Getting the Most Out of Your Vaccination Program

Presenter:

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Host/Moderator: Jay Parsons

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Getting the Most Out of Your Vaccination Program

- The Immune System Response
- Why We Vaccinate
- The Ruminant Dilemma
- Customizing Colostrum
- Vaccine Efficacy in Neonatal Lambs
- Production Environment & Vaccination Schedules
- Q & A Session

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The Immune System

- There are various aspects of this defense system:
  - Innate
  - Adaptive Immunity
    - Humoral
    - Cell-mediated
- Adaptive Immunity via the Humoral Response is the defense system we leverage with vaccinations.
  - The Humoral Response consists of B-cells that produce antibodies that are specifically targeted towards an invading pathogen or toxin.

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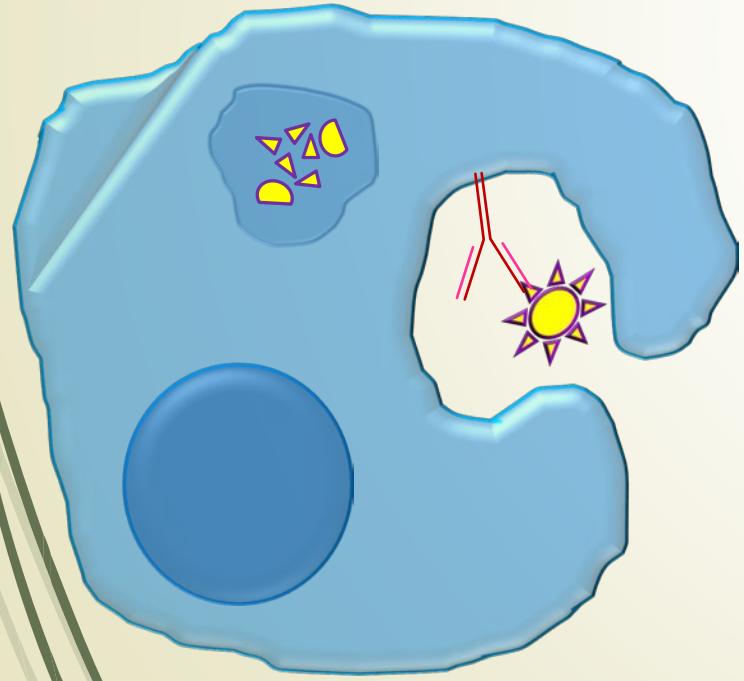
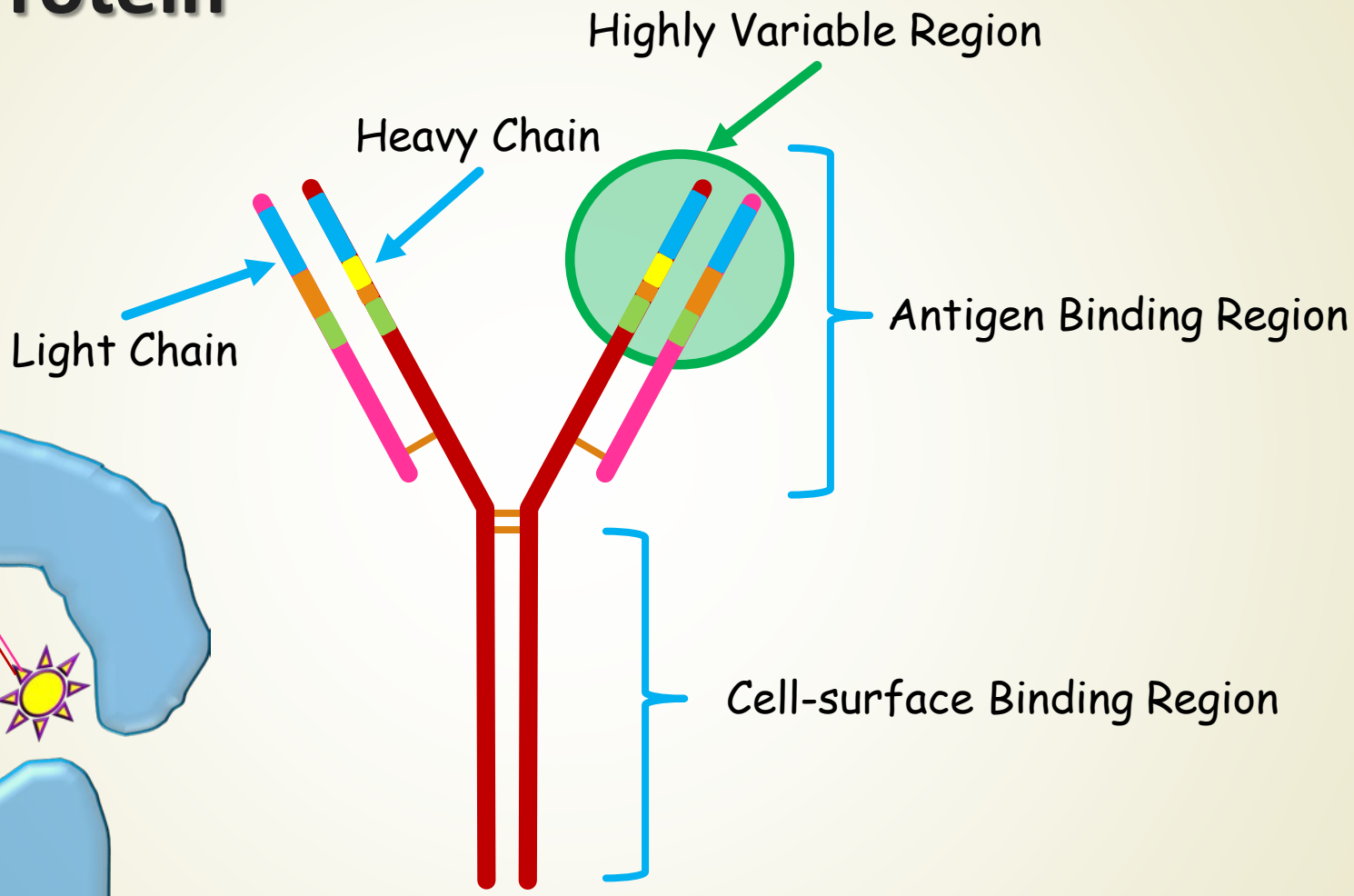
The Immune System: The Antibody Protein





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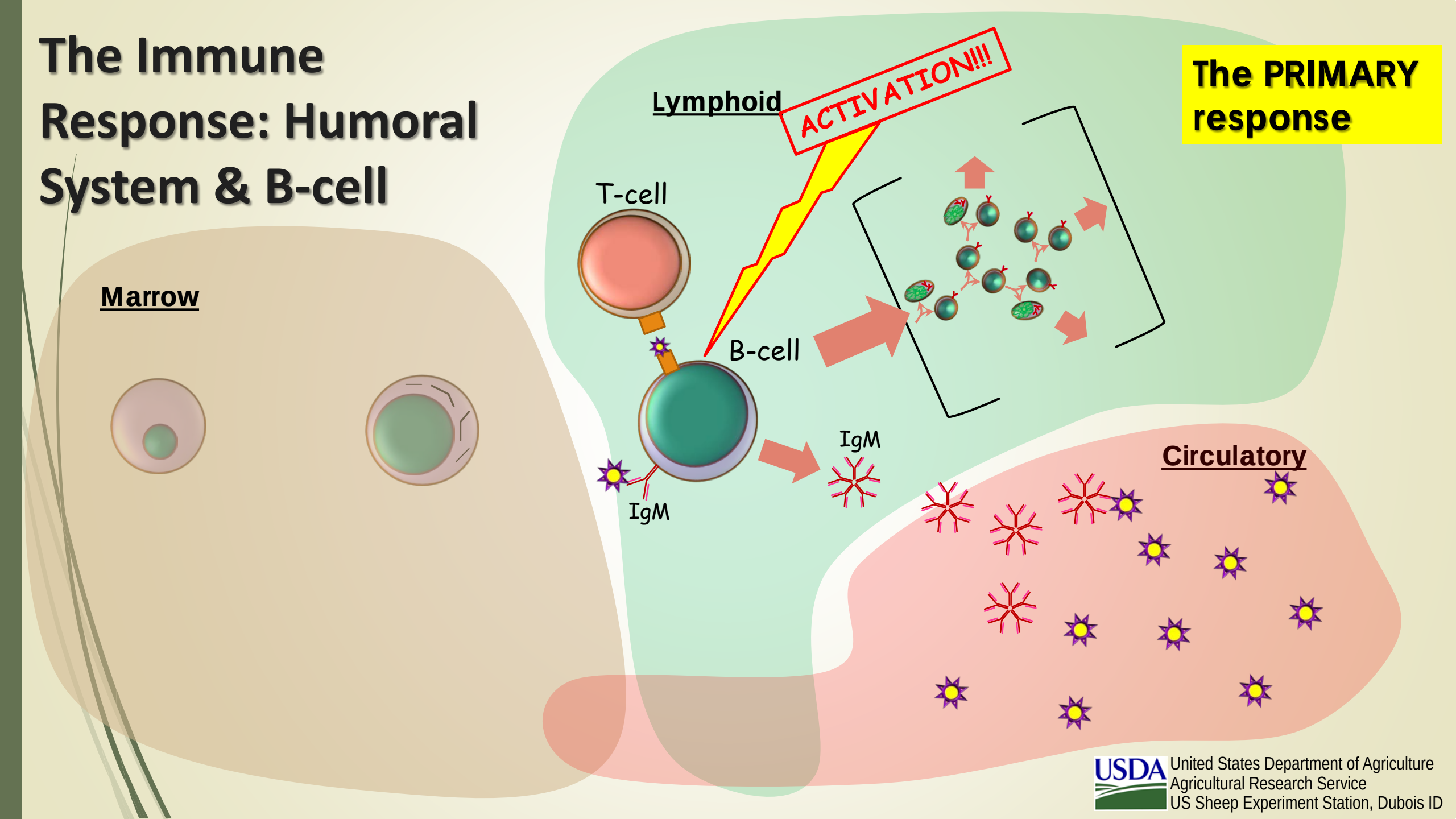
The Immune Response: Humoral System & B-cell



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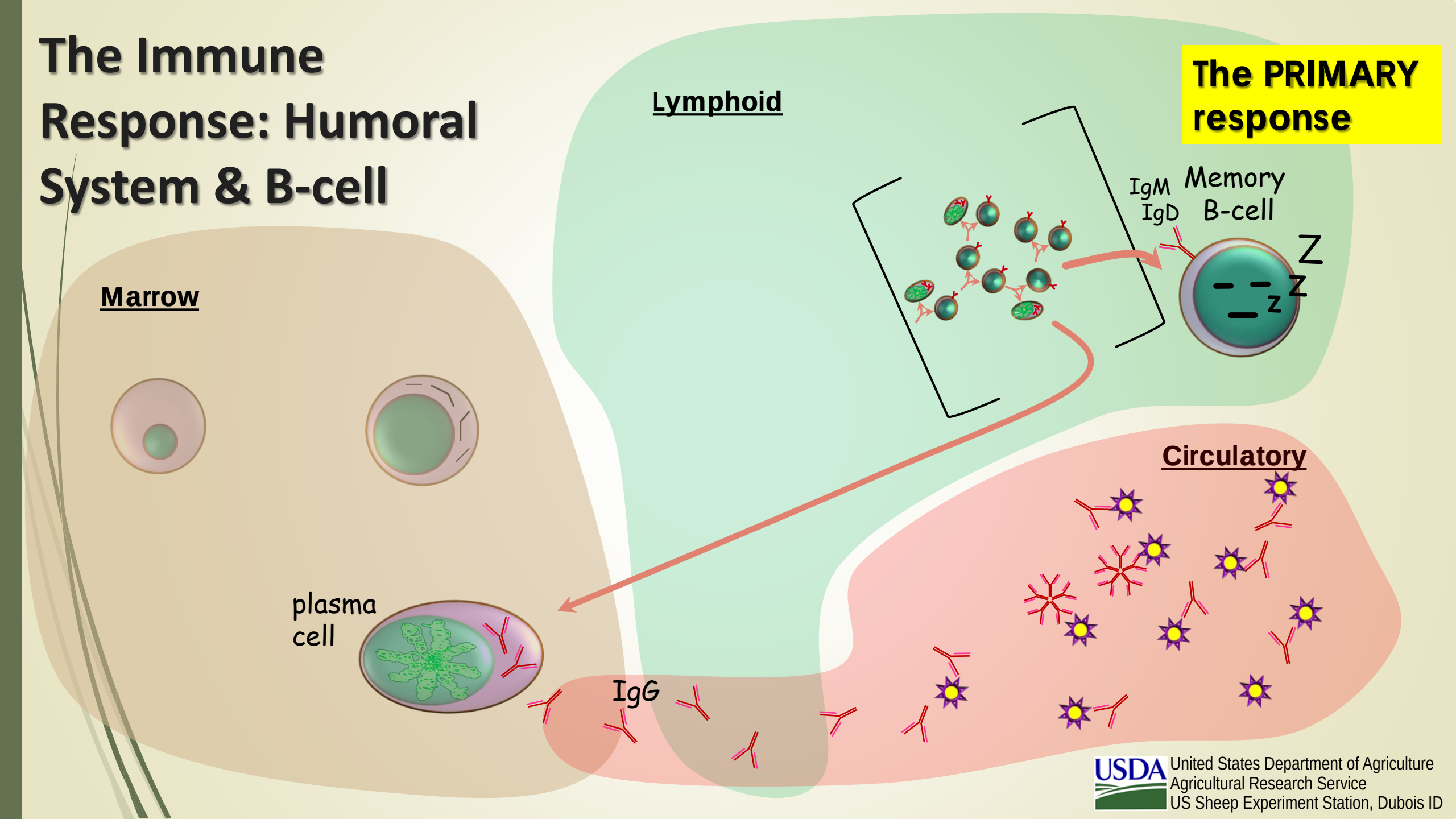

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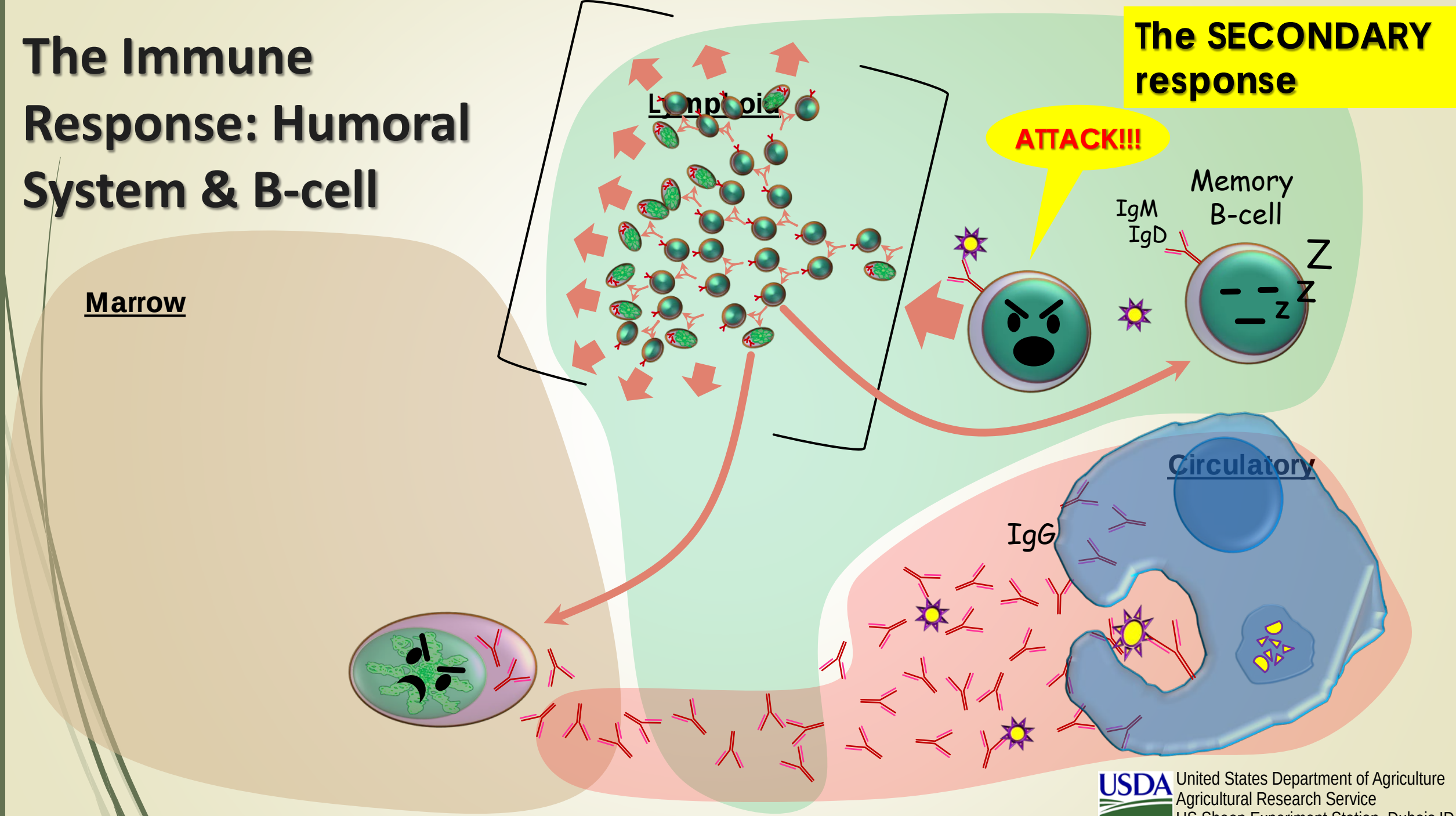

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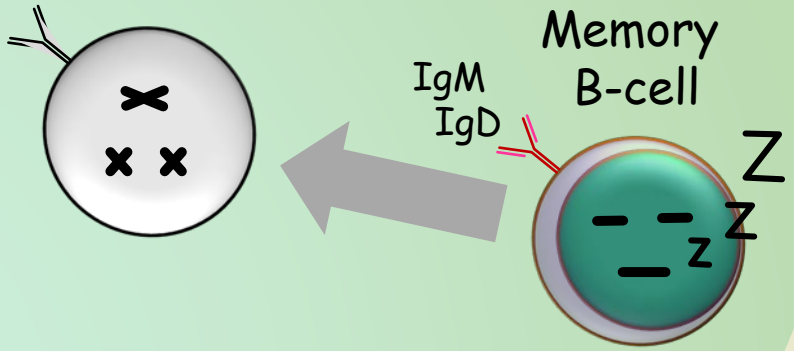
The Immune Response: Humoral System & B-cell

Lymphoid



Marrow

Circulatory

NOTICE!!!!

If the pathogen is not encountered again for a long period of time, then the Memory B-cell will die. With the death of the Memory B-cell, the "rapid response" dies, too.

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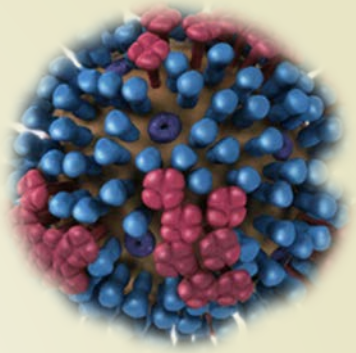
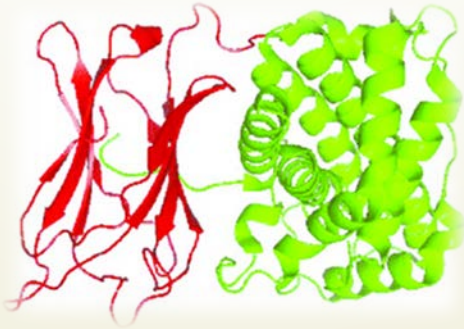
Why We Vaccinate



- **Vaccination** (vak-sə-ˈnā-shən): **Injection of a or killed [or modified] microbe in order to stimulate the immune system against the microbe, thereby preventing disease.** (MedicineNet.com)
- **Vaccinations, or immunizations, work by stimulating the natural disease-fighting system of the body.**



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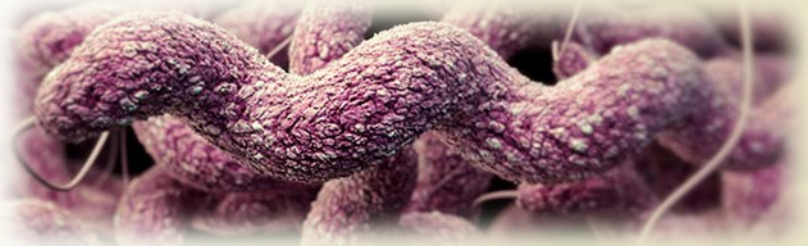
Why We Vaccinate

- So, vaccination is a tool to leverage “nature” (i.e., the natural function of the animal) to prepare your animals for an upcoming disease.
- Vaccination/vaccine is NOT:
  - Introducing a disease
  - Passed from mother to young
  - A one-time, fix-all “silver bullet”
  - Always 100% efficacious
  - An antibiotic



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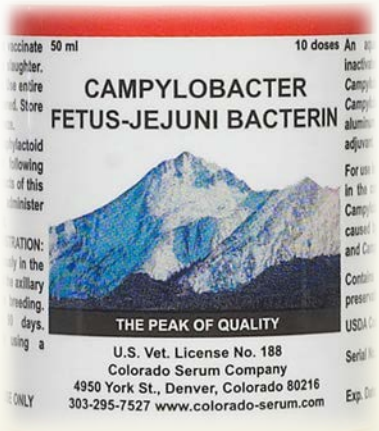
Why We Vaccinate

- Vaccines are ALLOWED for certified organic systems
- Examples of vaccines used in sheep production:
  - Clostridials (7 ways, 8 ways, toxins)
    - Enterotoxemia - bloody scours
    - Enterotoxemia – overeating disease
    - Tetanus
  - Campylobacters
    - Vibriosis
  - Soremouth
  - Caseous lymphadenitis



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Why We Vaccinate: Stages of Vaccination

- The PRIMARY injection
  - The initial exposure of the animal to the vaccine or antigen
  - Critical for selection of the B-cell with the “effective” antibody

- The SECONDARY injection
  - The follow-up exposure
  - Critical for initiating mass division of the effective B-cell line

- The BOOSTER injection
  - The annual or repeated exposure
  - Critical for maintaining the effective B-cell line

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The Ruminant Dilemma: Ruminants are not Human

- Passive transfer is the transfer of maternal (your mom's) antibodies to the offspring (you). **It is critical for survival!**
  - **Maternal antibodies are targeted against diseases that are common in the production environment**
- For humans and many other species (e.g., dogs, pigs, mice), passive transfer mostly occurs *in utero* or "in the womb."
  - Transfer of antibodies is possible via a placental antibody receptor
- Furthermore, humans and many other non-ruminant species are born with a functional or mature immune system.
  - Proof of this for humans is the at-birth vaccination for Hepatitis-B

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The Ruminant Dilemma: Treat Ruminants as Ruminants

STRIKE 1!

- Passive transfer in ruminants does NOT occur *in utero*

STRIKE 2!

- Ruminants are born with an immature immune system, specifically the humoral system
  - It takes about 3 to 4 weeks for a mature immune system to develop

- Passive transfer in ruminants is only acquired through consuming colostrum within the first 12 to 24 hours after birth
  - If a lamb or calf fails to consume colostrum within this period, passive transfer is not possible. Failure of passive transfer may result in mortality rates >70%.

STRIKE 3! OUT!!!

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Customizing Colostrum

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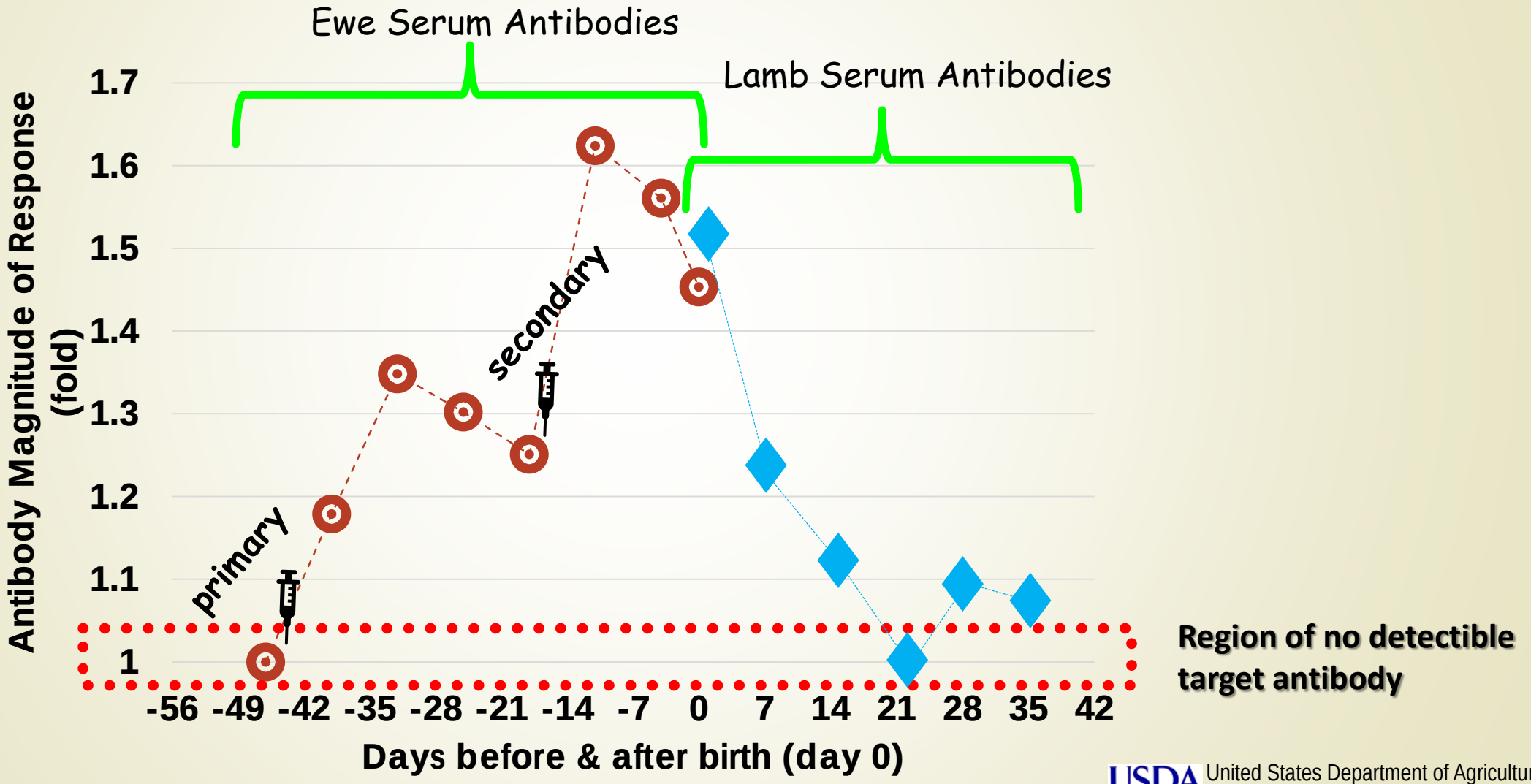
Customizing Colostrum: Antibody Transfer from the Ewe to the Lamb



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Vaccination Efficacy in Neonatal Lambs

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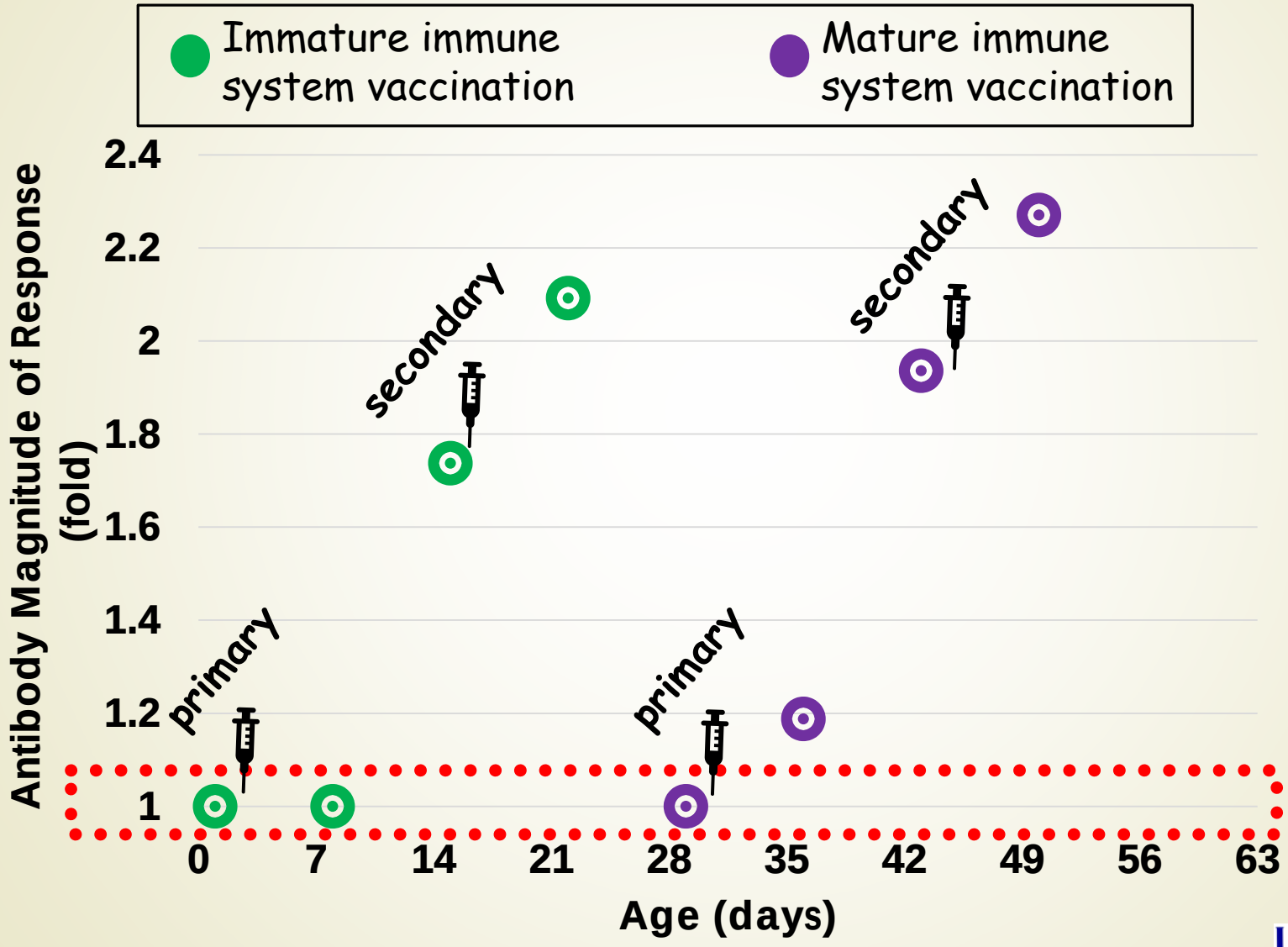
Vaccination Efficacy: Lamb Maturity



Region of no detectible target antibody

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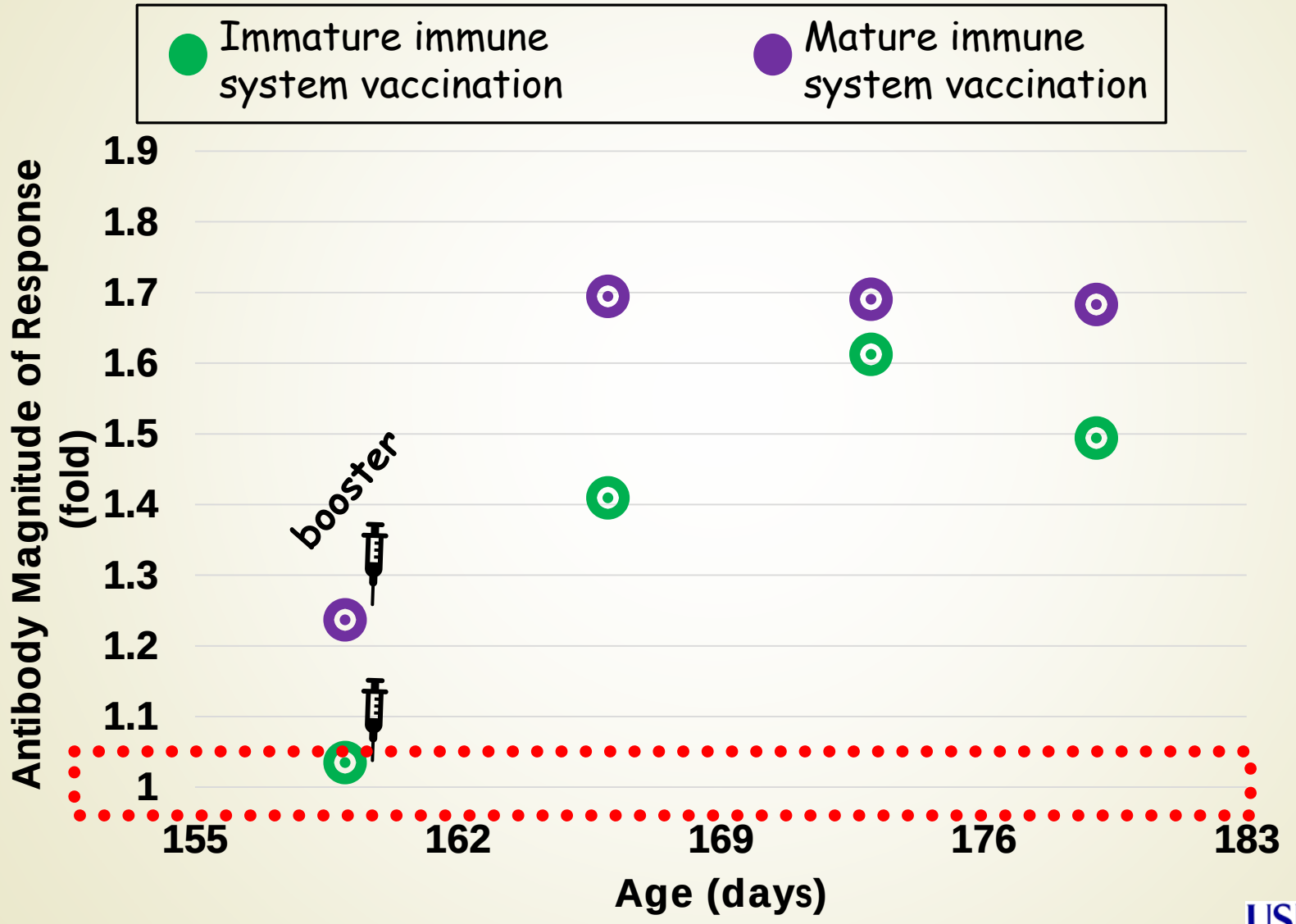
Vaccination Efficacy: Lamb Maturity



Region of no detectible target antibody

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Concluding Remarks: Environment & Schedules

Production Environment

- Recognize the Variation in Production Environments
  - Sheep Density
    - Pasture vs. Range vs. Confined Systems
  - Vectors
    - Other animals
    - “Open” flock
    - Neighbors
  - Facility Hygiene
  - Climate

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Schedules

- Timing for optimal preparedness
  - Age of lamb
  - Timing of booster/secondary vaccination and expected pathogen exposure: Examples
    - *Campylobacter* spp. – pre-breeding
    - *Clostridium* spp. – pre-lambing, pre-growing/finishing diets
    - *Corynebacterium pseudotuberculosis* – near shearing
- FOOD FOR THOUGHT: There is a balance between labor inputs and maximal vaccination efficacy. Labor costs may be greater than a few losses due to disease.

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Conclusion

- Know the diseases relevant to your flock, neighborhood, and region. Consult with your neighbors, experienced producers, associations (e.g., ASI), university extension, and veterinarian.
- Consider “timing” when optimizing a vaccination strategy. REMEMBER, a proper vaccination schedule will include a Primary & Secondary vaccination for the “naïve” sheep and annual Booster for the vaccinated sheep.

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Conclusion

- Vaccination, Labor, and Sheep Sickness/Death all cost money. Evaluate costs and risks to determine when and how vaccination is to be applied. NOTE that I said "when and how," not "IF."
- Producers should take advantage of the primary "natural" and most effective (and cost efficient) method to improve flock health, which is VACCINATION.

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