

Antibiotic Stewardship in Animal Health

Antibiotic Stewardship

1. Responsibility for appropriate diagnostics and establishment of an accurate and functional case definition

Enter...

No: Stop

5. Is this antibiotic intervention still necessary?

Yes...

2. Is there a non-antibiotic alternative which will appropriately prevent, control, or treat this disease challenge?

If not...

While asking...

4. Assuring use of the antibiotic as shown to be safe and effective

While...

3. Selection of an antibiotic which has been demonstrated to be safe and effective for this purpose

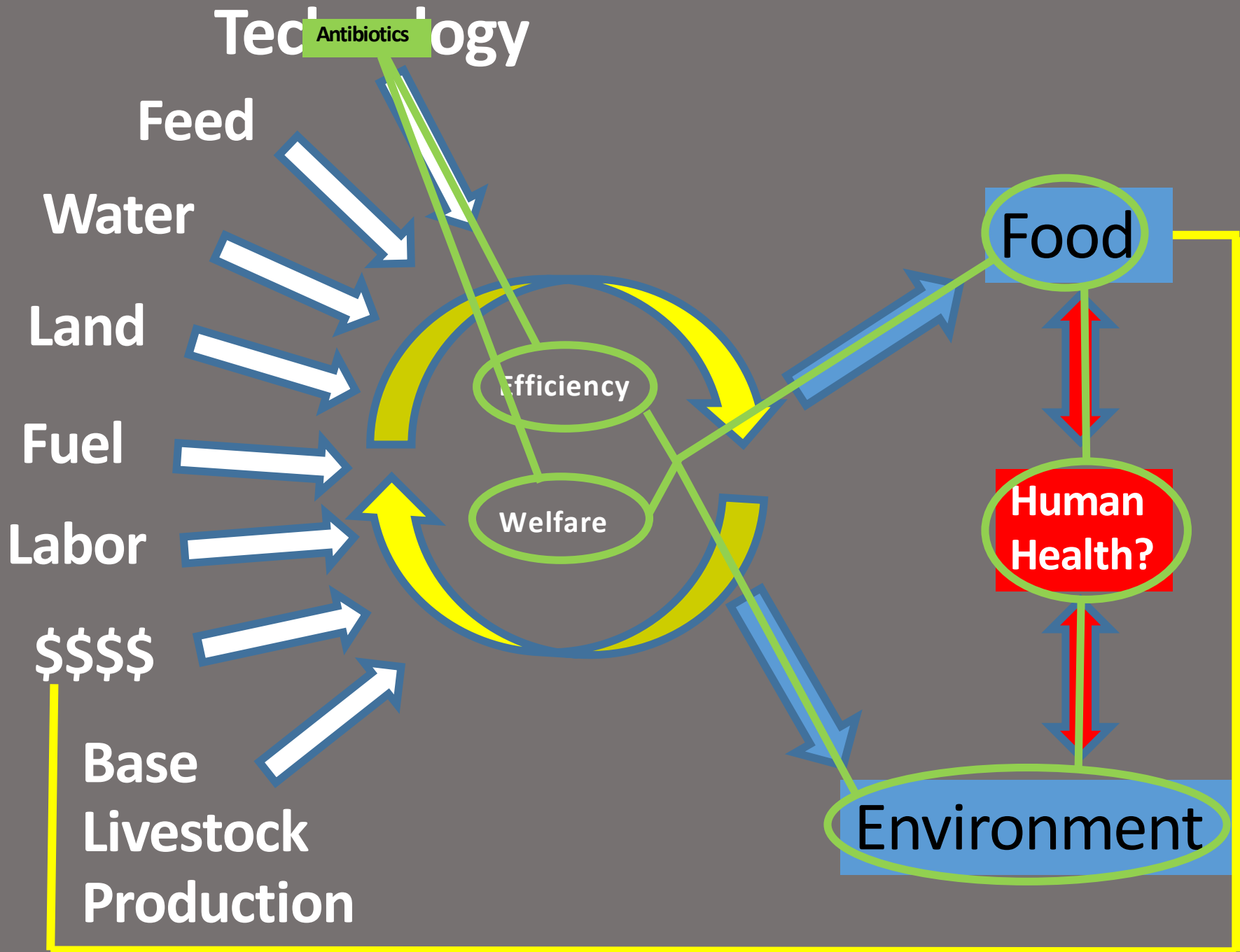
Equations

$$\text{Total Use} = \text{Effective Use} + \text{Ineffective Use}$$

I Don't Know What Else to Do Use
Perceived Ineffective Use

$$\text{Antibiotic Resistance Selection} = \text{Antibiotic Exposure} + \text{Exposed Bacterial Population}$$

$$\text{The Ultimate Antibiotic Failure} = \text{Bacterial Population Exposure Without Achieving the Desired Effect}$$



Technology

Antibiotics

Feed

Water

Land

Fuel

Labor

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Base
Livestock
Production

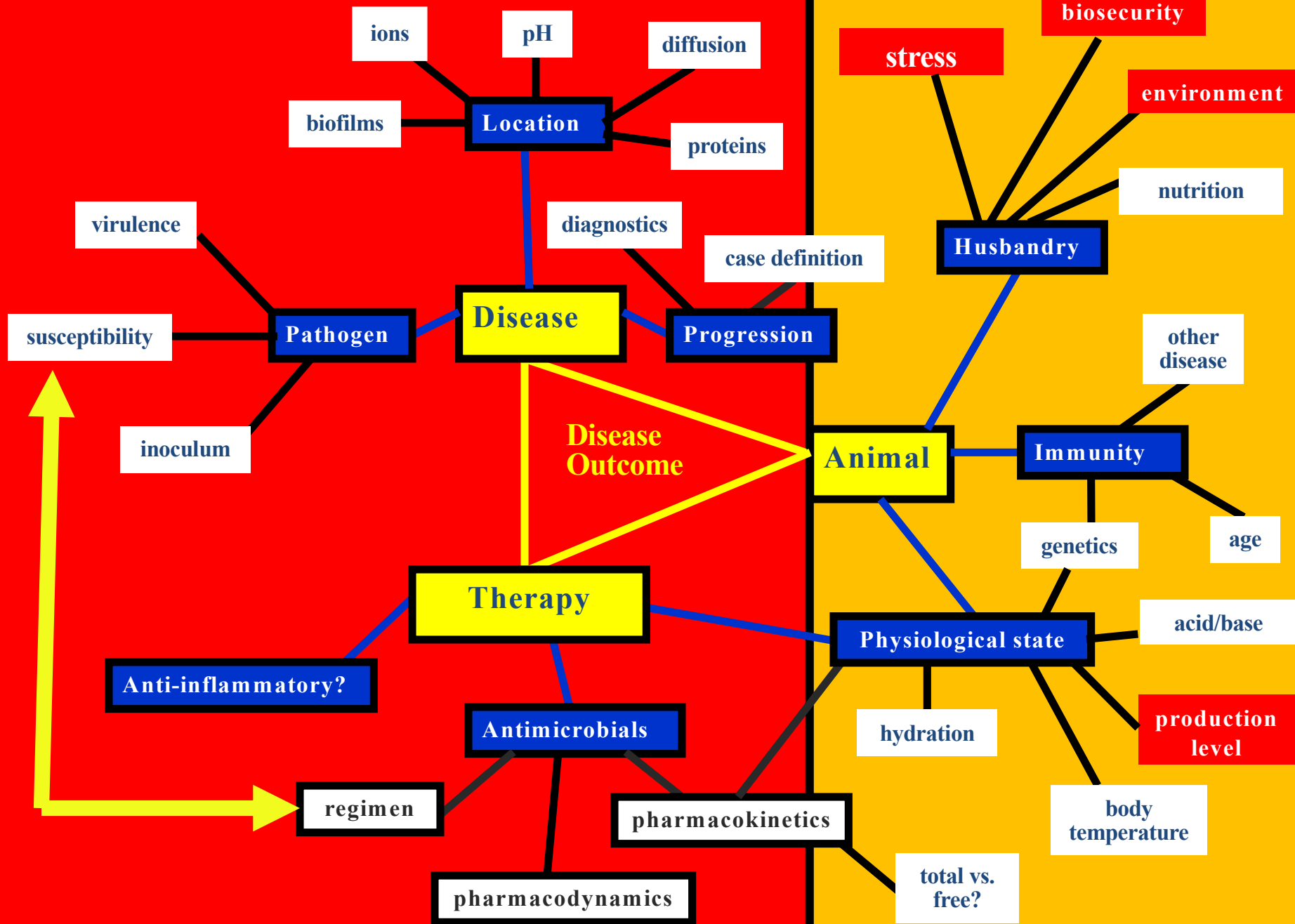
Efficiency

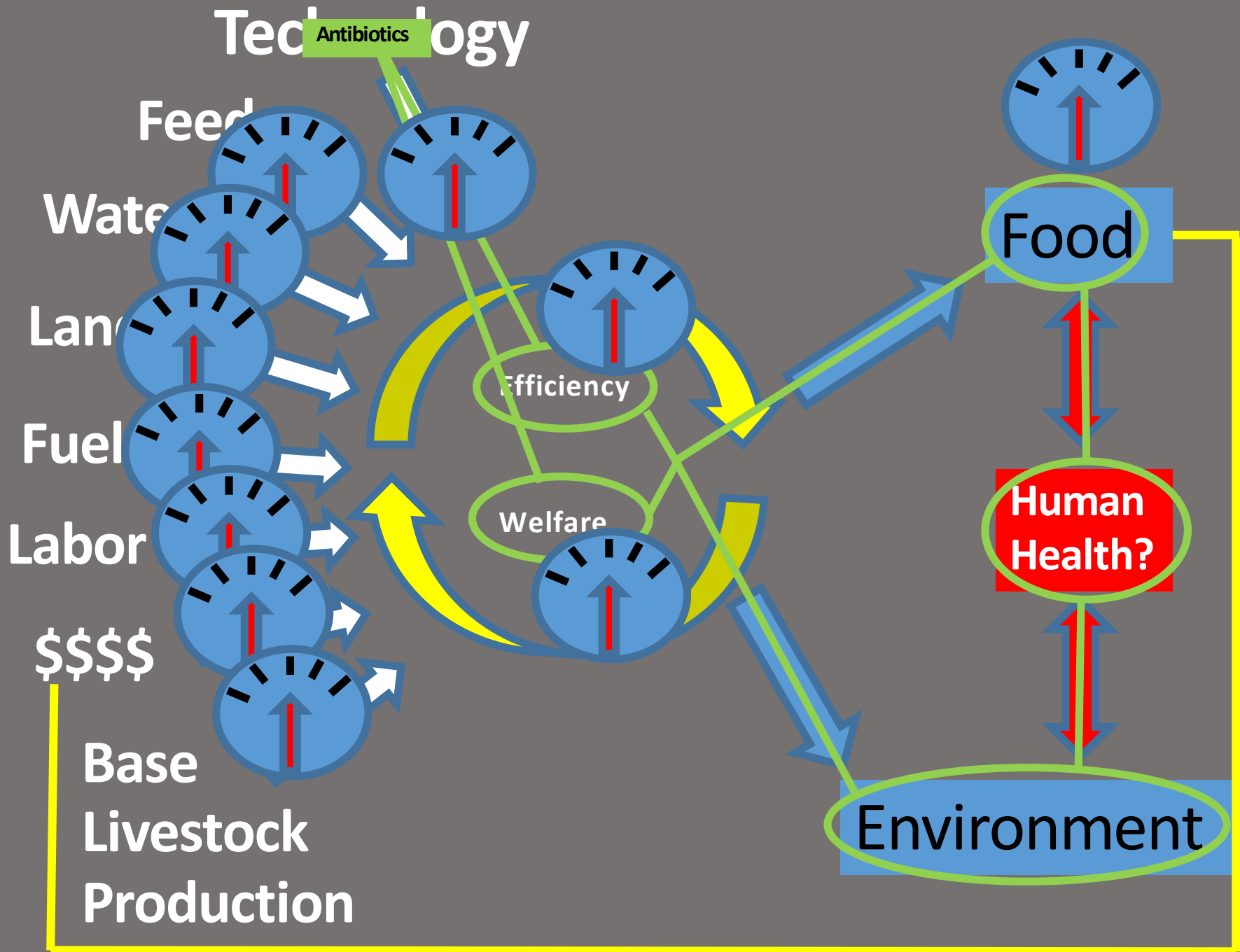
Welfare

Food

Human
Health?

Environment





Capturing Use Data

What we would like...

Coupled to cause
Accurate
Granular
Current
Easy
Enables benchmarking

We would really rather not...

Not coupled to cause
Approximate
Aggregate
Significant lag
Resource intensive
Unable to benchmark

Capturing Use Data

Reality...

Coupled to cause	Not coupled to cause
Accurate	Approximate
Granular	Aggregate
Current	Historical
Easy	Resource intensive
Enables benchmarking	Unable to benchmark

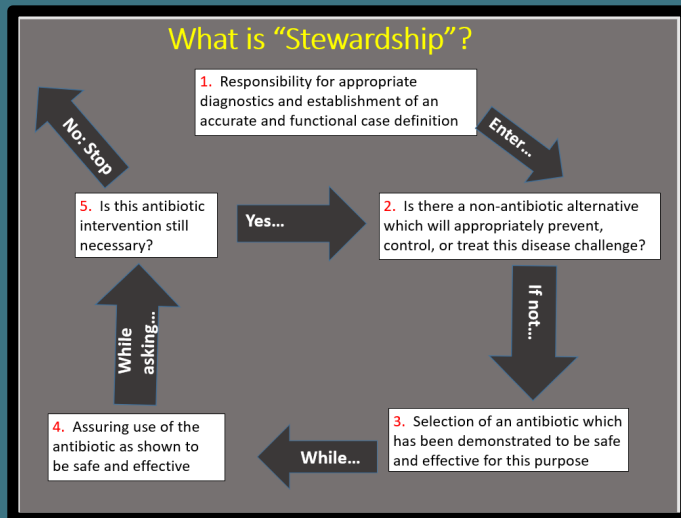
Do outcomes matter?

Tradeoffs

Utility for individual production unit benchmarking



Ease of collection



Understanding is all about...

Numerators

Disease Incidence?

Denominators

Population

Production

Antibiotic Use Monitoring Happens Within...

**No
Records**



**Sophisticated
Electronic
Systems**

Numerators

◉ Grams of drug

- Individual animal treatment records
- Sales to production unit being measured
 - Entire unit
 - Specific animal groups moving through the unit
- Group level
 - Feed consumption and inclusion rate
 - Target inclusion rate
 - Supplement used and inclusion rate of supplement
 - Micromachine records
 - Water consumption and inclusion rate or amount administered through water

Numerators

- Animals exposed (regimens)
 - Individual animal or group records
 - Grams of drug used extrapolated by using Defined Course Dose (DCD)
 - Protocol defined regimens for extrapolating average course administration (grams)
 - If all animals receive a drug, then simple, it is the number of animals in the system during the observed time period.
 - DCD accuracy declines as spread over more varying administrations in different systems. (e.g., multiple regimens and varying weights of animals at times of administration)

Numerators

◉ Duration of exposure

- Relatively straight forward for
 - In-feed or in-water drugs where duration of exposure equals regimen duration
 - Drugs administered daily (e.g., injection, intramammary tubes, oral medications)
 - Individual animal records or group records may be used, or
 - Extrapolation from grams of drug based on DDD
- Breaks down for...
 - Single administration antibiotics

**What about companion
animal use?**

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