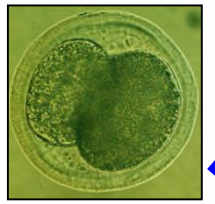
Animal Production Life Cycle

Reproductive Technologies

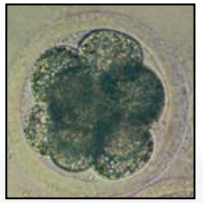
- Mature size
- Gamete production
- Reproduction

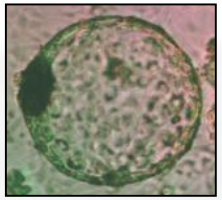
Development

Fertilization

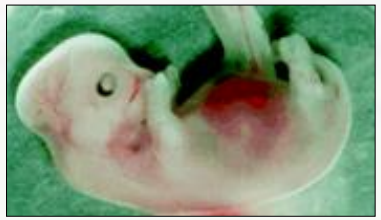


Embryonic development





- Cellular differentiation
- Establishment of pregnancy
- Embryonic implantation



- Fetal growth
- Sexual differentiation
- Organogenesis

- Parturition ("Birth")

- Lactation

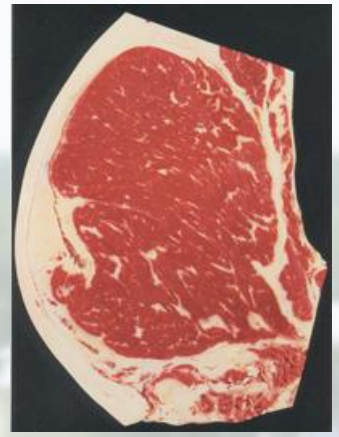
Lactation

- Growth
- Puberty

Growth

To marble or not to marble…

The term “marbling” refers to intra-muscular fat, most commonly found in “British Breeds” of Beef Cattle.



In comparison, the “Exotic” (or “Continental” Breeds express a lot less intra-muscular fat.

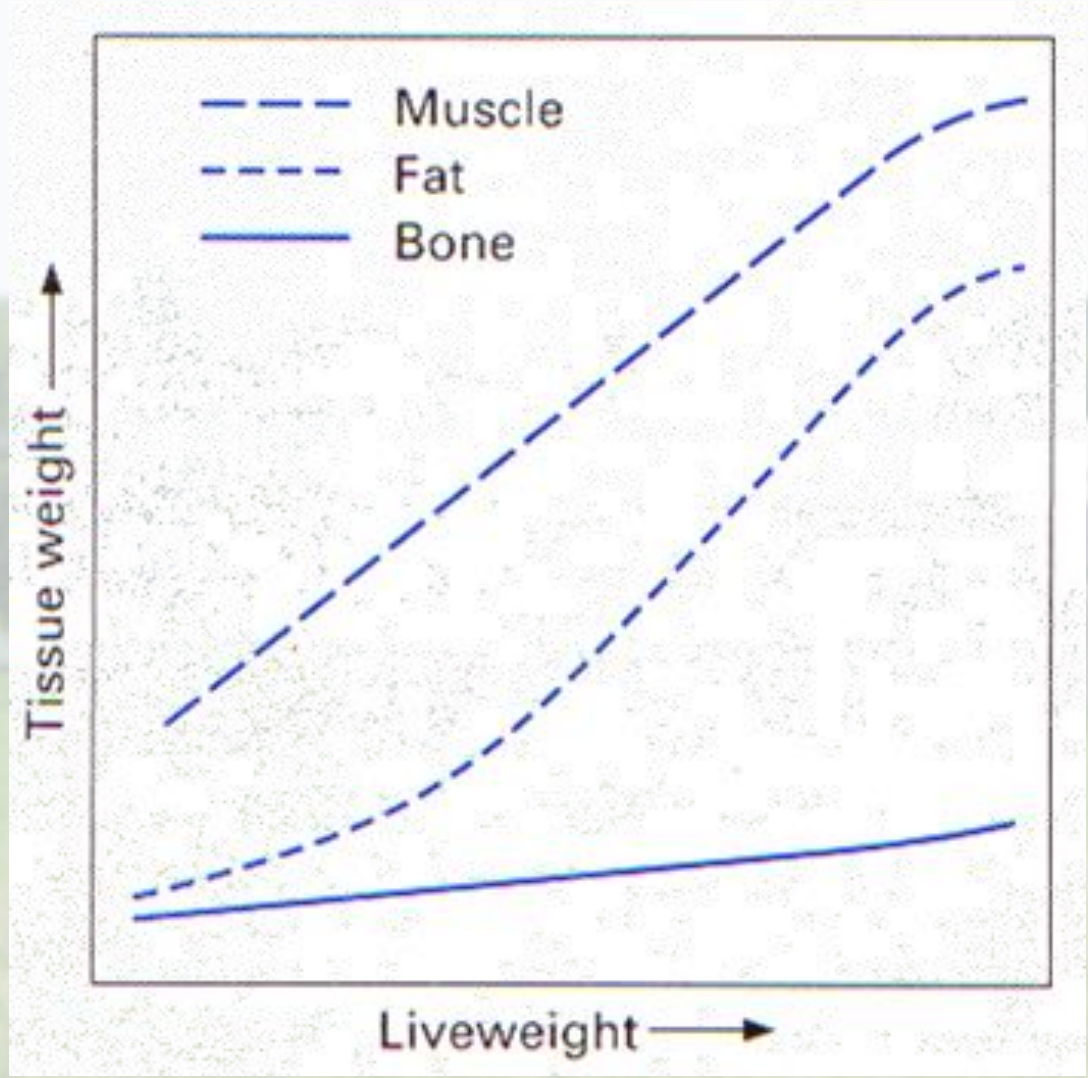
Kobe Beef (from Wagyu Cattle)

Carcass Composition

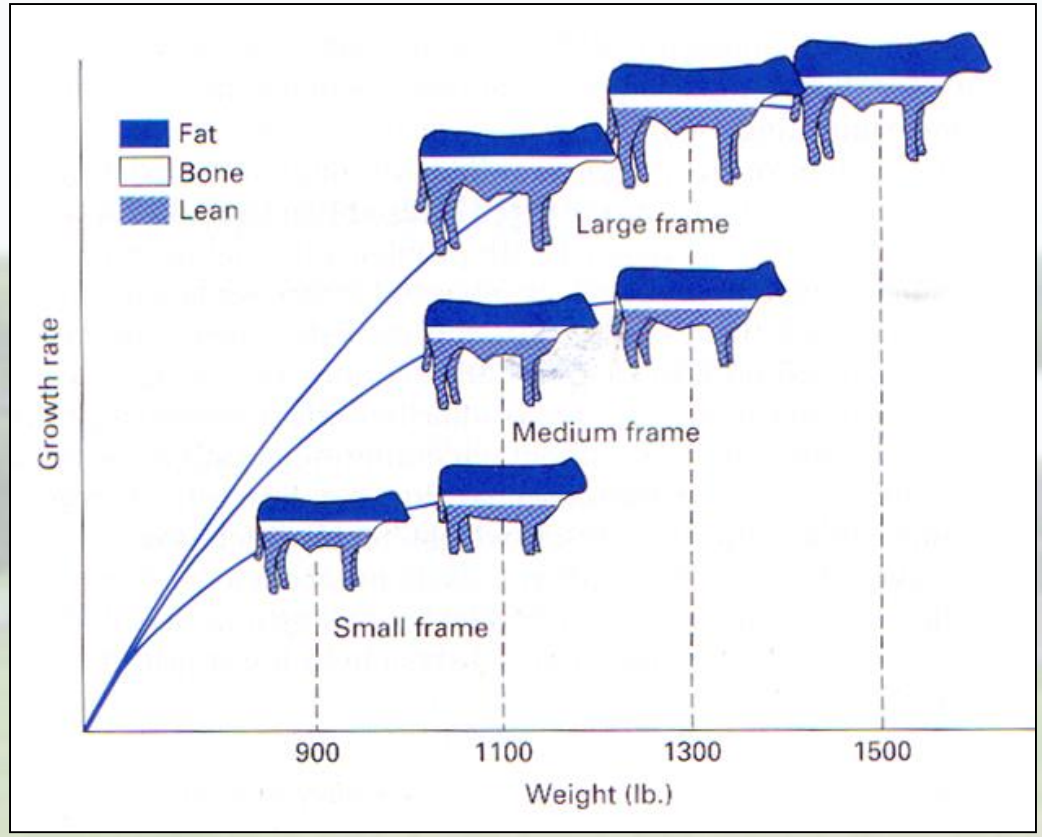
- **Definition:**
  - the dead body of an animal; specifically one that has been slaughtered for food, with the head, limbs, and entrails removed
- **What defines a Superior Carcass?**
  - High proportion of lean (muscle)
  - Low proportion of bone…
  - "Optimum" amount of fat

- **Animal <u>growth</u> and <u>age</u> *also* affects carcass composition**

The expected changes in carcass composition during an animal's growth in terms of Fat, Muscle, and Bone:

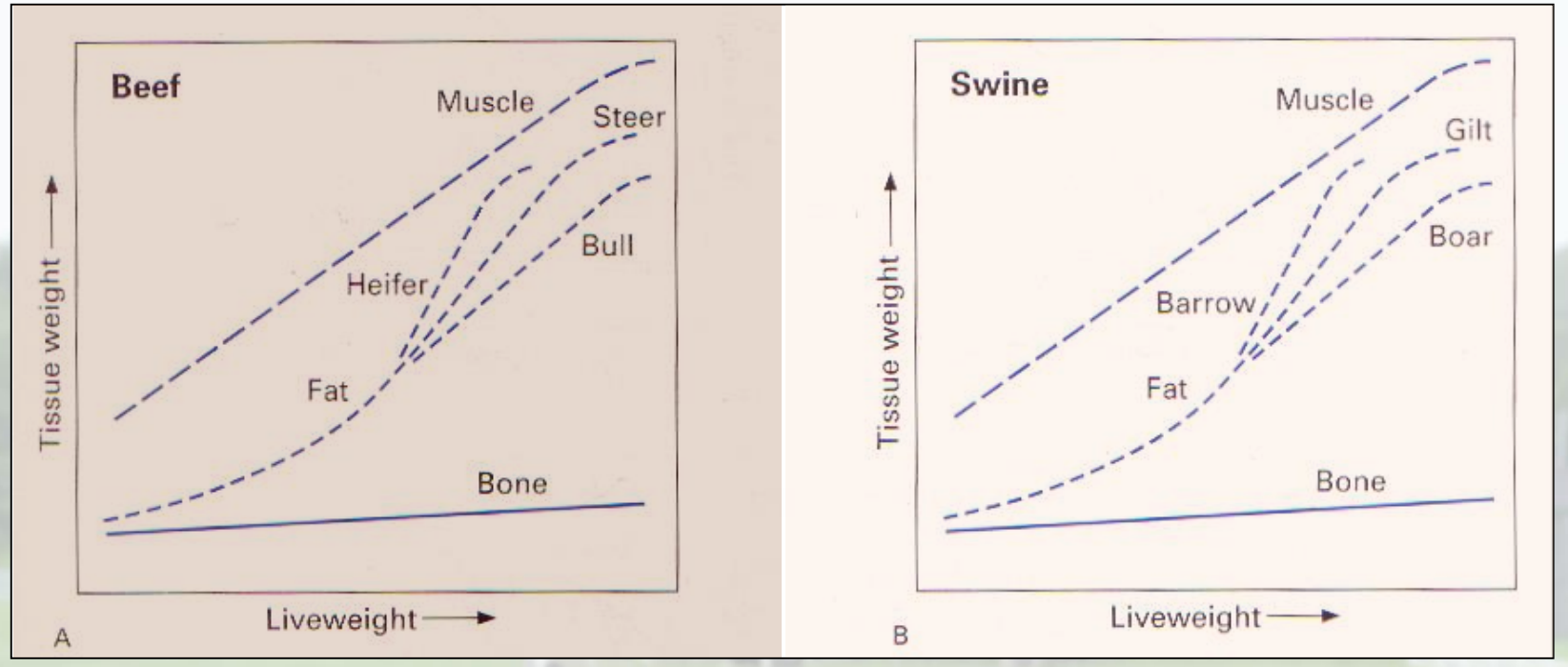


Effects of frame size in the carcass composition

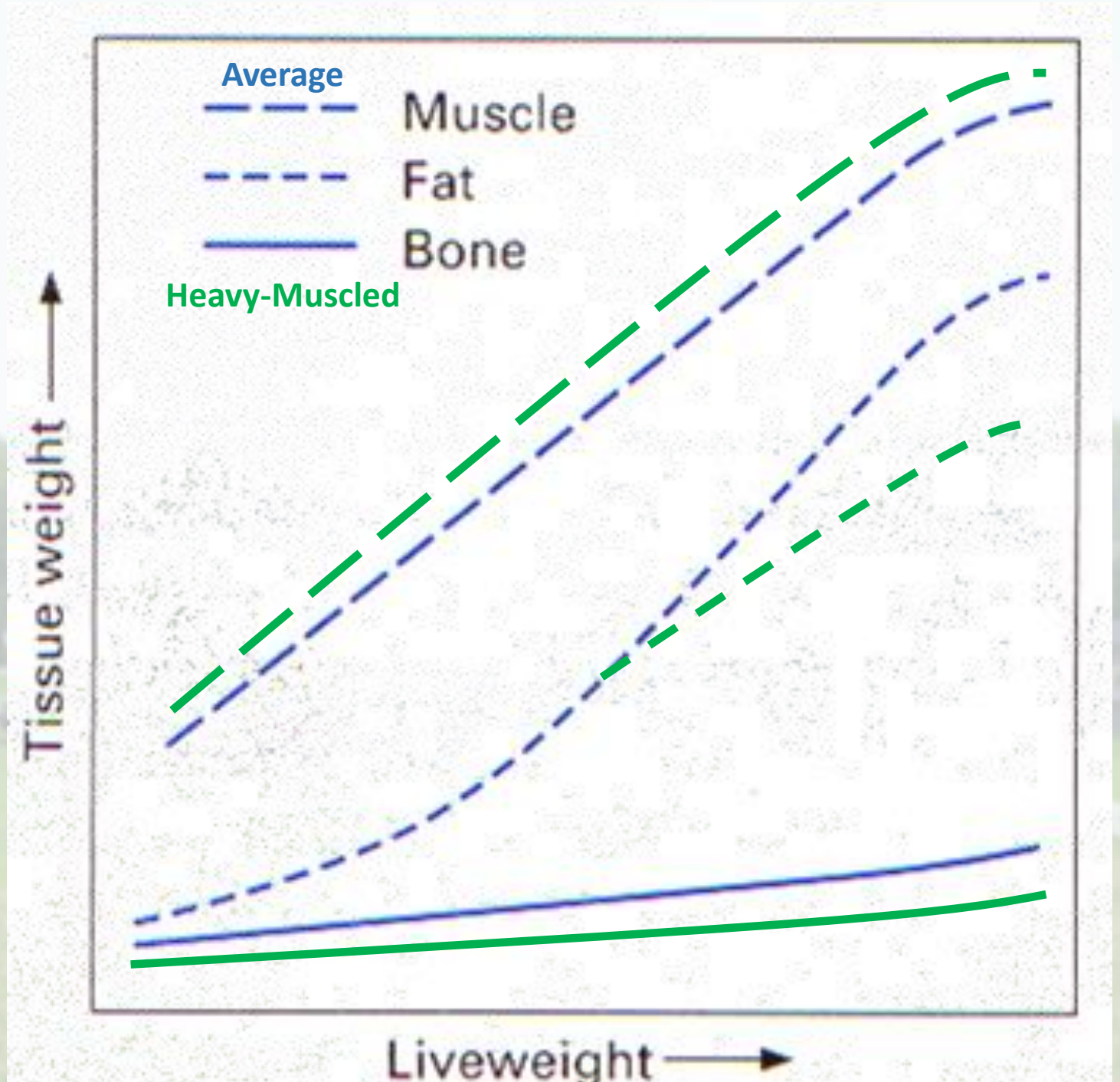


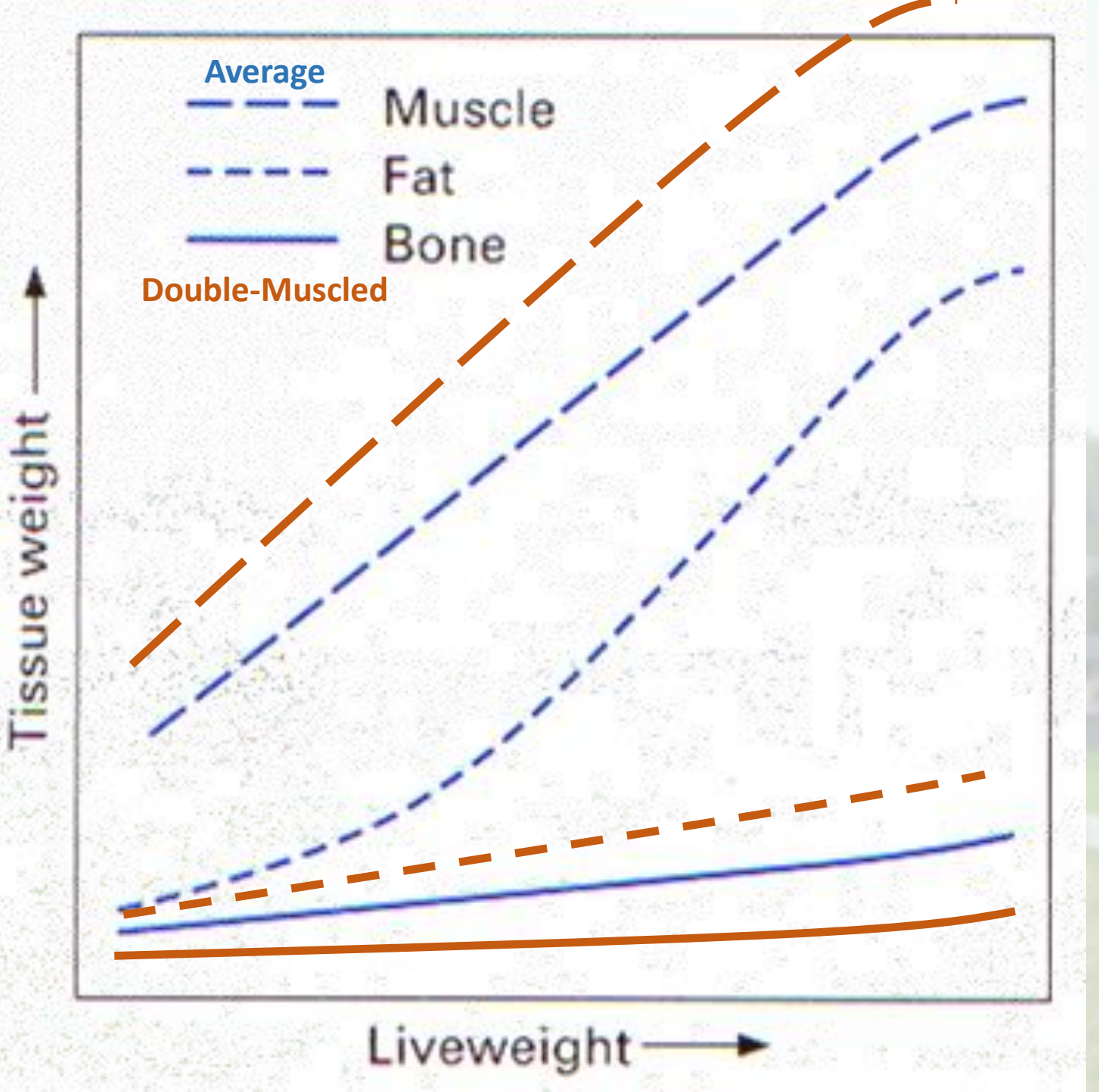
Earlier or later maturing animals have great difference in carcass composition *at similar live weights*. Earlier maturing animals have increased fat deposition at lighter weight than later maturing animals.

Effect of sex of the animal (male, female, or castrate) on carcass composition, *depending* on the Species



- In Cattle, heifers deposit fat earlier than steers and bulls and should, therefore, be slaughtered at a lower weight than the “males”.
- However, in Swine, barrows accumulate fat earlier than gilts and boars at similar slaughter weight.


Average
Muscle
Fat
Bone
Heavy-Muscled
Tissue weight
Liveweight


Average
Muscle
Fat
Bone
Double-Muscled
Tissue weight
Liveweight

Growth, Development, and Puberty

- **Growth:**

  Increase in the body weight until *mature size* is reached.

- **Development:**

  The directed coordination of all physiological processes until *maturity* is reached.

- **Puberty:**

  when estrus is first expressed *<u>with</u>* ovulation (female);

  When ejaculation occurs with sperm production (male).

Puberty (Female)

Puberty is defined as the age when estrus is first expressed ***with*** ovulation (i.e., when enough gonadotropins are being produced to induce follicle growth, oocyte maturation and ovulation).

- Affected by species, breed, temperature, season and general level of management.
- Occurs well before 100% mature weight is reached (which means that we should rarely breed an animal at first estrus)

The difference between Puberty and *Sexual* Maturity is subtle!

Think of it as: "*CAN* do it" vs. "*SHOULD* do it"

Age at Puberty (Selected Species)

Species	Age at Puberty (range in months)	"Earliest" Possible Birth
Cats	6 - 18	8 months
Dogs	5 - 24	7 months
Swine	4 - 7	7½ months
Goats	5 - 7	10 months
Sheep	7 - 10	12 months
Cattle	8 - 13	17 months
Horses	12 - 24	23 months

Species and *Breed* Differences in Age and Weight at Puberty

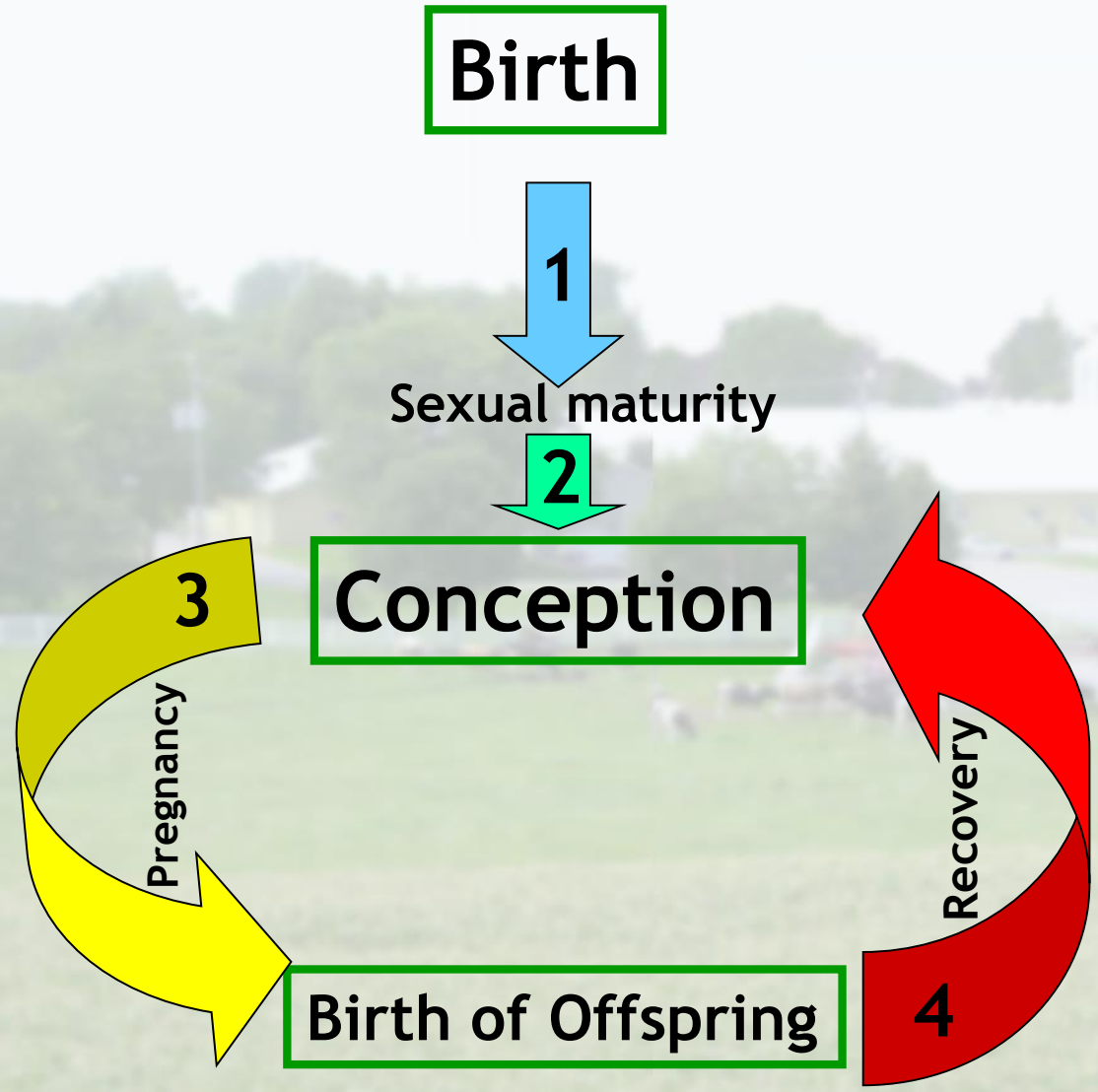
	Age of Puberty (months)	Weight (kg)
Doe	5-7	10-30
Sow	4-7	68-90
Ewe	7-10	27-34
Dairy Breeds	8-13	160-270
Jersey	8	160
Guernsey	11	200
Holstein	11	270
Ayrshire	13	240
European Beef Breeds	10-15	250-300
Zebu	17-27	160-200

Weight at Puberty is only *approximately* 40% of mature body weight !

How can we *quantify* Reproductive Efficiency?

- Desire and ability to mate
- Capacity to produce normal gametes
- Capacity to conceive
- Capacity to nourish the embryo
- Capacity to grow the fetus
- Ability to *deliver* and to raise offspring
- Complete recovery of the female reproductive tract for the establishment of a new gestation

Reproductive efficiency in livestock production



Reproductive Efficiency ⇧

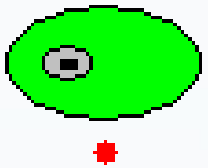
- > Pregnancy rate
- > Birth percentage
- < Inter-parturition intervals
- < Days open
- > Number of offspring

Nervous vs. Endocrine (Hormone) Systems

- Major communication systems in the body
- Integrate stimuli and responses to changes in external and internal environment (homeostasis regulation)
- Both are crucial to coordinated functions of highly differentiated cells, tissues and organs
- Unlike the nervous system, the endocrine system is anatomically discontinuous

Nervous system

- The nervous system exerts point-to-point control through nerves.
- Nervous control is electrical in nature and fast!



Endocrine system

- Hormones travel via the bloodstream to target cells
- Target cells have specific receptors

"Relatively" slower!

Principal functions of the Endocrine System

- Maintenance of the internal environment in the body (Homeostasis regulation).
- Integration and regulation of growth and development.
- Control of sexual reproduction.
  - Gametogenesis
  - Coitus
  - Fertilization
  - Maintenance of pregnancy
  - Birth
  - Nourishment of the newborn / Lactation