



PARTNERS **IN**
PROGRESS

Poultry Physiology and Maintaining the fermentation Capacity of the Gut Microbiota

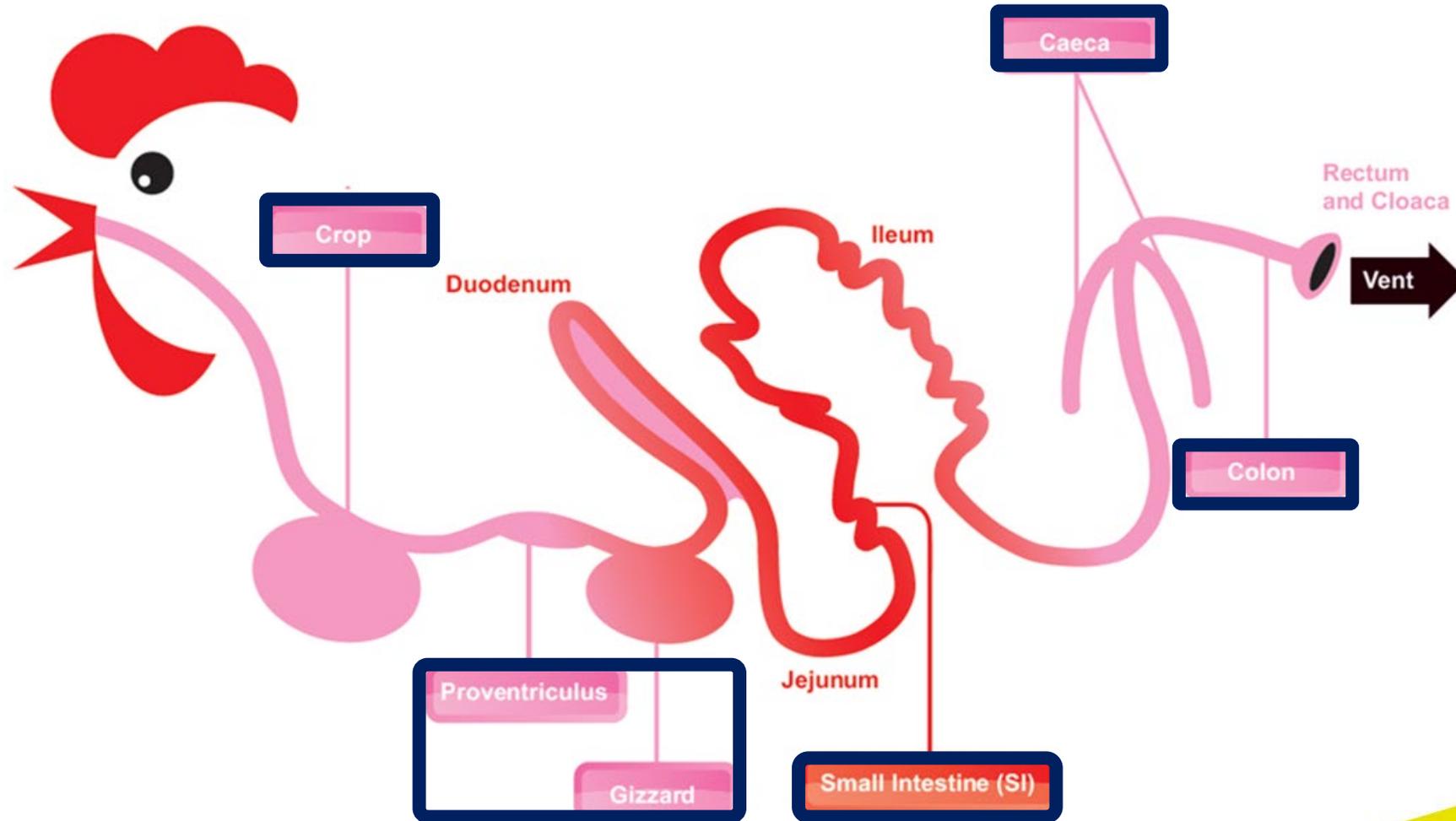
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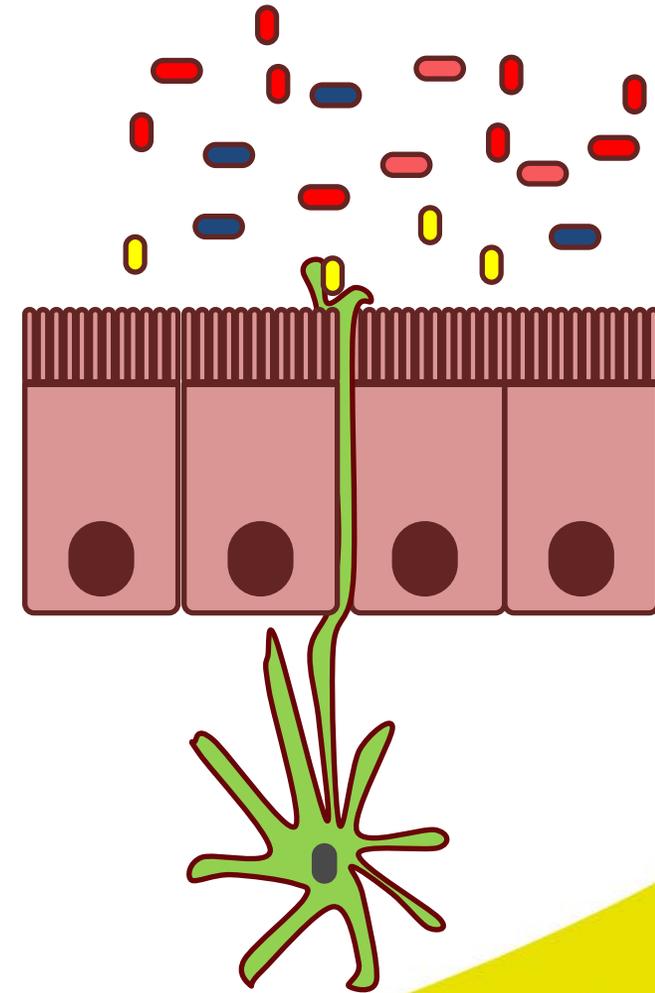
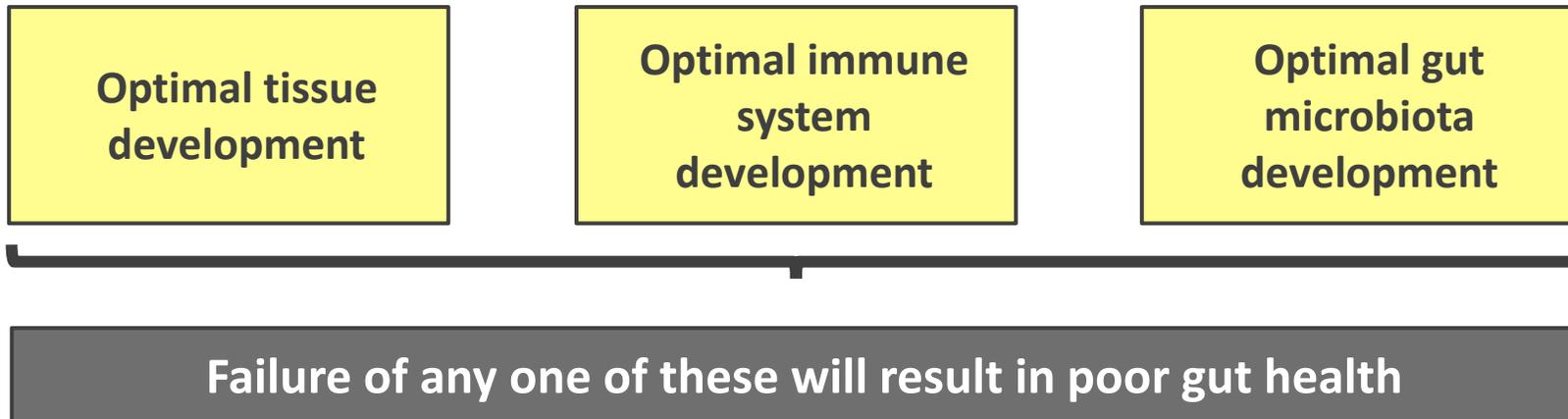
Edinburgh UK

What is the gut?



What is intestinal health?

- Ability to defend against gut pathogens
- Ability to breakdown feed into constituent parts
- Ability to absorb all the digested nutrients
- Ability of the immune system to respond correctly



What is the impact of poor gut health?

- **Broilers**

- Poor FCR
- Poor growth
- Poor flock health

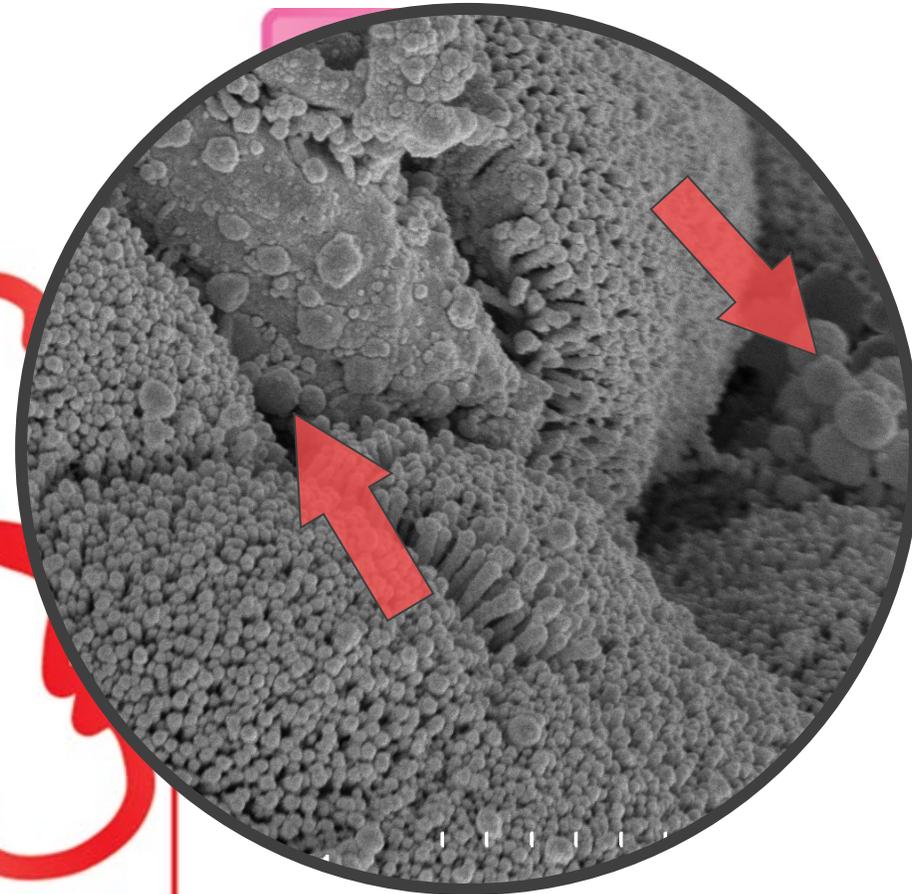
- **Breeders**

- Poor gut health can reduce nutrient uptake
 - Less nutrients for growth and egg production
 - Poor antibody deposition in the egg
 - Poor flock uniformity
 - Malabsorption of nutrients results in bacterial overgrowth
- Poor gut integrity can result in bacteria passing into the bloodstream
 - Infectious joint disease
 - Peritonitis
- Bacterial imbalance in the gut can affect the egg
 - When the egg passes through the cloaca it comes into contact with gut bacteria
 - These can enter the egg - impact the embryo & chick



The gut microbiota

- Large community of bacteria living in the gut
- Trillions of bacteria made up of 700-800 species
 - A mix of favourable and unfavourable bacteria
- Plays a major role in animal health and immune system development



Proventriculus

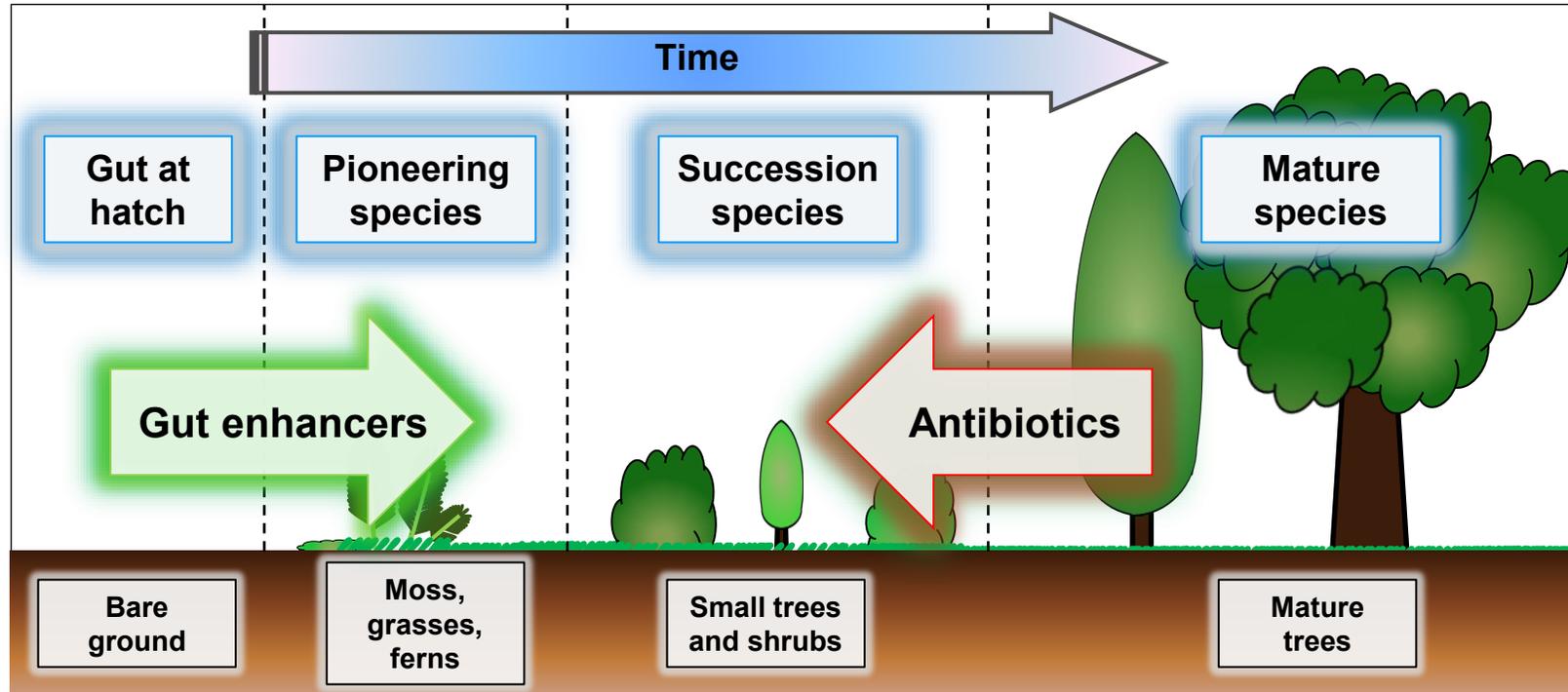
Jejunum

Gizzard

Small Intestine (SI)

Development of the gut microbiota

The microbiota is a dynamic entity that develops over time



Any pressure on the gut system during brooding can slow the rate of succession

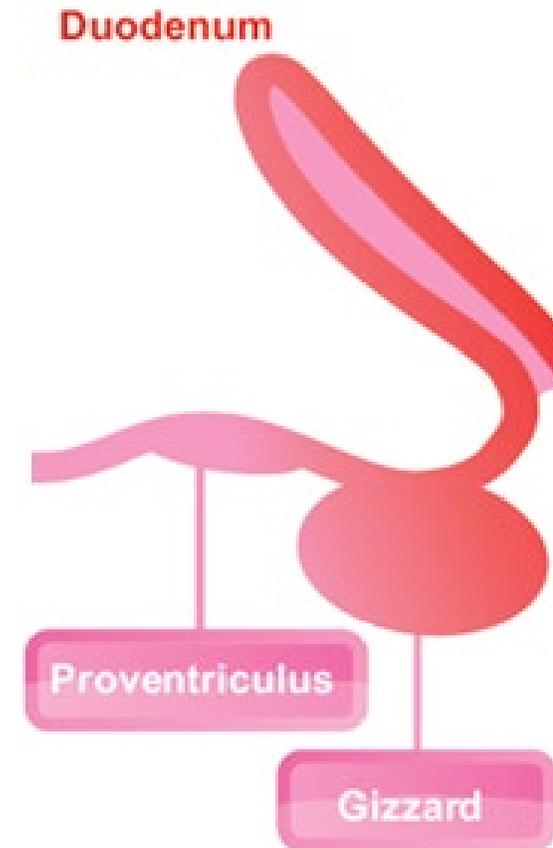
The foregut

In the gizzard, feed is mixed with acid and pepsin

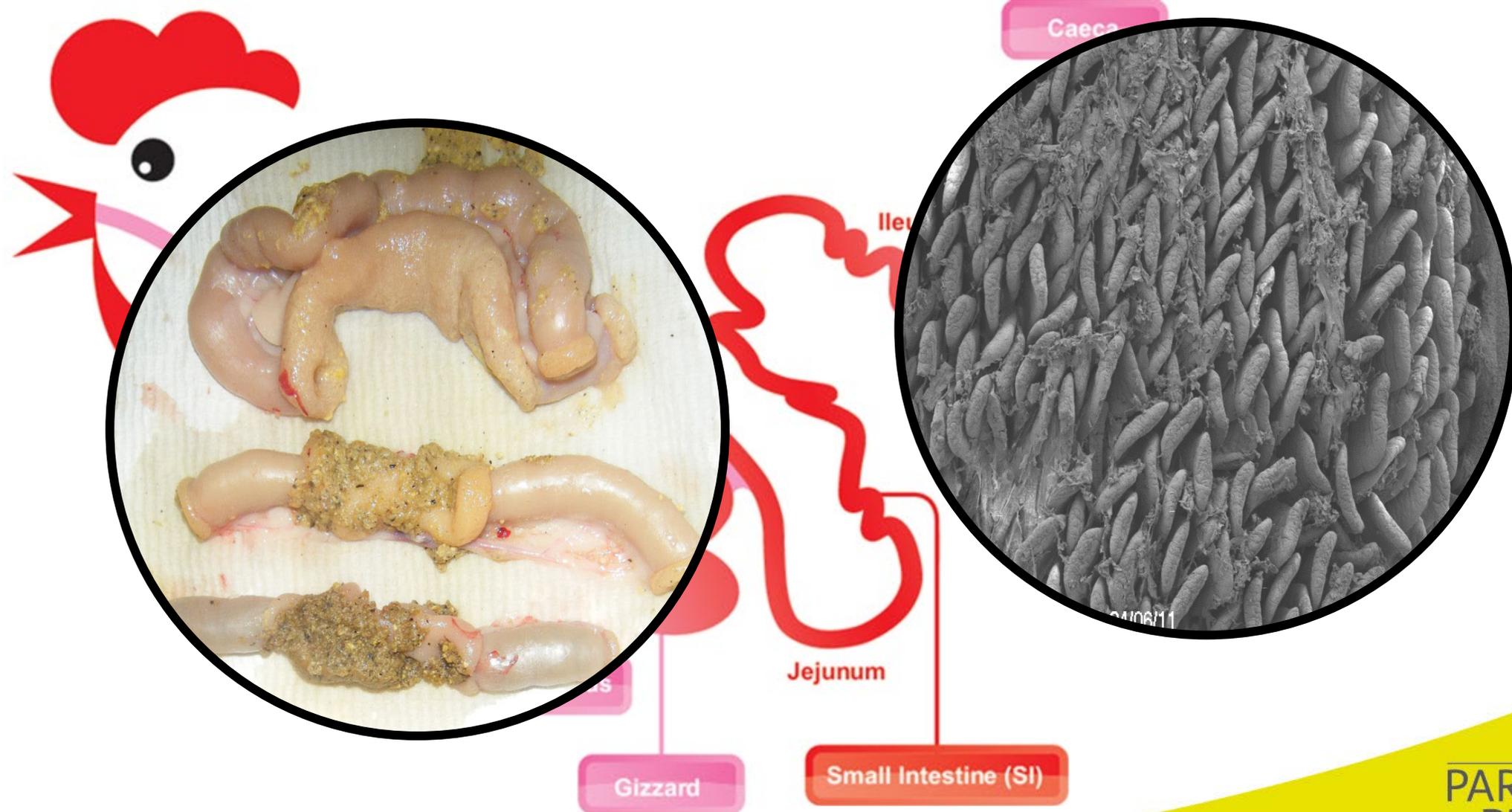
- Grinds the feed for digestion
- Prepares proteins for absorption in small intestine

Small particle size reduces the time feed stays in the gizzard

- Inefficient protein digestion
- Protein into hind gut
- Increased gut viscosity
- Poor absorption and FCR



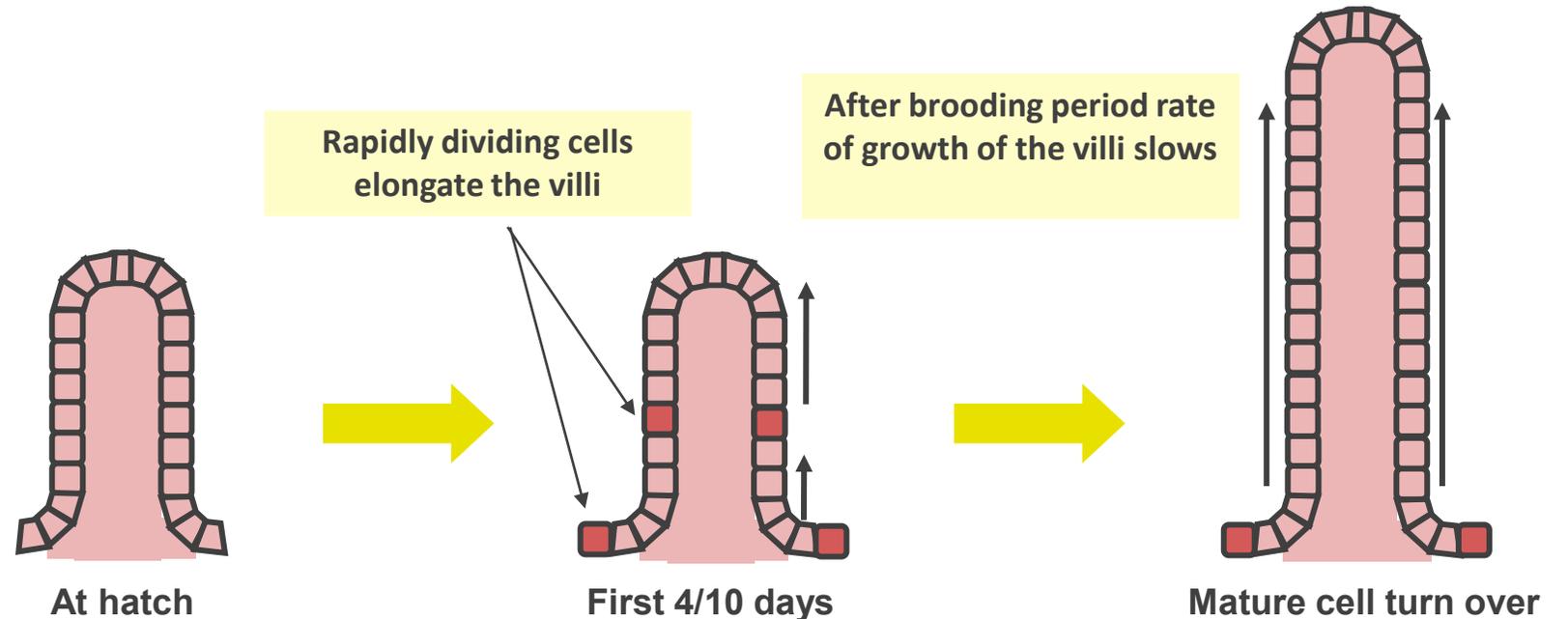
The midgut



The midgut

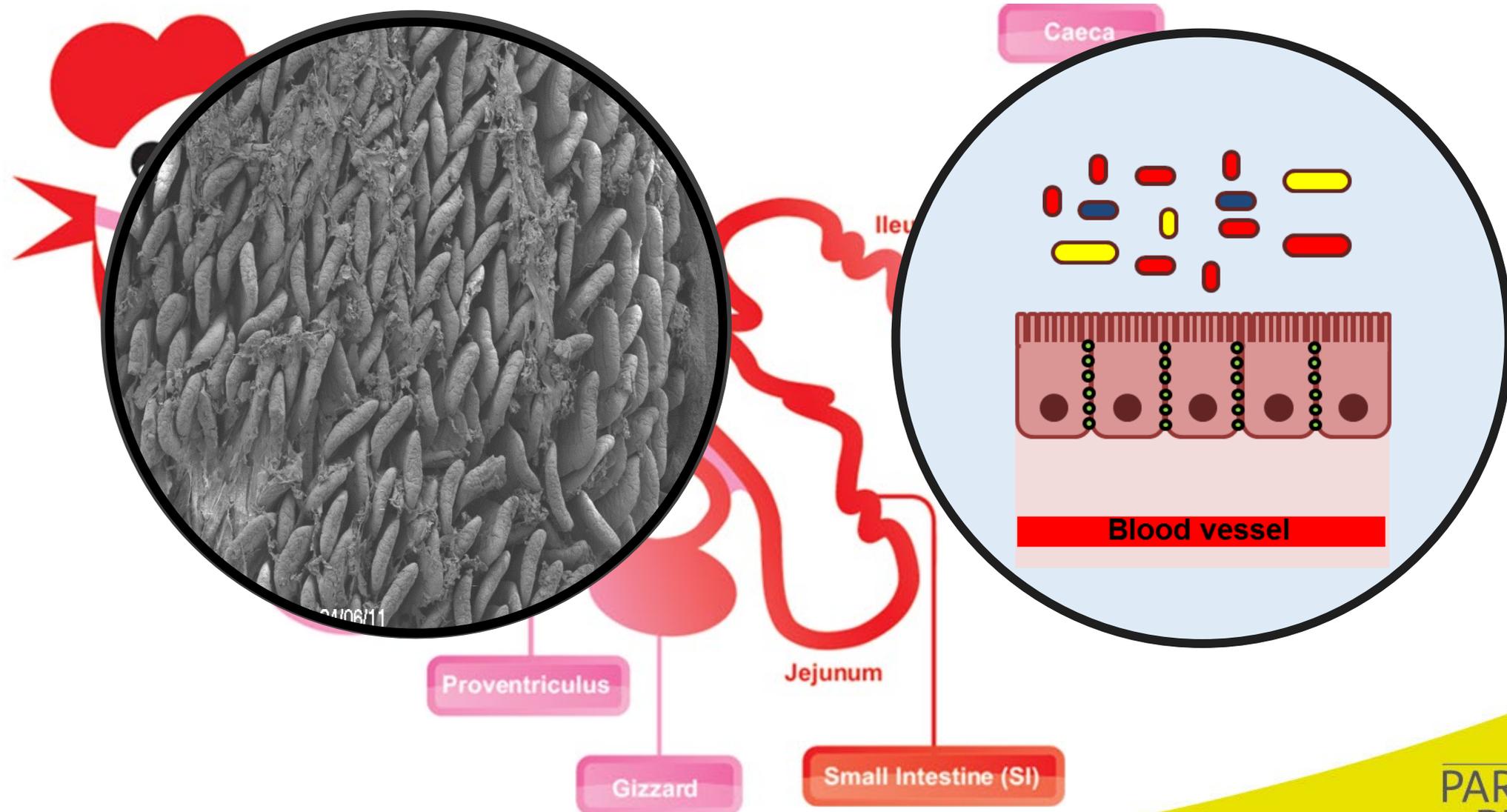
Brooding plays a critical role in the development of the villi

- Gut development starts in the egg
- Growth is dependant on the presence of food in gut
- Stimulated by the intestinal bacteria
- Growth inhibited by stress

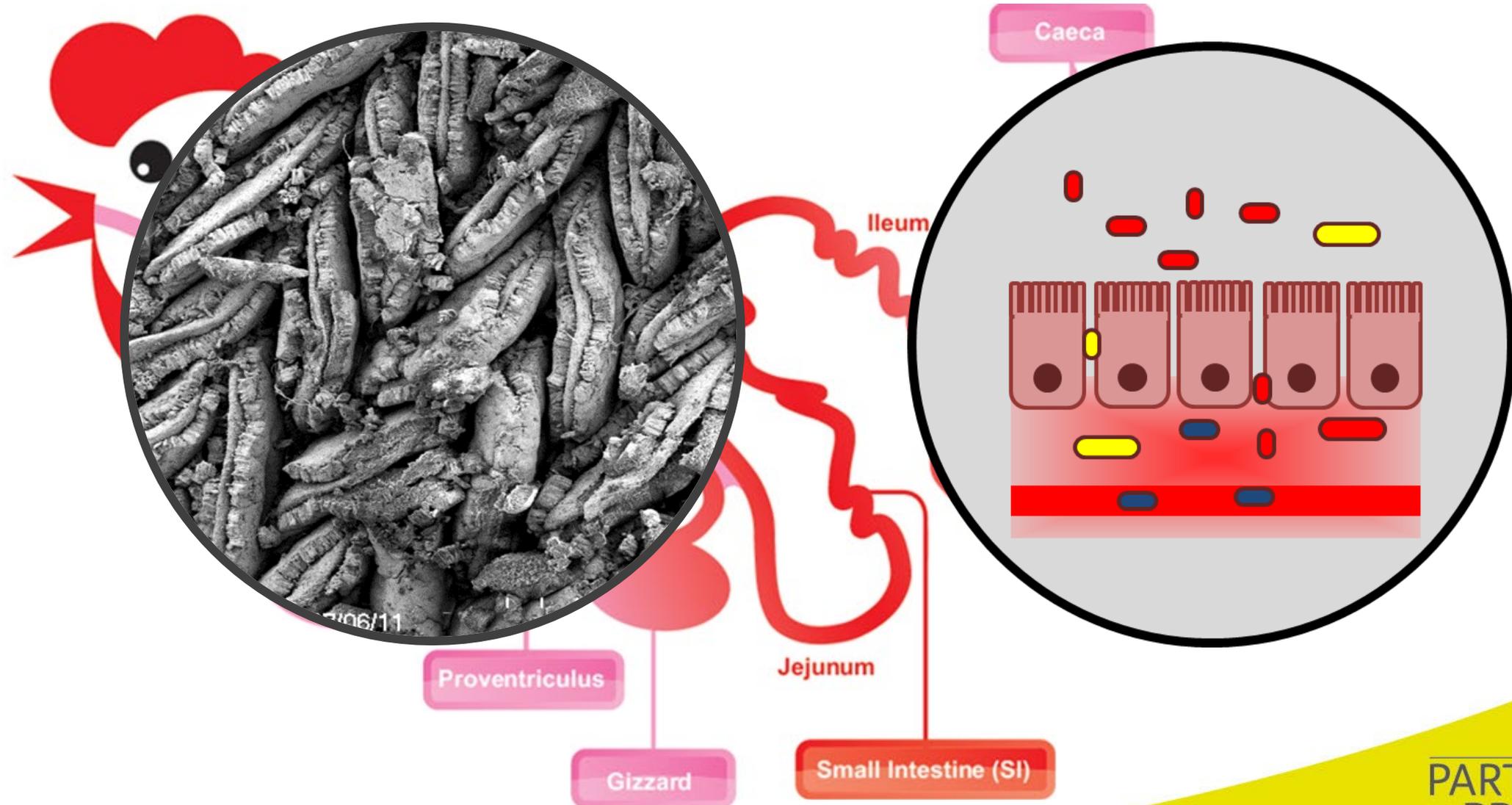


Gut health
enhancement
products

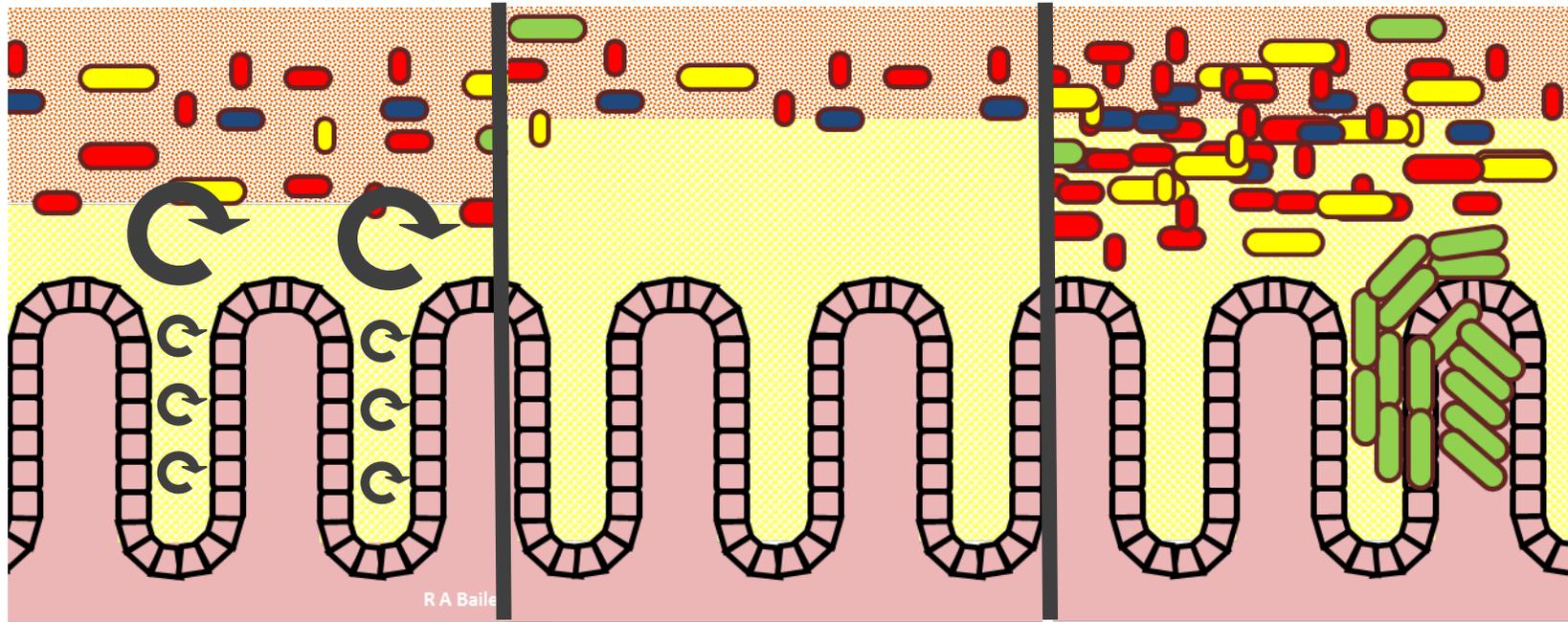
The midgut



The midgut



The midgut

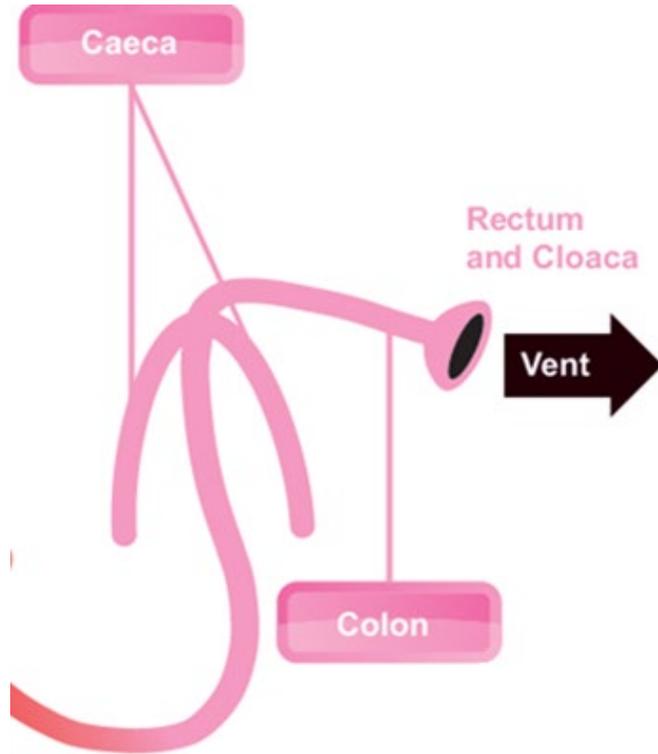


- Currents mix nutrients assisting absorption
- Oxygen from villi blood supply oxygenates mucus

- When this mechanism is disrupted nutrient absorption is reduced
- Oxygen level of the mucus decreases

- Bacterial overgrowth
- Bacteria migrate into mucus layer
- Biofilm formation and breach of gut surface

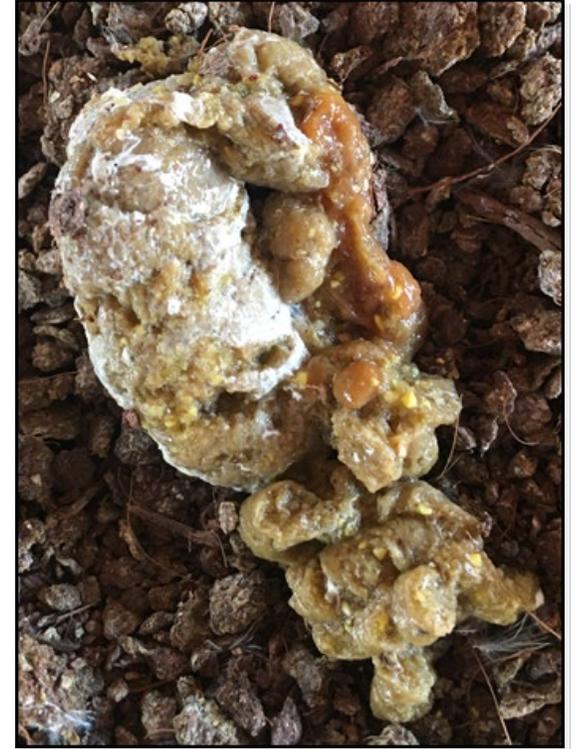
The hindgut



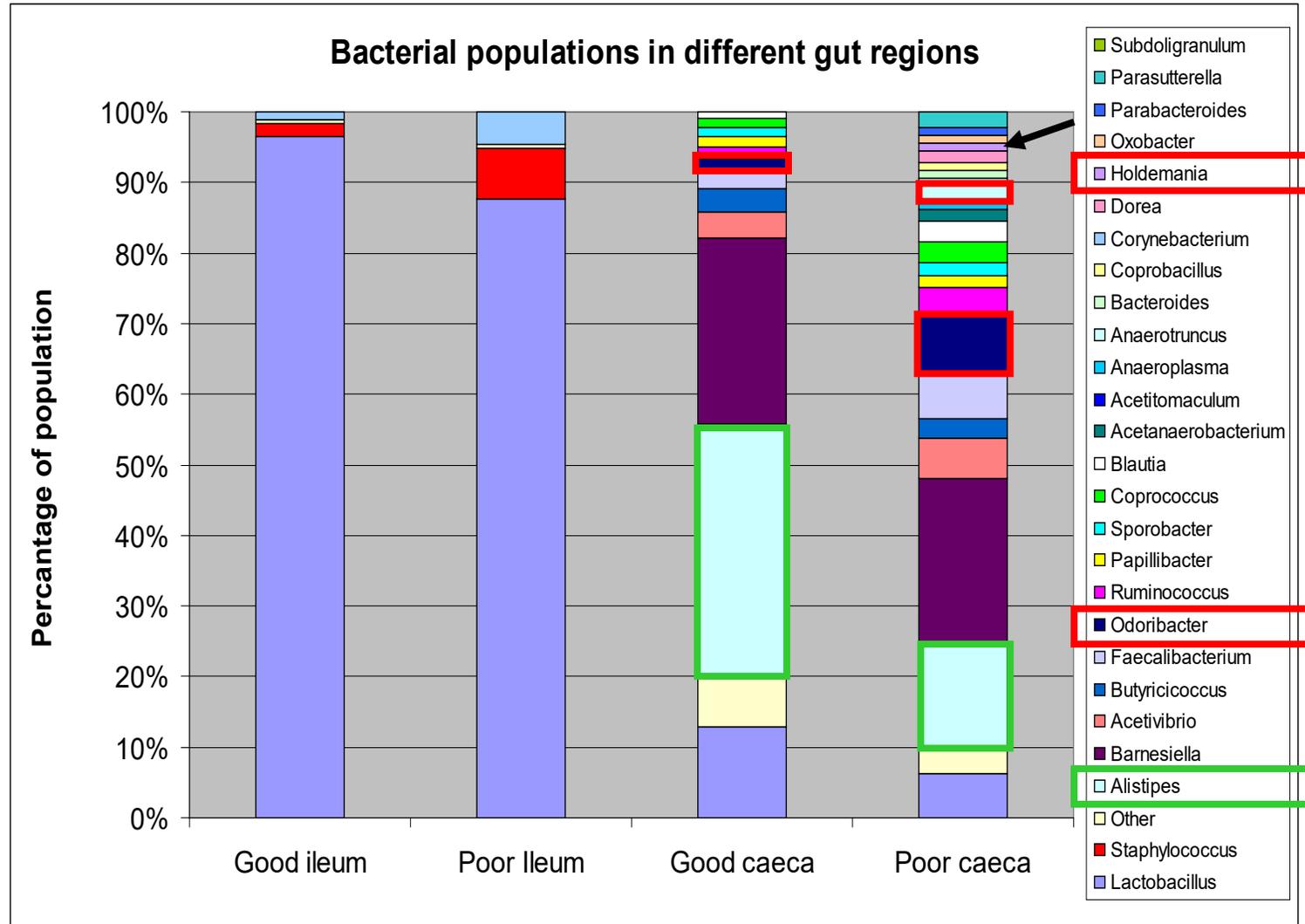
- Digesta that enters the caeca is subjected to bacterial degradation
- The bacterial activity depends upon what enters the caeca
- With good gut health this activity involves fermentation to produce beneficial compounds



Gut imbalance



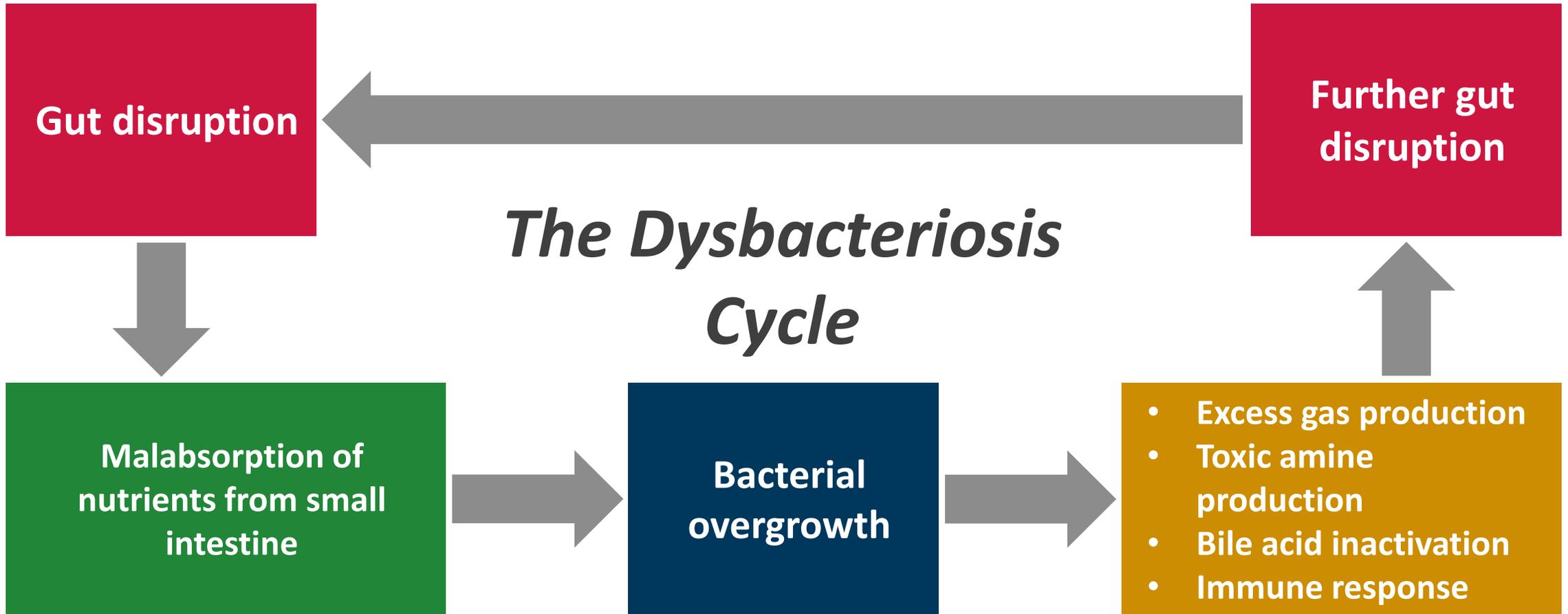
Gut imbalance



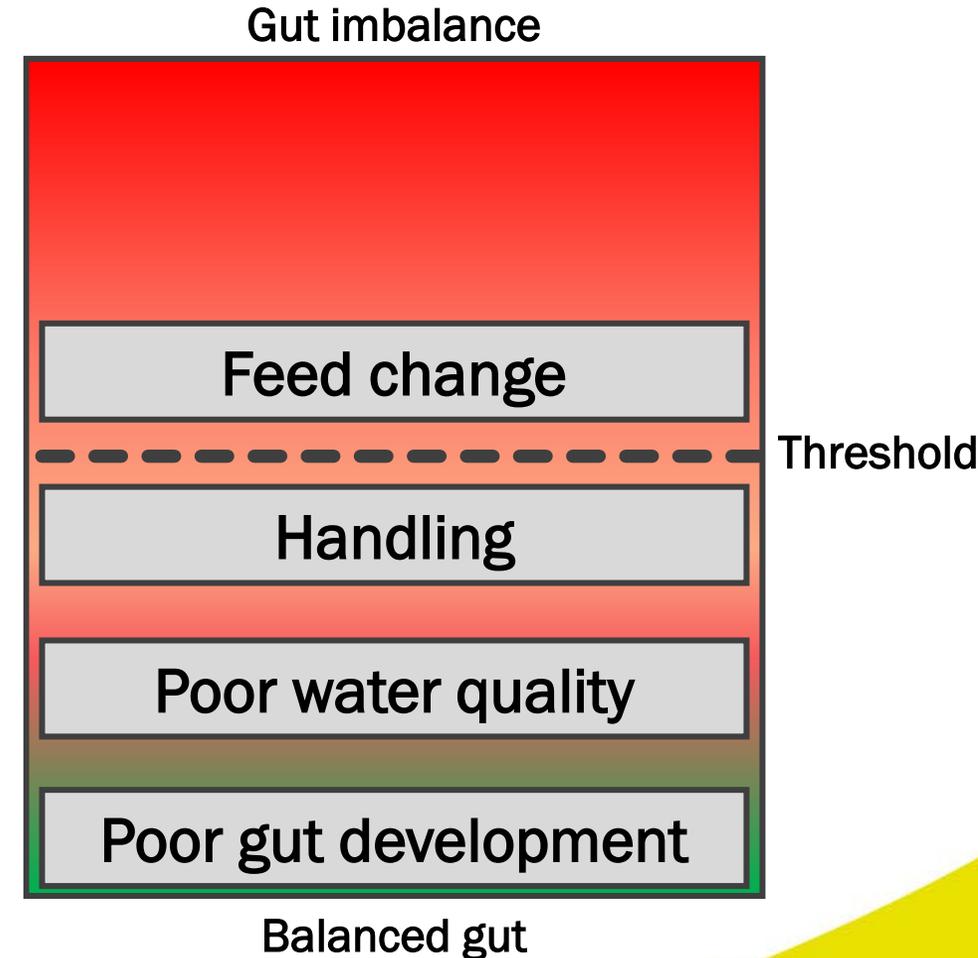
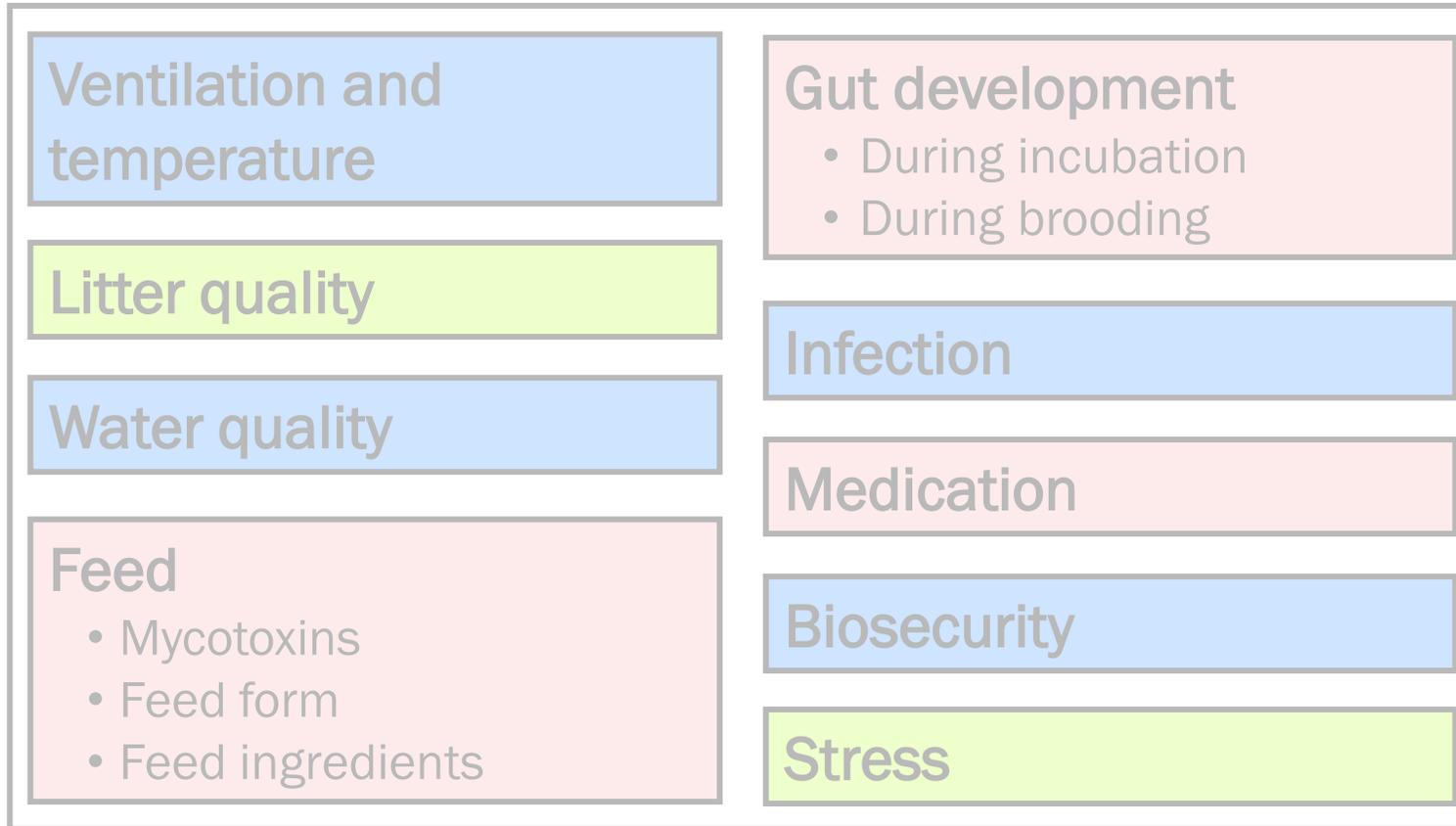
As the gut becomes imbalanced the activity of the bacteria changes

Less beneficial compounds are produced

What happens during a gut imbalance?



Factors affecting gut health



These factors can be additive

How can we solve a gut health issue?

- Whilst the cause of the gut health issue is being investigated, it is important to help the birds before it gets worse
- Application of extra phytogetic products or organic acid in the water for 3-4 days can help
- This helps to balance the microbiota and stimulate the regeneration of the gut tissues

Important to act early!

How can we promote gut health?

- ‘Alternatives to antibiotics’ or ‘Alternative strategies’?
 - Prophylactic vs. therapeutic?
 - Tailor made programs from farm to farm?
 - Flock to flock variations in product programs?

DEVELOPMENT

- Gut tissues
- Gut immunity
- Gut microbiota

Setting up the gut for the life of the bird

TRANSITION

- Feed changes
- Vaccinations
- Environmental
- Handling

Prevent reduction in nutrient absorption and overgrowth of less favourable bacteria

MAINTENANCE

- Gut has developed
- Stable microbiota
- Promote integrity

Ensure gut is supported to conserve homeostasis

Key points for promoting gut health

1. Management of the birds
2. Management of the sheds
3. Good biosecurity and disease control
4. Good water sanitation
5. Good feed quality

Before we start to think about gut enhancement products, we have to get these things right

Feed quality

- Content
 - Quality of raw ingredients
 - Different raw ingredients will influence the bacteria
 - Changes in nutrient density will alter the gut microbiota composition
- Mycotoxins and biogenic amines
 - Irritation of the gut resulting in inflammation and tissue damage
 - Shrinkage of villi
 - Shown to cause immunosuppression resulting in gut imbalance



Water quality

- Gut health relies on the provision of good quality water
- Water can be a source of pathogen challenge
- The pH and mineral content of water can influence the physiology of the gut and activity of bacteria
- Having a good water sanitation protocol is essential for gut health throughout the life of a breeder

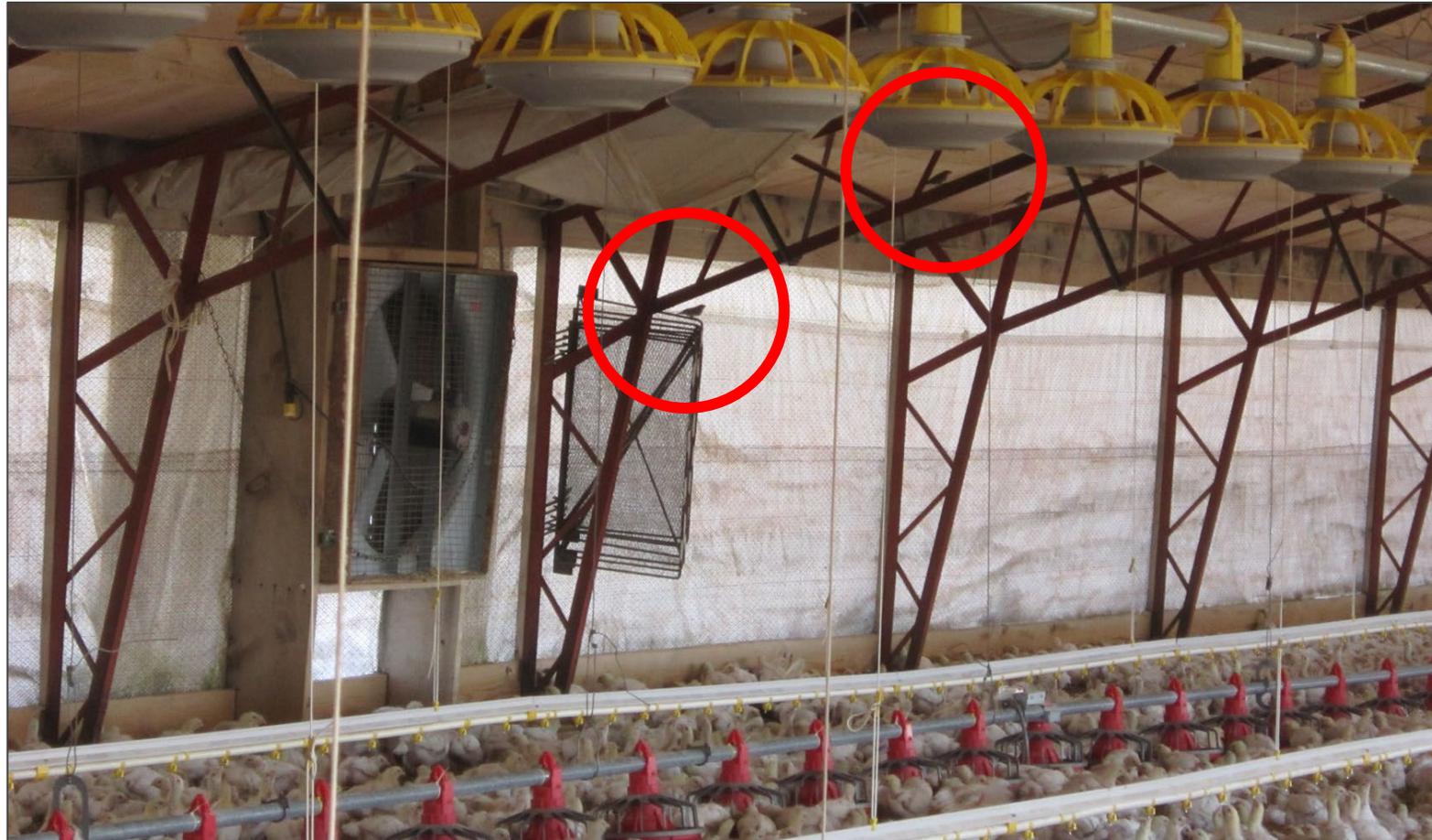


- Remove biofilm and scale from water lines
- Through the life of the flock ensure water is sanitised (e.g. Chlorine, Chlorine dioxide, Hydrogen peroxide)
- Acidify the water (pH of 5.5-6.5)
- Flush lines every 6-8 weeks to prevent biofilm build up

Water management



Biosecurity and disease prevention



PRODUCTS

- Phytochemicals/plant extracts
- Direct fed microbials
 - Probiotics
 - Competitive exclusion products
- Organic acids
 - Traditional
 - Protected
- Prebiotics
- Mannan-oligosaccharides
- Bacterial/yeast fermentation products
- Feed enzymes

MODES OF ACTION

- Improve gut integrity
- Stimulate or provide a beneficial flora
- Improve gut development
- Improve gut function
- Inhibit pathogens

Choose a product that will help your needs and give the required support to the gut

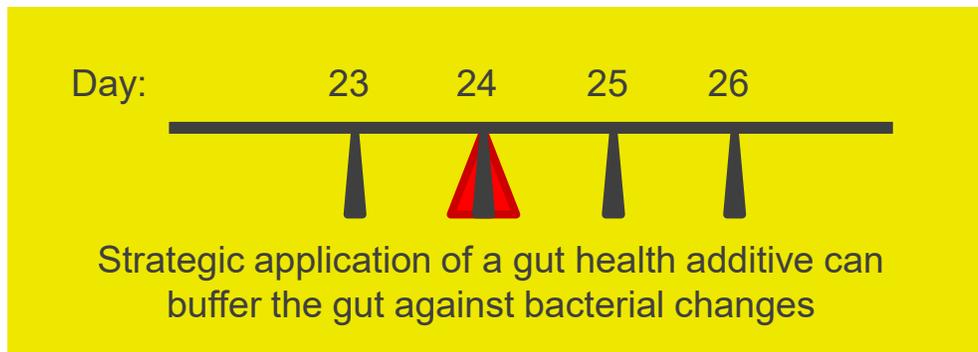
Development phase

- On the farm, gut health can be influenced from day 1
 1. Ensure chicks get access to feed as soon as possible to stimulate development of the gut
 2. Correct brooding temperatures
 3. Provide gut health products to boost the early gut development and seed the gut with beneficial bacteria
- By doing this, the gut development is optimal ensuring the birds are better equipped to cope with gut challenge



Transition phase

- When the gut is at risk of becoming imbalanced
 - Feed changes
 - Vaccinations
 - Environmental
 - Handling
- Minimise the number of intestinal stressors at one time to prevent overloading the gut
- Use gut health additives over risk periods



Maintenance phase

Once the gut is fully developed, it is essential that gut health is supported to maintain it

- There are key periods where gut health may need extra support
 - **Around peak production (20-30 weeks):**
 - Increased organic acids in the water to help the gut
 - Support the gut with probiotics or phytogenic products
 - Daily administration – in feed or water
 - Weekly administration – in the water
 - **After peak production (30+ weeks):**
 - Gut integrity can decrease with age
 - Increased risk of bacterial translocation across the gut wall
 - Increased use of products to boost gut integrity, such as butyric acid
- Monitor gut health daily



Key messages

1. Ensure optimal brooding to promote the best gut development.
2. Understand what the gut needs at each time point of the bird's life.
3. Good gut health relies on optimal water sanitation.
4. Feed formulation and quality is important for good gut health and performance.
5. Know when the gut is at risk of imbalance and support it accordingly.
6. React quickly when a problem is seen before it becomes more serious.

Questions & Answers

THANK
YOU!

