Spring Ranchers Forum Proceedings

a program by the

Central Florida Livestock Agents Group

Thursday, March 19, 2020

Yarborough Ranch

1355 Snow Hill Rd.

Geneva, Florida 32732

UF | IFAS Extension
UNIVERSITY of FLORIDA
An equal opportunity institution

CENTRAL FLORIDA
LIVESTOCK
AGENTS GROUP

Spring Ranchers Forum
March 19, 2020
Proceedings

Central Florida Livestock Agents Group

<u>Agents</u>

Caitlin Bainum (Marion County)
Laura Bennett (Multi-County)
Jonael Bosques-Mendez (Hardee County)
Clay Cooper (Citrus County)
Ed Jennings (Levi County)
Brittany Justesen (Osceola County)
Megan Mann (Lake County)
Wendy Mussoline (Multi-County)
Francisco Rivera-Melendez (Hillsborough County)
Stacy Strickland (Osceola County)
Joe Walter (Brevard County)
Tim Wilson (St. Johns County)
JK Yarborough (Multi-County)

Central Florida Livestock Agents Group

UF | IFAS Extension
UNIVERSITY of FLORIDA
An equal opportunity institution

SPRING RANCHERS FORUM

a program by the
Central Florida Livestock Agents Group
THURSDAY, MARCH 19, 2020
YARBOROUGH RANCH
1355 Snow Hill Road, Geneva, FL 32732

AGENDA

8:00am - Arrival / Registration

8:30am - Reproductive Technologies in Florida Beef Systems
- Dr. Mario Binelli, Assistant Professor of Physiology, UF

10:00am - Cattle Dystocia and Calf Pulling
- Dr. Todd Thrift, Associate Professor, UF

11:00am - Trade Show Break

11:50 am - Ryegrass Varity Trail Update
- Dr. Wendy Mussoline, UF/IFAS Extension Multi County Agent

12:00pm - Official Welcome Steak Lunch

1:00pm - Selling Your Own Meat - Kylie Philipps, M.S. Student UF

1:30pm - Warm-Season Pasture Establishment
- Dr. Joao Vendramini, Associate Professor, RCREC UF

2:30pm - Florida Market News Services
- Jay Thomas, Market Reporter FDACS

3:00pm - Being an "Ag-vocate": Tools to Help Ag Discussions
- CFLAG Agents

NOTES

UF | IFAS Extension
UNIVERSITY of FLORIDA

Springs Ranchers Forum
March 19th, 2020

Reproductive Technologies in Florida Beef Systems

Mario Binelli, PhD
Department of Animal Sciences
University of Florida

1

Increasing technological level

- Control of the breeding season
- Timed bull breeding
- AI + bull
- Timed AI + bull
- TAI + resynch +TAI
- Embryo transfer
- OPU + IVF + Embryo transfer

2

Guiding principles:

Use of technology will benefit your cow-calf operation.

Apply gradually.

Have realistic expectations.

3

Survey: Reproductive Technology level used in your operation

1. Please indicate the number of females in reproduction in your operation: <20____; <100____; <1000____; >1000____.
2. For each technology, place an "X" at the level used currently in your operation.
3. For each technology, place an "O" at the level you intend to use in the future in your operation.

TECHNOLOGY			
	Virgin heifers	**First-calf heifers**	**Mature cows**
1. Breeding Season			
No breeding season			
Breeding season <180d			
Breeding season <120d			
Breeding season<90d			
2. Breeding Methods			
Bull only			
AI+Bull			
AI only			
3. Estrus Synchronization Methods			
No synchronization			
Synchronization + bull (no AI)			
Synchronization + Check heat + AI			
Synchronization + Timed-AI (no heat check)			
Resynch (Timed-AI + Timed-AI)			
4. Advanced Technologies			
No advanced technologies			
Embryo transfer (ET)			
OPU + in vitro fertilization (IVF) + ET			
Reproductive tract score			
Early weaning			
5. Pregnancy diagnostic			
No preg check			
Preg check at weaning			
Preg check between end of breeding season and weaning			
Preg check within the breeding season			
Multiple preg checks			

4

Survey: Reproductive Technology level used in your operation

1. Please indicate the number of <u>females in reproduction</u> in your operation: <20____; <100____; <1000__X__; >1000____.
2. For each technology, place an "X" at the level <u>used currently</u> in your operation.
3. For each technology, place an "O" at the level you <u>intend to use in the future</u> in you operation.

TECHNOLOGY			
	Virgin heifers	**First-calf heifers**	**Mature cows**
1. Breeding Season			
No breeding season			
Breeding season <180d			
Breeding season <120d			
Breeding season<90d	X	X	X
2. Breeding Methods			
Bull only			
AI+Bull	X	X	X
AI only			
3. Estrus Synchronization Methods			
No synchronization			
Synchronization + bull (no AI)			
Synchronization + Check heat + AI	X	X	X
Synchronization + Timed-AI (no heat check)			
Resynch (Timed-AI + Timed-AI)			
4. Advanced Technologies			
No advanced technologies		X	
Embryo transfer (ET)			
OPU + in vitro fertilization (IVF) + ET			X
Reproductive tract score	X		
Early weaning			
5. Pregnancy diagnostic			
No preg check			
Preg check at weaning			
Preg check between end of breeding season and weaning			
Preg check within the breeding season			
Multiple preg checks	X	X	X

5

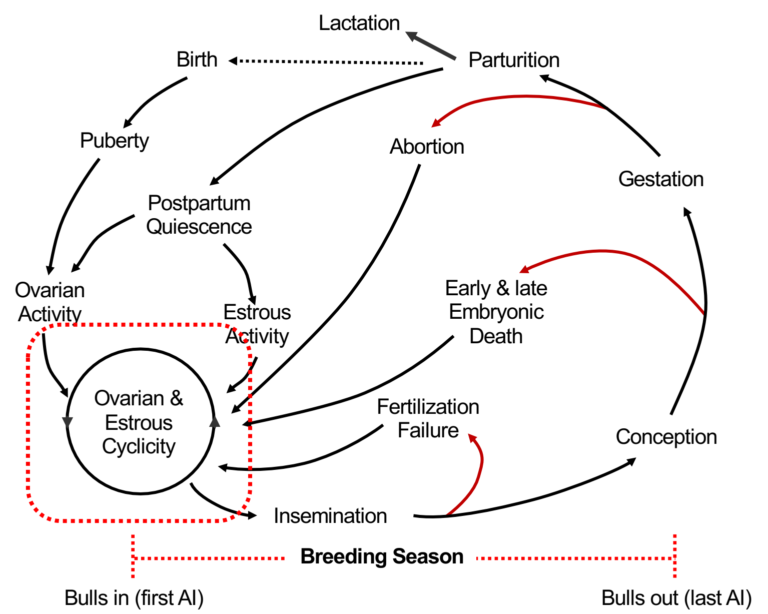
Survey: Reproductive Technology level used in your operation

1. Please indicate the number of <u>females in reproduction</u> in your operation: <20____; <100____; <1000__X__; >1000____.
2. For each technology, place an "X" at the level <u>used currently</u> in your operation.
3. For each technology, place an "O" at the level you <u>intend to use in the future</u> in you operation.

TECHNOLOGY			
	Virgin heifers	**First-calf heifers**	**Mature cows**
1. Breeding Season			
No breeding season			
Breeding season <180d			
Breeding season <120d			
Breeding season<90d	X	X	X
2. Breeding Methods			
Bull only			
AI+Bull	X	X	X
AI only	O		
3. Estrus Synchronization Methods			
No synchronization			
Synchronization + bull (no AI)			
Synchronization + Check heat + AI	X	X	X
Synchronization + Timed-AI (no heat check)			
Resynch (Timed-AI + Timed-AI)			O
4. Advanced Technologies			
No advanced technologies		X	
Embryo transfer (ET)			
OPU + in vitro fertilization (IVF) + ET			X
Reproductive tract score	X		
Early weaning		O	
5. Pregnancy diagnostic			
No preg check			
Preg check at weaning			
Preg check between end of breeding season and weaning			
Preg check within the breeding season			
Multiple preg checks	X	X	X

6

Schematic of Bovine Reproductive Cycle (Female)



7

Breeding Season

8

She is the first!

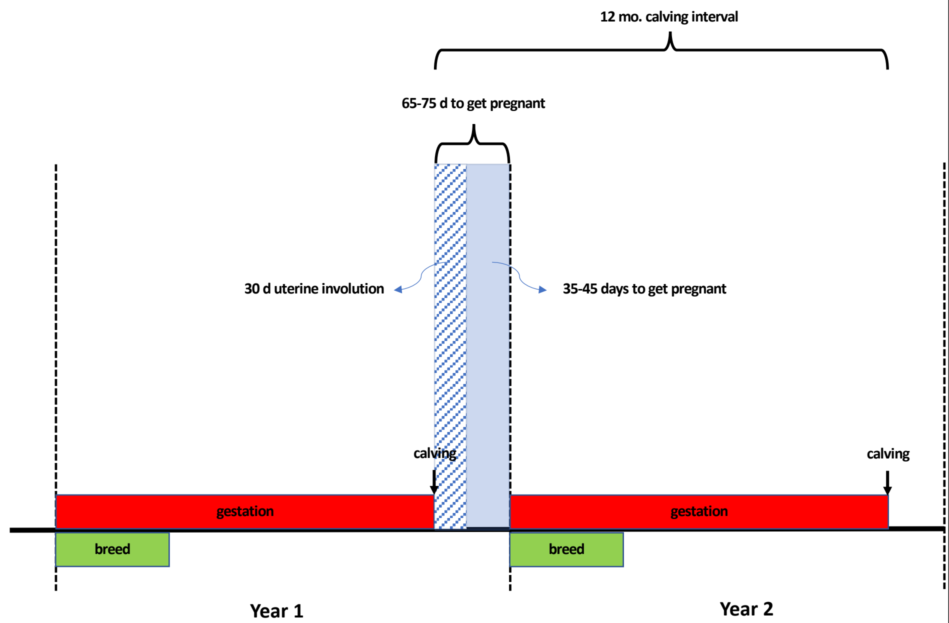
9

Guiding principle:

Breeding early in the season is critical to maximize lifetime productivity.

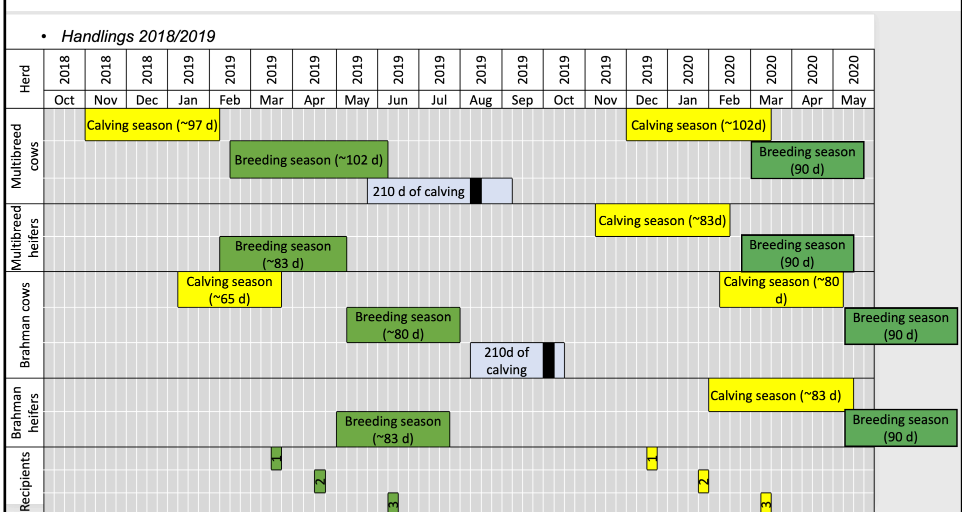
10

There is a 30-45 days window to get a cow pregnant in a 90-day breeding season, to keep a 12 mo. calving interval



11

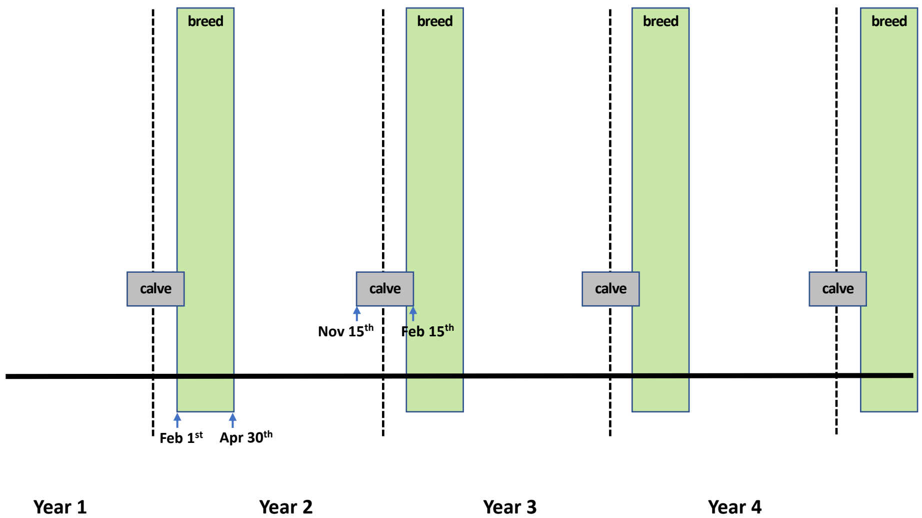
UF 2018-2019-2020 Breeding Season(s)



UF Beef Unit manager: Mr. Danny Driver

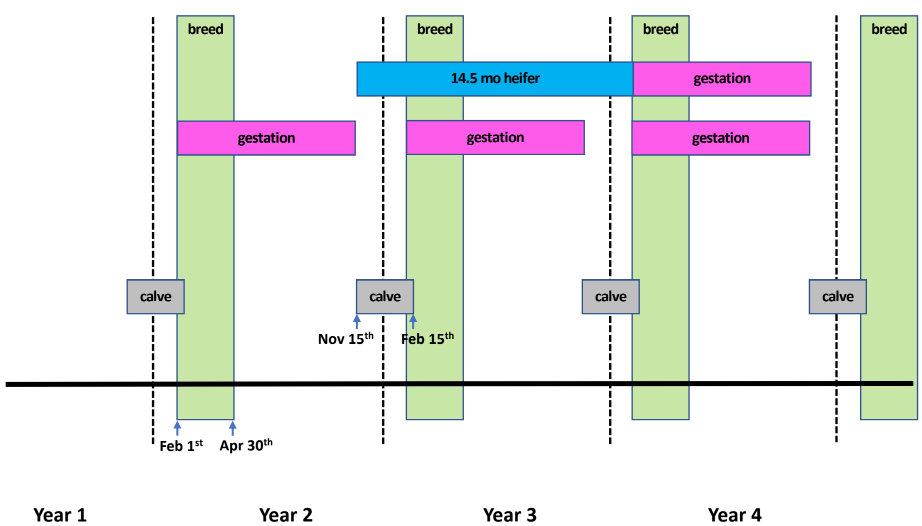
12

A multi-year scenario



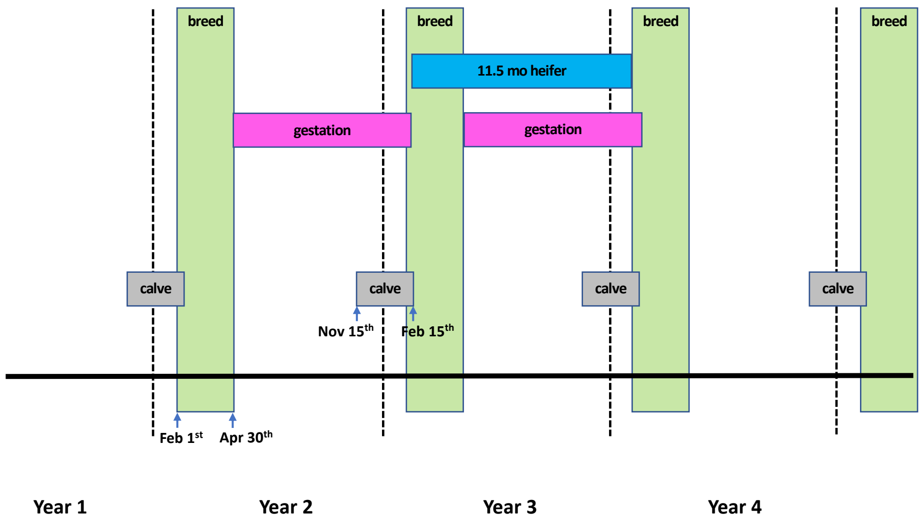
13

A multi-year success scenario: dam and yearling heifer pregnant at the beginning of breeding season year 4



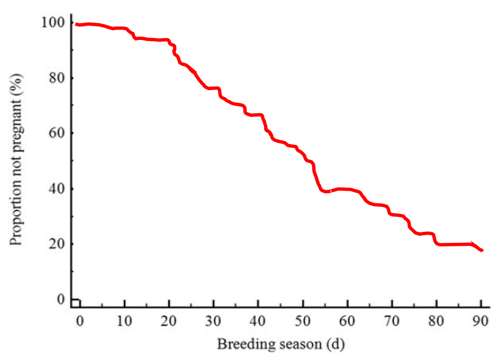
14

A multi-year challenging scenario: dam and yearling heifer not pregnant at the end of breeding season year 4



15

Proportion of open cows during a 90-day breeding season (bull only).



16

Estrus Synchronization

17

Guiding principle:

Estrous behavior (heat) is the golden standard of fertility.

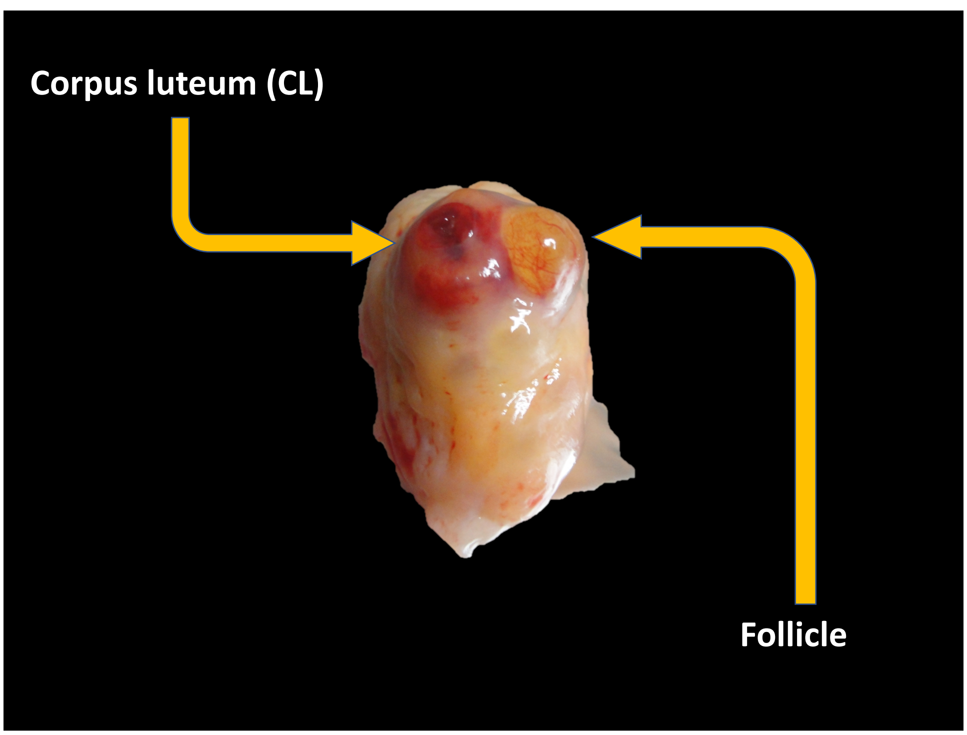
18

Definition of an Estrous Cycle

0 → 21

TIME (days)

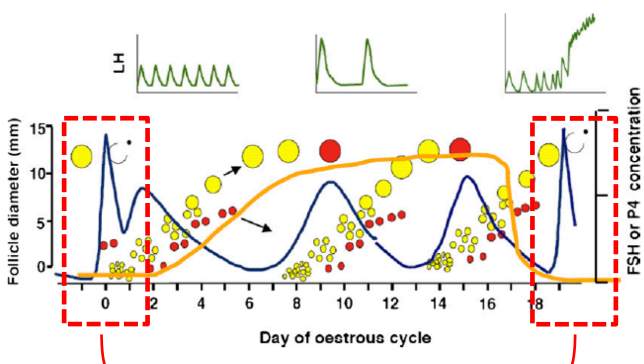
19

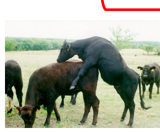


20

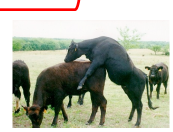
21

Estrous cycles in cattle



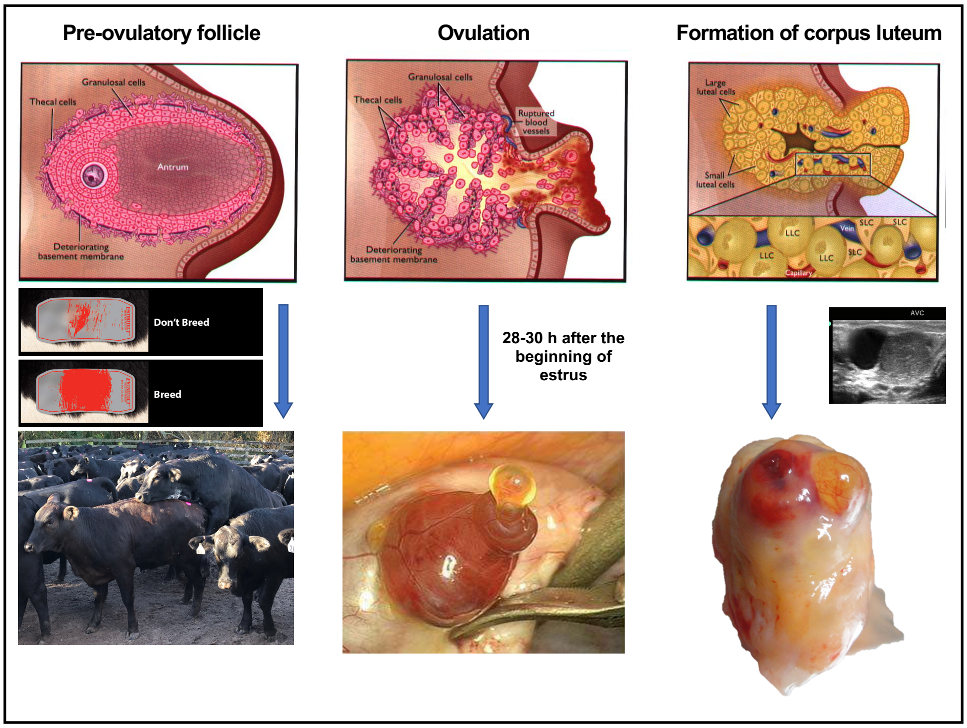


Estrus and ovulation



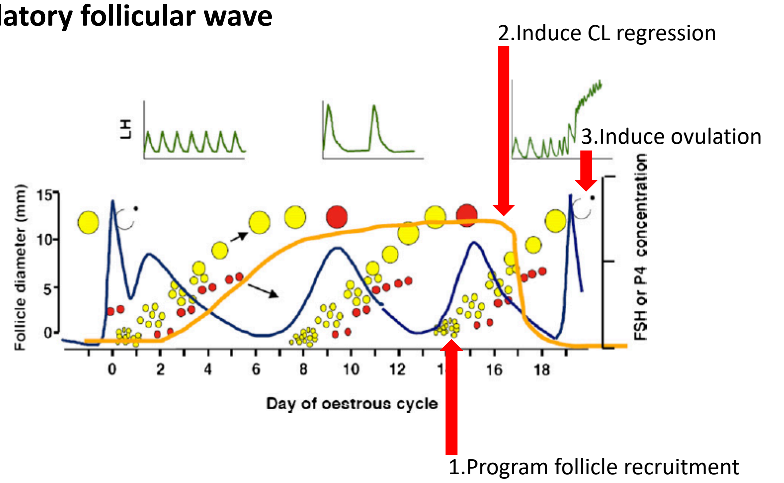
Adapted from Forde et al., 2010

22



23

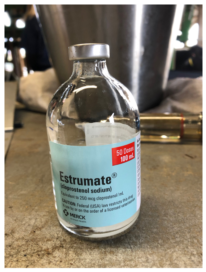
A synchronization protocol attempts to mimic the events of the ovulatory follicular wave



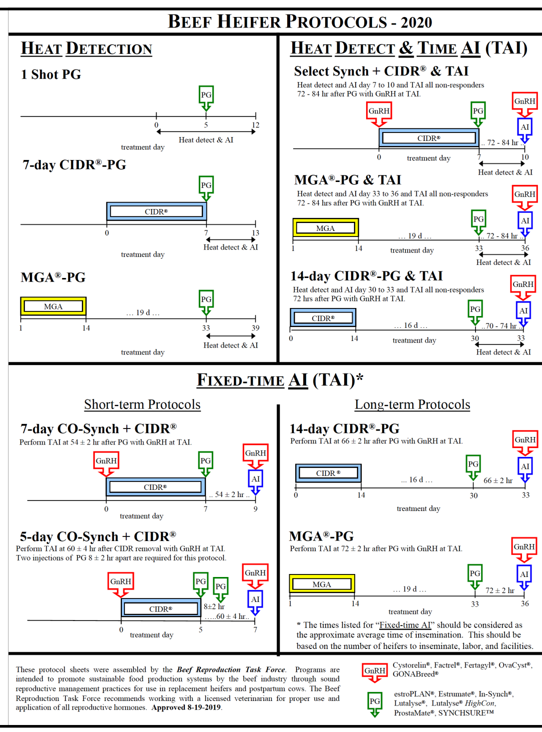
Adapted from Forde et al., 2010

24

Toolbox

PGF	GnRH	CIDR	Estrotect
			 
PG estroPLAN®, Estrumate®, In-Synch®, Lutalyse®, Lutalyse® *HighCon*, ProstaMate®, SYNCHSURE™	GnRH Cystorelin®, Factrel®, Fertagyl®, OvaCyst®, GONABreed®	(or MGA)	

25



Beef Heifer Protocols - 2020

Heat Detection

1 Shot PG

7-day CIDR®-PG

MGA®-PG

Heat Detect & Time AI (TAI)

Select Synch + CIDR® & TAI
Heat detect and AI day 7 to 10 and TAI all non-responders 72 - 84 hr after PG with GnRH at TAI.

MGA®-PG & TAI
Heat detect and AI day 33 to 36 and TAI all non-responders 72 - 84 hrs after PG with GnRH at TAI.

14-day CIDR®-PG & TAI
Heat detect and AI day 30 to 33 and TAI all non-responders 72 hrs after PG with GnRH at TAI.

Fixed-time AI (TAI)*

Short-term Protocols

7-day CO-Synch + CIDR®
Perform TAI at 54 ± 2 hr after PG with GnRH at TAI.

5-day CO-Synch + CIDR®
Perform TAI at 60 ± 4 hr after CIDR removal with GnRH at TAI. Two injections of PG 8 ± 2 hr apart are required for this protocol.

Long-term Protocols

14-day CIDR®-PG
Perform TAI at 66 ± 2 hr after PG with GnRH at TAI.

MGA®-PG
Perform TAI at 72 ± 2 hr after PG with GnRH at TAI.

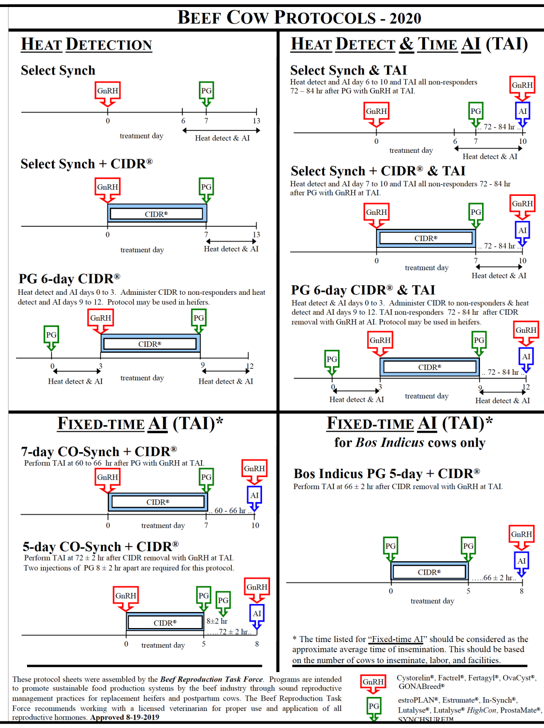
* The times listed for "Fixed-time AI" should be considered as the approximate average time of insemination. This should be based on the number of heifers to inseminate, labor, and facilities.

These protocol sheets were assembled by the ***Beef Reproduction Task Force***. Programs are intended to promote sustainable food production systems by the beef industry through sound reproductive management practices for use in replacement heifers and postpartum cows. The Beef Reproduction Task Force recommends working with a licensed veterinarian for proper use and application of all reproductive hormones. **Approved 8-19-2019**.

GnRH Cystorelin®, Factrel®, Fertagyl®, OvaCyst®, GONABreed®

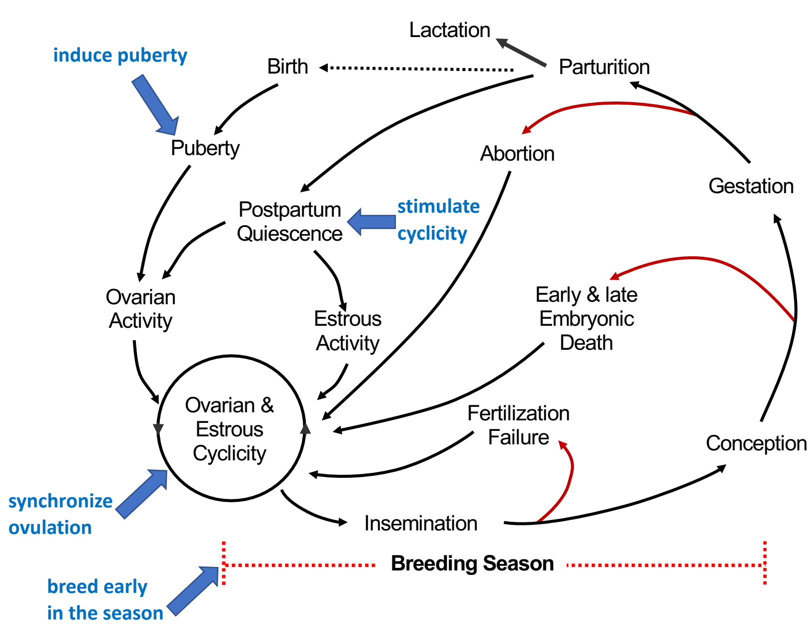
PG estroPLAN®, Estrumate®, In-Synch®, Lutalyse®, Lutalyse® *HighCon*, ProstaMate®, SYNCHSURE™

26



27

Uses of Synchronization

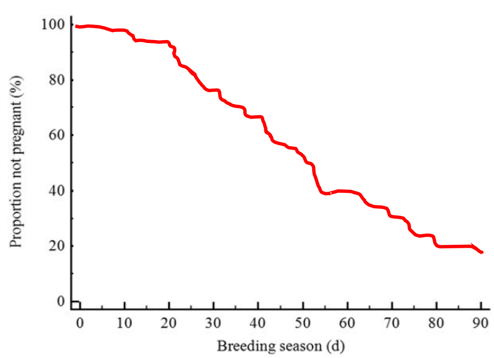


28

A strategy to breed early in the season

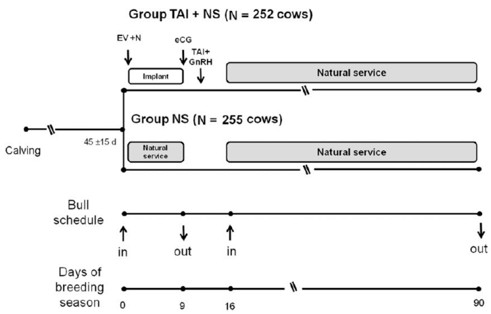
29

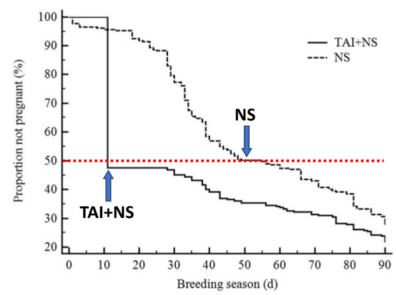
Proportion of open cows during a 90-day breeding season (bull only).



30

Take home point: submitting animals to a round of TAI in the beginning of the breeding season increases reproductive efficiency



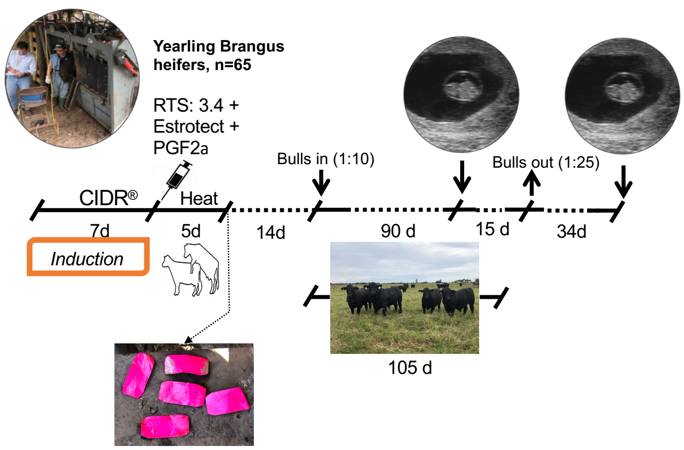


31

A strategy to breed early in the season (if you don't want to AI): let's see it at work in Florida

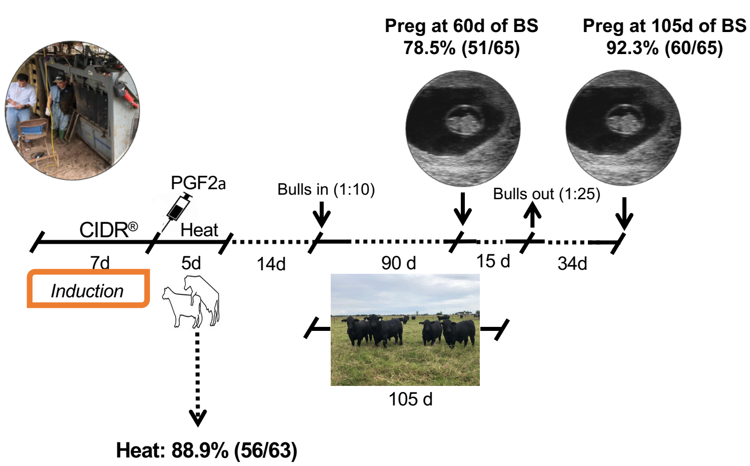
32

San Marino Ranch, Okeechobee, FL (2018-2019)



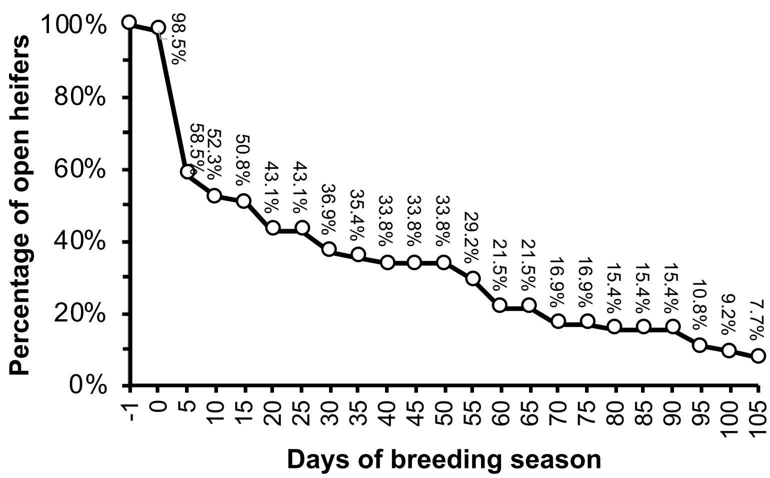
33

San Marino Ranch, Okeechobee, FL (2018-2019)



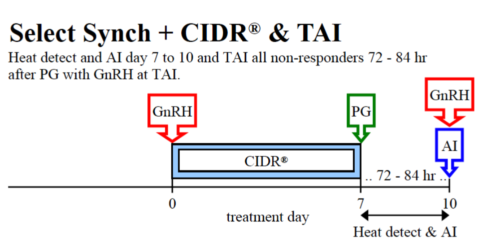
34

San Marino Ranch, Okeechobee, FL (2018-2019)



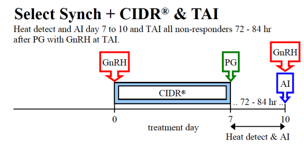
35

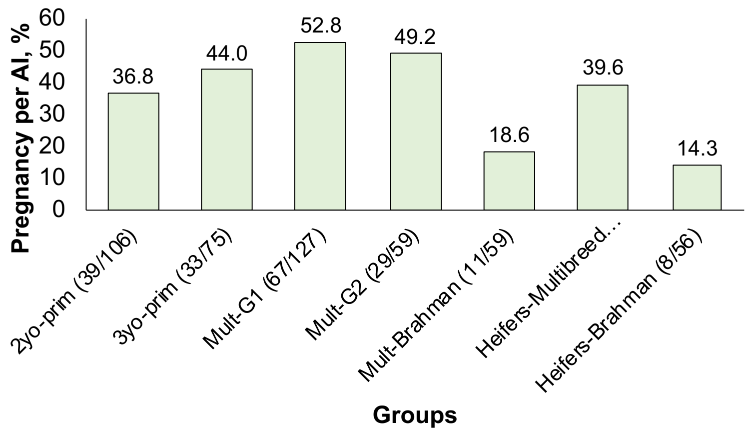
UF 2019 breeding season fertility to single AI + bull



36

UF Beef Units 2019 Breeding Season

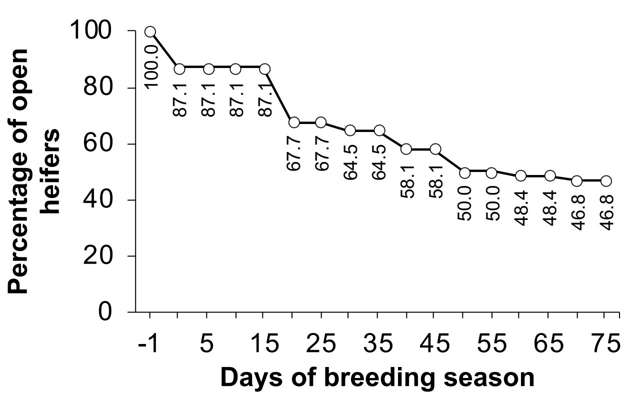




37

UF Beef Units 2019 Breeding Season – Brahman yearlings

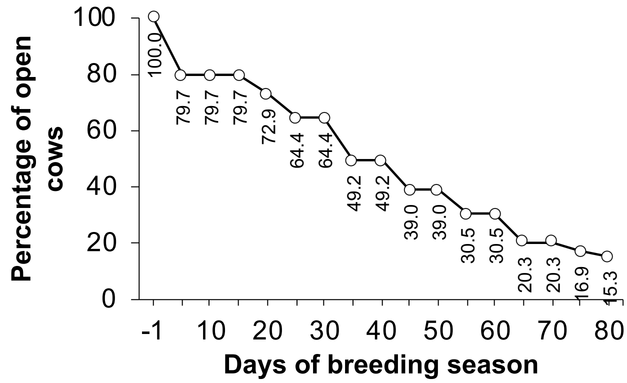
- Pregnancy dynamics along the 75 d breeding season (n= 62 heifers)



38

UF Beef Units 2019 Breeding Season – Brahman cows

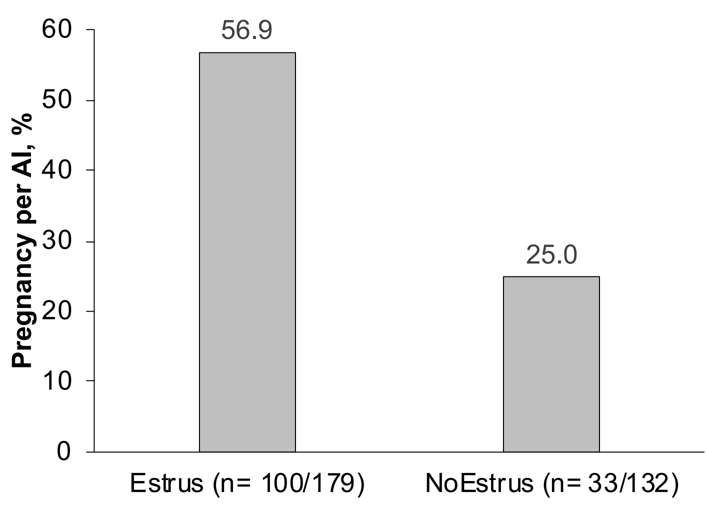
- Pregnancy dynamics along the 80 d breeding season (n= 59)



39

Pregnancy rates to AI in heifers (heat vs. non-heat)

- Pelaez & Sons, Marianna and BRU



40

Advanced Technology

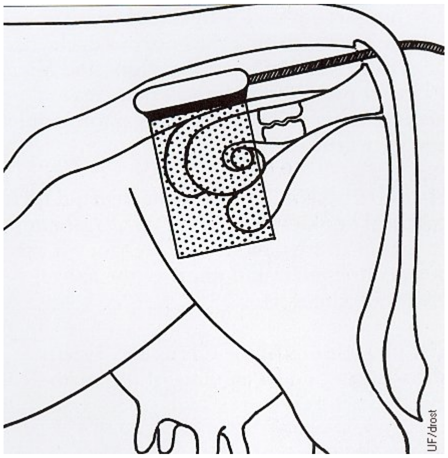
41

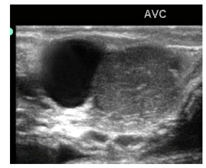
Guiding principle:

Advanced technologies require specialized skills.

42

Pre-breeding heifer evaluation: Reproductive Tract Scores





43

Reproductive Tract Score

Table 1. Reproductive tract score (RTS) system (Anderson et al., 1991)

		Ovary			
RTS	Uterine horn	Length, mm	Height, mm	Width, mm	Ovarian structures
1	Immature <20-mm diameter, no tone	15	10	8	No palpable structures
2	20- to 25-mm diameter, no tone	18	12	10	8-mm follicles
3	25- to 30-mm diameter, slight tone	22	15	10	8- to 10-mm follicles
4	30-mm diameter, good tone	30	16	12	>10-mm follicles, corpus luteum possible
5	>30-mm diameter, good tone, erect	>32	20	15	>10-mm follicles, corpus luteum present

44

Multibreed herd, UF-BRU, Gainesville, FL

. Age, weight, estrus expression and pregnancy/AI according to the RTS evaluated at the beginning of induction

RTS	Age, y	Weight, lb	Estrus by TAI, %	Pregnancy/AI, %
1 (n= 12)	1.03	637.5	16.7	16.7
2 (n= 24)	1.05	671.9	29.2	25.0
3 (n= 14)	1.07	725.0	57.1	35.7
4 (n= 13)	1.11	795.4	76.9	61.5
5 (n= 23)	1.09	792.8	73.9	52.2

45

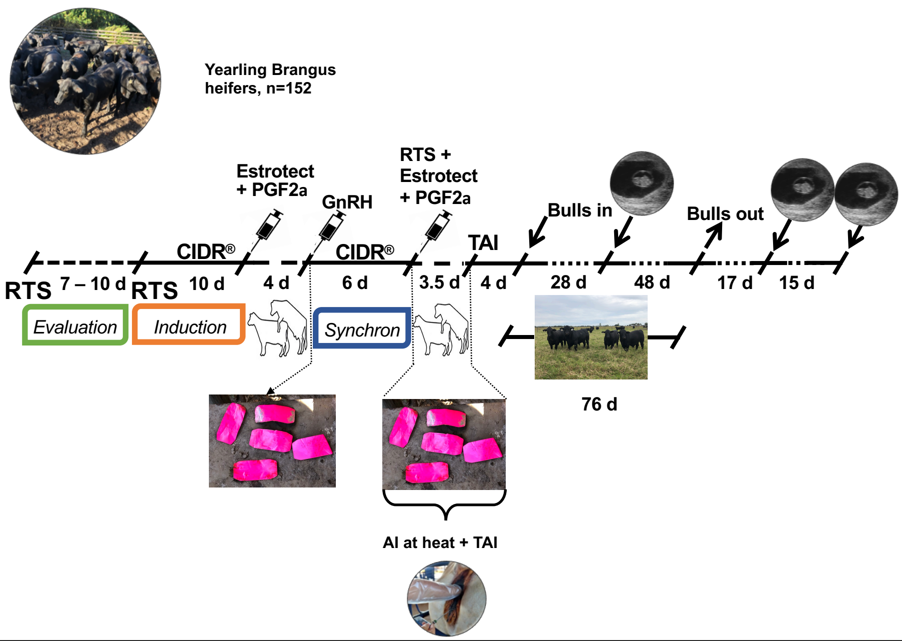
Multibreed herd, UF-BRU, Gainesville, FL

. Weight and RTS according to the influence of Brahman

% of Brahman	Weight, lb	Mean RTS
12 (n= 9)	782.22	3.44
28 (n= 12)	769.58	3.92
38 (n= 17)	705.59	3.12
50 (n= 20)	759.50	3.50
67 (n= 15)	731.33	2.73
100 (n= 13)	620.77	2.08

46

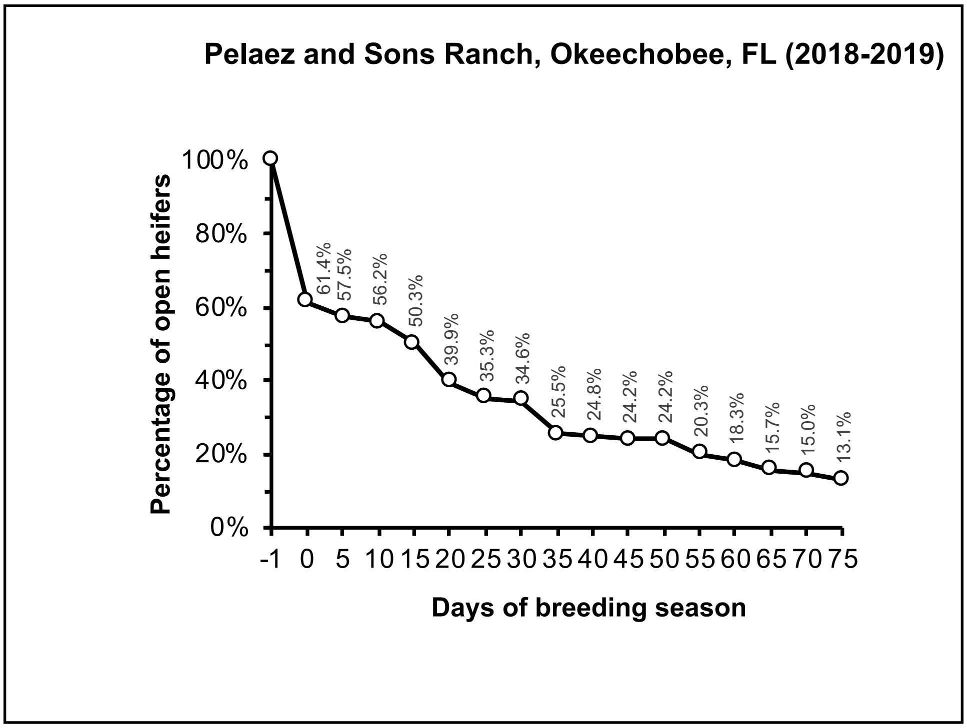
Pelaez and Sons Ranch, Okeechobee, FL (2018-2019)



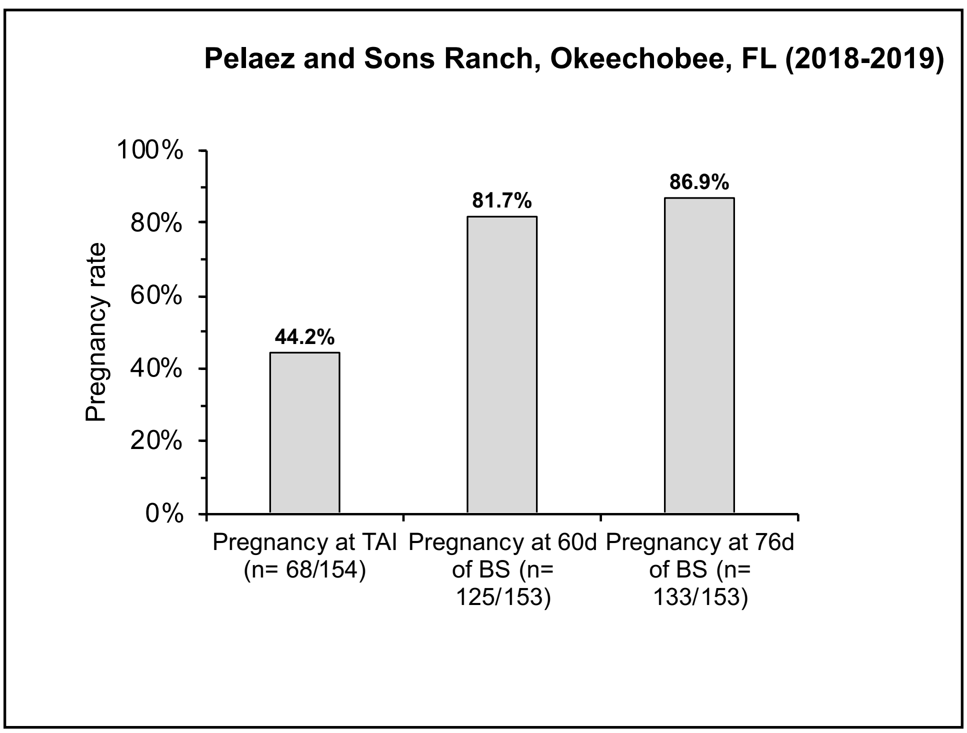
47

Variable	Pubertal		Prepubertal	
	Non-CIDR	CIDR	Non-CIDR	CIDR
Mean of RTS1	3.54	3.68	2.27	2.18
	3.61		2.23	
Mean of RTS2	3.61	3.58	2.91	2.27
	3.60		2.59	
Mean of RTS3	3.73	3.64	3.60	3.70
	3.69		3.68	
Increase from RTS1 to RTS3	2%		65%	

48


Pelaez and Sons Ranch, Okeechobee, FL (2018-2019)
Percentage of open heifers
100%
80%
60%
40%
20%
0%
-1 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
Days of breeding season
61.4%
57.5%
56.2%
50.3%
39.9%
35.3%
34.6%
25.5%
24.8%
24.2%
24.2%
20.3%
18.3%
15.7%
15.0%
13.1%

49


Pelaez and Sons Ranch, Okeechobee, FL (2018-2019)
Pregnancy rate
100%
80%
60%
40%
20%
0%
44.2%
81.7%
86.9%
Pregnancy at TAI (n= 68/154)
Pregnancy at 60d of BS (n= 125/153)
Pregnancy at 76d of BS (n= 133/153)

50

- Effect of induction on pregnancy/AI of prepubertal and pubertal heifers (BRU, Marianna and P&S)

Variable	PUB		PRE	
	CIDR	NoCIDR	CIDR	NoCIDR
Pregnancy/AI, % (P/AI)	45.7 (43/94)	48.9 (46/94)	39.3 (24/61)	31.8 (20/63)
	47.3 (89/188)		35.5 (44/124)	

51

Conclusions:

1. **Reproductive and nutritional management of heifers and cows should aim to maximize pregnancies early in the breeding season.**
2. **Exposure to a synchronization protocol followed by natural breeding or AI increases pregnancies early in the breeding season.**
3. **Estrus is the golden ”marker” of fertility.**
4. **Puberty can be induced by exposure to progesterone.**

52

Survey: Reproductive Technology level used in your operation

1. Please indicate the number of females in reproduction in your operation: <20____; <100____; <1000__X__; >1000____.
2. For each technology, place an "X" at the level used currently in your operation.
3. For each technology, place an "O" at the level you intend to use in the future in you operation.

TECHNOLOGY			
	Virgin heifers	First-calf heifers	Mature cows
1. Breeding Season			
No breeding season			
Breeding season <180d			
Breeding season <120d			
Breeding season<90d	X	X	X
2. Breeding Methods			
Bull only			
AI+Bull	X	X	X
AI only	O		
3. Estrus Synchronization Methods			
No synchronization			
Synchronization + bull (no AI)			
Synchronization + Check heat + AI	X	X	X
Synchronization + Timed-AI (no heat check)			
Resynch (Timed-AI + Timed-AI)			O
4. Advanced Technologies			
No advanced technologies		X	
Embryo transfer (ET)			
OPU + in vitro fertilization (IVF) + ET			X
Reproductive tract score	X		
Early weaning		O	
5. Pregnancy diagnostic			
No preg check			
Preg check at weaning			
Preg check between end of breeding season and weaning			
Preg check within the breeding season			
Multiple preg checks	X	X	X

53

54

Come on over and visit us at UF!

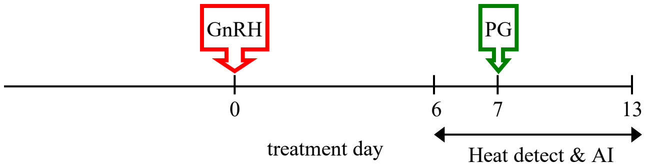
(mario.binelli@ufl.edu)

55

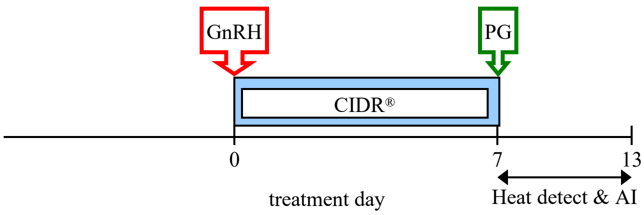
Beef Cow Protocols - 2020

Heat Detection

Select Synch

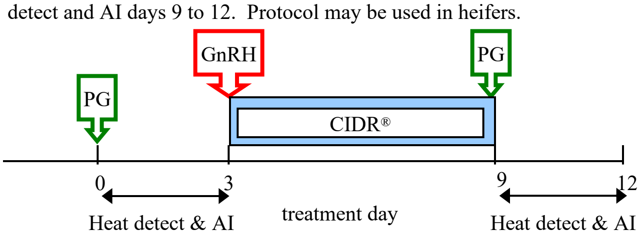


Select Synch + CIDR®



PG 6-day CIDR®

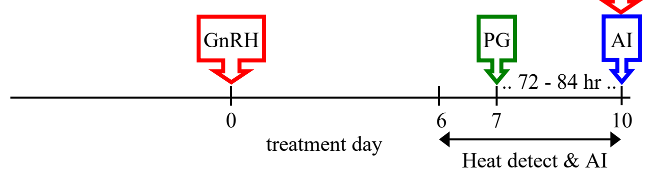
Heat detect and AI days 0 to 3. Administer CIDR to non-responders and heat detect and AI days 9 to 12. Protocol may be used in heifers.



Heat Detect & Time AI (TAI)

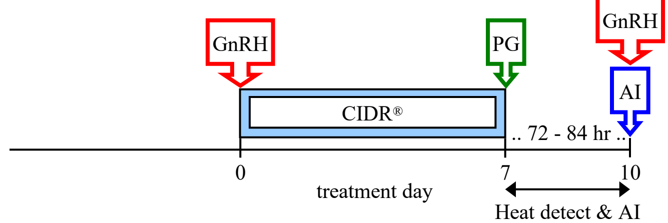
Select Synch & TAI

Heat detect and AI day 6 to 10 and TAI all non-responders 72 – 84 hr after PG with GnRH at TAI.



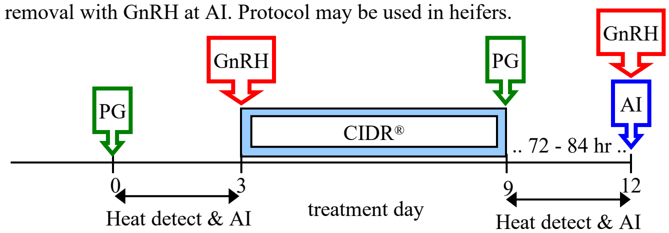
Select Synch + CIDR® & TAI

Heat detect and AI day 7 to 10 and TAI all non-responders 72 - 84 hr after PG with GnRH at TAI.



PG 6-day CIDR® & TAI

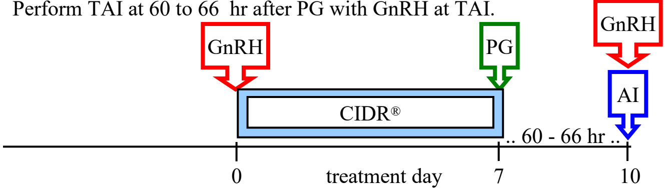
Heat detect & AI days 0 to 3. Administer CIDR to non-responders & heat detect and AI days 9 to 12. TAI non-responders 72 - 84 hr after CIDR removal with GnRH at AI. Protocol may be used in heifers.



Fixed-time AI (TAI)*

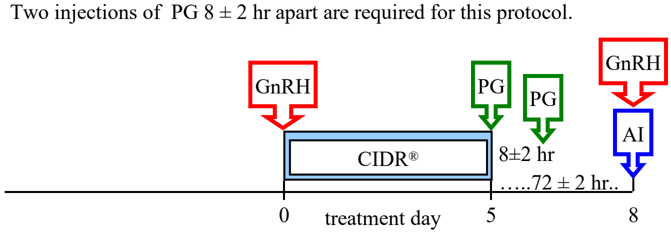
7-day CO-Synch + CIDR®

Perform TAI at 60 to 66 hr after PG with GnRH at TAI.



5-day CO-Synch + CIDR®

Perform TAI at 72 ± 2 hr after CIDR removal with GnRH at TAI.
Two injections of PG 8 ± 2 hr apart are required for this protocol.

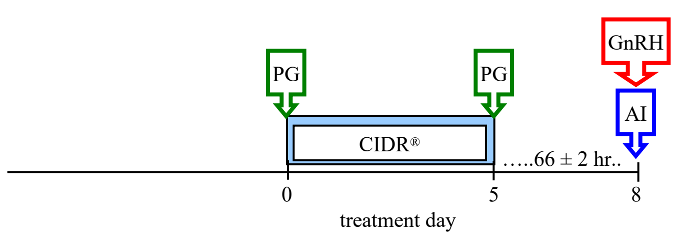


Fixed-time AI (TAI)*

for *Bos Indicus* cows only

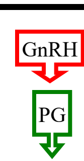
Bos Indicus PG 5-day + CIDR®

Perform TAI at 66 ± 2 hr after CIDR removal with GnRH at TAI.



* The time listed for "Fixed-time AI" should be considered as the approximate average time of insemination. This should be based on the number of cows to inseminate, labor, and facilities.

These protocol sheets were assembled by the ***Beef Reproduction Task Force***. Programs are intended to promote sustainable food production systems by the beef industry through sound reproductive management practices for replacement heifers and postpartum cows. The Beef Reproduction Task Force recommends working with a licensed veterinarian for proper use and application of all reproductive hormones. **Approved 8-19-2019**



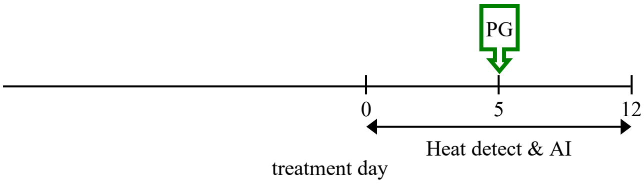
Cystorelin®, Factrel®, Fertagyl®, OvaCyst®, GONABreed®

estroPLAN®, Estrumate®, In-Synch®, Lutalyse®, Lutalyse® *HighCon*, ProstaMate®, SYNCHSURE™

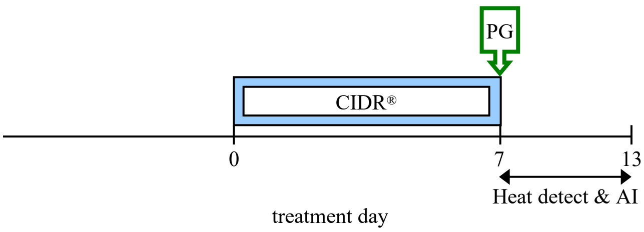
BEEF HEIFER PROTOCOLS - 2020

HEAT DETECTION

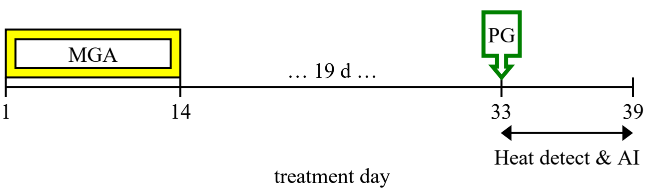
1 Shot PG



7-day CIDR®-PG



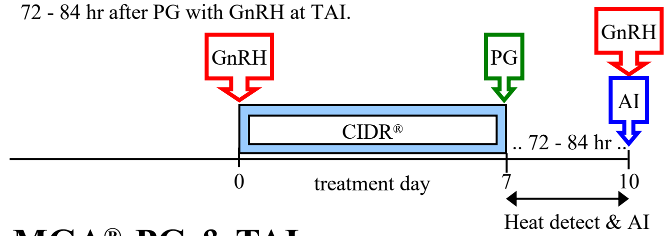
MGA®-PG



HEAT DETECT & TIME AI (TAI)

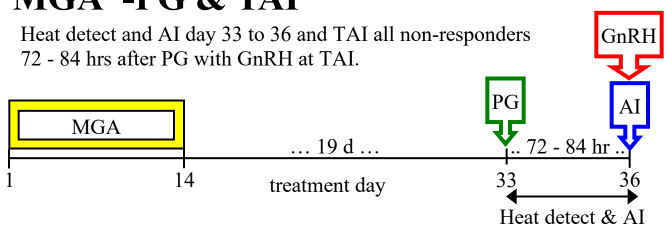
Select Synch + CIDR® & TAI

Heat detect and AI day 7 to 10 and TAI all non-responders 72 - 84 hr after PG with GnRH at TAI.



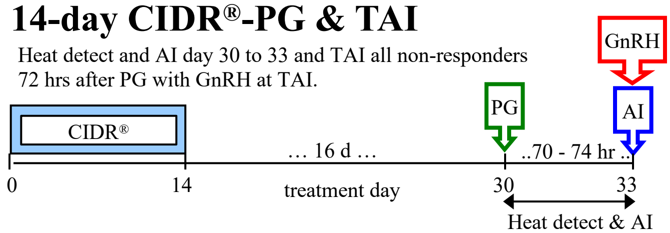
MGA®-PG & TAI

Heat detect and AI day 33 to 36 and TAI all non-responders 72 - 84 hrs after PG with GnRH at TAI.



14-day CIDR®-PG & TAI

Heat detect and AI day 30 to 33 and TAI all non-responders 72 hrs after PG with GnRH at TAI.

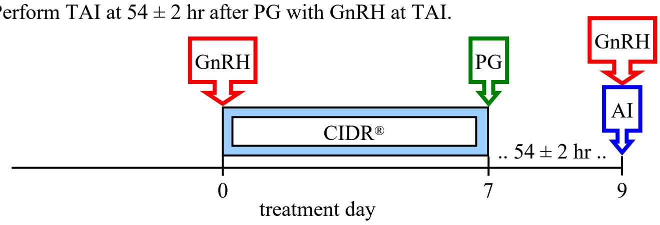


FIXED-TIME AI (TAI)*

Short-term Protocols

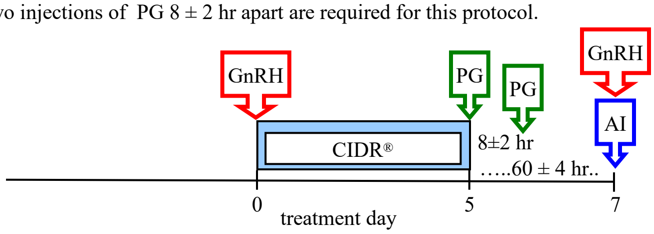
7-day CO-Synch + CIDR®

Perform TAI at 54 ± 2 hr after PG with GnRH at TAI.



5-day CO-Synch + CIDR®

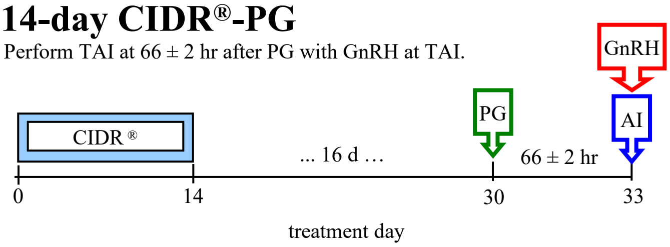
Perform TAI at 60 ± 4 hr after CIDR removal with GnRH at TAI.
Two injections of PG 8 ± 2 hr apart are required for this protocol.



Long-term Protocols

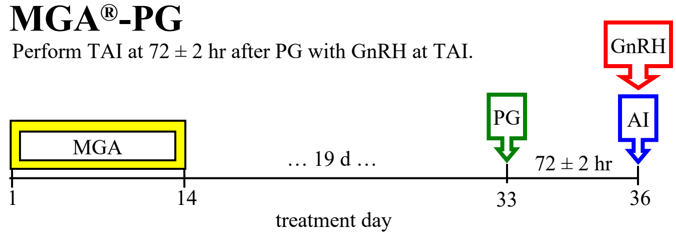
14-day CIDR®-PG

Perform TAI at 66 ± 2 hr after PG with GnRH at TAI.



MGA®-PG

Perform TAI at 72 ± 2 hr after PG with GnRH at TAI.



* The times listed for "Fixed-time AI" should be considered as the approximate average time of insemination. This should be based on the number of heifers to inseminate, labor, and facilities.

These protocol sheets were assembled by the ***Beef Reproduction Task Force***. Programs are intended to promote sustainable food production systems by the beef industry through sound reproductive management practices for use in replacement heifers and postpartum cows. The Beef Reproduction Task Force recommends working with a licensed veterinarian for proper use and application of all reproductive hormones. **Approved 8-19-2019**.

Cystorelin®, Factrel®, Fertagyl®, OvaCyst®, GONABreed®

estroPLAN®, Estrumate®, In-Synch®, Lutalyse®, Lutalyse® *HighCon*, ProstaMate®, SYNCHSURE™

Ryegrass Variety Trial in Northeast Florida

By Wendy Mussoline, PhD
UF/IFAS Multi-County Agriculture Extension Agent

Introduction

Ryegrass (aka annual ryegrass) is a common cool-season forage that serves as a supplemental feed for livestock in the winter months. In North Florida, it is typically planted in October and, depending on the weather, it can provide a supplemental grazing source until March. Ryegrass performance is best when planted on flatwood soils or heavier sandy loam soils, rather than well-drained sandy soils. It can be planted on a clean-tilled seedbed, but it is most often overseeded on perennial pasture grass. Ryegrass is one of the few cool-season forages that can be successfully established by broadcasting rather than drilling the seed into the soil. Rainfall is very important for establishment (unless irrigation is readily available) so the planting schedule should be coordinated with predicted rain events.

There are many different varieties of Ryegrass. According to data collected over three years in multi-locations, UF/IFAS recommends the following season-long varieties for North Florida (Blount, 2018):

- Andes
- Attain
- Big Boss
- Credence
- Diamond T
- Earlyploid
- Flying A
- Jackson
- Jumbo
- Lonestar
- Marshall (susceptible to rust and gray leaf spot)
- Maximus
- Nelson
- Passerel Plus
- Prine
- TAMTBO
- Tetrastar

This is a relatively long list of choices and hay producers often would like more specific guidance to how to "get the most bang for the buck." Therefore, a large-plot ryegrass variety trial with limited selections was conducted in Flagler County during the 2018-2019 winter season. The purpose of the demonstration was to better assess the performance of certain varieties in a site-specific area and to evaluate the forage quality as a function of both the biomass productivity and nutritive value.

Methods

A total of 18 acres of ryegrass was planted at Clegg Sod & Hay Farms in Bunnell, Florida on November 5, 2018. Three of the recommended varieties for North Florida including Attain, Big Boss and Jumbo were broadcasted at a seeding rate of 50 lbs/acre. Each variety was planted on similar six-acre plots. All three varieties are tetraploids opposed to diploids, meaning that they have four sets of chromosomes rather than just two. In general, tetraploid plants are taller and have wider leaves. The soil type is predominantly Winder fine sand, which is a nearly level, poorly drained soil on low flatwoods (USDA, 1997). This type of soil is well suited for pastures, but the main limitation is excessive wetness during rainy seasons. Soil samples were collected prior to planting and the pH of the soil was 6.6 and so no lime additions were necessary. The plots were fertilized according to the recommendations given in the UF Soils Laboratory report.

Figure 1. David Clegg (Flagler County) assists with sample collection using a calibrated square and battery-powered clippers

Samples from each plot were collected and evaluated for biomass yield and nutritive value on February 12, 2019 (106 days after planting). A calibrated square was used to define the boundaries for sample collection and the grass was trimmed to the minimum recommended grazing height (i.e. 3 to 4 inches) as shown in Figure 1. The cut grass was weighed and as-fed biomass quantities were determined in tons per acre. Seed cost combined with biomass yield was used to determine which variety was most economical on a $/ton basis (see Table 1). Rainfall data was monitored during the growing season using the UF Florida Automated Weather Network (FAWN) at the Pierson station. Rainfall is shown in Figure 2.

A representative sample from each variety was sent Dairy One Forage Laboratory in Ithaca, NY. The samples were analyzed for dry matter (DM), crude protein (CP), total digestible nutrients (TDN), non-fiber carbohydrates (NFC), neutral detergent fiber (NDF), acid detergent fiber (ADF), and relative feed value (RFV), macronutrients including Ca, P, Mg, K, and Na, and micronutrients including Fe, Zn, Cu, Mn, and Mo. Results from the laboratory analyses are included in Table 2.

Results and Discussion

The 2018-2019 winter season was an exceptionally wet season when compared to the monthly averages over the couple decades. For example, rainfall in December has averaged 1.97 inches in Pierson over the last 19 years. However, Pierson received a total of 6.95 inches of rainfall in December alone. A total of 12.17 inches of rainfall were recorded over the entire growing period and daily rainfall events are shown in Figure 2. Since this area is poorly drained on low flatwoods, the excessive rainfall may have played a role in biomass yields.

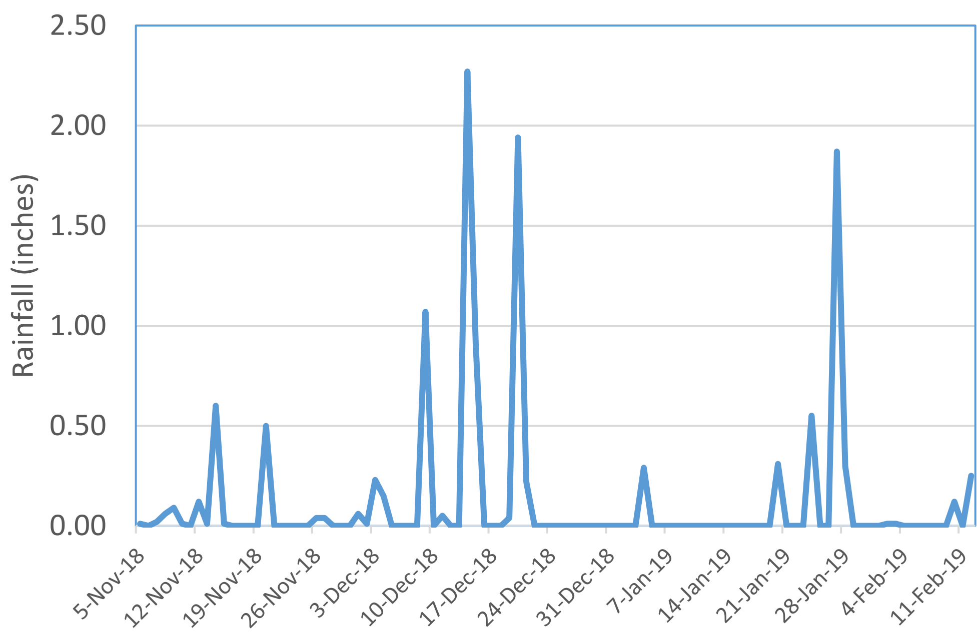


Figure 2. Rainfall data collected from nearest UF FAWN site (i.e. Pierson) during the growing season

The biomass yields for all three varieties were higher than the typical range of 4 to 5 t/A (Hancock, 1997). The biomass yields (see Table 1) were highest for Big Boss at 10.8 t/A, while Attain had the poorest performance at 8.6 tons/A. Jumbo was in the middle at 9.8 t/A. The relative cost was calculated using the initial cost of the seed combined with the biomass productivity for each variety. Big Boss was clearly superior since it had the highest productivity and lowest investment cost, resulting in a forage cost of $3.38/t, despite the exceptionally wet season.

Table 1. Biomass Productivity and Cost Per Ton for Each Variety

	UNITS	ATTAIN	BIG BOSS	JUMBO
SEED COST	$/50lb	$40.00	$36.50	$40.00
BIOMASS YIELD	ton/A	8.6	10.8	9.8
FORAGE COST	$/ton	$4.65	$3.38	$4.08

Table 2. Nutritional Analyses for Each Variety (Dairy One Forage Laboratory)

ANALYTE	UNITS	ATTAIN	BIG BOSS	JUMBO
DM	%	85.8	88.3	89
CP	%DM	19.1	29	33.4
ADF	%DM	25.2	27	25
NDF	%DM	39.1	39.1	37.8
NFC	%DM	29.6	19.7	16.6
TDN	%DM	71	71	72
**** RFV**		165	161	171
Ca	%DM	0.53	0.41	0.36
P	%DM	0.55	0.44	0.49
Mg	%DM	0.2	0.19	0.21
K	%DM	3.51	3.5	5.59
Na	%DM	0.513	0.349	0.192
Fe	ppm	112	106	104
Zn	ppm	35	38	47
Cu	ppm	13	12	14
Mn	ppm	53	85	86
Mo	ppm	2.1	2	2.2

** Note: RFV is relative feed value which is used to compare cool season forages to a standard alfalfa hay in full bloom, which is assigned a value of 100.

Ryegrass is an affordable source of protein during the winter months. CP for annual ryegrass typically ranges from 10 to 20%DM, but this is highly dependent on the growing season and conditions (Hancock, 1997). The analytical results show an exceptionally high CP value on a dry matter basis for both Jumbo (33%DM) and Big Boss (29%DM) when compared to Attain (19%DM). Although Jumbo has a slightly higher CP content, the cheapest protein source of the three when considering biomass yield is Big Boss ($11.65 per ton of CP) followed by Jumbo ($12.22 per ton of CP) and then Attain ($24.35 per ton of CP), all on a dry matter basis. TDN and RFV were essentially the same for all three varieties.

Carbohydrates are the primary source of energy in ruminant diets they can be categorized as either structural (part of the cell wall) or non-structural (inside the cell wall). Structural carbohydrates consist mainly of fiber and are less digestible than non-structural carbohydrates. Although some fiber is beneficial in an animal's diet, too much fiber can lead to lower feed intake, energy and production (Mertens, 1997). Fiber can be partitioned further into NDF, which encompasses cellulose, hemicellulose, lignin, insoluble minerals and fiber-bound nitrogen, and ADF, which excludes hemicellulose. NDF is correlated with animal intake whereas ADF is correlated with digestibility, and lower NDF and ADF values are preferred to improve forage quality. All three varieties had similar values of NDF and ADF, however, the NFC (non-fiber carbohydrates that are more easily digested) was higher in the Attain. With the exception of a slightly higher concentration of K in Jumbo, there were no notable differences in the macro- and micro-nutrient concentrations among the three varieties.

Conclusions

Despite the wet conditions (i.e. 12.17 inches of rain) during the growing season, all three ryegrass varieties had high biomass yields ranging from 8.6 t/A for Attain to 10.8 t/A for Big Boss. Big Boss clearly outperformed the other two varieties in biomass yield and was comparable in nutritional value. Based on the lower initial seed cost, Big Boss was a better economical choice as a protein source at $11.65 per ton of CP compared with Attain at $24.35 per ton of CP. Although this demonstration did not incorporate replications and statistical differences, it was effective for providing the producer with helpful information about varieties sold locally and the economic advantages of one over the other for this site-specific area.

References

1. Blount, A.R., Wallau, M., Rios, E., Vendramini, J.M.B., Dubeux, J.C.B., Babar, A., Kenworthy, K.E,, and K.H. Quesenberry. 2018. 2018 Cool-season forage variety recommendations for Florida. UF EDIS Publication SS-AGR-84.

2. Hancock, D.W., Lacy R.C., and R.L. Stewart. 2014. UGA Extension Bulletin 1392 Forage Systems for Stocker Cattle.

3. Mertens D. R. 1997. Creating a system for meeting the fiber requirements of dairy cows. *J Dairy Sci* **80**:1463–1481.

4. USDA-NRCS, 1997. Soil Survey of Flagler County, Florida.

Why we should all be speaking up

Jonael Bosques, UF/IFAS Extension Hardee County

Imagine a world mired with senseless regulations that make animal agriculture too expensive to operate. Imagine a world where cattle herds are no more, and animal protein consumption is outlawed due to a drowning of producer and scientific voice, slowly eating away our industry. Today we are on our way to this world, but we need a collective and strategic voice to educate decisionmakers and the general public of what really happens in our farms and ranches.

Farmers are innovators – In 1960 an average farmer in the USA produced enough food to feed 26 people, but today, a farmer feeds an average of 155 people. How did we get here? By adopting innovative practices that make us more efficient while using fewer inputs. Cattle farmers have been able to produce 36% more beef since 1970 with less animals (140 million cattle in 1970 to 90 million in 2019), and a similar environmental footprint thanks to advancements in technology adoption in the areas of beef cattle nutrition, health protocols, reproductive technologies, and genetic selection. These gains need to be fully explained to our consumers.

Agriculture communication – Promoting the understanding of how farmers and ranchers utilize natural resources, select and implement animal care methodologies, and benefit rural communities can make significant end-rows with the majority of individuals that are seeking true information in regards to what happens on the other side of our cattleguard. Agricultural communication needs to be honest, and science based. We need to make others feel confident and proud of supporting our industry from the other side of the dinner table. Achieving this last goal requires that our individual county associations empower their membership by providing a platform for communications training.

Gaining common ground – Finding connections within the end-user community is paramount to promoting the purchasing of animal protein. Investing time producing educational content on why farmers and ranchers support and implement best management practices that improve natural areas and waterways, animal welfare and health protocols vetted by local veterinarians, and animal selection and technology for increased efficiency to keep improving our herd's footprint on the environment are some of the key priorities we all should have. Cattlemen and other agriculture operators represent 1.7 % of the total US population. Being at the table is more necessary today than it has ever been. We all can contribute to this conversation in one way or another.

References:

1. **Impact of 50 Years of Beef Technologies** - https://animal.ifas.ufl.edu/beef_extension/bcsc/2011/pdf/hersom.pdf
2. **Cows and Climate Change podcast** - https://www.ucdavis.edu/food/news/making-cattle-more-sustainable/
3. **Five Reasons to become an advocate for agriculture** - https://www.agdaily.com/insights/top-5-reasons-become-agriculture-advocate/

Antibiotic Use and Resistance for Beef Cattle Producers[1]

Chad Carr, Matt Hersom, K. C. Jeong, Nicolas DiLorenzo, Jason Scheffler, Gina Faniola, Stephanie Miller, Haley Denney, Victoria Roberts, Nahilia Williams, Bianca McCracken[2]

Recent work at UF/IFAS has shown that antibiotic-resistant bacteria can be present at a farm even if that farm uses no antibiotics. Some level of antimicrobial resistance is natural, and some threshold level of resistance will be present on every farm, but cattle producers can still work against antibiotic-resistant microorganisms (ARMs) by avoiding overuse of antibiotics and following best management practices to keep animals and people as healthy as possible.

Why are antibiotic-resistant microorganisms important to understand?

Over 2 million illnesses and 23,000 human deaths are estimated to be caused by antibiotic-resistant microorganisms (ARMs) in the United States each year (US HHS-CDC 2013). The healthcare costs in the United States for ARMs are estimated at 2 billion dollars annually (Thorpe et al. 2018).

What are ARMs and resulting antibiotic resistance?

Susceptible bacteria die when antibiotics are administered. Most of the bacteria left alive after administration of antibiotics are resistant to the antibiotic: antibiotic-resistant microorganisms, or ARMs. When these ARMs reproduce, they proliferate their antibiotic-resistant genes in a process typically called “vertical gene transfer” within their environment, spreading these genes and increasing the problem (Soucy et al. 2015, Belk 2018, and Mir et al. 2018).

Because the use of any antibiotic selects for a population of ARMs, it has been suggested (Vieira et al. 2011, Mir et al. 2018) that the use of antibiotics in food production is partially responsible for the spread of ARMs in the environment, residences, and healthcare facilities. Antibiotic-resistant microorganisms can exist in the absence of antibiotics or antibiotic residues.

Are ARMs the same as an antibiotic residue?

No, they are completely different phenomena. Livestock treated with antibiotics must observe a mandated withdrawal period to allow antibiotics to clear from their system before milk or meat from that animal are marketed. Livestock cannot be marketed if residual antibiotics in their meat or milk exceed permitted levels. Instances of an antibiotic exceeding the maximum allowable chemical concentration in an animal tissue are very low in the developed world, particularly in the United States (USDA-FSIS 2017).

Have ARMs only developed since the development of antibiotics in the 20th century?

No. Antibiotic resistance is inherent in nature. Most antibiotics are derived from microorganisms found in soil. The natural presence of an antibiotic in the soil results in selection for ARMs. For example, D’Costa et al. (2011) identified 30,000-year-old actinobacteria in permafrost, which is a thick layer of frozen soil, and the ancient bacteria contained genes encoding resistance to multiple antibiotics.

1. This document is AN351, one of a series of the Animal Sciences Department, UF/IFAS Extension. Original publication date January 2019. Visit the EDIS website at https://edis.ifas.ufl.edu for the currently supported version of this publication.

2. Chad Carr, associate professor; Matt Hersom, associate professor; K. C. Jeong, associate professor; Nicolas DiLorenzo, associate professor; Jason Scheffler, assistant professor, UF/IFAS Department of Animal Sciences, UF/IFAS Extension; Victoria Roberts, Nahilia Williams, and Bianca McCracken, FAMU Animal Sciences alumni and interns with the USDA/NIFA Antimicrobial Resistance Project; Gina Faniola, Stephanie Miller, Haley Denney, UF/IFAS Department of Animal Sciences alumni and interns with the USDA/NIFA Antimicrobial Resistance Project; UF/IFAS Extension, Gainesville, FL 32611

How are antibiotics used in livestock production?
Antibiotics are used in four major ways in agriculture (Schwarz et al. 2001). Therapeutic antibiotics are used to treat a diagnosed disease. Prophylactic antibiotics are used to prevent disease. Metaphylactics are administered to an entire herd or flock to prevent the spread of disease. Growth promotion is the fourth major use. Criticism of the use of antibiotics purely for growth promotion has led many countries, including the United States, to restrict or ban the use of antibiotics for growth promotion.

What percentage of antibiotics used for animals is determined to be "important for human health?"
According to the FDA's 2016 estimates, 58% (Figure 1). Tetracycline is by far the predominant antibiotic drug class used in US animal populations. Tetracycline is an antibiotic drug class that accounts for less than 5% of human use in the United States (US-FDA 2017).

What about the media statements that 70% of the antibiotics determined "important for human health" are actually used for animals?
The FDA highly discourages those statements. It is technically true that more antibiotics are given to livestock than are given to humans, but that is because the amount of antibiotics that will be an effective dose for a cow is much larger than the amount that will an effective dose for a human because the cow weighs so much more than the person. The average human adult weighs around 180 pounds compared to a 1,600-pound dairy cow. That cow's dose would treat approximately 9 humans.

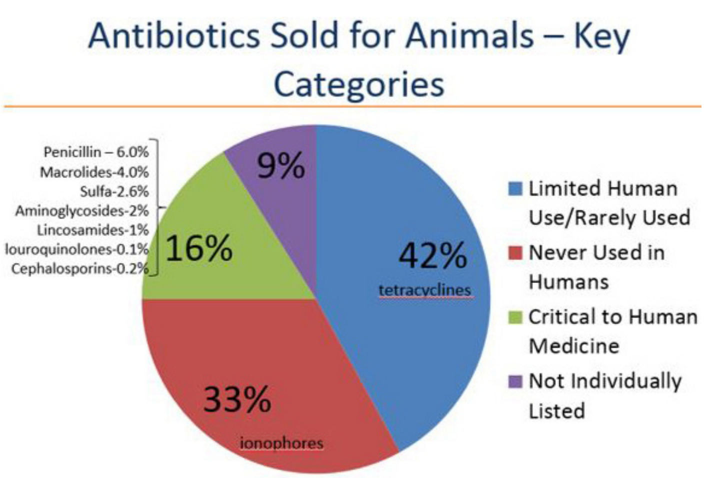


Figure 1. Key animal antibiotics categories.
Credits: FDA

The antibiotics we use to treat animals are different from the ones we use to treat humans: why doesn't that keep the human antibiotics effective?
Bacteria with resistance to one type of antibiotic frequently are found to be resistant to other antibiotics as well. A review by Soucy et al. (2015) documents a phenomenon known as horizontal genetic transfer where there is a transfer of genetic material from one microorganism to another of a different species. Also, the means a microorganism uses to survive one antibiotic could potentially incur resistance to another antibiotic. Additionally, a review by Belk (2018) documents how long-term supplementation of a given antibiotic to a market steer during a 150-day feeding period would shift the microflora of the bacteria so that they remain resistant.

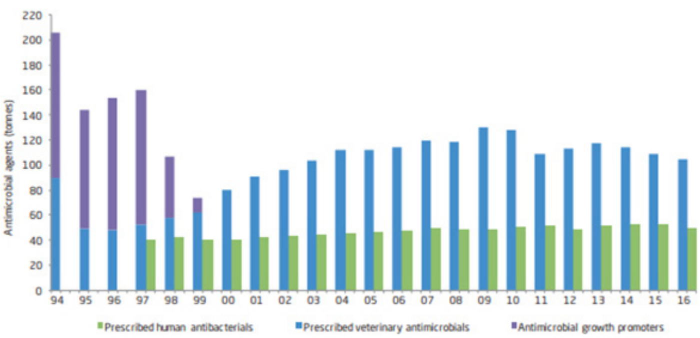
How have antibiotics been regulated in other countries and the United States?
In 1986 and 1999, respectively, concern about proliferating ARMs led the Swedish and Danish governments to ban antibiotic use for growth promotion in food animals (Aarestrup 2003, WHO 2003). The European Commission followed with a similar ban for all EU-member countries in 2006 (European Commission 2005).

The United States followed with a similar regulation in 2017 titled Guidance 213, the Veterinary Feed Directive (VFD; Federal Register 2015; Hersom et al. 2017). The US rule has no impact on injectable antibiotics, rather only those included in feed or water. It disallows the use of antibiotics for growth promotion and encourages the judicious use of medically important feed-grade antibiotics. The US government has introduced this directive as a means of attempting to reduce the livestock industry's contribution to antibiotic resistance (Hersom et al. 2017).

How did Danish and Dutch regulation of antibiotic use affect ARMs in meat animals and humans?
The Danish government has a very robust database titled DANMAP to track antibiotic use in animals, ARMs from purchased meat, and ARMs in human clinics. Figure 2 shows that no growth-promoting antibiotics were sold in Denmark after 2000, following the 1999 ban. It also shows that more therapeutic antibiotics were prescribed than before the 1999 ban, a trend which has continued (Figure 2). Additional results from DANMAP suggest that the percentage of antibiotic-resistant *Salmonella typhimurium* isolated from Danish pigs and pork has not decreased since the growth-promotion ban of 1999. This is theorized to be due to the greater use of therapeutic antibiotics. Also, the percentage of antibiotic-resistant *Salmonella typhimurium* isolated from infected humans since 2008 has not decreased.

The Netherlands has a similar database titled NETHMAP. Just as in Denmark, no growth-promoting antibiotics have been sold since the 2006 ban (Figure 3). Also as in Denmark, more therapeutic antibiotics were prescribed initially (Figure 3). However, therapeutic antibiotic use has since declined steadily in Dutch food animals. Accordingly, *Salmonella typhimurium* isolated from cattle, hogs, and people in the Netherlands has become less resistant to antibiotics since 2006 (Figure 4).

In the Danish example, resistance increased with more use of therapeutic antibiotics, but in the Dutch example, resistance appears to be decreasing.



Sources: Human therapeutics: The Danish Health Data Authority. Antimicrobials for animals: Until 2001, data are based on reports from the pharmaceutical industry of total annual sales from the Federation of Danish pig producers and slaughterhouses (1994-1995) and Danish Medicines Agency and Danish Plant Directorate (1996-2000). Data from 2004-2016 are based on data extracted from VetStat (3rd March and 22nd August 2017) and includes all antimicrobial agents registered for use in animals.

Figure 2. Prescribed antimicrobial agents for humans and for all animal species in Denmark.
Credits: DANMAP 2017—Use of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from food animals, food and humans in Denmark. ISSN 1600-2032

What impact have US regulations had on the industry?

The FDA reported that less food-animal antibiotics were marketed in 2016 than 2015 (FDA 2017). This was before the VFD became law in January, 2017, suggesting that the industry preemptively reduced sales to prepare for the VFD. It was the first decline in year-to-year sales since the FDA began collecting data of antibiotic sales for animals in 2009.

What has the University of Florida/IFAS learned?

Cefotaxime is a third-generation cephalosporin used extensively in human medicine for the treatment of bacterial pneumonias, soft tissue infections, and meningitis. It is on the WHO list of essential medicines (FDA 2012). Bacteria become resistant to cephalosporins by the production of β-lactamase enzymes, with one of the primary enzymes being extended-spectrum β-lactamases (ESBLs). Bacteria producing ESBL enzymes are likely resistant to cephalosporins such as Naxcel®, Excenel®, and Excede® and penicillin (Mir et al. 2016 and 2018).

In a UF/IFAS study, 188 spring-born calves with no exposure to any antibiotics were followed during the first year of life to assess ARMs, specifically cefotaxime-resistant bacteria (CRB). Fecal samples were collected from calves quarterly. Over 92% of the calves tested positive for CRB at least once during the first year of life, despite never being exposed to any antibiotic (Mir et al. 2018).

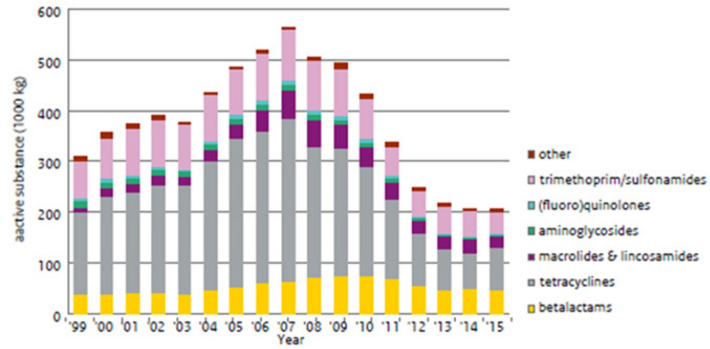


Figure 3. Antimicrobial veterinary medicinal product sales from 1999–2015 in kg (thousands).
Credits: NethMap 2016—Consumption of antimicrobial agents and antimicrobial resistance among medically important bacteria in the Netherlands in 2015

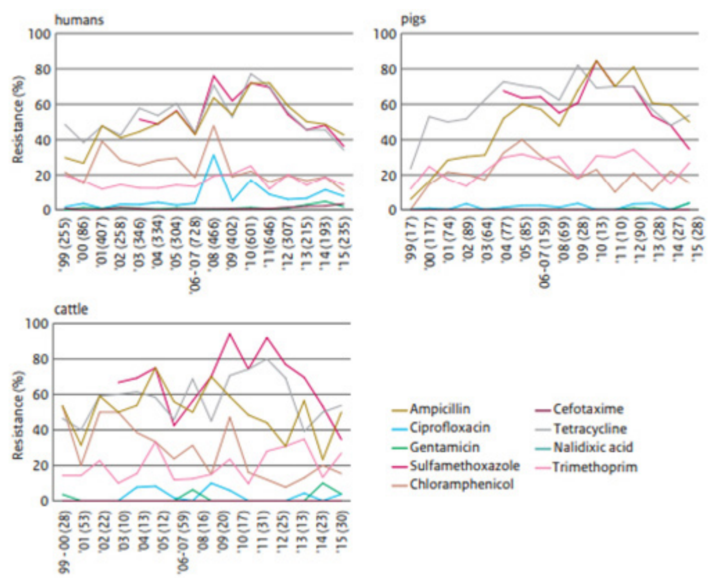


Figure 4. Trends in resistance (%) of *S. typhimurium* isolated from humans and food animals in 1999–2015.
Credits: NethMap 2016—Consumption of antimicrobial agents and antimicrobial resistance among medically important bacteria in the Netherlands in 2015

Where did the ARMs come from?

It is possible that the pathogens could have developed ESBLs through natural evolution of the microbiota in the soil on this farm as described in permafrost (D'Costa et al. 2011). It is also possible ARMs could have been introduced into the soil via vectors such as contaminated bird droppings or municipal wastewater effluents.

What can I do as a cow-calf producer?
Very little antibiotics are used at the cow-calf level in the United States, yet results from the work at UF/IFAS suggest a large percentage of US cattle would nevertheless express ARMs. Use antibiotics judiciously when needed, and properly follow label instructions for dosage, administration, and withdrawal period.

Are any antibiotics used in beef feedyards?
A large percentage of calves receive an injectable metaphylactic antibiotic treatment when they arrive at a feedyard to prevent clinical sickness following the stress of transportation and being exposed to other cattle. Additionally, most cattle are fed an ionophore to control coccidiosis and a macrolide to prevent liver abscesses. Producers and scientists will look for effective alternatives to these technologies to reduce possible establishment of ARMs.

What can I do as a consumer?
Prevent cross-contamination. Cook meat properly to prevent food-borne illness and inhibit the spread of antimicrobial resistance from any remaining pathogen (Bub et al. 2013).

What do producers and consumers need to know?
Antibiotic resistance is a complicated issue. The recent work here at UF/IFAS documents that antibiotic-resistant bacteria can be present at a farm even if that farm uses no antibiotics. There is evidence that some level of antimicrobial resistance is natural, and some threshold level of resistance will be present on every farm. Producers and managers must use antibiotics sparingly and judiciously to minimize antimicrobial resistance.

Literature Cited

Aarestrup, F. M. 2003. "Effects of termination of AGP use on antimicrobial resistance in food animals." Pages 6–11 in Working papers for the WHO international review panels evaluation. Document WHO/CDS/CPE/ZFK/2003.1a. World Health Organization, Geneva, Switzerland.

Belk, K. E. 2018. "Alternatives to long-term treatment with antibiotics in feed." *National Cattlemen*. 8.

Bub, E. L., K. Schneider, C. C. Carr. and M. Hersom. 2013. *Food Processing: The Meat We Eat*. AN283. Gainesville: University of Florida Institute of Food and Agricultural Sciences. http://edis.ifas.ufl.edu/an283

DANMAP. 2016. Use of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from food animals, food and humans in Denmark. https://www.danmap.org/-/media/arkiv/projekt-sites/danmap/danmap-reports/danmap-2016/danmap_2016_web.pdf?la=en

D'Costa, V. M., C. E. King, L. Kalan, M. Morar, W. W. Sung, C. Schwarz, D. Froese, G. Zazula, F. Calmels, R. Debruyne, and G. B. Golding. 2011. "Antibiotic resistance is ancient." *Nature* 477 (7365), p.457.

European Commission. 2005. Ban on antibiotics as growth promoters in animal feed enters into effect. http://europa.eu/rapid/press-release_IP-05-1687_en.htm

Federal Register. 2015. Wednesday, June 3, 2015. Rules and Regulations. Federal Register 80(106): 31708–31735.

Hersom, M., T. Thrift, and J. Yelich. 2017. AN327. *How the Veterinary Feed Directive Affects Cattle Owners*. Gainesville: University of Florida Institute of Food and Agricultural Sciences. http://edis.ifas.ufl.edu/an327

Mir, R. A., T. A. Weppelmann, J. A. Johnson, D. Archer, J. G. Morris Jr, and K. C. Jeong. 2016. "Identification and Characterization of Cefotaxime Resistant Bacteria in Beef Cattle." *PLoS ONE* 11(9): e0163279. doi: 10.1371/journal.pone .0163279

Mir, R. A., T. A. Weppelmann, L. Teng, A. Kirpich, M. A. Elzo, J. D. Driver, and K. C. Jeong. 2018. "Colonization Dynamics of Cefotaxime Resistant Bacteria in Beef Cattle Raised Without Cephalosporin Antibiotics." *Frontiers in Microbiology* 9, 500.

NethMap. 2016. Consumption of antimicrobial agents and antimicrobial resistance among medically important bacteria in the Netherlands. https://www.wur.nl/upload_mm/0/b/c/433ca2d5-c97f-4aa1-ad34-a45ad522df95_92416_008804_NethmapMaran2016+TG2.pdf

Schwarz, S., C. Kehrenberg, and T. R. Walsh. 2001. "Use of antimicrobial agents in veterinary medicine and food animal production." *International Journal of Antimicrobial Agents* 17(6), 431–437.

Soucy, S. M., J. Huang, and J. P. Gogarten. 2015. "Horizontal gene transfer: building the web of life." *Nature Reviews Genetics* 16 (8), p.472.

Thorpe, K. E., P. Joski, and K. J. Johnston. 2018. "Antibiotic-Resistant Infection Treatment Costs Have Doubled Since 2002, Now Exceeding $2 Billion Annually." *Health Affairs* 37(4), 662–669.

USDA Food Safety and Inspection Service. 2018. National residue program for meat, poultry, and egg products. https://www.fsis.usda.gov/wps/wcm/connect/93ae550c-6fac-42cf-8c11-006748a4d817/2017-Red-Book.pdf?MOD=AJPERES

US HHS-CDC. 2013. https://www.cdc.gov/drugresistance/pdf/3-2013-508.pdf

US-FDA. 2012. "Use and Importance of Cephalosporins in Human Medicine." Federal Register 77, 735–745. Available online at: https://www.govinfo.gov/content/pkg/FR-2012-01-06/pdf/2012-35.pdf

US-FDA. 2017. Antimicrobials Sold or Distributed for Use in Food-Producing Animals. https://www.fda.gov/downloads/forindustry/userfees/animaldruguserfeeactadufa/ucm588085.pdf

Vieira, A. R., P. Collignon, F. M. Aarestrup, S. A. McEwen, R. S. Hendriksen, T. Hald, and H. C. Wegener. 2011. "Association between antimicrobial resistance in *Escherichia coli* isolates from food animals and blood stream isolates from humans in Europe: an ecological study." *Foodborne Pathogens and Disease*. 8 (12), 1295–1301.

World Health Organization. 2003. Impacts of antimicrobial growth promoter termination in Denmark. Pages 1–57 in Document WHO/CDS/CPE/ZFK/2003.1. WHO, Foulum, Denmark.

Five Basic Steps to Successful Perennial Pasture Grass Establishment From Vegetative Cuttings on South Florida Flatwoods[1]

Joe Vendramini, Ann Blount, and Paul Mislevy[2]

Introduction

Establishment of perennial pastures is critical and there are several basic steps that are important to minimize the risk of establishment failure and to guarantee effective stand growth. Overlooking any of these steps may result in reduced returns. Florida warm-season perennial grasses are the foundation for Florida's livestock industry. In south Florida, these grasses are represented by: bahiagrass, digitgrass, hybrid bermudagrass, and limpograss. Except for bahiagrass, all require vegetative propagation for establishment. This publication describes the different steps that minimize establishment failure and lead to a favorable outcome of dense stand of perennial pasture grass.

General Considerations

Partial vs. Total Renovation

Reestablishment or total renovation appears to be the most effective way to renovate unproductive pastures that have been lost to mole cricket damage, overgrazing, prolonged drought, and instances of multiple freezing temperatures during late winter, etc. This practice destroys the entire sod, allowing for a clean seedbed for reestablishment to new, desirable grasses. Mechanical chopping or aeration practices appear to have little effect on forage yield. Studies in Florida, Oklahoma, Mississippi, Tennessee, and Alabama have shown that various types of aeration machines did not increase forage yield.

While replanting damaged bahiagrass pastures with alternative improved grasses such as stargrass, bermudagrass, or limpograss is expensive and will normally cost $350 to $500/A, the investment should pay for itself with greater forage production and carrying capacity.

Step 1) A Clean, Moist Seedbed Ready for Planting

One reason for preparing a seed bed is to control weeds. Preparing a clean seedbed (Figure 1) for perennial grass planting can take several forms. The preferred option is to seed a winter annual crop, such as ryegrass, during the fall of the year on the pasture that needs renovation. This

1. This document is SSAGR24, one of a series of the Agronomy Department, UF/IFAS Extension. Original publication date October 2001. Revised June 2019. Visit the EDIS website at https://edis.ifas.ufl.edu for the currently supported version of this publication.

2. Joe Vendramini, professor and forage specialist, UF/IFAS Range Cattle Research and Education Center; Ann Blount, professor, UF/IFAS North Florida REC; and P. Mislevy, professor emeritus, Agronomy Department, UF/IFAS RCREC; UF/IFAS Extension, Gainesville, FL 32611.

is accomplished by moldboard plowing, disking, seeding, and packing. The following spring, when the winter annual dies and dry conditions prevail, the land should be tilled at 2- to 3-week intervals until planted to the desired perennial grass. Another land preparation choice is to spray at least 2 qt/A of Roundup® (2lb/A glyphosate) on the deteriorated pasture in early spring (March) when vegetation is about 6 inches tall, followed by another application of 2 qt/A 3 days later. Allow 3 to 4 weeks for plants to die, followed by tillage during the dry season. A third method would be to completely turn over the sod with a moldboard plow in April to desiccate the sod, followed by repeated disking until planting.

Figure 1. A clean, moist seedbed ready for planting.

Step 2) Preconditioning Clean Planting Material

Planting material should be obtained from a pure grass stand with no common bermudagrass or weeds and preconditioned as follows: a) Apply 400 lb/A of a 20-10-20 (P_2O_5-K_2O) analysis fertilizer in March to increase top-growth and b) Two weeks before cutting plant material, apply 50 lb N/A to initiate growth of shoots at the base of each leaf node (Figure 2). These shoots develop into new plants faster when planted if they receive N fertilizer prior to cutting. One acre of preconditioned plant material should provide enough planting material to cover 13 to 15 planted acres.

Step 3) Time Your Planting for Good Soil Moisture

It is best to wait for at least 2 to 3 inches of rainfall before planting vegetative cuttings (tops) of perennial grasses. Generally, good rainfall should prevail in the immediate period-to-weeks after planting. In south Florida, early July plantings work in most years.

Figure 2. Preconditioned planting material with new tillers (shoots).

Step 4) Adoption of Good Planting Techniques

Preconditioned grass material must be cut and baled fresh within 5 minutes (Figure 3).

Figure 3. Cutting, baling, and loading clean, preconditioned planting material at the same time.

Material must be loosened and uniformly spread on a prepared seedbed (1500 lb/A) (Figure 4) the same day as baled and followed within 15 minutes by disking or crimping material into the soil with a crimper machine also called a “pizza cutter” (Figure 5).

Finally, the land should be rolled firmly in two directions immediately after disking or crimping material into the soil. The objective of step 4 is to minimize drying of planting material and improve plant-soil moisture contact. This will allow for a successful establishment even if no rain is received for two to four days after planting.

Figure 4. Using a spreader to uniformly distribute planting material on seedbed.

Figure 5. Crimper or 'pizza cutter' used to push planting material into soil with a roller behind it to firm the soil. A second rolling in a perpendicular direction is required.

Step 5) Implementaion of Good Weed Control and Fertilizer Program After Planting

Weedmaster will control seedlings of many sedges and broadleaf weeds in vegetatively planted stargrass, bermudagrass, and pangolagrass. Spray newly planted fields of those species with Weedmaster® at 2 pt/A, 7 days after planting. Young limpograss shoots are *killed* by Weedmaster®; hence, 1.5-2 pt/A of Banvel™® herbicide should be applied to control sedges and broadleaf weeds in newly planted limpograss. Fertilize establishing grasses 7 days after planting with about 350lb/A 10-10-10 (N-P_2O_5-K_2O) and an additional 50 lb N/A at 35 days after planting.

The steps outlined allow new stargrass and bermudagrass fields to be grazed or harvested for hay within 60 to 70 days after planting (Figure 6). This will ensure long-term, clean, pure fields if managed properly thereafter.

Summary

1. Prepare a clean seed bed

2. Precondition clean, pure planting material by:

Figure 6. Newly established Florakirk bermudagrass pasture 51 days after planting.

- Applying 400 lb/A of a 20-10-20 (N-P_2O_5-K_2O) fertilizer 90 days before harvest
- Applying 50 lb N/A at 15 days before harvest

3. Plant in early July to coincide with good rainfall or after adequate rainfall.

4. Practice good planting techniques by:

- Cutting and baling planting material within 5 minutes.
- Uniformly spreading 1500 lb planting material/A.
- Crimping or disking-in plant material within 15 minutes after spreading on clean seed bed.
- Rolling land firmly in two directions immediately after crimping or disking.

5. Adopt good weed control and fertilization programs by:

- Applying Weedmaster® (2 pt/A) on bermudagrass, stargrass, and pangolagrass or Banvel® (1.5-2 lb/A) on limpograss 7 days after planting.
- Applying 350 lb/A of a 10-10-10 (N-P_2O_5-K_2O) fertilizer 7 days after planting.
- Applying 50 lb N/A at 35 days after planting.

Warm-Season Forage Mixtures for Pasture Establishment

Joe Vendramini and Lynn Sollenberger

Published in *The Floirda Cattleman and Livestock Journal*, September 2019

Warm-season perennial grasses are the most used forage for beef cattle production in Florida. In spite of the superior persistence of warm-season grasses under adverse conditions, unproper management may lead to a decrease of the desirable forage species and pasture renovation may be needed. Pasture renovation is one of the most costly activities in beef cattle production and it is estimated that re-establishment of a degraded pasture may cost from $500 to $700 per acre. In addition to the considerable expense, the pasture may have to be deferred from grazing for about 6 months. The decrease in grazing area leads to an overall increase in stocking rate, which may result in overgrazing. Some warm-season perennial forage species are notorious for slow establishment, such as bahiagrass and Tifton 85, which may aggravate the overgrazing problems.

Mixing warm-season annual forages with warm-season perennial grasses at establishment is a feasible management practice to decrease the gap between pasture establishment and the first grazing event. However, the effects of mixing forages at establishment on forage production, nutritive value, and the subsequent effects on the warm-season perennial grass establishment is unknow.

Two experiments were conducted recently to test different forage mixtures at establishment in Ona and Gainesville. In experiment 1, a mixture of bahiagrass (25 lb/Acre) and pearl millet was tested. The treatments were bahiagrass alone, bahiagrass + pearl millet half seeding rate (12.5 lb/acre), and bahiagrass + pearl millet full seeding rate (25 lb/acre). The cultivars used were Argentine bahiagrass and Tifleaf 3 pearl millet and the pastures were planted in June 2017. The forage was harvested at 5 inches stubble height on 6, 12, and 18 weeks after seeding, totaling 3 harvests. The pearl millet had fast germination with significant growth shortly after seeding. Pastures seeded with mixtures had 5 times more forage production than bahiagrass alone 6 weeks after seeding, and twice as much 12 weeks after seeding (Figure 1). Forage production was similar among all treatments 18 weeks after seeding, primarily because pearl millet is an annual forage and its life cycle ended by18 weeks. Overall, bahiagrass alone produced 700 lb DM/acre, bahiagrass + pearl millet half seeding rate produced 2400 lb DM/acre and bahiagrass + pearl millet full seeding rate produced 2000 lb DM/acre. In addition to the greater forage production, the mixtures had superior nutritive values with 18% crude protein and 67% digestibility. However, the bahiagrass + pearl millet full seeding rate decreased bahiagrass ground cover in the subsequent year after establishment. These data imply that mixing bahiagrass and pearl millet at establishment is a feasible management practice to produce forage with superior nutritive value 6 and 12 weeks after establishment; however, pearl millet full seeding rates should be avoided to decrease forage species competition and increase bahiagrass establishment.

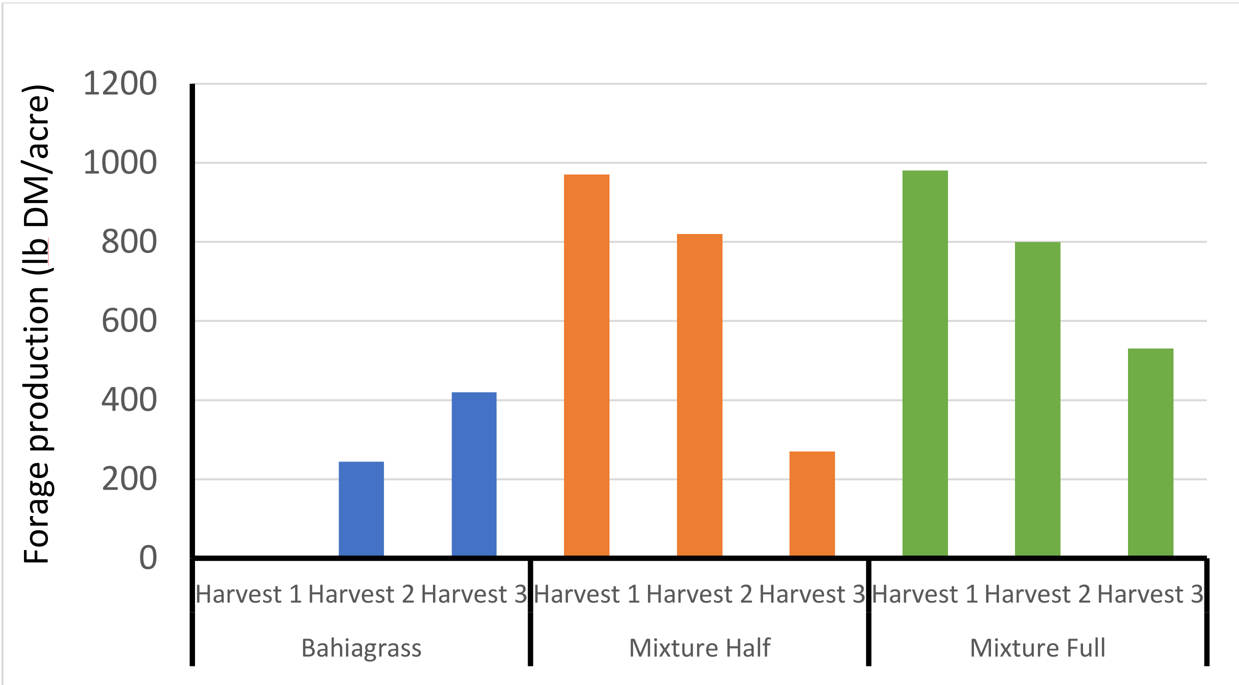
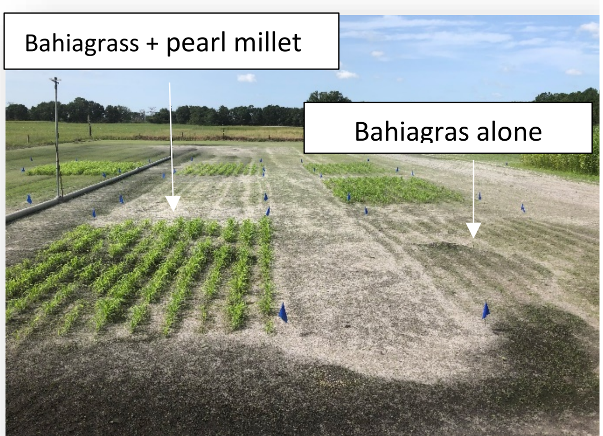


Figure 1. Forage production of bahiagrass alone, bahiagrass + pearl millet half seeding rate (12.5 lb/acre) or bahiagrass + pearl millet full seeding rate (25 lb/acre) planted in Ona, FL.



1 week after seeding

18 weeks after seeding

Experiment 2 was conducted in Gainesville, FL and treatments were Tifton 85 alone, Tifton 85 + pearl millet + sunn hemp full seeding rate (12.5 and 12.5 lb/acre), or Tifton 85 + pearl millet + sunn hemp full seeding rate (25 and 25 lb/acre). Tifton 85 was planted with 1200 lb/acre of vegetative plant material. Plots were planted in July 2017 and harvested 6, 12, and 18 weeks after planting. Tifton 85 + pearl millet + sunn hemp full seeding rate had the greatest forage production 6 weeks after planting (1500 lb DM/acre), while Tifton 85 + pearl millet + sunn hemp half seeding rate had the greatest forage production 12 weeks after planting (3500 lb DM/acre). The mixtures had similar forage production 18 weeks after planting but still greater than Tifton 85 alone. Tifton 85 alone had the least forage production during the trial (Figure 2). In addition, Tifton 85 alone had greater weed infestation than the mixture treatments (35% vs. 5%). The nutritive value of the forage harvested was similar across all treatments with approximately 13% crude protein and 60% digestibility. The Tifton 85 ground cover at the end of the growing season was evaluated and plots planted with Tifton 85 alone had better ground cover (80%) than plots planted with Tifton 85 + pearl millet + sunn hemp half seeding rate (50%), and Tifton 85 + pearl millet + sunn hemp full seeding rate (30%).

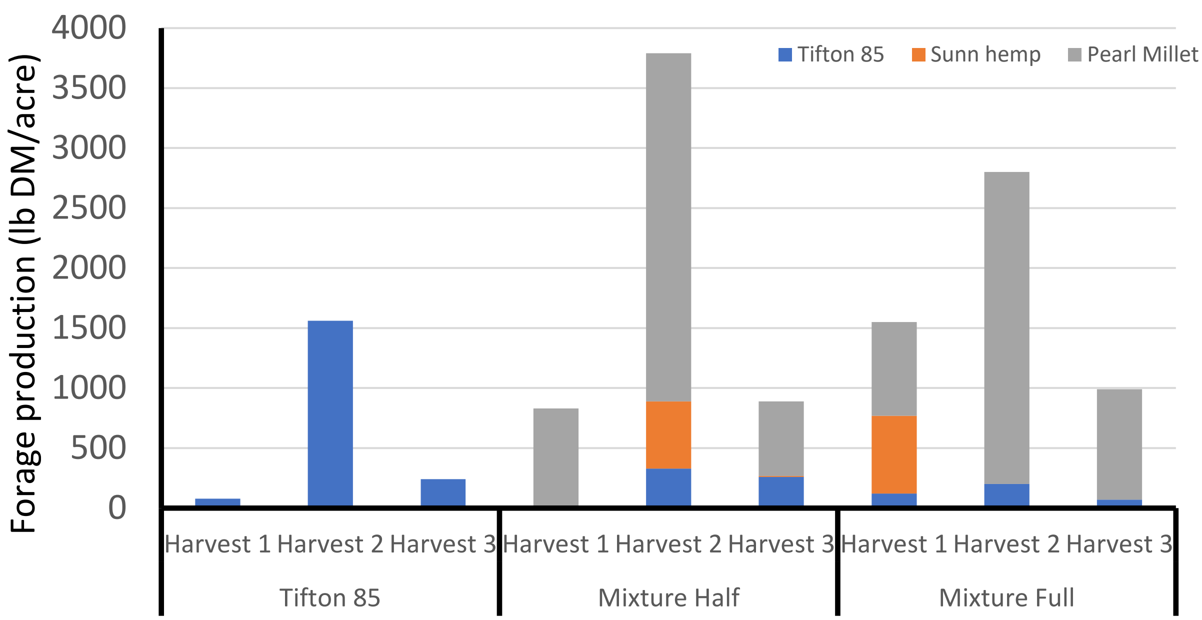


Figure 2. Herbage accumulation of Tifton 85 alone, Tifton 85 + pearl millet + sunn hemp half seeding rate (12.5 and 12.5 lb/acre) or Tifton 85 + pearl millet + sunn hemp full seeding rate (25 + 25 lb/acre) plots planted in Gainesville, FL.

Tifton 85 alone – 6 weeks after planting

Tifton 85 + pearl millet + sunn hemp half seeding rate – 6 weeks after planting

In summary, mixing a warm-season perennial grass with warm-season annual forages increases forage production during the year of establishment. Warm-season annual forages usually have similar or greater nutritive value than warm-season perennial grasses and should be grazed by cattle with greater nutrient requirements. The mixture can decrease ground cover and establishment of the warm-season perennial grass, therefore, using half of the recommended seeding rate appears to be a good management practice to decrease competition and increase ground cover of the warm-season perennial grass.

If you have any questions about mixing warm-season perennial grass and warm-season annual forages, please contact Joe Vendramini at jv@ufl.edu.

Pasture Condition Score: An approach to optimize nitrogen fertilization in bahiagrass pastures in Florida

Published in *The Florida Cattleman and Livestock Journal*, October 2018

Bahiagrass is the main forage used by the beef cattle industry in Florida because of its reliability and persistence under adverse climatic conditions and management practices. However, several years of challenging climatic conditions (floods and droughts) and mismanagement (low soil fertility and overgrazing) may lead to significant decrease in bahiagrass stand. The decreased bahiagrass population in the pasture may lead to less forage production, weed infestation, and consequently lower stocking rates and calves weaned per acre.

Nitrogen fertilization is commonly used to increase bahiagrass forage production and nutritive value; however, it is one of the most costly management practices in cow-calf operations. Therefore, the decision of which pastures will be fertilized must be made with criteria to optimize the investment.

Pasture condition score (PCS) is a visual estimate of the proportion of the desirable forage in a given pasture. The procedure is comprised by walking a pre-determined number of steps in the pasture and report if the forage species at the stop location (10 x 10 ft around the observer) is bahiagrass or another species. If the evaluation is conducted in a larger pasture, it can be done on horseback or motorized vehicle (ATV, Four wheeler, Truck). It is recommended to follow a zig zag pattern to have the most possible representation of the pasture. The number of stops is conditional to the size of the pasture but it is recommended to have the greatest number of possible stops. The number of stops with bahiagrass ground cover, divided by the total number of stops will result in the proportion of ground cover. The PCS values range from “3”, which is a pasture with 80-100% bahiagrass cover (Figure 1), to “1”, which is a pasture with 60% or less bahiagrass cover (Figure 3). The bahiagrass cover from a PCS “2” are from 80 to 60% (Figure 2). It is also important to note that the presence of weeds is not a parameter to determine PSC because some pastures may have a significant presence of weeds but still have desirable bahiagrass ground cover. However, it is expected that areas not covered by bahiagrass are likely to be occupied by weedy species. A proper weed control program is recommended to achieve greater nitrogen fertilization efficiency.

Producers should prioritize the nitrogen fertilization of pastures with PCS 3, followed by 2, and it is not recommended to fertilize pastures with PCS below 2. The expected responses of bahiagrass pastures fertilized with 50 lb N/acre in the spring with different PSCs are shown in Table 1.

Figure 1. Pasture condition score 3

Figure 2. Pasture condition score 2

Figure 3. Pasture condition score 1

Table 1. Relationship between forage production and pasture condition score in bahiagrass pastures fertilized with 50 lb N/acre in the spring and harvested after 5 weeks.

Pasture condition score	Expected forage production (lb DM/acre)	Ratio of N fertilization: Forage Production/acre	Nitrogen Fertilization Recommendation
3	1350	27	Yes.
2	1000	20	Yes. After pastures with PSC 3 have been fertilized and extra forage is needed
1	< 800	< 16	No. Producer should consider renovation

Please note that the bahiagrass response to nitrogen fertilization is highly dependent upon other soil fertility parameters (pH, P, K, etc.) and climatic conditions; however, pastures with greater PSC will have greater forage production under similar soil and climatic conditions. The general fertilization for bahiagrass pastures in Florida should follow the UF/IFAS recommendations http://edis.ifas.ufl.edu/ss163.

At this point in time, we have conducted the procedure with bahiagrass only, and further measurements will be done in the future to fine-tune the parameters and test this procedure with other warm-season perennial grass species. It is expected that bermudagrass, stargrass, and bermudagrass would have different patterns of response due to the ability of the plants to propagate by stolons and potentially cover some areas that were not previously covered by the desirable forage species.

If you have any questions about PCS, please contact Joe Vendramini, jv@ufl.edu.

The Many Labels of Beef

Caitlin Bainum, UF/IFAS Extension Marion County & Brittany Justesen, UF/IFAS Extension Osceola County

We are fortunate to have choices in most things, especially our food supply. These choices can become complicated if you are not aware of labeling implications and various marketing strategies. When it comes to beef products your choices are laid out by a variety of statements that appear on the label describing the various production practices used to raise that beef. There are a plethora of labels we could disseminate, but we will stick to the most common; grain finished, grass finished or grass fed, certified organic, naturally raised, and pasture raised. We will begin to decode these labels with this thought: All cattle eat grass for most of their lives until the finishing phase, which accounts for the last 4-6 months at which point grain would become more prominent in the diet under conventional production. While cattle can certainly be finished on grass, this process often takes longer and could account for more resources. Another important point to note is that all of the below methods of cattle production have a place in the beef market, and when discussing with consumers it is best to take an educational approach and simply know the facts of each method and encourage each person's right to choose.

Grain Finished:

- This would be the "industry standard", these cattle spend the majority of their lives eating forage and the final 4-6 months of their lives at a feed yard where they will consume grains. They may or may not receive approved antibiotics to treat or prevent disease and/or growth promoting hormones. These cattle tend to reach production weight at a younger age. This production method dates back to early research that still holds true, grain-finishing allows us to compensate for decreased efficiency in cattle as they age through the energy-dense grains.

Grass Fed:

- These cattle spend their entire lives consuming forage as their diet and may also receive antibiotics and growth promoting hormones. These cattle can still spend time at a feed yard receiving forage. These cattle typically produce leaner meat and tend to have lower USDA quality grades, which indicates fat within the muscle, as compared to grain-finished cattle.

Certified Organic:

- These cattle may consume grain in the diet, Certified Organic does NOT mean grass fed.
All feed must be certified organic by the Agriculture Marketing Service. These cattle can still spend time at a feed yard. These cattle NEVER receive any antibiotics or growth promoting hormones.

Naturally Raised:

- These cattle "never ever" receive antibiotics or growth promoting hormones, but they can be grain or grass finished. Naturally raised does NOT mean Certified Organic.

Pasture Raised:

- This is a tricky one. These cattle are kept on pasture throughout their lives, but can still be fed grain under this label. Pasture raised simply refers to where an animal eats, not what it eats.

References:

1. Penn State University, Grass-fed Beef Production. 2018. https://extension.psu.edu/grass-fed-beef-production
2. National Cattlemen's Beef Association, Decoding the label: know your beef choices. 2015. https://www.beefitswhatsfordinner.com/resources/infographic-library

TYPES OF BEEF PRODUCTION

GRAIN-FINISHED

*Cattle spend most of their life on forage

*Finished on grain in feed yard

*May be given FDA approved antibiotic and hormones

GRASS– FINISHED

*Cattle spend whole life on forage

*May be finished at feed yard on hay or silage

* May be given FDA approved antibiotics and hormones

USDA CERTIFIED ORGANIC

*Cattle may be grain or grass finished on organic feed and may be finished at feed yard

* Never receives hormones or antibiotics

NATURALLY RAISED

*May be grain or grass finished and may be finished at feed yard

*Never receives hormones or antibiotics

CENTRAL FLORIDA LIVESTOCK AGENTS GROUP

UF | IFAS Extension UNIVERSITY of FLORIDA

TALKING TO CONSUMERS
about animal antibiotics

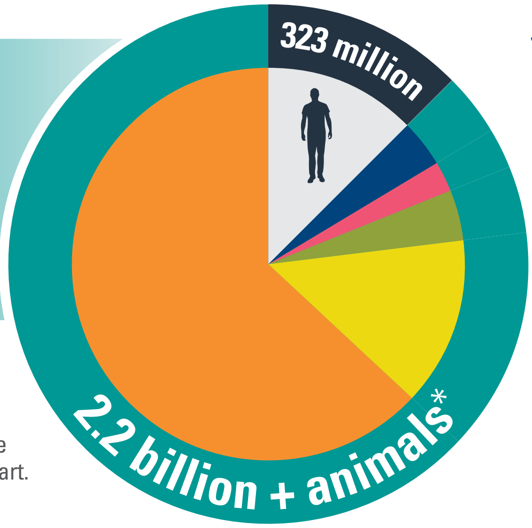
STARTS HERE

Merck Animal Health is committed to improving the health and well-being of animals through innovative science-based solutions, products, treatments and services that help ensure a safe and affordable food supply. The judicious use of antibiotics to treat, control and prevent sickness in animals is an important part of animal welfare and food safety.

There are far more farm animals in the United States than people:

323 million people vs. **2.2 billion** cows, pigs, turkeys and chickens[1]

You may have heard that 80% of antibiotics in the United States are used in agriculture, but that statistic makes more sense when it's put into perspective.[2]



* Other species are also included in the 80% statistic like sheep, goats, fish and companion animals - dogs, cats and horses. They increase the number of animals but are not reflected on this chart.

Antibiotics are used to treat, control and prevent illness in animals. Antibiotics are thoroughly tested and regulated and are used judiciously by farmers and veterinarians.[3]

Antibiotics are **safe**[4]

Antibiotics are used **responsibly**[3]

Antibiotics are sometimes **necessary** for animals[5]

1. United States Department of Agriculture. Census of Agriculture. 2012 Census Volume 1, Chapter 1: U.S. National Level Data. https://agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_1_US/usv1.pdf. Accessed August 15, 2017.
2. American Meat Institute. The Facts About Antibiotics in Livestock & Poultry Production. Sort fact from fiction. https://www.meatinstitute.org/index.php?ht=a/GetDocumentAction/i/99943. Accessed August 15, 2017.
3. AVMA. Judicious Therapeutic Use of Antimicrobials. https://www.avma.org/KB/Policies/Pages/Judicious-Therapeutic-Use-of-Antimicrobials.aspx. Accessed August 15, 2017.
4. FDA. About FDA. About the Center for Veterinary Medicine (CVM). https://www.fda.gov/AboutFDA/CentersOffices/OfficeofFoods/CVM/default.htm. 2017. Accessed August 15, 2017.
5. National Center for Appropriate Technology. ATTRA Sustainable Agriculture. Tipsheet: Treatment of Sick or Injured Organic Livestock. https://www.ams.usda.gov/sites/default/files/media/Treatment%20of%20Sick%20or%20Injured%20Organic%20Livestock_FINAL.pdf. 2015. Accessed August 15, 2017.
6. Centers for Disease Control and Prevention. Get Smart. Fast Facts. https://www.cdc.gov/getsmart/community/about/fast-facts.html. Dec., 2016. Accessed August 15, 2017.
7. Centers for Disease Control and Prevention. CDC: 1 in 3 antibiotic prescriptions unnecessary. https://www.cdc.gov/media/releases/2016/p0503-unnecessary-prescriptions.html. 2016. Accessed August 15, 2017.
8. FDA. Department of Health and Human Services. 2011 SUMMARY REPORT On Antimicrobials Sold or Distributed for Use in Food-Producing Animals. https://www.fda.gov/downloads/ForIndustry/UserFees/AnimalDrugUserFeeActADUFA/UCM338170.pdf. Sept., 2014. Accessed August 15, 2017.
9. United States Department of Agriculture. Food Safety and Inspection Service. Topics. Data Collection and Reports. Residue Chemistry. Blue Books. Residue Sampling Plans. United States National Residue Program for Meat, Poultry, and Egg Products: 2017 Residue Sampling Plans. https://www.fsis.usda.gov/wps/portal/fsis/topics/data-collection-and-reports/chemistry/blue-books/ct_index. Apr. 21, 2017. Accessed August 15, 2017.
10. FDA. Animal & Veterinary. Drug Residues. https://www.fda.gov/AnimalVeterinary/GuidanceComplianceEnforcement/ComplianceEnforcement/ucm264049.htm. 2017. Accessed August 15, 2017.

MERCK Animal Health

The Science of Healthier Animals®

TALKING TO CONSUMERS
about antibiotic use in animals

STARTS HERE

We understand consumers have questions about antibiotic use in animals, and we want to help answer them.

CONSUMER: I've heard that 80% of antibiotics in the U.S. are used in animals. How do you explain that?

I understand your concerns, and I'd like to help put that number into perspective, so it makes more sense. First, it's important to recognize that there are far more animals in the U.S. than there are people. In fact, there are 323 *million* people in the U.S., but there are 2.2 billion cows, pigs, turkeys and chickens.[1] To that, we also need to add other farm animals like sheep, goats and fish, as well as companion animals like dogs, cats and horses, which are included in the 80% statistic. When you add everything up and compare the number of animals to humans, 80% makes more sense. Antibiotics are used in animals to treat, prevent and control disease, and their use is judicious and strictly regulated.[3]

CONSUMER: What about the living conditions of animals. Do crowded conditions contribute to animals' need for antibiotics?

That's a very important question, and continuous improvement in animal well-being is something we strive for every day. Like people, animals sometimes get sick regardless of living conditions; it's part of nature. It's also important to understand the natural behavior of farm animals includes seeking close contact with each other and sharing their water and feeding systems.[2] This can sometimes lead to a rapid spread of sickness, which is why we sometimes treat animals with antibiotics as a preventative measure. Rest assured that farmers and ranchers strive to use antibiotics judiciously and responsibly to treat, prevent and/or control disease to ensure the health and well-being of their animals.

CONSUMER: What about antibiotic resistance and "superbugs?" I read that the use of antibiotics in agriculture contributes to this problem. Is there any truth to that?

I can assure you, combating antibiotic resistance is a top priority for me, and I share your concern. Any use of antibiotics, whether in animals or people, contributes to antibiotic resistance and the rise of "superbugs."[6] Nature finds a way and bacteria continue to find new ways to fight medicine. At the same time, science is always finding new ways to have the technological advantage over nature. Fortunately, farmers and ranchers are also doing a lot to make sure antibiotics are used judiciously in animal agriculture to preserve their usefulness for everyone.

CONSUMER: That is good to know. What is being done to combat antibiotic resistance?

I'm glad you're interested in this topic, because I'm passionate about it, too. In order to combat resistance, antibiotics must be used judiciously – both in human and animal health. A recent study by the Center for Disease Control (CDC) concluded that 30% of antibiotics used in people were deemed unnecessary.[7] The FDA implemented the Veterinary Feed Directive (VFD), which takes an important step to change the way medically important antibiotics are used in animal medicine. Under the VFD, medically important antibiotics cannot be used for growth promotion in animals. Additionally, medically important antibiotics necessary to treat a sick animal must be administered under direct supervision of a veterinarian. You might be surprised to find out the vast majority of antibiotics are used in either people or animals, but generally not in both.[8]

CONSUMER: That makes more sense now. What about antibiotic residue? What safety measures are in place to prevent antibiotic residues in the food I feed my family?

This question is also important to me, because I feed my family the same food you feed yours. You should know that antibiotics are thoroughly researched and regulated by the FDA. When an antibiotic is administered to an animal, there is a "withdrawal period" set by the FDA to make sure the antibiotic has cleared the animal's system before it enters the food supply.[9] Additionally, the USDA's Food Safety and Inspection Service routinely tests samples of our food to ensure all of our food is antibiotic-free.[10]

CONSUMER: I see a lot of antibiotic-free foods. I wonder if they are better?

I share your concerns for all of the claims that are on food packages today. When it comes to foods with antibiotic-free claims, it helps to know that all food is antibiotic-free. Some animals are raised without ever receiving antibiotics (known as No Antibiotics Ever). Food with a No Antibiotics Ever claim does not mean it is superior or safer in any way.

CONSUMER: This has all been very helpful. Thanks for your time.

My pleasure. We understand transparency in food production is important, and I enjoy these conversations and the open dialogue. Our tagline is "The Science of Healthier Animals," and we prioritize preventative approaches to help keep animals healthy and minimize the need for treatment. We are also always looking for ways to improve.

MERCK
Animal Health
The Science of Healthier Animals®

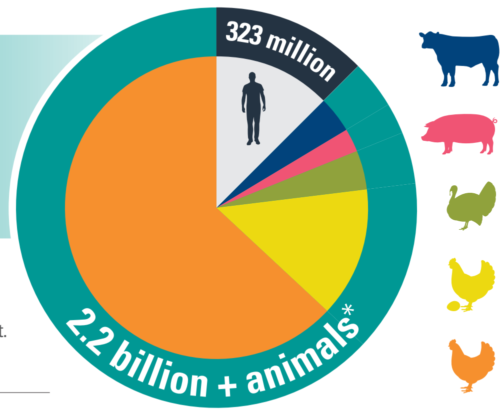
STARTS HERE

Putting Antibiotics into Perspective

There are far more farm animals in the United States than people:

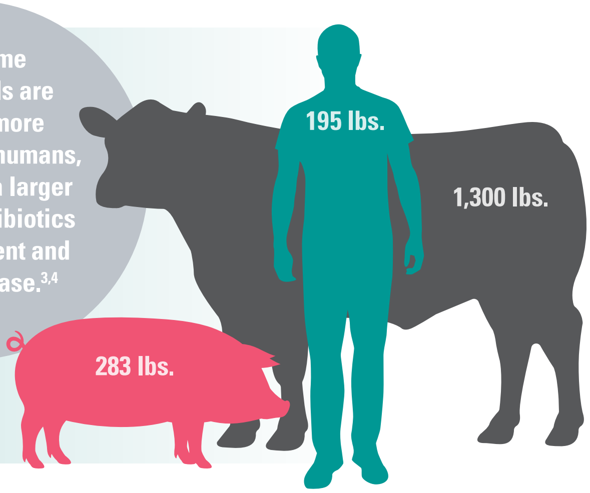
323 million people vs. **2.2 billion** cows, pigs, turkeys and chickens[1]

You may have heard that 80% of antibiotics in the United States are used in agriculture, but that statistic makes more sense when it's put into perspective.[2]



* Other species are also included in the 80% statistic like sheep, goats, fish and companion animals - dogs, cats and horses. They increase the number of animals but are not reflected on this chart.

Since some farm animals are generally more massive than humans, they require a larger volume of antibiotics to treat, prevent and control disease.[3,4]



Most antibiotics are used only in animals or only in humans, not in both.[5]

Use by Volume	Humans	Animals
Penicillins	44%	6%
Cephalosporins	15%	1%
Sulfa	14%	3%
Quinolones	9%	Less than 1%
Macrolides	5%	4%
Tetracyclines	4%	41%
Ionophores*	0%	30%

** Ionophores are never used in human medicine*

Antibiotics are used to treat, control and prevent illness in animals. Antibiotics are thoroughly tested and regulated and are used judiciously by farmers and veterinarians.[6]

FDA

The FDA sets "withdrawal times" based on research to assure antibiotics have cleared an animal's system before it enters the food supply.[7]

USDA

The USDA's Food Safety and Inspection Service routinely tests food to ensure it is free of antibiotic residues.[8]

AMERICAN VETERINARY MEDICAL ASSOCIATION

Antibiotics that are medically-important to humans must be administered under direct veterinary supervision.[9]

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

The CDC is working to reduce antibiotic use in humans and says at least 30% of antibiotics prescribed in U.S. doctor's offices and emergency rooms are unnecessary.[10]

1. United States Department of Agriculture. Census of Agriculture. 2012 Census Volume 1, Chapter 1: U.S. National Level Data. https://agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_1_US/. Accessed August 15, 2017.
2. American Meat Institute. The Facts About Antibiotics in Livestock & Poultry Production. Sort fact from fiction. https://www.meatinstitute.org/index.php?ht=a/GetDocumentAction/i/99943. Accessed August 15, 2017.
3. National Cattlemen's Beef Association. Modern Beef Production Fact Sheet. http://www.explorebeef.org/cmdocs/explorebeef/factsheet_modernbeefproduction.pdf. 2009. Accessed August 15, 2017.
4. Pork Checkoff. Quick Facts. Typical Market Pig Today. http://www.pork.org/pork-quick-facts/home/stats/consumption-and-expenditures/typical-market-pig-today/. 2017. Accessed August 15, 2017.
5. FDA. Department of Health and Human Services. 2011 SUMMARY REPORT On *Antimicrobials Sold or Distributed for Use in Food-Producing Animals*. https://www.fda.gov/downloads/ForIndustry/UserFees/AnimalDrugUserFeeActADUFA/UCM338170.pdf. September, 2014. Accessed August 15, 2017.
6. AVMA. Judicious Therapeutic Use of Antimicrobials. https://www.avma.org/KB/Policies/Pages/Judicious-Therapeutic-Use-of-Antimicrobials.aspx. 2017. Accessed August 15, 2017.
7. United States Department of Agriculture. Food Safety and Inspection Service. Topics. Data Collection and Reports. Residue Chemistry. Blue Books. Residue Sampling Plans. United States National Residue Program for Meat, Poultry, and Egg Products: 2017 Residue Sampling Plans. https://www.fsis.usda.gov/wps/portal/fsis/topics/data-collection-and-reports/chemistry/blue-books/ct_index. Apr. 21, 2017. Accessed August 15, 2017.
8. FDA. Animal & Veterinary. Drug Residues. https://www.fda.gov/AnimalVeterinary/GuidanceComplianceEnforcement/ComplianceEnforcement/ucm264049.htm. 2017. Accessed August 15, 2017.
9. FDA. Animal & Veterinary. Veterinary Feed Directive (VFD). https://www.fda.gov/animalveterinary/developmentapprovalprocess/ucm071807.htm. 2017. Accessed August 15, 2017.
10. Centers for Disease Control and Prevention. CDC: 1 in 3 antibiotic prescriptions unnecessary. https://www.cdc.gov/media/releases/2016/p0503-unnecessary-prescriptions.html. 2016. Accessed August 15, 2017.

MERCK Animal Health
The Science of Healthier Animals®

TALKING TO CONSUMERS
about hormone implants

STARTS HERE

Merck Animal Health is committed to improving the health and well-being of animals through innovative science-based solutions, products, treatments and services that help ensure a safe and affordable food supply. The use of hormone implants in beef cattle helps farmers raise healthy beef sustainably, which helps keep beef affordable for consumers.[1] Hormone implants have been proven safe for people, animals and the environment, and there are practical reasons for their use.[2]

Hormone implants are safe

- Hormone implants have been approved for use by the FDA for more than 60 years.[2]
- Each type of hormone implant must go through rigorous development and testing programs to prove beef from cattle given hormone implants is safe for people to eat, and the implant does not harm animals or the environment.[2]
- The USDA's Food Safety and Inspection Service routinely tests meat for any trace residues that are beyond the threshold for human safety.[3]
- Beef from cattle given hormone implants has never been linked to adverse effects in humans.[4]

Hormone implants are practical

- Hormone implants help cattle convert feed into more lean meat consumers desire instead of excess fat.[1]
- Hormone implants given to steers provide a fraction of the hormone levels bulls naturally produce, while still allowing for better muscle growth.[5]
- Hormone implants used in heifers being raised for beef balance natural hormone levels and allow for improved muscle growth.[1]

Hormone implants help farmers raise beef sustainably

- Hormone implants help farmers raise more beef with fewer cattle while using fewer natural resources like land, feed and water.[6]
- Without hormone implants, to raise the same amount of beef, U.S. farmers would need 11 million more head of cattle, 18 million more acres of land for grazing and growing feed and 515 billion more gallons of water for producing feed and maintaining animals.[7,8,9]

A three-ounce serving of beef from a steer implanted with estrogen contains

1.9

nanograms of estrogen[10]

A three-ounce serving of beef from a steer NOT implanted with estogen contains **1.3 nanograms of estrogen**[10]

A three-ounce serving of potatoes contains

225

nanograms of estrogen[10]

A three-ounce serving of cabbage contains

2,000

nanograms of estrogen[10]

Every day, an average woman produces

513,000

nanograms of estrogen[11]

Every day, an average man produces **136,000 nanograms of estrogen**[11]

1. Loy, D. Iowa Beef Center. Iowa State University Extension. Understanding Hormone Use In Beef Cattle Q&A. IBC 48. http://www.iowabeefcenter.org/information/IBC48.pdf. March 2011. Accessed August 2, 2017.
2. FDA. Steroid Hormone Implants Used for Growth in Food-Producing Animals. 2015. https://www.fda.gov/animalveterinary/safetyhealth/productsafetyinformation/ucm055436.htm. Accessed July 21, 2017.
3. United States Department of Agriculture. Food Safety and Inspection Service. Office of Public Health Science. United States National Residue Program for Meat, Poultry, and Egg Products. 2017 Residue Sampling Plans October 1, 2016 to September 30, 2017. https://www.fsis.usda.gov/wps/wcm/connect/1808d9c3-414f-4019-a31c-8454854ab66e/2017-Blue-Book.pdf?MOD=AJPERES. Accessed July 21, 2017.
4. Best Food Facts. Do Hormones in Milk, Meat and Eggs Cause Early Puberty? 2014. https://www.bestfoodfacts.org/hormones-milkmeat-earlypuberty/. Accessed August 10, 2017.
5. Wessler, B. Why is early castration of bull calves important? *Drovers CattleNetwork*. 2011. http://www.cattlenetwork.com/cattle-resources/preconditioning/Why-is-early-castration-of-bull-calves-important-125483643.html. Accessed July 21, 2017.
6. Capper, J. L., and D. J. Hayes. 2012. The environmental and economic impact from removing growth-enhancing technologies from U.S. beef production. *J. Anim. Sci.* 2012. 90:3527-3537.
7. Merck Animal Health. Meat Sustainability Calculator. http://www.meatsustainabilitycalculator.com/. Accessed August 10, 2017.
8. National Cattlemen's Beef Association. Beef Industry Statistics. 2017. http://www.beefusa.org/beefindustrystatistics.aspx. Accessed August 10, 2017.
9. Capper J. L. 2013. The environmental and economic impact of steroid implant and beta-adrenergic agonist use within U.S. beef production. In: Proceedings of the ADSA-ASAS Joint Annual Meeting, Indianapolis, IN, USA.
10. Treffer, B. University of Nebraska-Lincoln. Worried About Hormones? http://newsroom.unl.edu/announce/beef/2846/15997. 2017. Accessed August 2, 2017.
11. Hoffmann, B. and P. Evers. Drug Residues in Animals. A. G. Rico (Ed.). pp. 111-146. *Academic Press*. New York (1986).

MERCK Animal Health

The Science of Healthier Animals®

TALKING TO CONSUMERS
about hormone implants

STARTS HERE

We understand consumers have questions about hormone implants, and we want to help answer them.

CONSUMER: I try to make sure I'm feeding my family wholesome food, and I am really concerned about farmers' use of hormones.

I understand your concerns. Safety is a top priority for us, too. We feed our family the same beef that you feed your family. To put your mind at ease, the FDA has strict standards for allowing product approvals, and hormone implants have been approved for use for more than 60 years. A hormone implant must undergo rigorous testing to ensure it is safe for animals and the environment. The USDA's Food Safety and Inspection Service also routinely tests meat to ensure any trace residues found in meat are at safe levels for human consumption.[2,3]

CONSUMER: Should I be concerned about hormones in my meat?

I want to help you make knowledgeable choices about your food. Hormones are found in every living thing, and therefore in everything we eat.

- For example, you wouldn't expect to find hormones in a potato, but in reality, a three-ounce serving of potatoes contains 225 nanograms of estrogen.[10]
- To further put it in perspective, a three-ounce serving of beef from an animal given hormone implants contains only 1.9 nanograms of estrogen.[10]

CONSUMER: That's nice to hear, but how do we know the hormones you give animals are safe for us in the long run?

I share your concerns about feeding safe, healthy food to our families. And it's one we look at very closely. More than 60 years of studying hormone implant use in cattle has shown no link to human health concerns. The FDA and USDA continue to monitor and research the use of hormone implants to ensure their safety.[2,3]

CONSUMER: What about early puberty in girls? I read this was caused by hormones in our food.

I have children too, and want to be sure that the food they eat is wholesome and safe. Actually, no peer reviewed study has ever linked hormone implants used in raising beef to early onset puberty. According to *Scientific American*, many different factors contribute to earlier onset puberty, including gender, ethnicity, obesity, Body Mass Index (BMI) and other medical conditions.[4]

CONSUMER: That's all very helpful to hear. So, why do you use growth hormones in the first place?

I understand you have questions, and I'm glad that I can answer them. Farmers use hormone implants for several reasons. For starters, bulls (male cows) are castrated to curb aggression, which keeps workers and other animals safe. Hormone implants replace some of the hormones the steers would have naturally produced. They help the cattle make the most of the nutrients in their feed and improve their natural ability to convert feed into more lean beef instead of excess fat. Hormone implants ultimately benefit consumers like you and me because they also help farmers raise beef sustainably - making more food available while helping keep beef affordable.[1]

CONSUMER: Are they harmful to the animal?

Quality beef begins with quality care and the well-being of our cattle is a top priority. Hormone implants must go through rigorous development and testing programs to prove they are safe for people to eat and do not harm animals or the environment. Everything we do for our cattle we do under the advice of our veterinarian and the cattle nutritionist, who generally has a masters degree or PH.D., who ensure the cattle are getting the care and nutrients they need.[2]

CONSUMER: What impact do these implants have on the environment?

That is a great question. It's a positive story for the environment because the use of hormone implants allows farmers to raise beef sustainably. In fact, farmers are able to raise more beef with fewer animals and less land, water and feed. For example, if we didn't have this important tool, we'd need 11 million more cattle in the U.S. beef herd to produce the same amount of beef to feed the growing population.[7,8,9]

CONSUMER: Thanks for talking with me. I appreciate your answers.

My pleasure. We understand that transparency in food production is important to consumers like you, and I enjoy these conversations and the open dialogue. Safety is our top priority, and we always look for ways to improve.

MERCK
Animal Health
The Science of Healthier Animals®

STARTS HERE

Hormone Implants

ARE SAFE

A three-ounce serving of beef from a steer implanted with estrogen contains
1.9
nanograms of estrogen[1]

A three-ounce serving of beef from a steer NOT implanted with estrogen contains **1.3 nanograms of estrogen**[1]

A three-ounce serving of potatoes contains
225
nanograms of estrogen[1]

A three-ounce serving of cabbage contains
2,000
nanograms of estrogen[1]

Every day, an average woman produces
513,000
nanograms of estrogen[2]

Every day, an average man produces **136,000 nanograms of estrogen**[2]

ARE PRACTICAL

Bulls' hormone systems are removed to curb aggression for the safety and welfare of the animals (now called "steers") and the people who interact with them, and to make beef more tender and flavorful. Implants restore enough of a steer's naturally-produced hormone levels to **grow efficiently**.[3]

Heifers (female cattle that have not given birth) have hormone systems focused on reproduction. Hormone implants **balance a heifer's natural hormone levels** to allow it to grow more muscle instead of fat.[4]

Hormone implants help balance natural hormone levels in cattle to allow them to convert their feed into lean muscle instead of excess fat, which helps keep beef affordable.[4]

ARE SUSTAINABLE

To raise the same amount of beef WITHOUT hormone implants, it would take:[5,6,7]

11
MILLION MORE
cattle in the U.S. beef herd

18
MILLION MORE
acres of land for grazing and growing feed

515
BILLION MORE
gallons of water for producing feed and maintaining animals

1. Treffer, B. University of Nebraska-Lincoln. Worried About Hormones? http://newsroom.unl.edu/announce/beef/2846/15997. 2017. Accessed August 2, 2017.
2. Hoffmann, B. and P. Evers. Drug Residues in Animals. A. G. Rico (Ed.). pp. 111-146. Academic Press. New York (1986).
3. Wessler, B. Why is early castration of bull calves important? *Drovers CattleNetwork*. 2011. http://www.cattlenetwork.com/cattle-resources/preconditioning/Why-is-early-castration-of-bull-calves-important-125483643.html. Accessed July 21, 2017.
4. Loy, D. Iowa Beef Center. Iowa State University Extension. Understanding Hormone Use In Beef Cattle Q&A. IBC 48. http://www.iowabeefcenter.org/information/IBC48.pdf. March 2011. Accessed August 2, 2017.
5. Merck Animal Health. Meat Sustainability Calculator. http://www.meatsustainabilitycalculator.com/. Accessed August 10, 2017.
6. National Cattlemen's Beef Association. Beef Industry Statistics. 2017. http://www.beefusa.org/beefindustrystatistics.aspx. Accessed August 10, 2017.
7. Capper J. L. 2013. The environmental and economic impact of steroid implant and beta-adrenergic agonist use within U.S. beef production. In: Proceedings of the ADSA-ASAS Joint Annual Meeting, Indianapolis, IN, USA.

MERCK Animal Health
The Science of Healthier Animals®

STARTS HERE

Animal Vaccines

BENEFIT ANIMALS

Animal vaccines are considered the first line of defense against diseases.

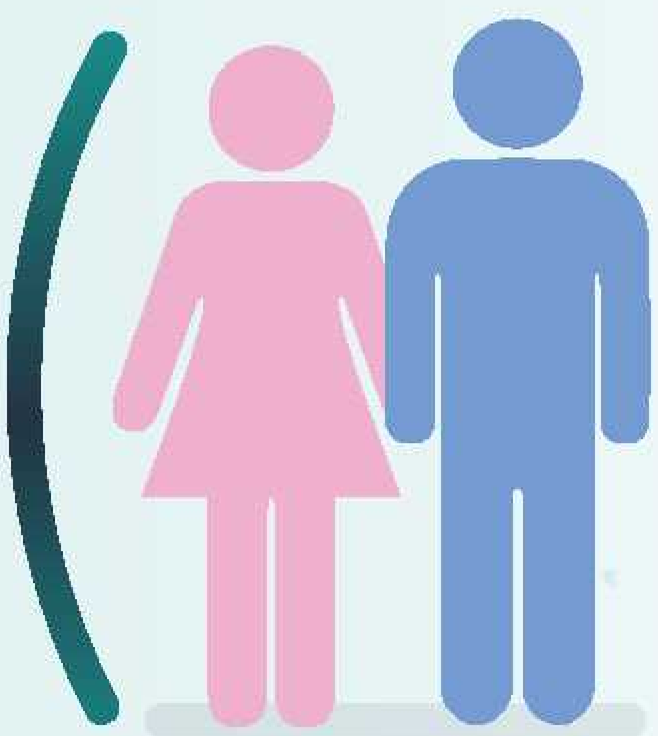
Vaccines reduce the need for treating illness, which leads to **less antibiotic use.**[1]

Less disease and illness means improved animal health and well-being.

BENEFIT PEOPLE

Did you know?
Using *E. coli* vaccines on cattle could prevent up to 83% of human infections.[2]

Vaccines protect animals from contracting diseases that they may then transmit to humans.[2,3]



Vaccines **minimize the likelihood and spread** of food-borne pathogens.[4]

Vaccines help **keep food affordable**. By keeping animals healthy, food can be produced using fewer resources.[5]

BENEFIT THE ENVIRONMENT

Animal vaccines reduce death loss in animal herds, which means we don't have to treat animals for illness as often and fewer resources are used or wasted.[5]

Healthy animals require fewer resources to grow, which reduces the environmental footprint of raising animals.[5]

1. WHO. Media centre. Antibiotic resistance. Fact sheet. October 2016. http://www.who.int/mediacentre/factsheets/antibiotic-resistance/en/. Accessed August 3, 2017.
2. Mathews, L., R. Reeve, D. L. Gally, J. C. Low, M. E. J. Woolhouse, S. P. McAteer, M. E. Locking, M. E. Chase-Topping, D. T. Haydon, L. J. Allison, M. F. Hanson, G. J. Gunn, and S. W. J. Reid. 2013. Predicting the public health benefit of vaccinating cattle against *Escherichia coli* O157. *Proc Natl Acad Sci.* USA. 110(40):16265-16270.
3. Rose, N. and Andraud, M. The use of vaccines to control pathogen spread in pig populations. *Porcine Health Management.* 2017. 3:8 DOI. 10.1186/s40813-017-0053-6. https://porcinehealthmanagement.biomedcentral.com/articles/10.1186/s40813-017-0053-6. Accessed August 3, 2017.
4. Farrington, C. P. On vaccine efficacy and reproduction numbers. *Math Biosci.* 2003.185:89-109. http://izt.ciens.ucv.ve/ecologia/Archivos/ECOLOGIA_DE%20_POBLACIONES_Hasta%202004/ECOL_POBLAC_Hasta%202004_(A-G)/Farrington%202003.pdf. Accessed August 3, 2017.
5. Roth, J. A. Veterinary Vaccines and Their Importance to Animal Health and Public Health. *Procedia in Vaccinology.* 2011. 5:127-136. http://ac.els-cdn.com/S1877282X11000270/1-s2.0-S1877282X11000270-main.pdf?_tid=b9d9e840-9803-11e7-ace0-00000aacb35e&acdnat=1505252922_65fef46b434fb96a9017e386b906543b. Accessed August 3, 2017.

MERCK Animal Health
The Science of Healthier Animals®