



Feeding to Build a Better Carcass: Backgrounding and carcass composition and quality

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Why build a better carcass?

- Meet market demands
- Improve price of carcass
- Increase return on investment for producers
- Improve product quality



What is a quality beef carcass?

- This definition is different depending on the market...
- High growth, high yield, low marbling, great for burgers
- Moderate growth, moderate yield, high marbling, export or restaurant markets



<http://aggiemeat.tamu.edu/meat-identification-pictures/beef-carcass-class/>

Beef Carcass Quality Indicators: Marbling

Canada A

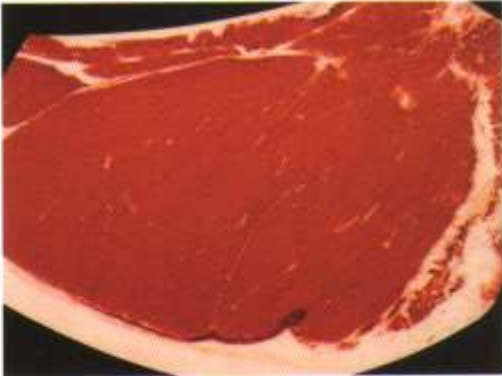
No Photo Standard

At the least, traces, but less than a slight amount

YES: The carcass has qualified for Canada A




Canada AA




At the least, a slight amount, but less than a small amount

YES: The carcass has qualified for Canada AA




Slight*

Canada Prime



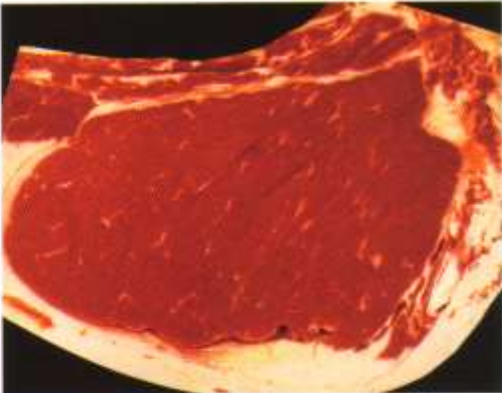
Slightly abundant or more.

Yes: The carcass has qualified for Canada Prime




Slightly Abundant*

Canada AAA



A small amount or more

YES: The carcass has qualified for Canada AAA

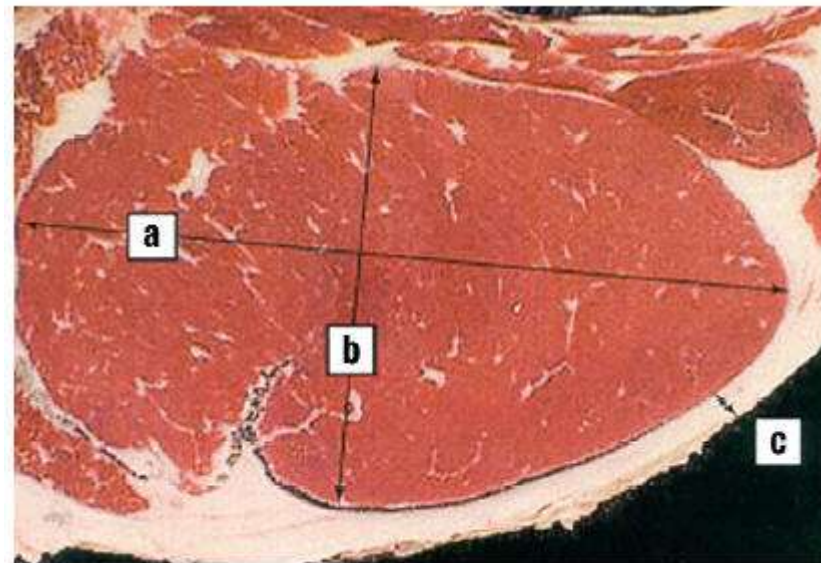


Small*

Beef Quality Indicators: Saleable Yield

$$\text{Lean \%} = 63.65 + 1.05 (\text{muscle score}) - 0.76 (\text{grade fat})$$

1. Length
 - Maximum length
2. Width
 - Maximum width
 - Generally perpendicular to the longitudinal axis
 - Within the second and third quarter of the rib-eye
3. Fat Class
 - Minimum point of thickness
 - Perpendicular to the outside surface
 - Within the fourth quarter of the rib-eye



a) rib-eye length b) rib-eye width c) fat depth on the rib-eye

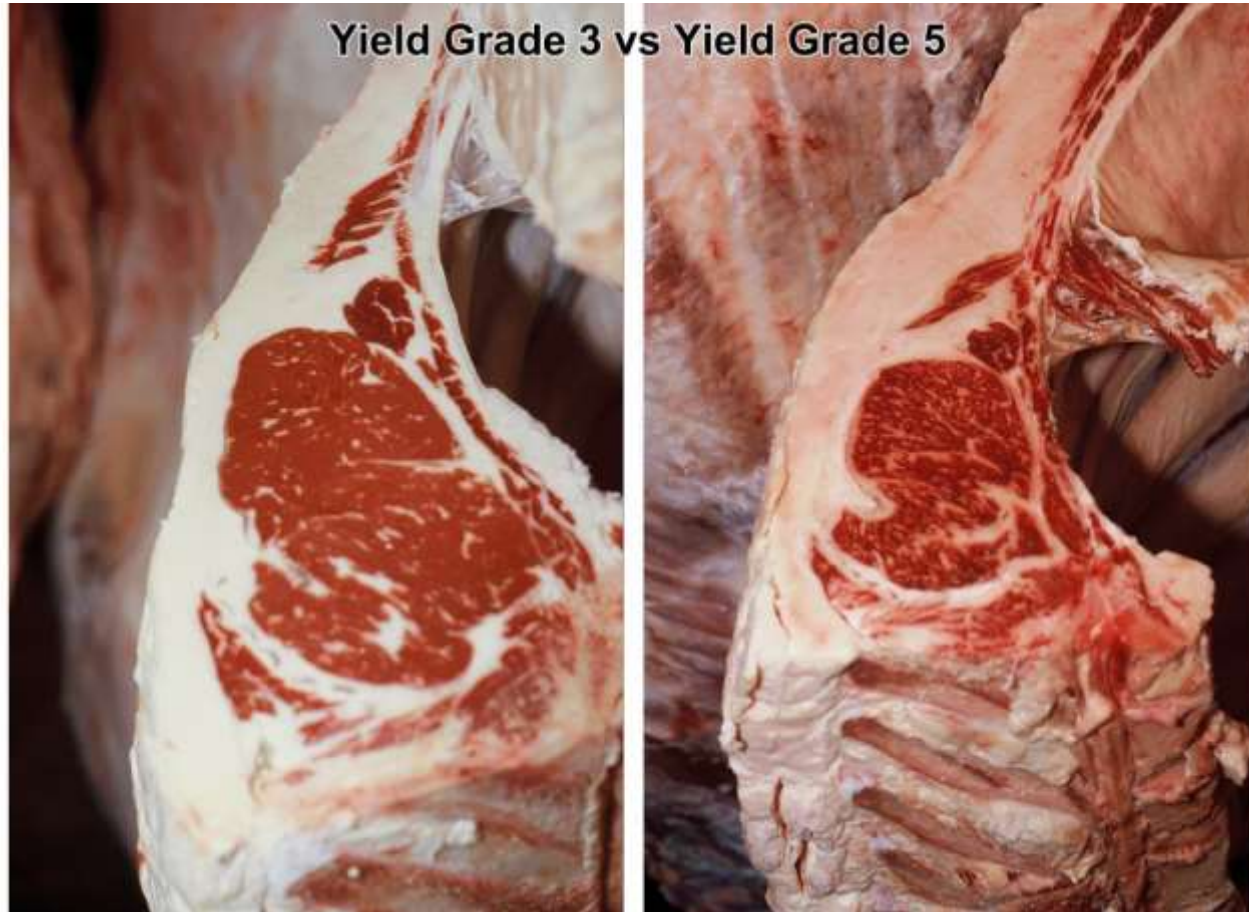


Canadian and USA Yield Grading

Canada Yield Grade	Determined Yield (%)	Yield Class
1	Greater than or equal to 59	Canada 1
2	54 to 58	Canada 2
3	Less than or equal to 53	Canada 3

USA Yield Grade	Determined Yield %
1	> 52.3
2	52.3 – 50
3	50 – 47.7
4	47.7 – 45.4
5	< 45.4

Carcass quality: yield, marbling, fat colour



Beef Carcass Quality Indicators: Saleable Yield

- Dressing percentage = (carcass weight/live weight) x 100
- Carcass size



Advantages of Backgrounding

- Early versus late maturing cattle performance during finishing period (Lopez-Campos et al. 2013)

Measurement	Calf-fed		Yearling-fed		Standard Error of the Mean
	No implant	Implant	No implant	Implant	
Days finished	83	83	76	76	1
Average daily gain (kg/day)	1.49 ^a	1.76 ^b	1.71 ^b	1.98 ^c	0.04
Dry matter intake (kg/day)	8.03 ^a	8.52 ^b	12.40 ^c	13.88 ^d	0.20
Feed conversion ratio (kg DM/kg gain)	5.46 ^b	4.86 ^a	7.42 ^c	7.25 ^c	0.14
End weight (kg)	429.7 ^a	461.2 ^b	650.7 ^c	696.5 ^d	8.2

Disadvantages of Backgrounding

- Early versus late maturing cattle performance during finishing period (Girard et al. 2012; Lopez-Campos et al. 2013)

Measurement	Calf-fed		Yearling-fed		Standard Error of the Mean
	No implant	Implant	No implant	Implant	
End weight (kg)	429.7 ^a	461.2 ^b	650.7 ^c	696.5 ^d	8.2
Net return	-42.38 ^b	17.04 ^c	-115.30 ^a	-147.45 ^a	21.25
Eye of round shear force (kg)	6.47 ^a		8.31 ^b		0.21
Top sirloin shear force (kg)	5.29 ^a		6.37 ^b		0.22

How can Backgrounding affect Carcass Quality?: Composition

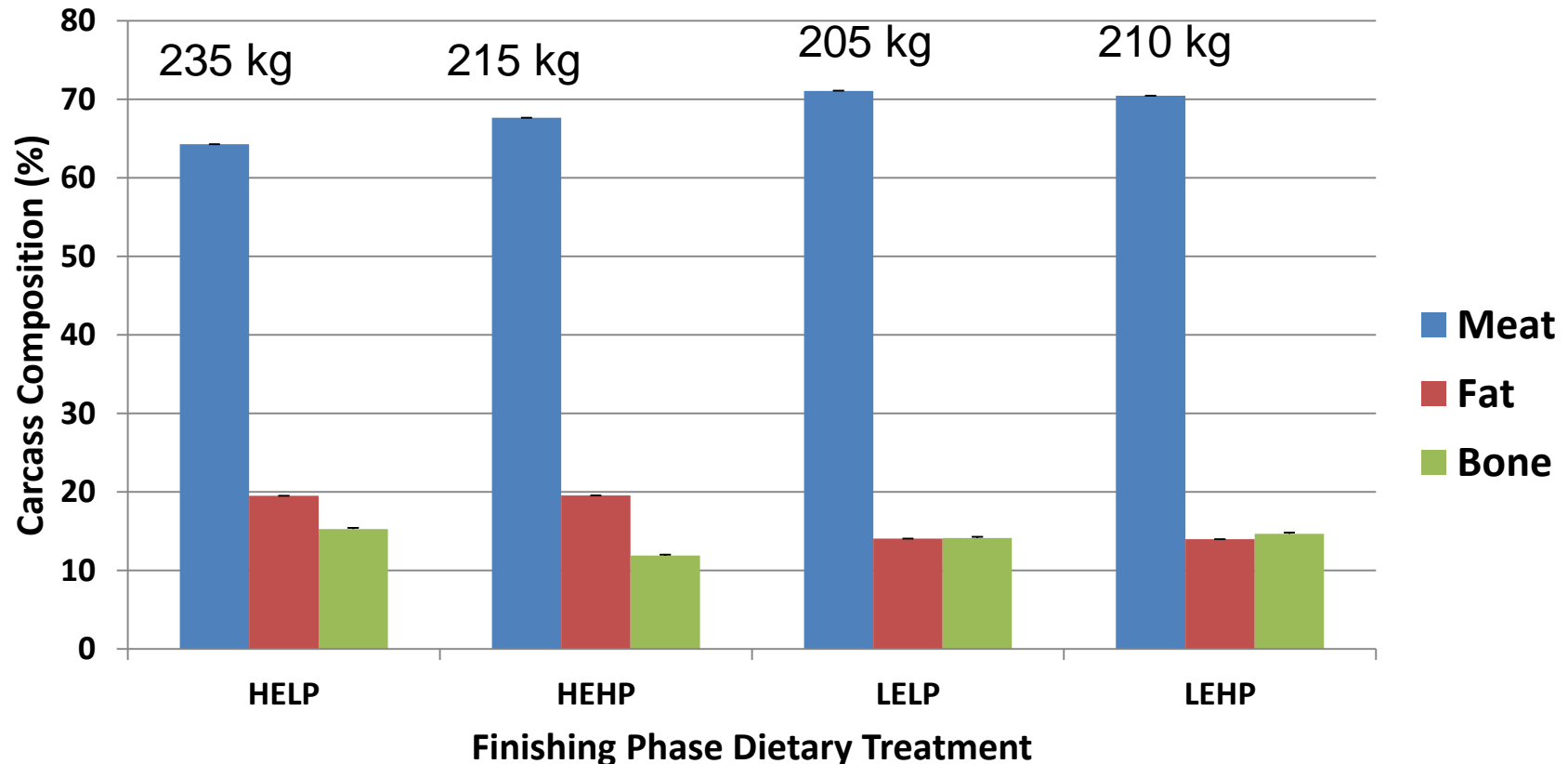
- Dietary energy and growth rate
- Breed



Diet protein/energy and carcass composition

- Total Digestible Nutrients: Low (LE) = 70%, high (HE) = 80 % feed
- Crude Protein: Low (LP) = 11.9%, high (HP) = 14.3%

Dietary Treatment Effects on Bovine Steer Hot Carcass Weight and Carcass Composition



(Li et al. 2014)

Dietary energy and protein during backgrounding

- Perception existed that cattle that were fat going into feedlot would be less efficient and have reduced daily gains

(Loken et al. 2009; McCurdy et al. 2010)

Backgrounding Energy and Carcass Quality

Measurement	Backgrounding Diet			Difference?
	Sorghum silage	Limited concentrate	Wheat pasture	
Net energy for gain (Mcal/kg) backgrounding	0.77	1.36	NA	
Average daily gain (kg/day) backgrounding	1.10 ^c	1.18 ^a	1.15 ^b	Yes
Body weight end of backgrounding (kg)	369	377	382	No
Fat (kg) in organs after backgrounding	19.9 ^{ab}	22.3 ^a	16.8 ^b	Yes
Marbling after backgrounding	273	305	245	No

(McCurdy et al. 2010)

Backgrounding Energy and Carcass Quality

Measurement	Backgrounding Diet			Difference?
	Sorghum silage	Limited concentrate	Wheat pasture	
Net energy for gain (Mcal/kg) backgrounding	0.77	1.36	NA	
Average daily gain (kg/day) finishing	2.02 ^a	1.85 ^b	1.64 ^c	Yes
Body weight end of finishing (kg)	581	571	584	No
Hot carcass weight (kg)	379	376	386	No
Fat (kg) in organs after finishing	39.6	43.1	43.4	No
Marbling at finishing	449 ^a	423 ^{ab}	409 ^b	Yes

(McCurdy et al. 2010)

Backgrounding Energy and Carcass Quality

Measurement	Backgrounding Diet			Difference?
	Sorghum silage	Limited concentrate	Wheat pasture	
Net energy for gain (Mcal/kg) backgrounding	0.77	1.36	NA	
Fat (kg) in organs after backgrounding (112 d)	19.9 ^{ab}	22.3 ^a	16.8 ^b	Yes
Average daily gain (kg/day) finishing	2.02 ^a	1.85 ^b	1.64 ^c	Yes
Marbling at finishing	449 ^a	423 ^{ab}	409 ^b	Yes

- Calves with increased organ fat had increased average daily gain and gain to feed during finishing

(McCurdy et al. 2010)

Backgrounding Energy and Carcass Quality

Measurement	Growth Rate		Difference?
	Low	High	
No. of steers	39	37	
Backgrounding			
Net energy gain (Mcal/kg)	1.06	1.19	
Average daily gain (kg/day)	1.40	1.68	Yes
Dry matter intake (kg/day)	8.35	9.49	Yes
Finishing			
Finishing average daily gain (kg/day)	1.55	1.55	No
Dry matter intake (kg/day)	10.73	10.35	No

(Loken et al. 2009)

Backgrounding Energy and Carcass Quality

Measurement	Growth Rate		Difference?
	Low	High	
No. of steers	39	37	
Body weight after backgrounding (kg)	355.2	374.5	No
Body weight after finishing	563.8	582.5	No
Hot carcass weight (kg)	357	368	No
Marbling score	421	435	No
USDA yield grade	2.66	2.74	No
USDA quality grade	155	175	No

No effect on carcass quality

(Loken et al. 2009)

Backgrounding Energy and Total Cost per Animal

Measurement	Growth Rate		Difference?
	Low	High	
No. of steers	39	37	
Backgrounding cost (\$/animal)	126.00	140.35	Yes
Finishing cost (\$/animal)	395.71	366.59	Yes
Total cost (\$/animal)	521.71	506.94	Probably not

No overall cost difference, but the proportion spent in the finishing phase relies upon that spent in backgrounding

How does backgrounding affect carcass quality?

- Cattle receiving more energy during backgrounding will have increased average daily gain and protein gain during backgrounding and possibly finishing
- Cattle that were fattest had lowest heat production losses and highest retained heat energy than low fat cattle
- Low fat cattle after backgrounding still have similar fat to high fat cattle after finishing, but high fat cattle have the most protein

(Loken et al. 2009; McCurdy et al. 2010)

How can Backgrounding affect Carcass Quality?: Composition

- Dietary energy and growth rate
- Breed



Backgrounding and Cattle Breed

- Age at maturity and mature size more important than actual breed
- Large at maturity cattle usually late maturing
- Large at maturity cattle take longer to 'finish'



Breed and Backgrounding

Measurement	Breed Type			Standard Error of the Mean
	Angus	Charolais	Hereford	
Initial weight (kg)	289.5 ^b	299.8 ^a	291.1 ^b	1.3
End of backgrounding weight (kg)	352.5 ^b	368.8 ^a	355.6 ^b	1.8
Average daily gain (kg/day)	0.90 ^b	0.99 ^a	0.92 ^b	0.02
Initial back fat (mm)	2.1 ^a	1.3 ^b	2.3 ^a	0.2
End of backgrounding back fat (mm)	2.6 ^a	2.1 ^b	2.8 ^a	1.2
Feed:gain backgrounding	7.79	7.59	7.60	0.2

(Block et al. 2001)

Breed and Backgrounding

Measurement	Breed Type			Standard Error of the Mean
	Angus	Charolais	Hereford	
End of backgrounding weight (kg)	352.5 ^b	368.8 ^a	355.6 ^b	1.8
End of finishing weight (kg)	545.9 ^b	610.8 ^a	555.8 ^b	8.0
Average daily gain finishing (kg/day)	1.90 ^a	1.76 ^b	1.90 ^a	0.02
End of backgrounding back fat (mm)	2.6 ^a	2.1 ^b	2.8 ^a	1.2
End of finishing back fat (mm)	10.8 ^a	9.7 ^b	10.5 ^a	0.3
Feed:gain finishing	5.69 ^b	6.27 ^a	5.58 ^b	0.2

(Block et al. 2001)

Breed and Backgrounding

Measurement	Breed Type			Standard Error of the Mean
	Angus	Charolais	Hereford	
End of finishing weight (kg)	545.9 ^b	610.8 ^a	555.8 ^b	8.0
Hot carcass weight (kg)	315.4 ^b	356.0 ^a	317.4 ^b	5.1
End of finishing back fat (mm)	10.8 ^a	9.7 ^b	10.5 ^a	0.3
Grade fat (mm)	9.0	8.5	8.5	0.2
Marbling	2.0 ^a	2.1 ^a	1.6 ^b	0.1

(Block et al. 2001)



Timing of feed stuffs to increase marbling

- Feed low protein/high fat products (DDGS) early in growing phase 140 to 250 days of age to increase marbling score and quality grade (Segers et al. 2014)
- Carcass fatness increases when re-fed high quality feed after a period of low quality feed (compensatory growth)
- Marbling increases with age, but toughness of rib eye increases from 18 months of age (Duckett et al. 2014)

Finishing feed and fatty acids

- Grain finishing is associated with decreased poly-unsaturated fatty acids and increased mono-unsaturated fatty acids (Fincham et al. 2009)
- Grain increases shelf stability of beef



<http://www.wisconsinrivermeats.com/images/meatinfo5.jpg>

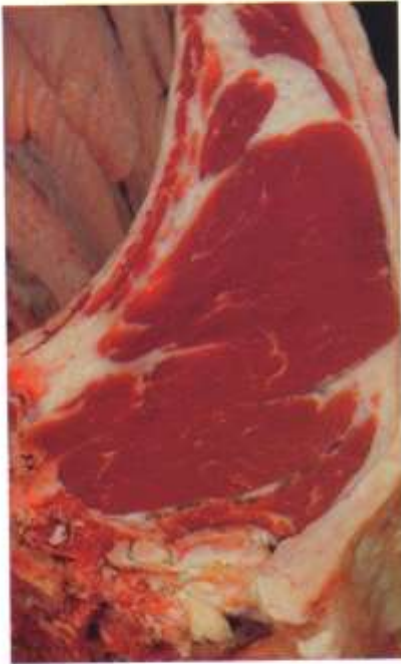
Using feed to manage carcass composition and quality

- Know the protein and energy levels of your feeds
- Use compensatory growth to increase feed efficiency and marbling and back fat at finish
- Grain-based diets will increase dressing percentage by reducing internal organ proportions
- Feed diets with increased energy to increase back fat and marbling and prevent dark cutting

3. Is the carcass a "Dark Cutter"?

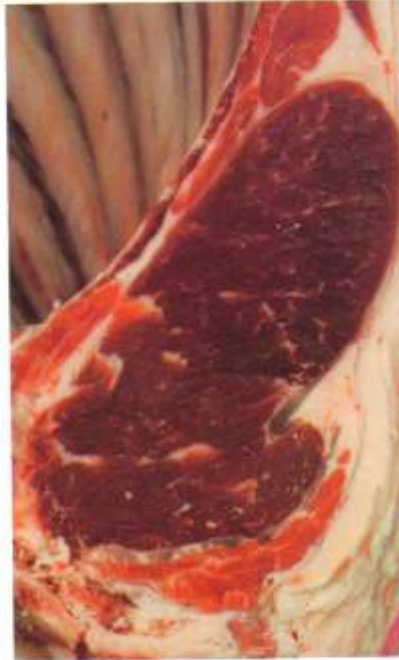
Acceptable

(c) Longissimus muscles that, 10 minutes after being exposed by knife-ribbing, are firm and bright red in colour;



Dark Cutter

(c) Longissimus muscles that, 10 minutes after being exposed by knife-ribbing, are dark red in colour;



Determine the answer to the question:

3. Is the carcass a "Dark Cutter"?

YES: The carcass has qualified for Canada B4 

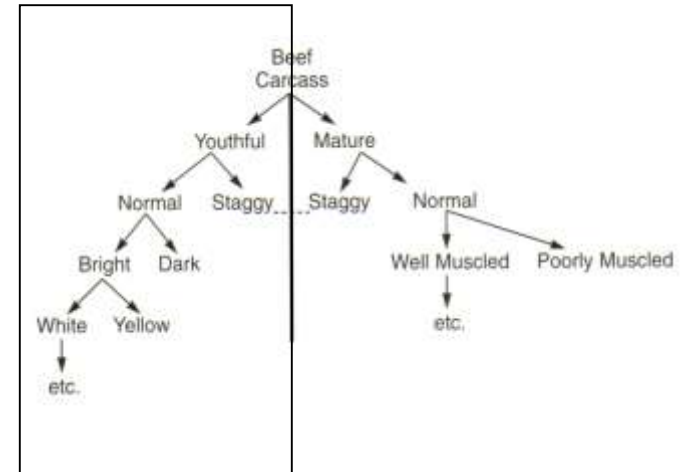
Grade Standards for Canada B4

35. The standards for a beef carcass of the grade Canada B4 are the following:
- (a) the maturity characteristics set out in Schedule I to this Part;
 - (b) muscling that ranges from deficient to excellent;
 - (c) Longissimus muscles that, 10 minutes after being exposed by knife-ribbing, are dark red in colour; and
 - (d) a fat covering that has a colour ranging from white to yellow.

Grade the carcass Canada B4 or hold for re grade

DARK CUTTING BEEF

Bright red or dark?



Incidence of Dark Cutting

Cattle most likely to cut dark are:

- heifers (4%)
- Small lightly muscled cattle
- Large heavy cattle if held for 72 h with frequent trucking events
- Important to have sufficient nutrition to withstand physical stress



Thank you!

