Growth promoting technologies – Strengthening your bottom-line while preserving meat quality

Bailey N. Harsh, Ph.D.

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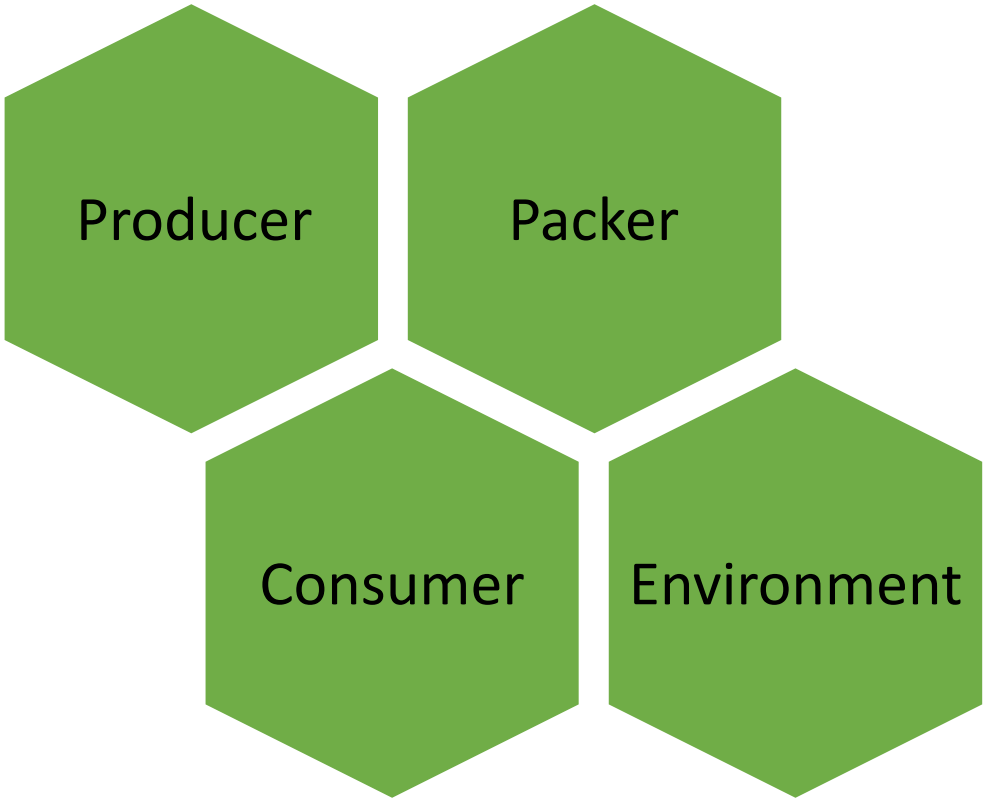
350
701
380

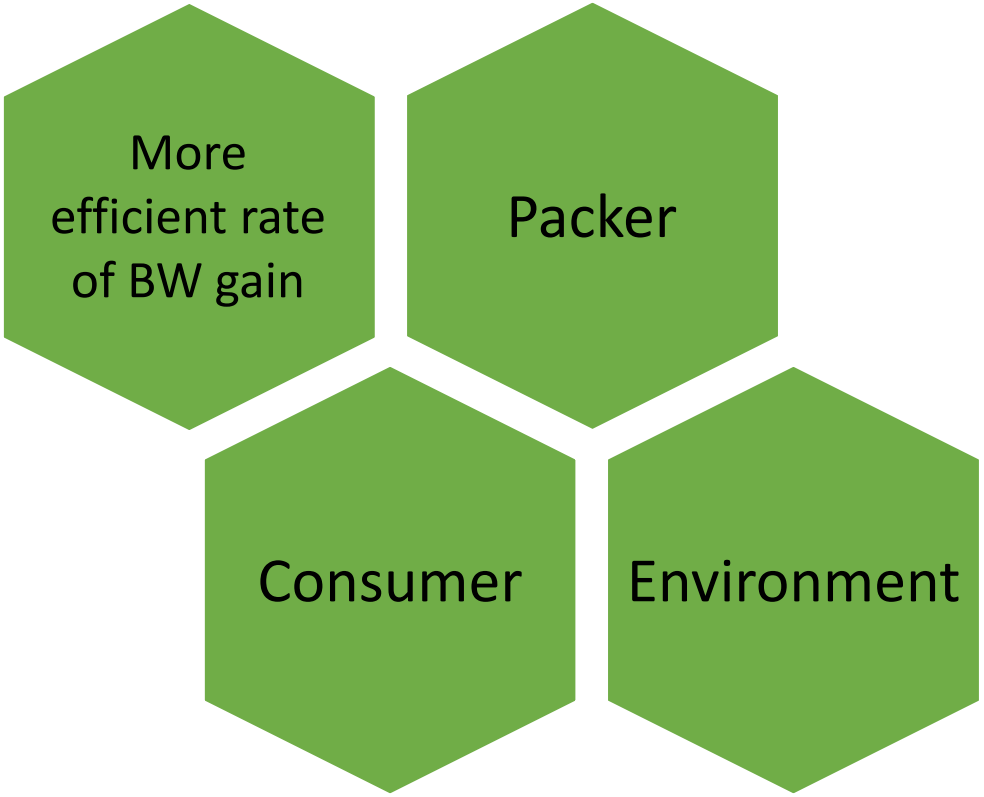

G1
G1

Technology adoption



- ~ 90% of heifers and steers, regardless of weight or capacity, were implanted at least once(APHIS, 2013)
- ~ 85% of feedlots covered by consulting nutritionists fed a beta-agonist (Samuelson et al., 2016)

Technology adoption



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Technology adoption

More efficient rate of BW gain

Improved retail cut yield

Consumer

Environment

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Technology adoption

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Reduced outputs/lb. of beef

- ~ 90% of heifers and steers, regardless of weight or capacity, were implanted at least once(APHIS, 2013)
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Implants

- Potency (Aggressive)
  - Active hormone
  - Dosage
  - Carrier compound
- Additive Effects
  - Reimplanting
- Strategies
  - Finish date
  - Price spread
  - Genetics
  - Feeding program

Implant types

- Estrogenic (E)
  - Estradiol/Estradiol benzoate
  - Zeranol* (non-steroidal)
- Androgenic (A)
  - Testosterone
  - Trenbolone acetate* (TBA)
- Combination (C)
  - Most are estradiol + TBA
  - Estradiol benzoate + testosterone
- Progestins
  - Progesterone
  - Melengestrol acetate* (orally-active)

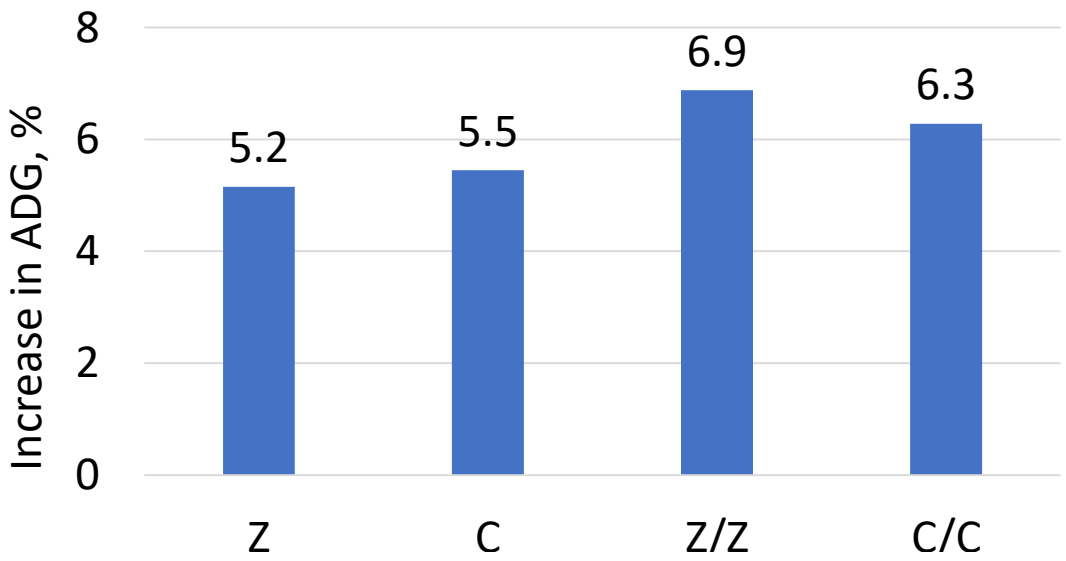
*Synthetic

	Trade name	Hormone content
Estrogenic (E)	Component E-S with Tylan[2]	20 mg estradiol benzoate + 200 mg progesterone + tylosin
	Compudose 200[2]	25.7 mg estradiol
	Encore (Compudose 400) [2]	43.9 mg estradiol
	Magnum[3]	72 mg zeranol
	Ralgro[3]	36 mg zeranol
	Synovex-S[4]	20 mg estradiol benzoate + 200 mg progesterone
Androgenic (A)	Component T-H with Tylan[2]	200 mg TBA5 + tylosin
	Component T-S with Tylan[2]	200 mg TBA + tylosin
	Finaplix-H[3]	200 mg TBA
	Finaplix-S[3]	140 mg TBA
Combination (C)	Component E-H with Tylan[2]	20 mg estradiol benzoate + 200 mg testosterone propionate + tylosin
	Component TE-G[2]	8 mg estradiol + 40 mg TBA
	Component TE-G with Tylan[2]	Component TE-G + tylosin
	Component TE-IH with Tylan[2]	8 mg estradiol + 80 mg TBA + tylosin
	Component TE-IS[2]	16 mg estradiol + 80 mg TBA
	Component TE-IS with Tylan[2]	Component TE-IS + tylosin

	Trade name	Hormone content
Combination (C)	Component TE-S2	24 mg estradiol + 120 mg TBA
	Component TE-S with Tylan[2]	Component TE-S + tylosin
	Component TE-200[2]	20 mg estradiol + 200 mg TBA
	Component TE-200 with Tylan[2]	Component TE-200 + tylosin
	Revalor-G[3]	4 mg estradiol + 40 mg TBA
	Revalor-H[3]	14 mg estradiol + 140 mg TBA
	Revalor-IH[3]	8 mg estradiol + 80 mg of TBA
	Revalor-IS[3]	16 mg estradiol + 80 mg of TBA
	Revalor-S[3]	24 mg estradiol + 120 mg TB
	Revalor-XS[3]	40 mg estradiol + 200 mg TBA
	Synovex-Choice[4]	14 mg estradiol benzoate + 100 mg TBA
	Synovex-H[4]	20 mg estradiol benzoate + 200 mg testosterone propionate
	Synovex-Plus[4]	28 mg estradiol benzoate + 200 mg TBA
	Synovex-T120[4]	24 mg estradiol + 120 mg TBA
	Synovex-T40[4]	8 mg estradiol + 40 mg TBA
	Synovex T-80[4]	16 mg estradiol + 80 mg TBA

Suckling calves

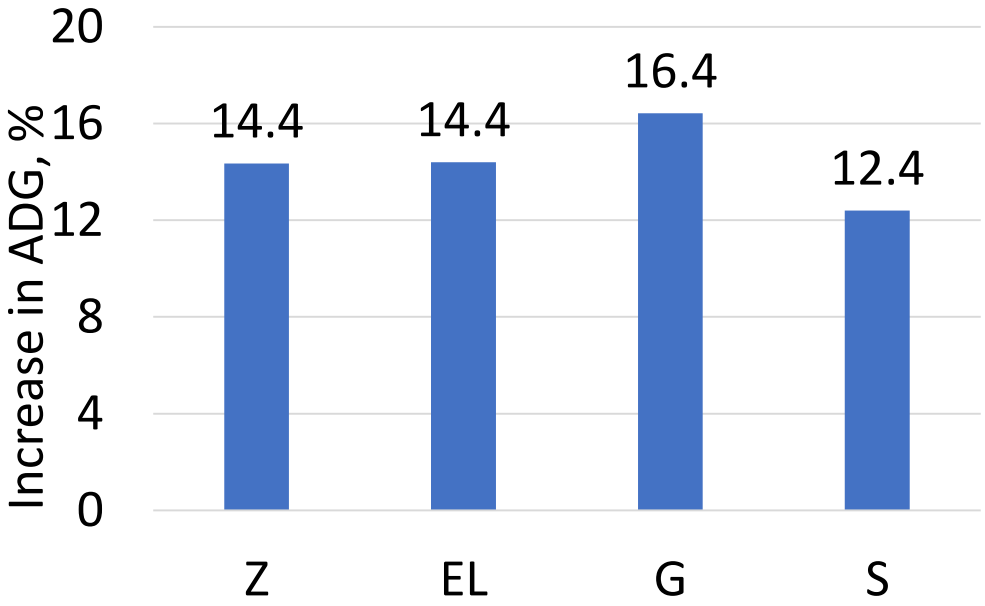
- Most common are:
  - Estradiol benzoate + Progesterone (C)
  - Zeranol (Z)
  - Estradiol
- Age requirement: >30 - 45 days
- Can be used in potential replacement heifers
- Greater ADG improvements realized in calves on higher nutritional plane



Adapted from: Duckett and Andrae, 2001

Stocker calves

- Most common are:
  - Zeranol (Z)
  - Long-duration estradiol (EL)
  - Estradiol benzoate & TBA (G)
  - EB & progesterone (S)
- Payout period ranges from 100 – 400 days
- Increases ADG even at weight gains as low as 0.6 lbs/day



Adapted from: Duckett and Andrae, 2001

Feedlot cattle

- Well documented improvements in ADG and feed efficiency (feed/gain)
- Re-implanting in the feedlot has an additive effect on performance, however…

Implant type	Change from non-implanted control, %	
	ADG	Feed/gain
E	16.4*	-6.2
E/E	17.6*	-6.2
E/C	17.3*	-8.9*
C	19.1*	-10.4*
C/C	20.0*	-13.5*

(Duckett and Pratt, 2014) *Denotes significance ($P < 0.05$)

Carcass traits

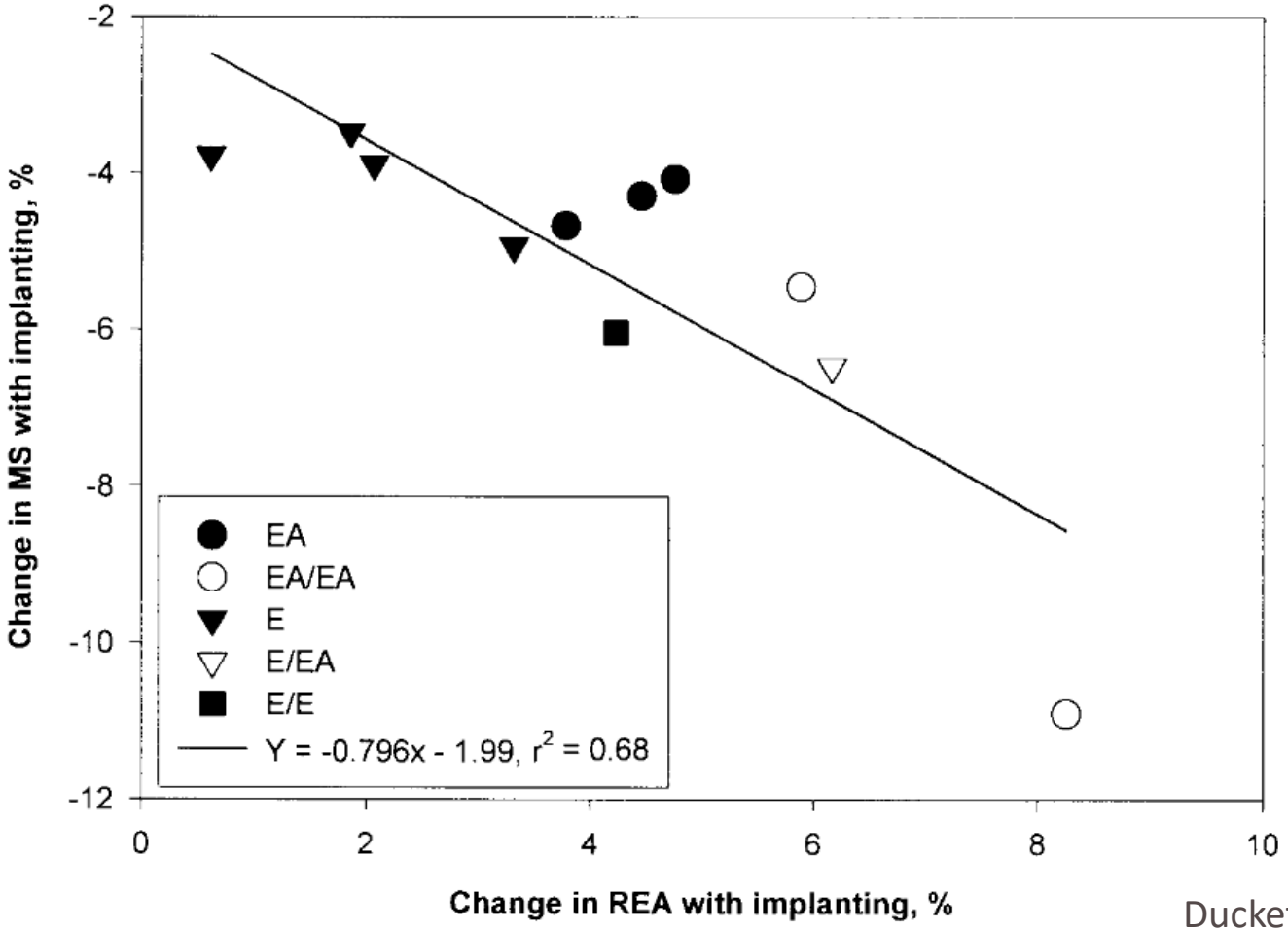
- ↑ HCW Hot carcass weight
- ↑ REA Ribeye area
- ↑ DP Dressing percentage

Implant type	Change from non-implanted control, %	
	HCW	REA
E	3.15	2.82
E/E	5.95*	4.8*
E/C	6.61*	7.4*
C	4.75*	5.8*
C/C	7.46*	9.0*

(Duckett and Pratt, 2014) *Denotes significance ($P < 0.05$)

Marbling

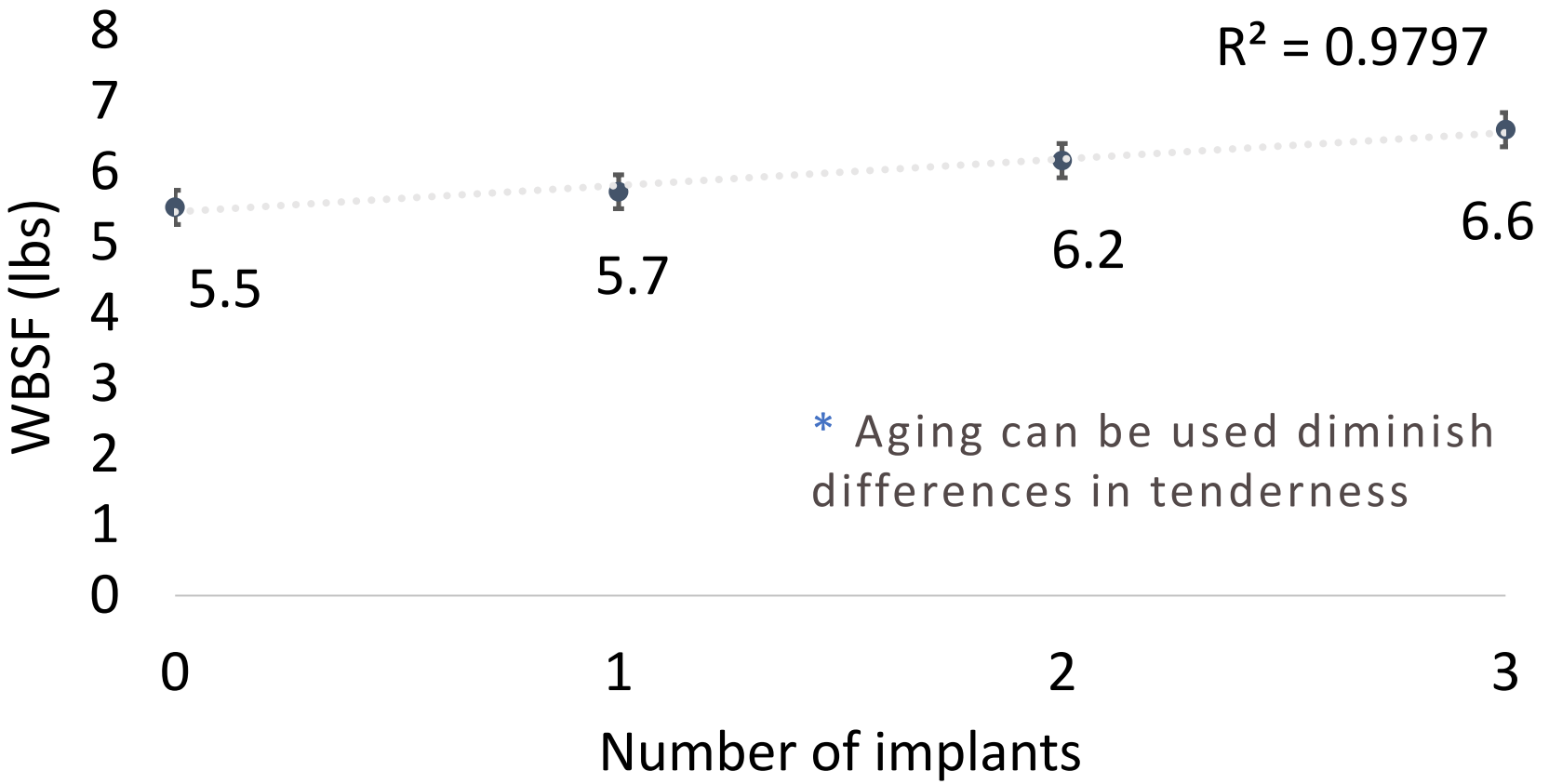
- What goes up must come down…
- Some reduction in marbling score and % grading Choice



Duckett & Andrae, 2001

Meat quality/palatability

- Most studies report some reduction in tenderness



Scheffler et al., 2003

Additive effects of re-implanting

	Means by number of implants administered				
Trait	0	2	3	4	5
Marbling score[a]	538	485*	461*	447*	447*
Choice and Prime, %	82.0	70.0	68.7	59.3*	65.3*
Shear force, kg	3.54	3.97*	4.27*	4.12*	4.19*

[A] 300 = slight, 400 = small, 500 = modest

* Denotes statistical difference from non-implanted control ($P < 0.05$)

If some is good, more is better… not necessarily

Economic impact

- Carryover effects of early implants is minimal on feedlot performance and carcass quality
- Implants reduce the cost of production by increasing value per animal

	Change from non-implanted control, %		
Implant Type	**ADG, %**	**LW, lbs**	**Increase in value, $/animal**
Suckling steer calf	5	17	$16
Stocker steer	15	33	$25
Feedlot steer	20	75	$51
All phases		125	$93

(Duckett and Andrae, 2001)

Economic impact

- Average return on investment across all strategies was $102.62 per head in 2013
  - This is increased from $45.36 in 1996

		Change from non-implanted control, %			
Implant Type	**2013 ROI**	**ADG**	**Feed:Gain**	**HCW**	**LMA**
Estrogenic	$54.02	16.4	-6.2	3.15	2.82
Estrogenic/Estrogenic	$91.97	17.6	-6.2	5.95	4.8
Estrogenic/Combination	$168.10	17.3	-8.9	6.61	7.4
Combination	$162.81	19.1	-10.4	4.75	5.8
Combination/Combination	$218.00	20.0	-13.5	7.46	9.0

(Duckett and Pratt, 2014)

Estrogenic activity of common foods

* A nanogram is one billionth of a gram, analogous to one blade of grass in an entire football field

Estrogenic activity of beef

Item	Estrogen Amount
Pregnant woman	19,600,000 ng/d
Non-pregnant woman	513,000 ng/d
Adult man	136,000 ng/d
Pre-puberal child	41,000 ng/d
500 g of beef from implanted cattle	7 ng/d

Hoffman and Eversol, 1986

Beta agonists

Beta-adrenergic agonists

- Two compounds are approved for use:
  - Ractopamine hydrochloride
  - Zilpaterol hydrochloride
- Fed for last 28-42 days of finishing period

Engain 9 Ractopamine Hydrochloride

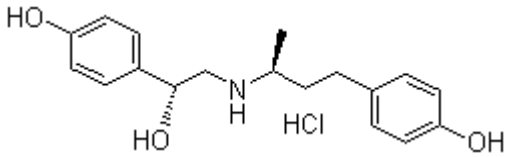
Elanco Topmax

Actogain 45 Ractopamine Hydrochloride

Elanco Paylean

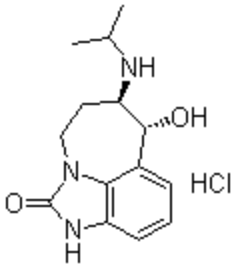
Elanco Optaflexx

Ractopamine HCl



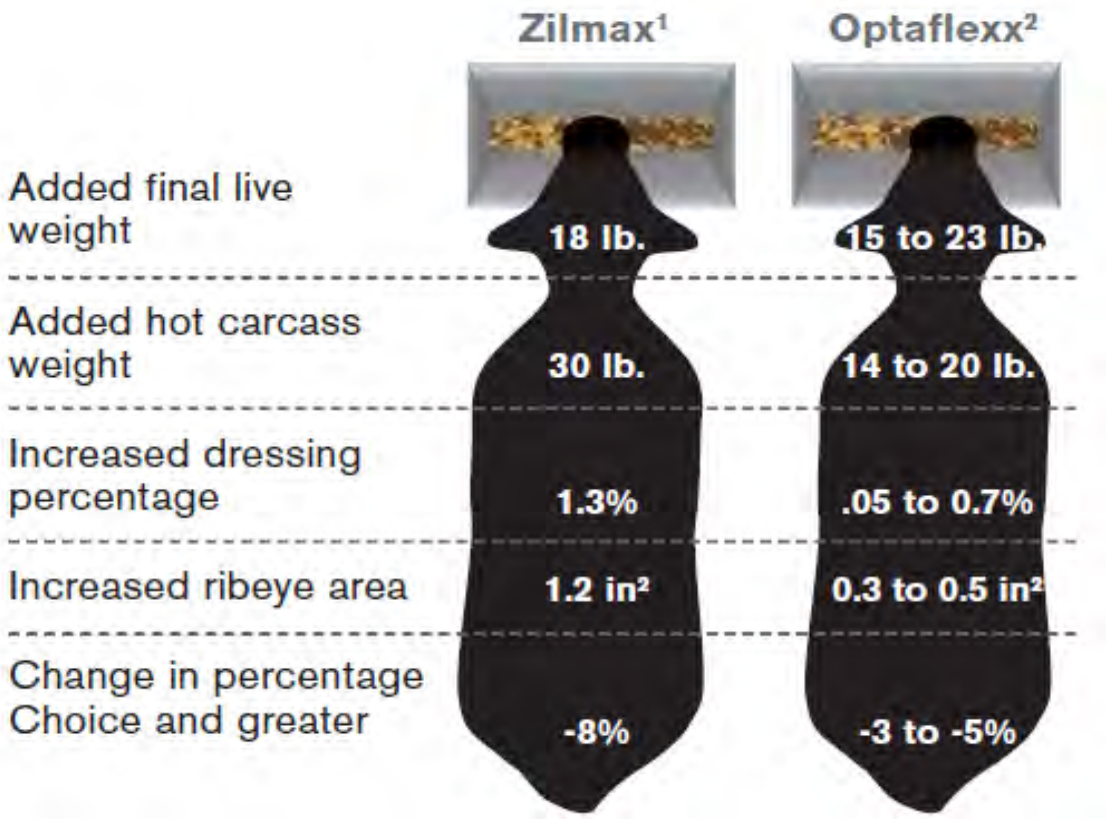
Zilmax

Zilpaterol HCl



Beta-adrenergic agonists

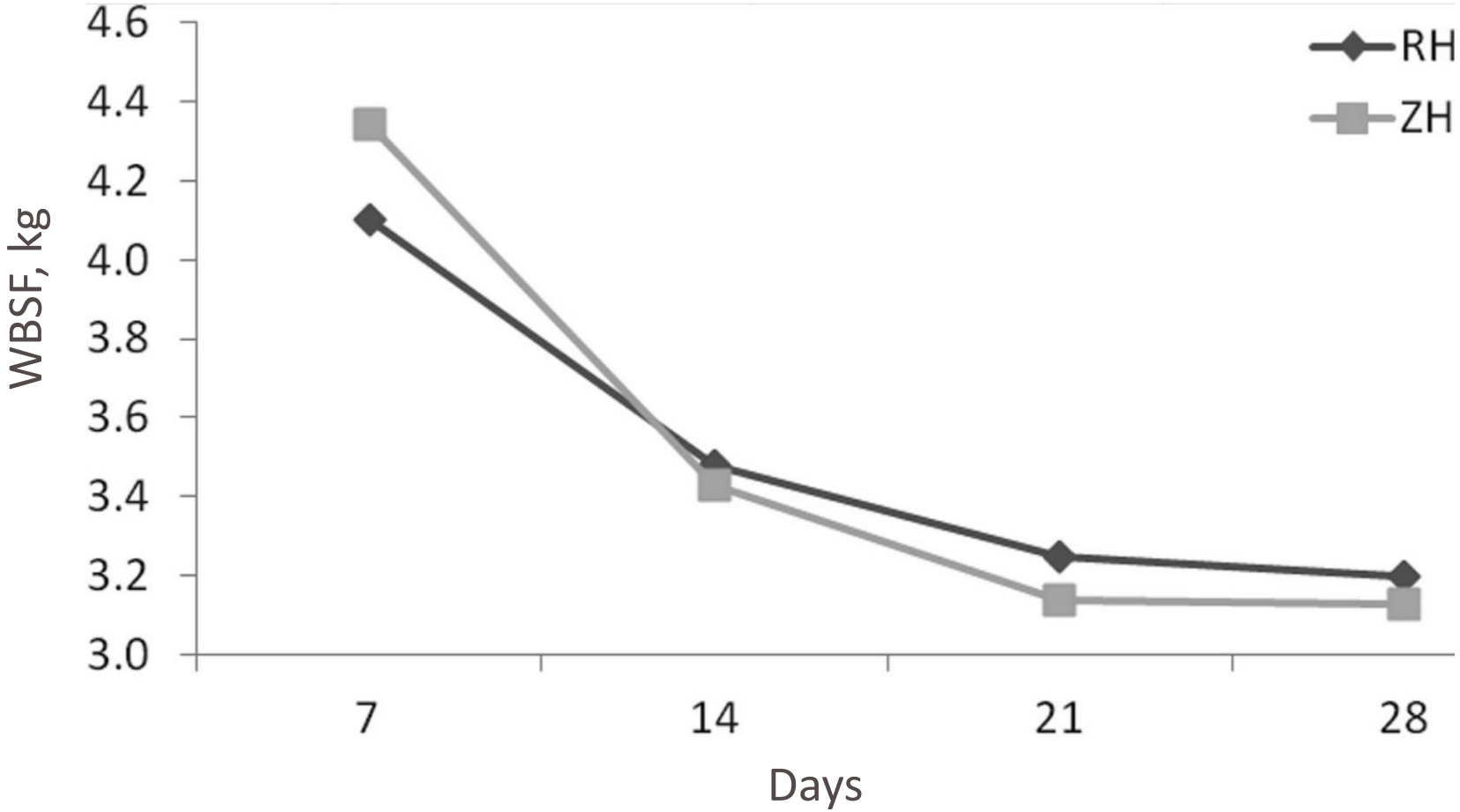
- Boost performance at the feed bunk and on the rail
- Net value of Optaflexx for steers: $28/head



[1]Steers: Zilmax Resource Guide [2]Steers: Optaflexx Research Brief 5

Meat quality/palatability

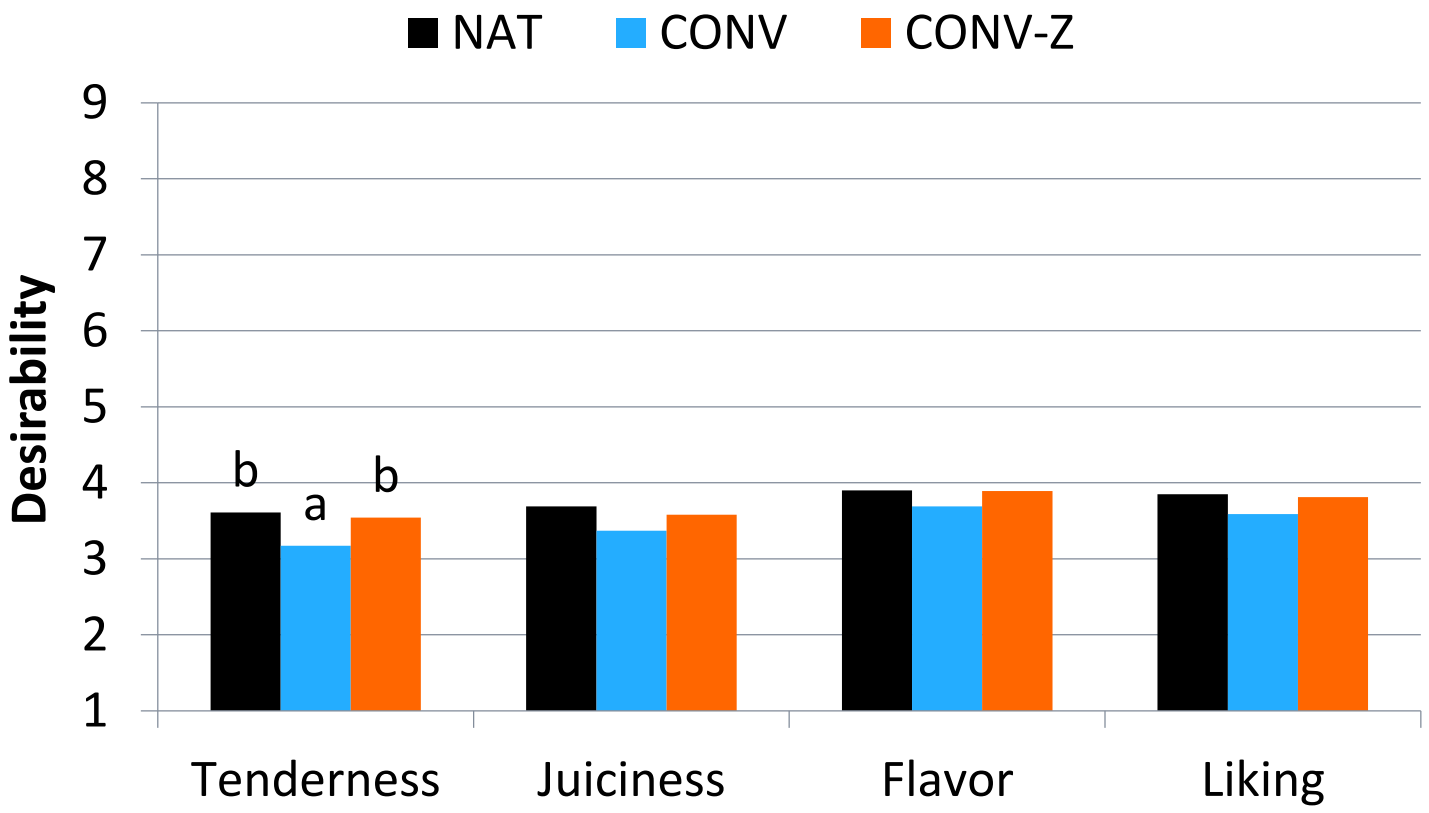
- Reduction in tenderness can be mitigated through aging



Vandonkersgoed et al., 2011

Multiple technologies

- What are the effects of different production systems on consumer palatability?

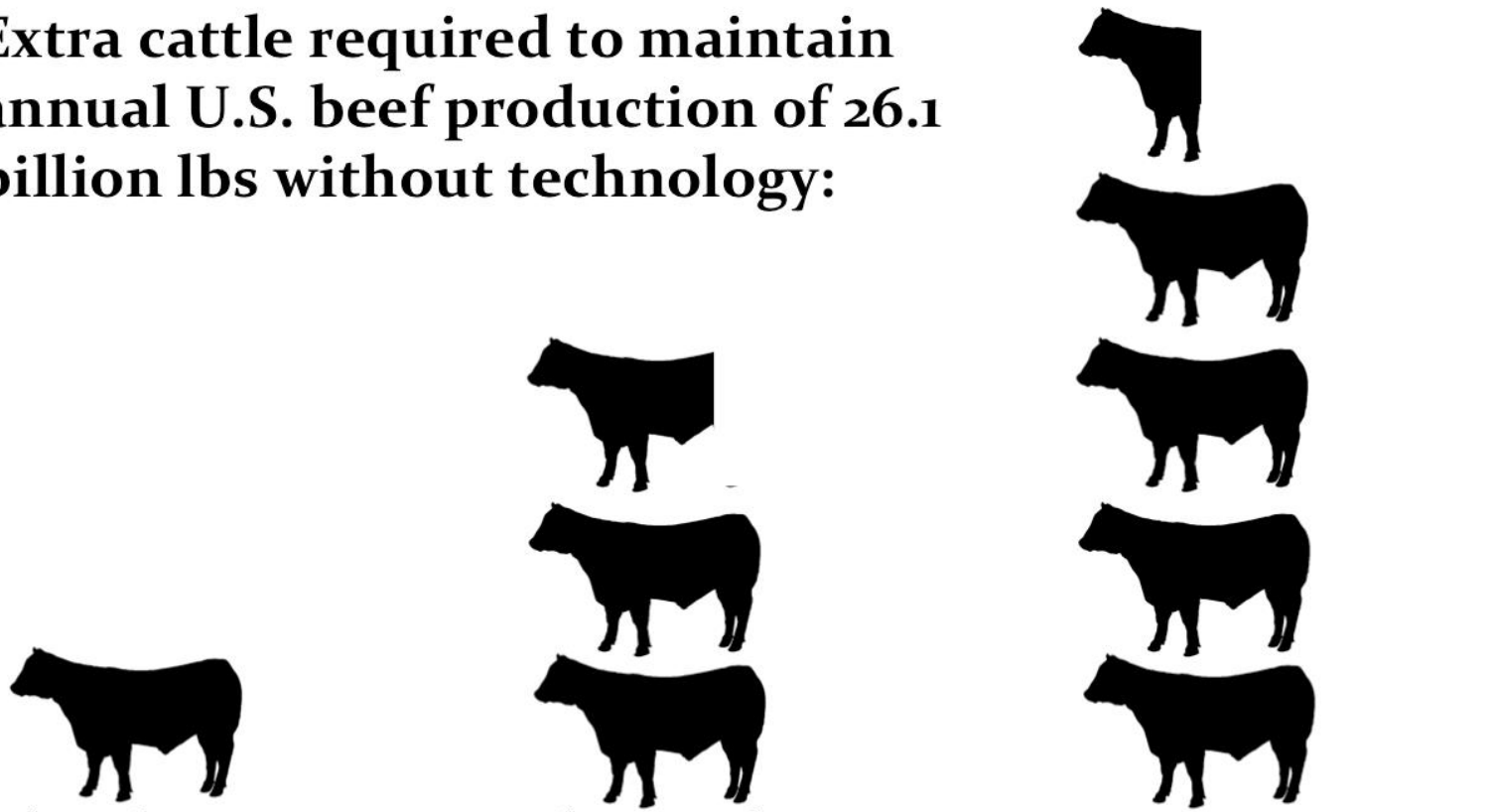


1 = extremely desirable, 9 = extremely undesirable

Harsh, 2014

Multiple technologies

Extra cattle required to maintain annual U.S. beef production of 26.1 billion lbs without technology:



Without beta agonists: +3.5 million

Without implants: +9.9 million

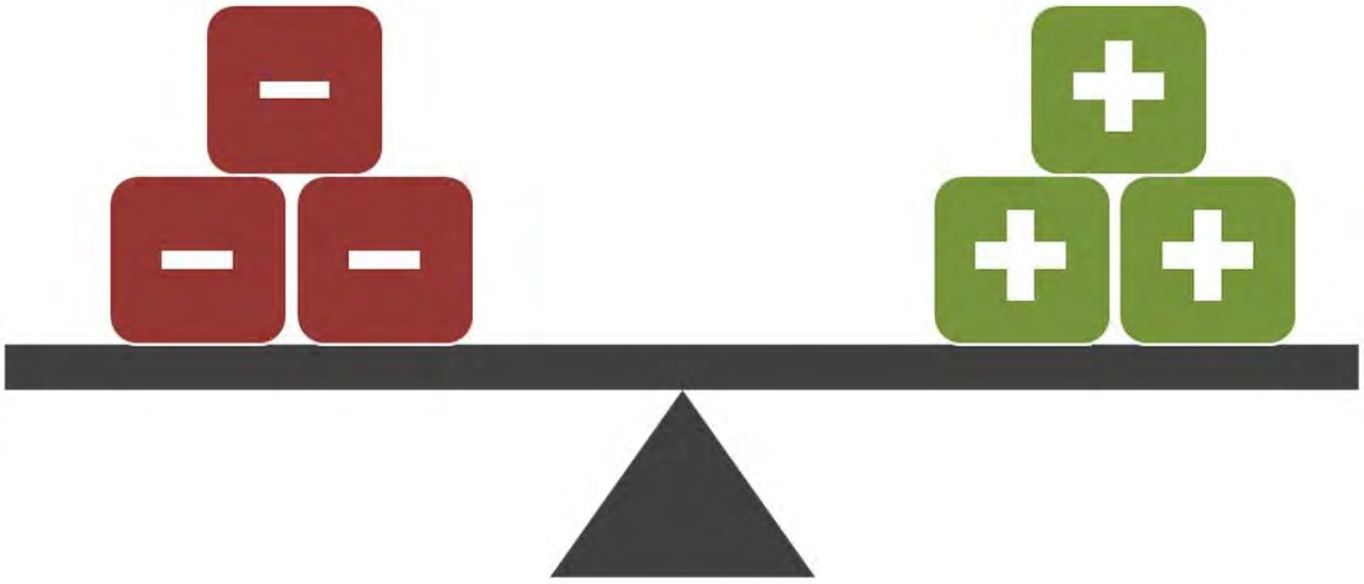
Without either technology: +15 million

Data adapted from Capper, J. L. (2013)

Technology trade-offs

- Quality challenges
- Consumer acceptance
- Non-tariff trade barriers*

- Efficient growth/performance
- Greater salable yield
- Price competitiveness
- Sustainability



Questions?

Bailey N. Harsh
bharsh@ufl.edu
Office: 352-392-2455