Bucket Load of Estrogen + Off Feed 24 Hours +
 Pushed Around by Friends for 12 Hours + Pack Her Own Weight 30 Times in 12 Hours +
 Cowboy's Arm in Rectum + .5 cm Rod in Vagina/Cervix = Stress is Maximized

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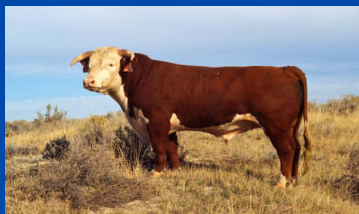
Handling Cattle after AI

	Day Transported after AI		
	1 - 4	8 - 12	29 - 33
Synchronized Pregnancy Rate	74%	62%	65%
Breeding Season Pregnancy Rate	95%	94%	94%
Mean Day of Conception	9.6	13.4	13.6

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Sire Selection

- ★ Determines more than 85% of the total improvement made in a herd



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Fundamental Principles of Sire Selection

- Key questions before purchasing semen:
 - Do you keep replacement heifers?
 - How/when do you sell your calves?
- Be Proactive:
 - Understand EPD/Selection Indexes
 - Know what your looking for!
 - Don't waiver!

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Reproductive Traits

1. Puberty/ Resume cycling
2. Fertile ovulation
3. Conception (Cow and Bull)
4. Maintenance of Pregnancy
5. Give birth to live calf

These interdependent traits culminate in a qualitative response, measured 1 time every year.



Calving Ease

- 16 % advantage in conception rate to cows not having dystocia (2000 head; Laster 1973)
- Short duration of labor; 10% more in estrus at beginning of breeding season; 14% higher fall pregnancy % (Doornbos 1984)



Calving Assistance

Item	Late	Stage II
		Early
Calf Vigor	1.1	1.2
PPI	51	49
% in heat	82	91*
Services/conception	1.24	1.15
Fall Pregnancy	78	92*
Calf ADG	1.63	1.74*
Calf WW	387	422*

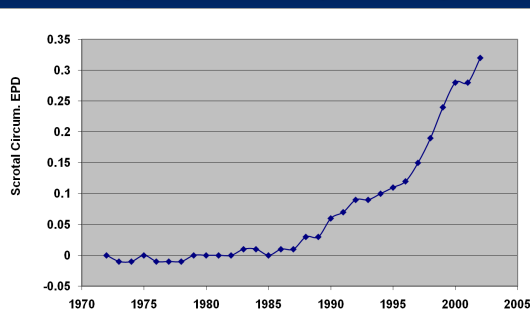


Scrotal Circumference

- 21 day reduced age at first estrus; 1.6cm increase in scrotal circumference in progeny from 141 sires selected for scrotal circumference (Morris, 1993)
- Daughters of bulls with a high SC EPD reached puberty 62 days earlier than a low SC EPD line (Hough, 1991)



Has Age of Puberty Changed?



Milk Production

- Balance between productivity and resource availability and cost



- Selection for increased milk will not be profitable in all systems



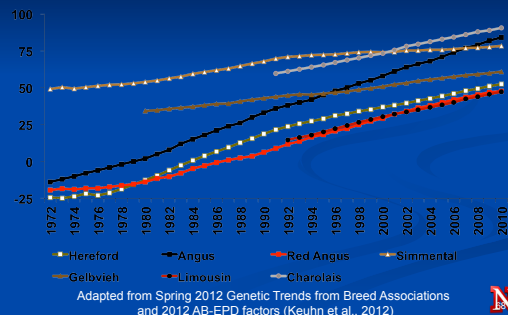
Mature Size

- Increased feed requirements per cow.
- Related positively to other growth traits.
- Most desirable = cows that excel in early growth, but mature at moderate weight.

Kolstad, 1993; MacNeil et al., 1994; Koots and Gibson, 1998



Genetic Trends for Yearling Weight, lb



If a producer was using angus bulls with average EPD for milk, WW and YW in 1998-2000, the same bulls would be ranked in the bottom 5 % for these traits today

"The reproduction rate of the cow herd has not increased the past 20 years and has tended to decline the past 10 years."

-Dr. Jim McGrann
North American Prof. Emeritus - Texas A&M

McGrann, Personal Communication 2016

PREVENTION WORKS.



"Thus, as we strive to improve growth rate in the cattle industry and to make the commercial cow more efficient from the standpoint of utilizing nutrients, we must insure that we do not deviate from the goal of maintaining an optimum level of reproductive efficiency."

--Dr. Larry R. Corah, K-State



Advantage of Crossbred Cows

Trait	Maternal Heterosis
Longevity	1.2 yrs (44%)
Calf Weight/Cow Exposed	74 lb (25%)
Net Profit/Cow Exposed	\$100



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Factors that Affect Estrous Response & Conception Rates

- ✓ Body Condition Scores
- ✓ Age
- ✓ Postpartum Intervals
- ✓ Percent Cycling in Herd
- ✓ Nutrition
- ✓ Weather
- ✓ Correct Application of Protocols



What are the primary problems?

- Cattle are not good candidates for an estrus synch/ AI program
- Protocol compliance
- Sire selection
- Semen handling
- Facilities
- Shipping (trucking) stress
- Cattle lose weight during the breeding season
- Unlikely that the biological activity of the ES products is compromised



Closing Thoughts

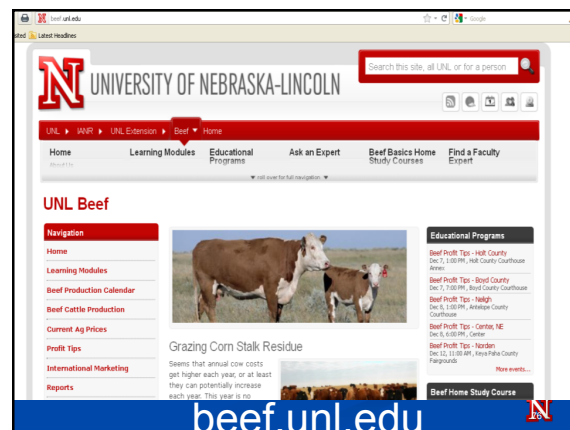
- Focus on high percentage pregnant early
- Begins with heifer development
- Consider synchronization
- Supplementation, what, when, timing
- Segregate high risk animals
- BCS at calving
- Sound herd health program
- Genetics that fit the environment
- Heterosis



Proceedings, Applied Reproductive Strategies in Beef Cattle
August 31 – September 1, 2011, Joplin, MO

KEYS TO A SUCCESSFUL ESTRUS SYNCHRONIZATION AND ARTIFICIAL INSEMINATION PROGRAM

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