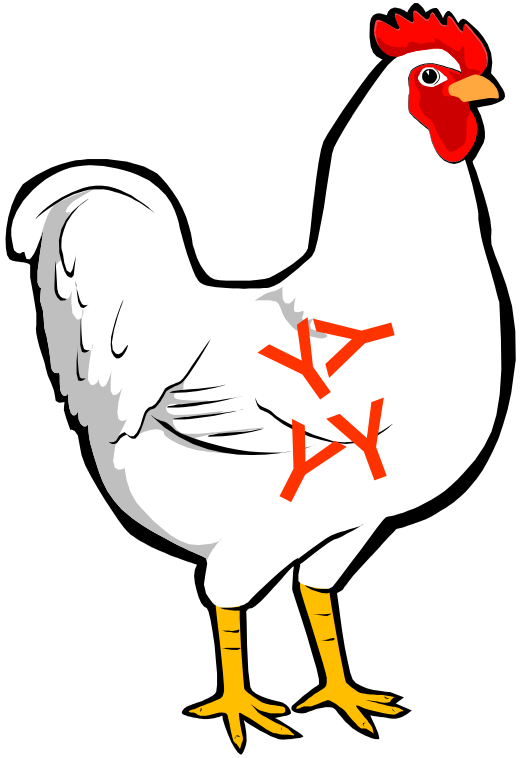
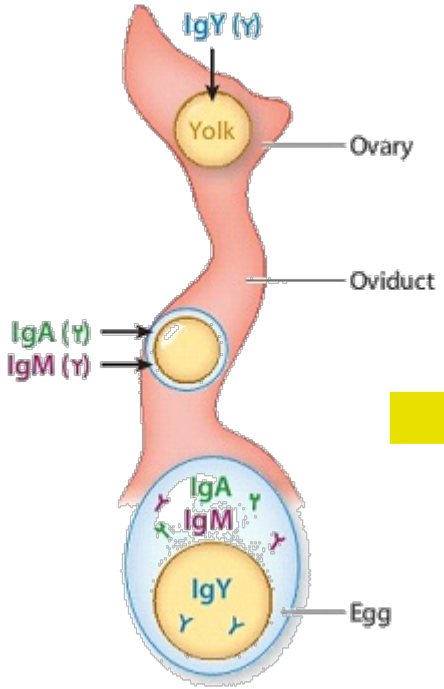
What is IgY

What is IgY?

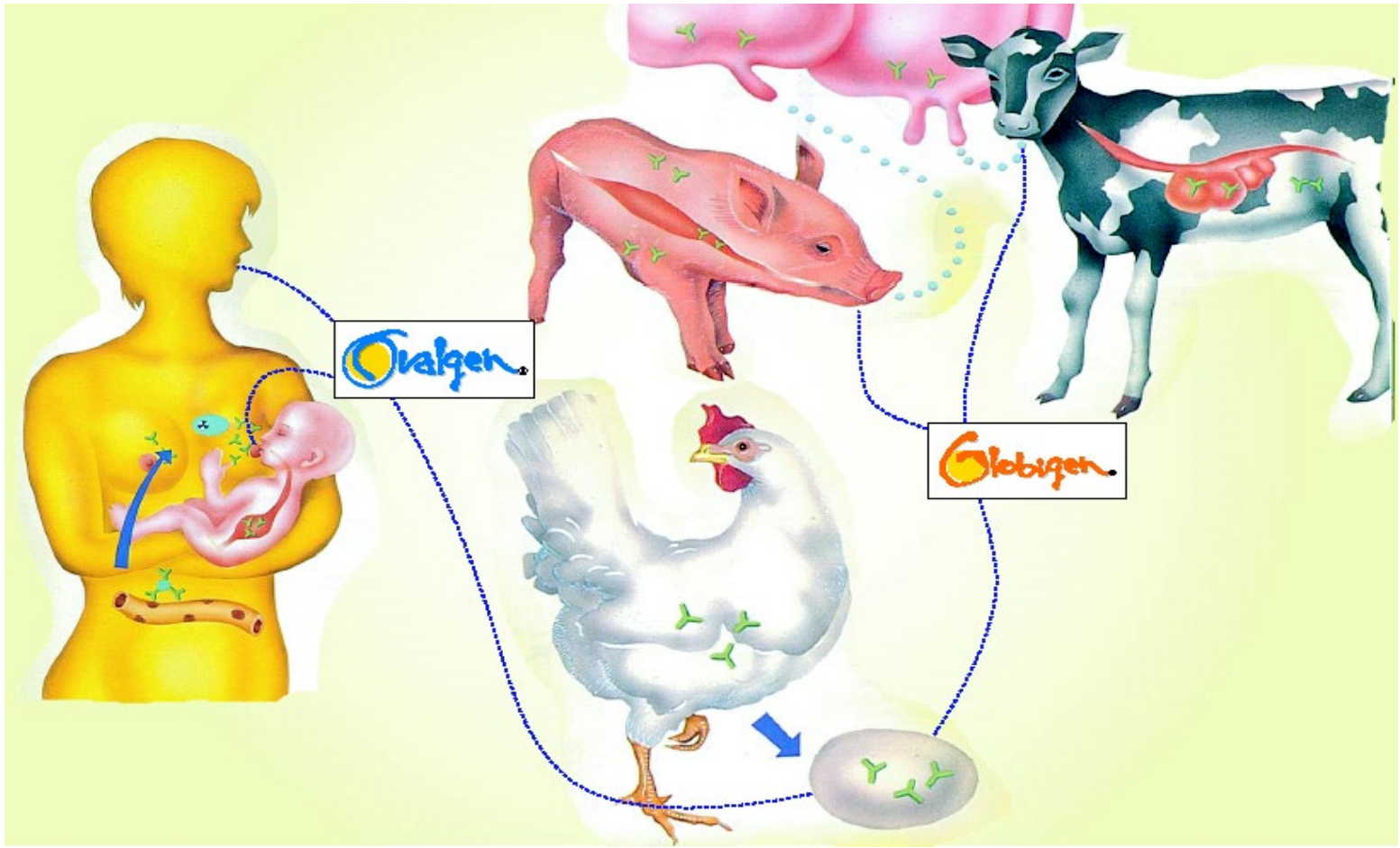
IgY (**I**mmuno**g**lobulin in **Y**olk) is an antibody from egg yolk.





A single egg contains about 100 mg IgY

Concept of Immunoglobulin Y (IgY): Oral passive immunity

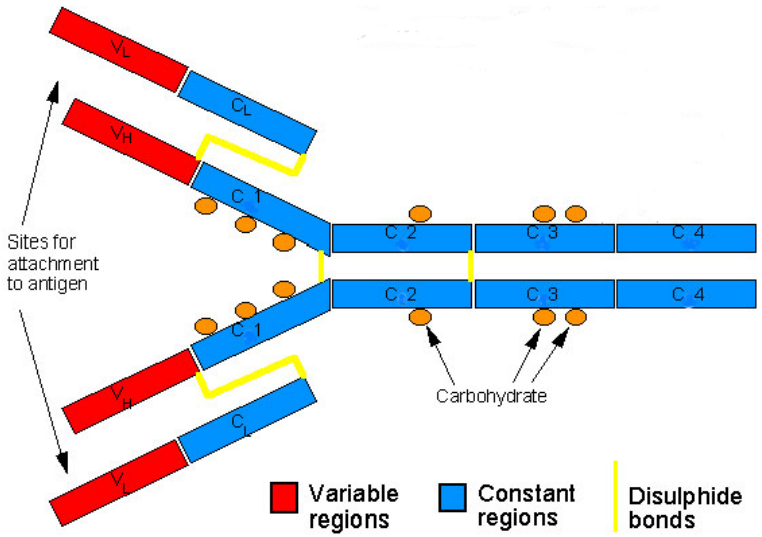


Learning from

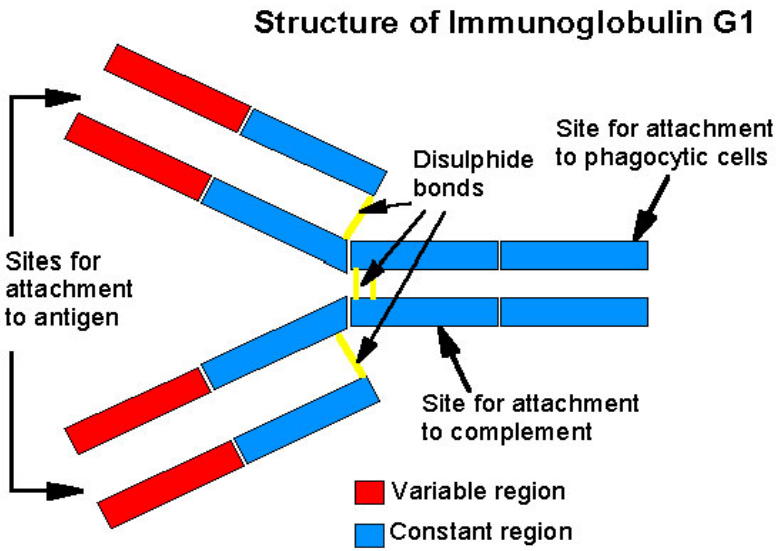
NATURE

About IgY and IgG

IgY



IgG



IgY properties

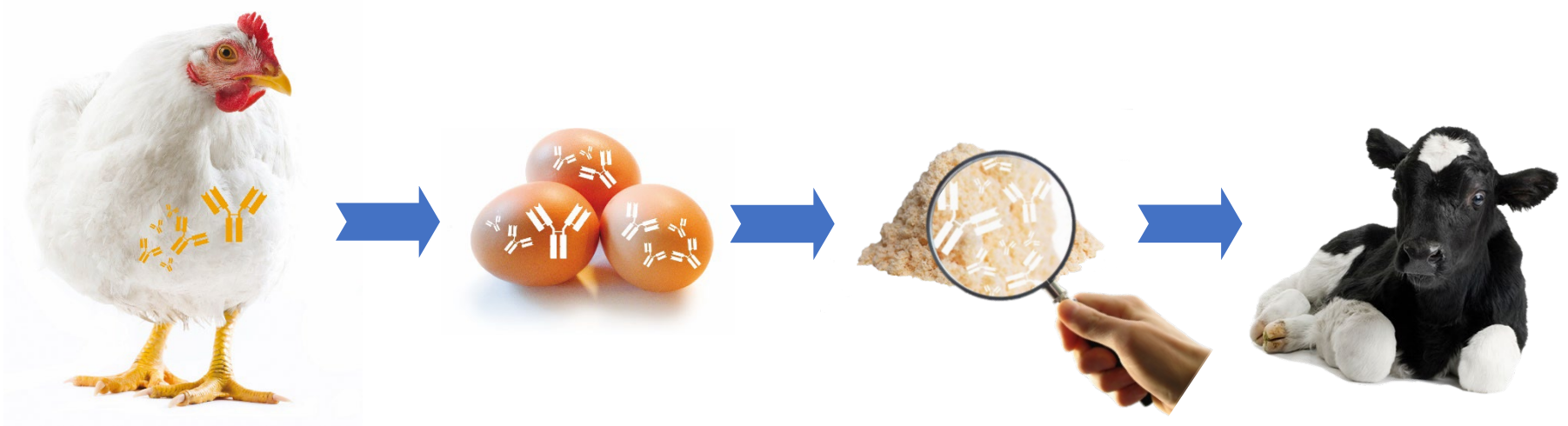
- Consists of 4 constant domains (IgG: 3)
- Bigger than IgG: MW is 180 kD (IgG: 160 kD)
- Has higher neutralizability to pathogens than IgG
- Has higher avidity to antigen than IgG (bind antigens stronger)

The IgY concept

- Hens transfer (the entire load) immunoglobulin Yolk (IgY) into egg yolks while the egg is in the ovary (at once).
- IgY stored in the egg aims to protect the chick on its 1st days of life.
- IgY concentration *per* egg ranges from 50 to 100 mg.

- Specific IgY is an egg containing natural specific egg immunoglobulins (IgY);
- Specific IgY formulas for different animal species and different stages;
- Specific IgY supports the intestinal health of young animals;
- Specific IgY enhances performance and reduces mortality.

The IgY concept



IgY antibodies are formed

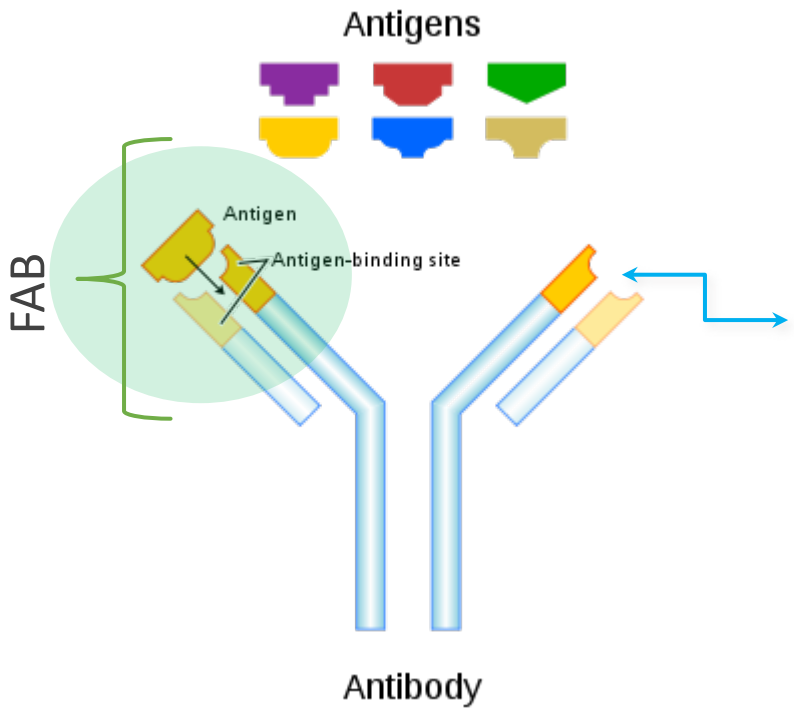
IgY are Transfer into the eggs

Production of specific IgY

Binding of Pathogens at the target site

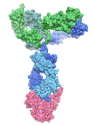
- Immunoglobulin = Antibody
- Ig = Abbreviation for Immunoglobulins
- Antigen = Pathogen

Basic Immunology



- Ig are proteins used by the immune system to ***identify and neutralize foreign substances***
- FAB – *Fragments of Antigen-Binding*
- *V – Variable regions:*
- **Antigen-specific design**
- **They react in a <u>key-and-lock model</u>**

Basic Immunology - Antibodies



- Antigen-specific design
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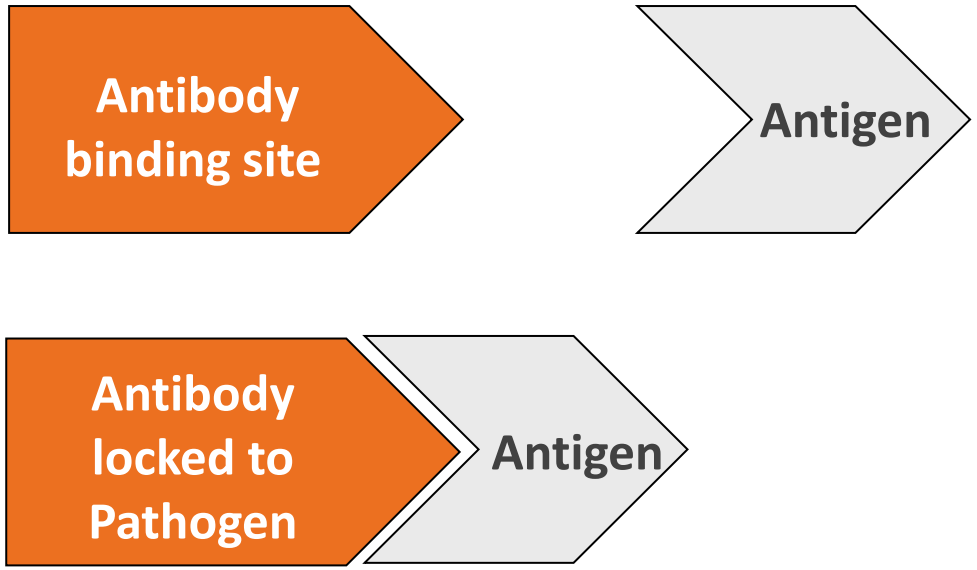


Antibody binding to Pathogen

Key IgY Mode of Action

IgY : Mode of Action

- **Adherence inhibition**
- **Neutralization**
- **Agglutination**
- **Damaging cells**

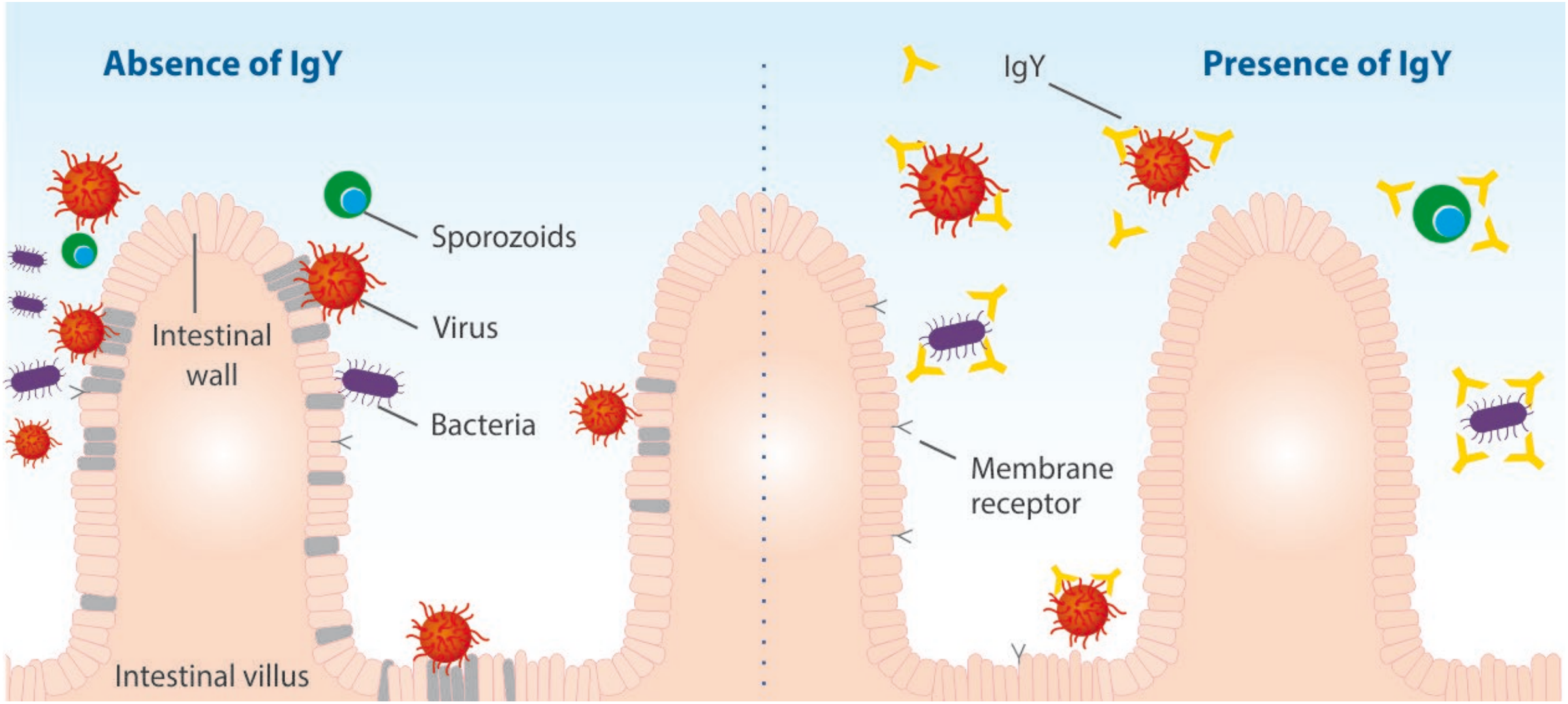
Leads to

Growth Inhibition

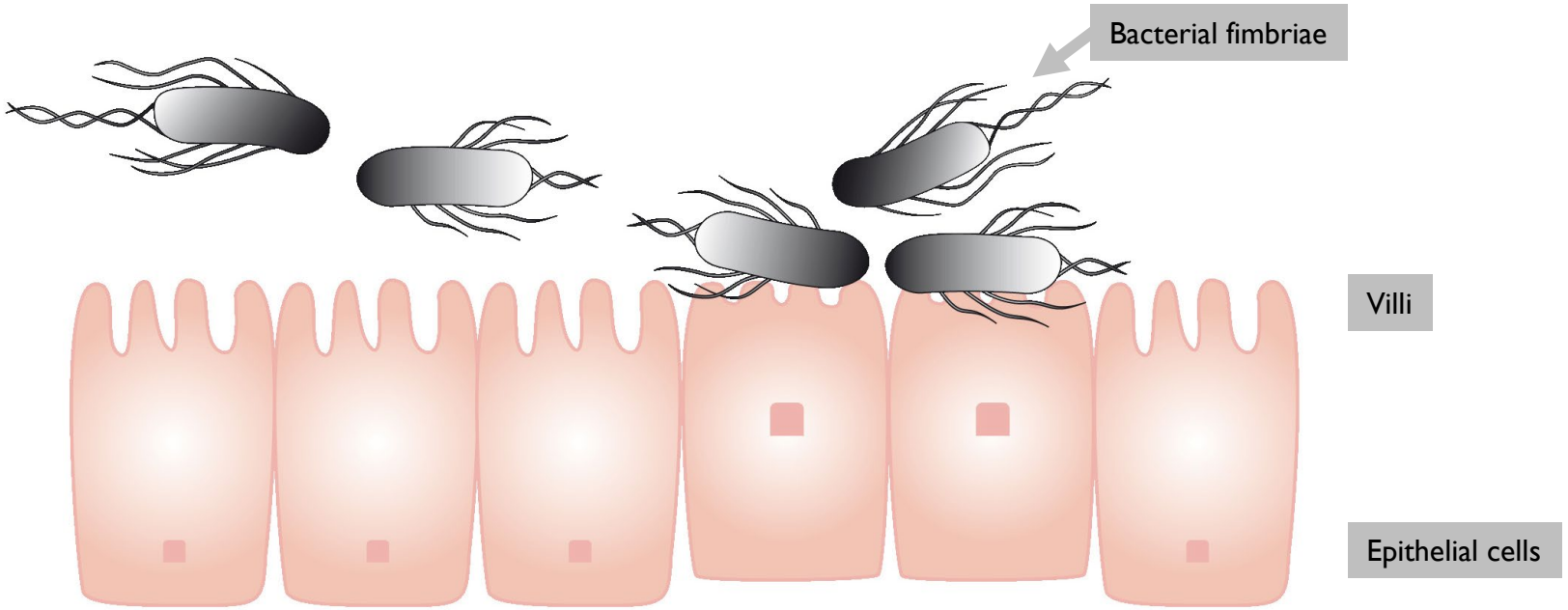
Disease : Development Principal

- **Adhesion**
- **Infection**
- **Invasion**

Mode of Action

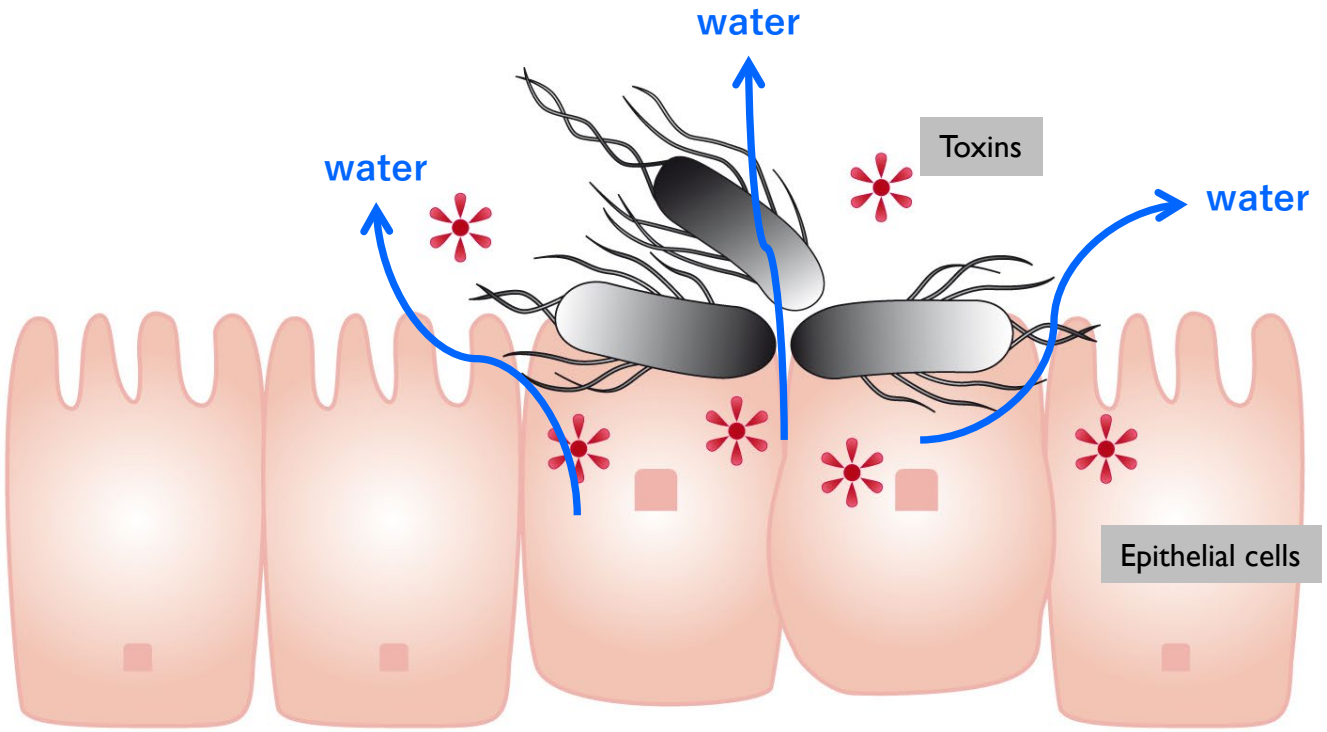


Mechanism of pathogenesis due to *Escherichia coli*



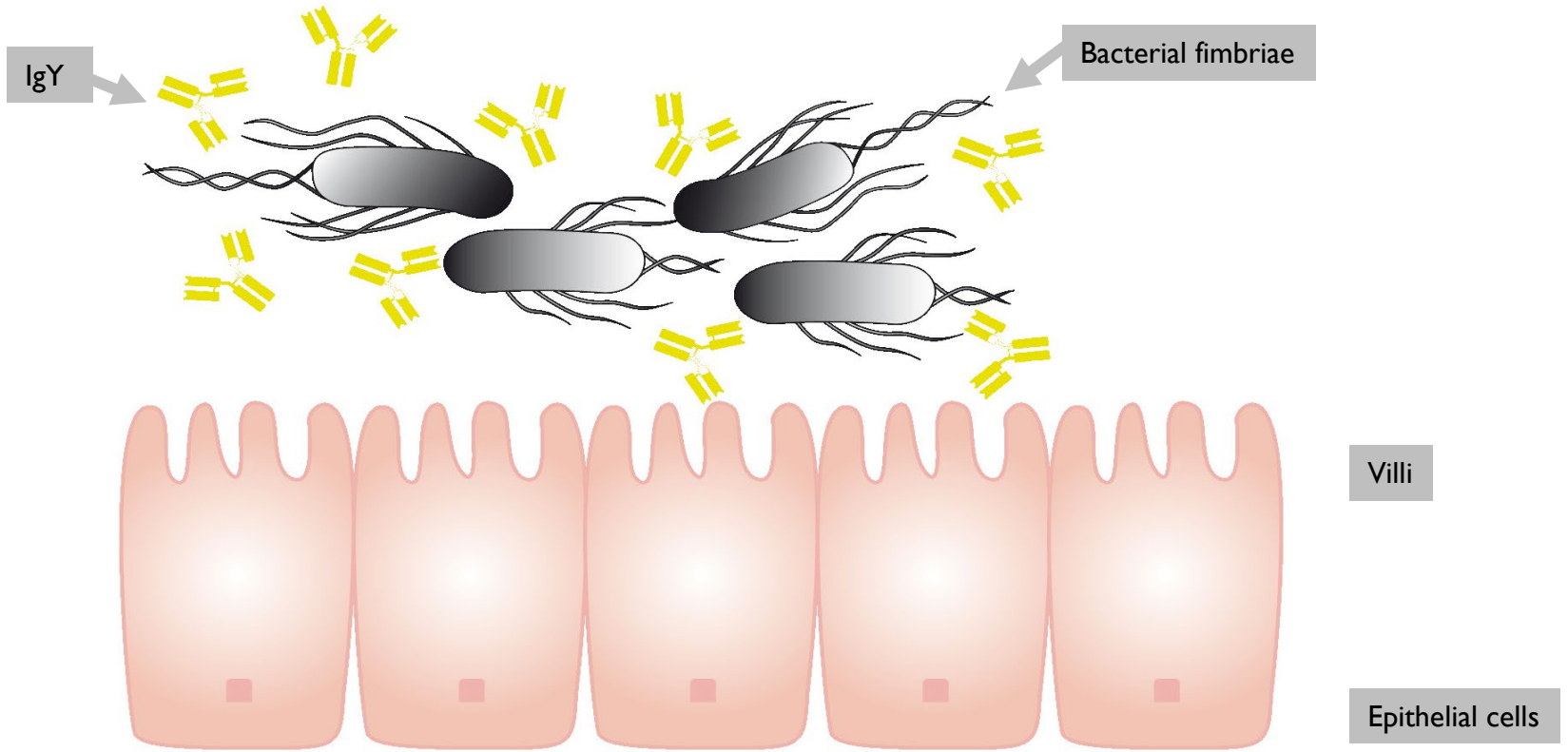
Step 1: ETEC strains adhere to enterocytes by fimbrial adhesions and colonize.

Mechanism of pathogenesis due to *Escherichia coli*



Step 2: Enterotoxins release from colonizing ETEC strain and trigger severe diarrhea, thus causing considerable economic losses.

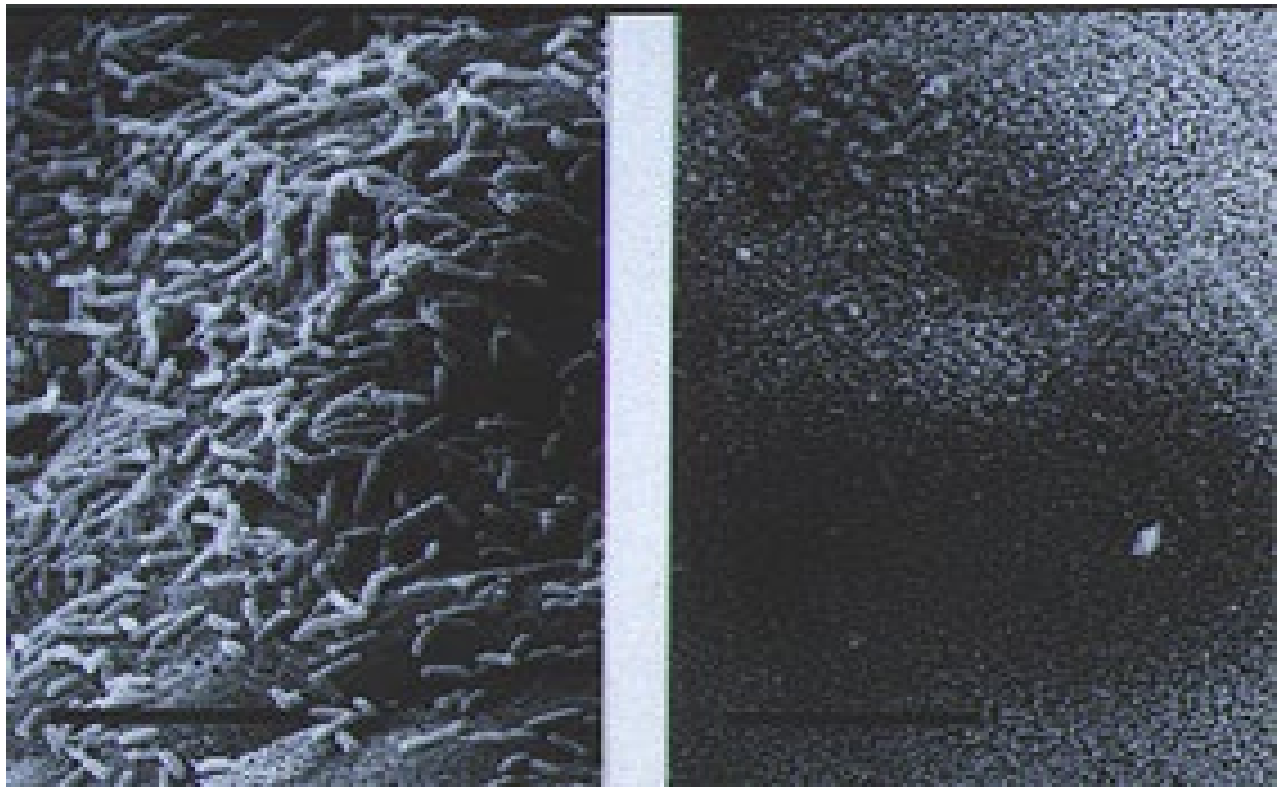
Mechanism of pathogenesis due to *Escherichia coli*



IgY can effectively block the initial stages of the colonization process

Attachment inhibition (bacteria)

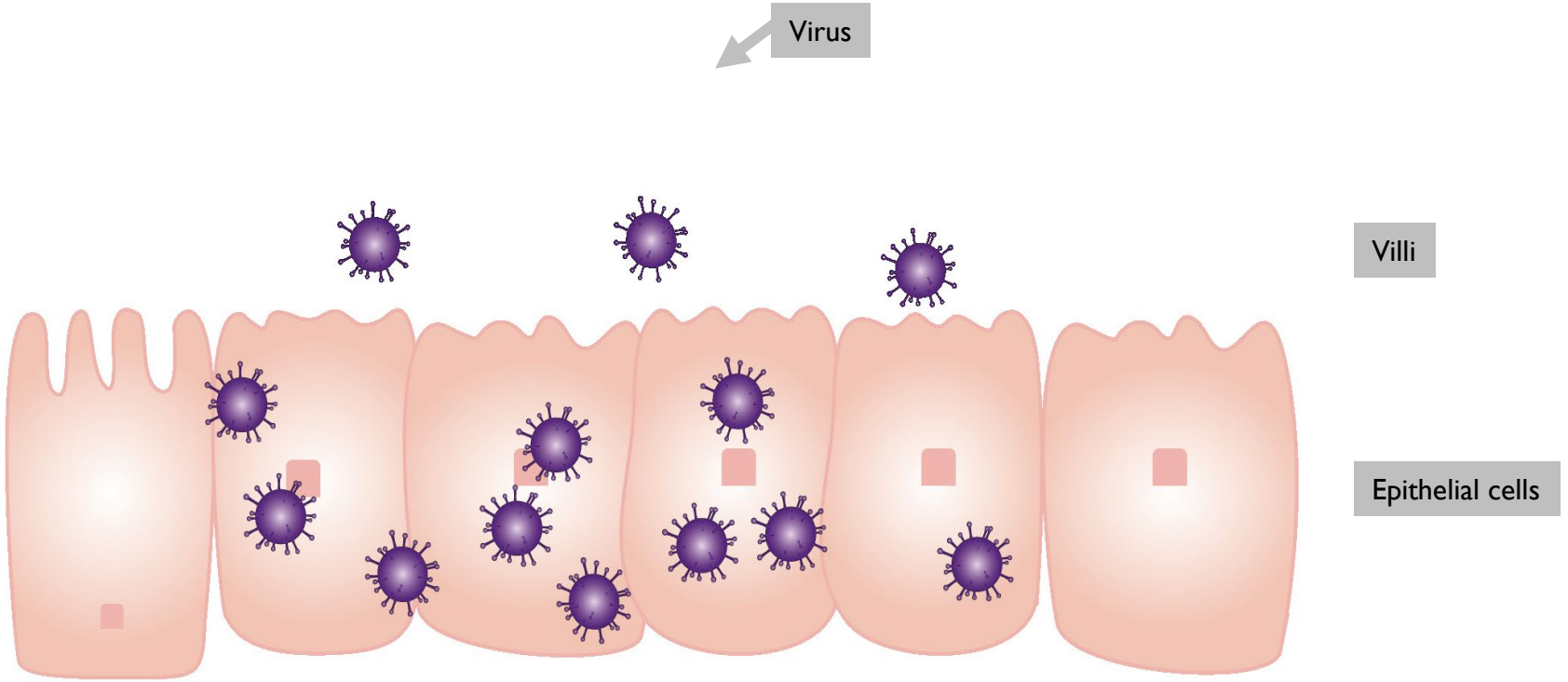
***Escherichia coli* challenge trial with piglets**



Control **IgY**

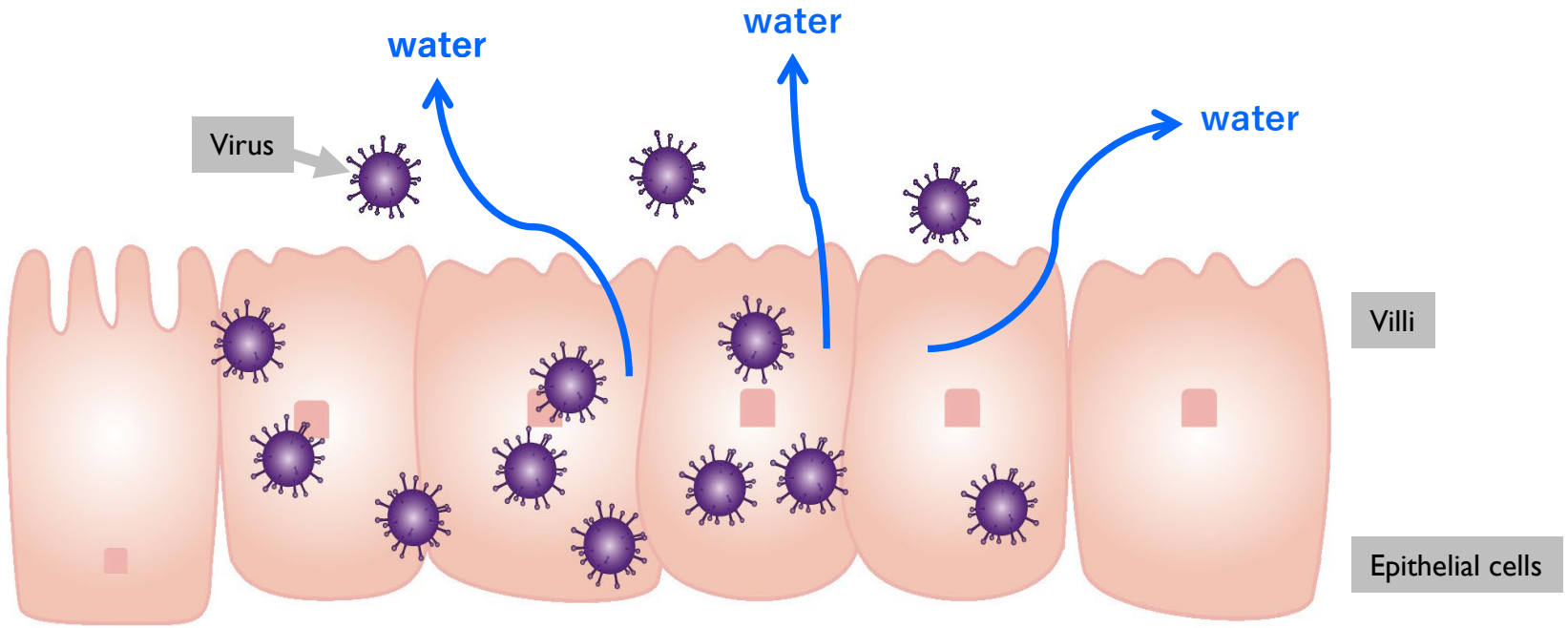
(Yokoyama et al. 1992)

Mechanism of pathogenesis due to viral infection



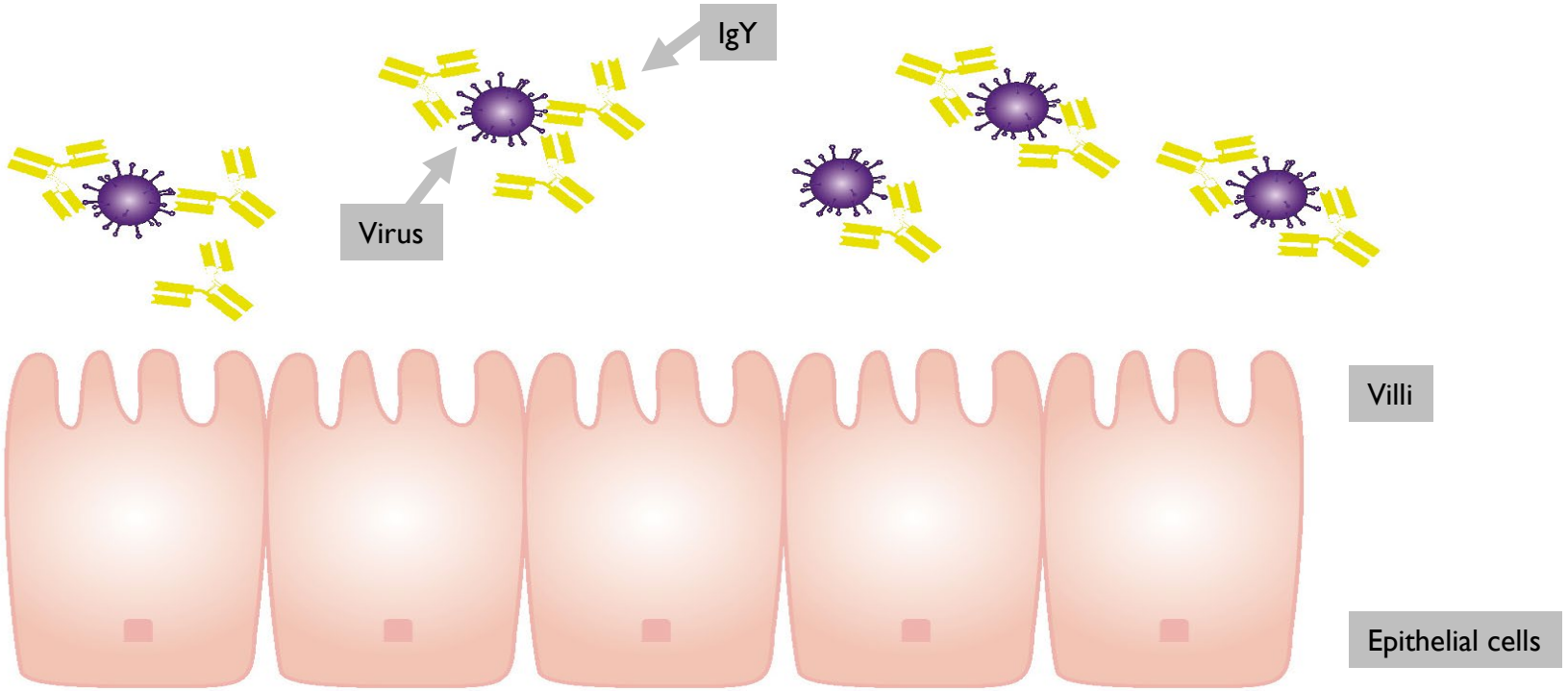
Step1: Virus attachment to the cell surface receptors is responsible for virus infectivity as virus replicates into the enterocytes

Mechanism of pathogenesis due to viral infection



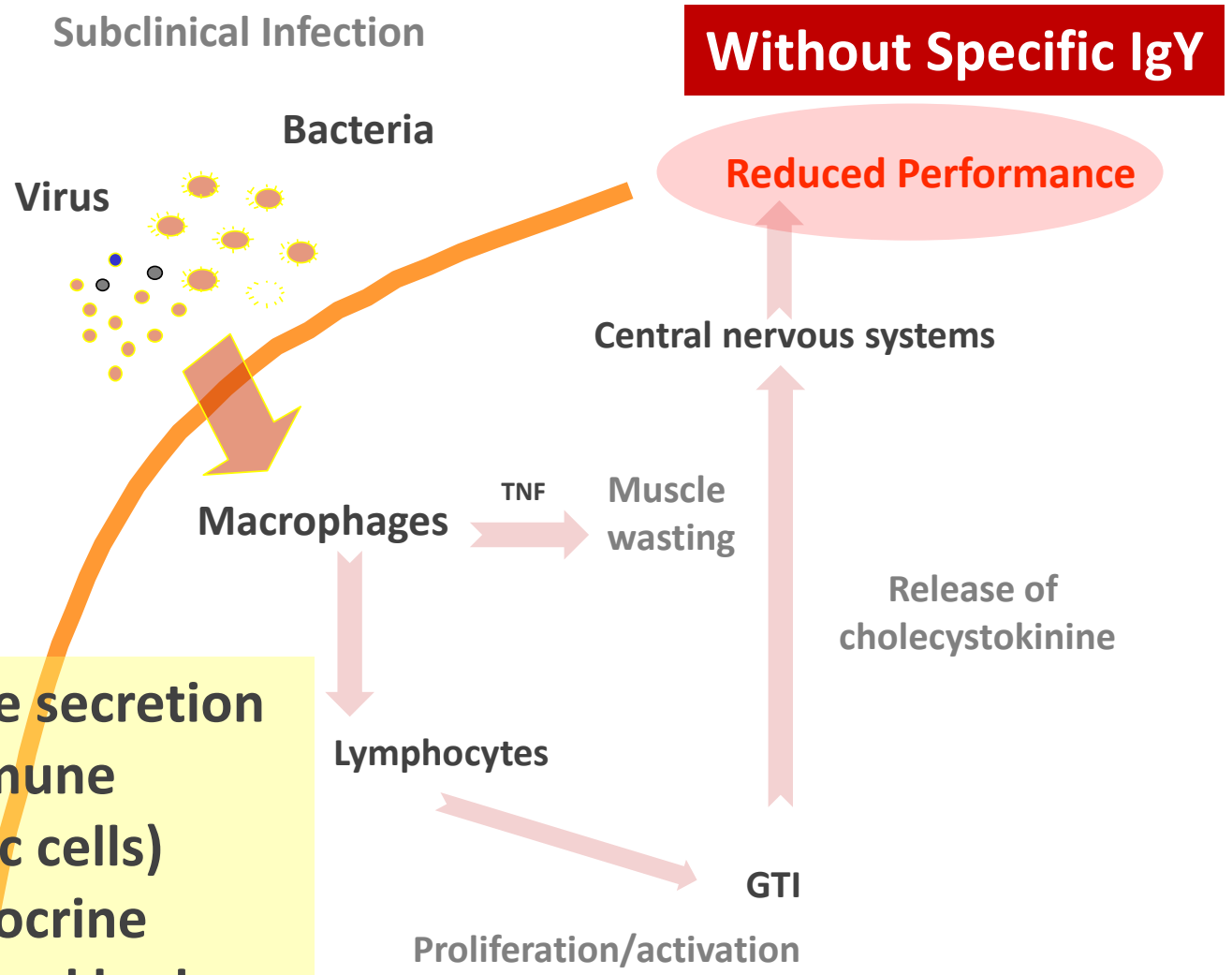
Step 2: Virus replication results in intestinal villous epithelial cell dysfunction / death and digestive and absorptive functions rapidly decrease

IgY can effectively block initial stages of infection process



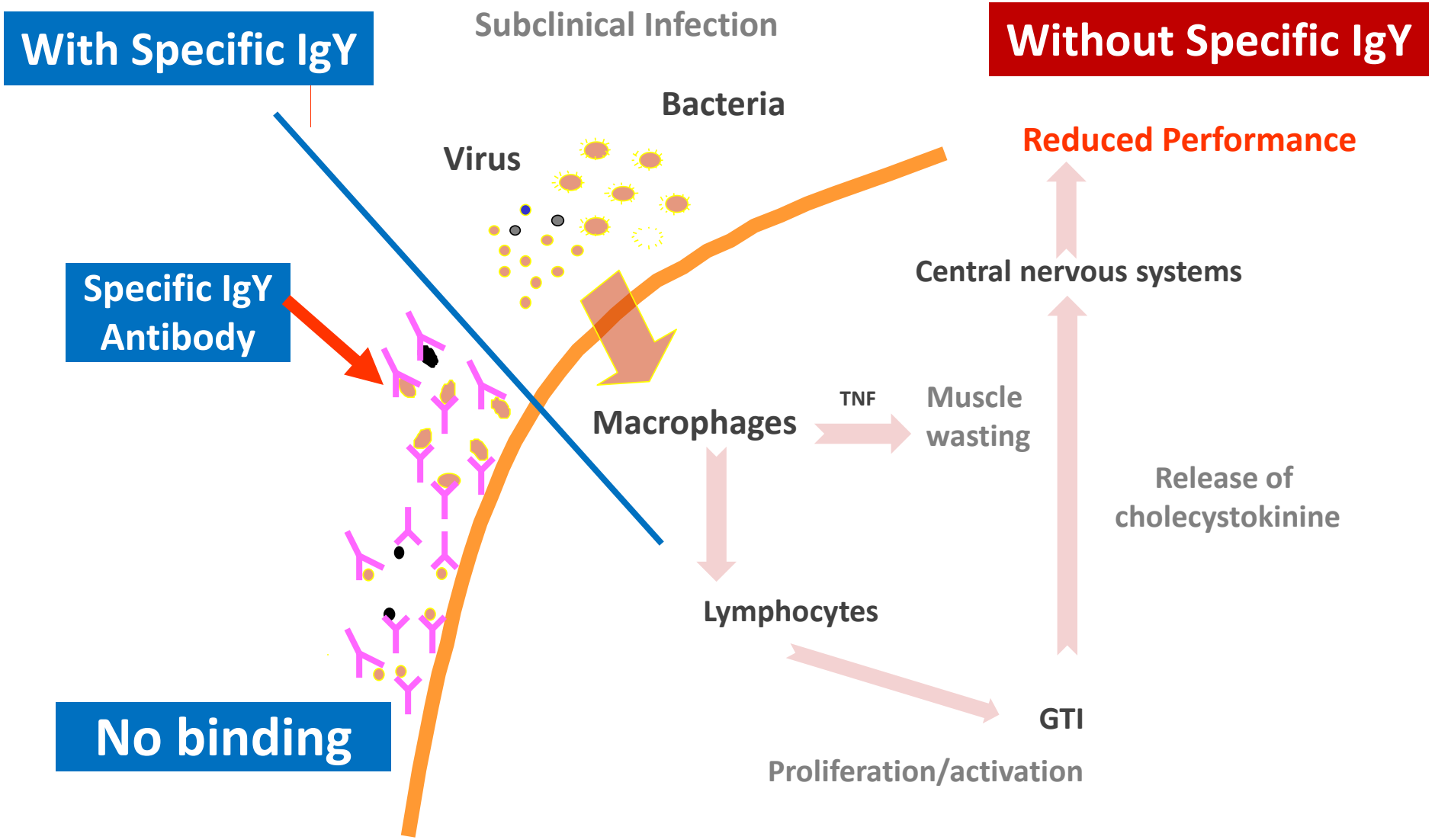
IgY can effectively block initial stages of the infection process

How do Antibodies work in the immune system ?



- Initiated IS - cytokine secretion
- Activate cellular immune response (phagocytic cells)
- Altering several endocrine processes in the animal body

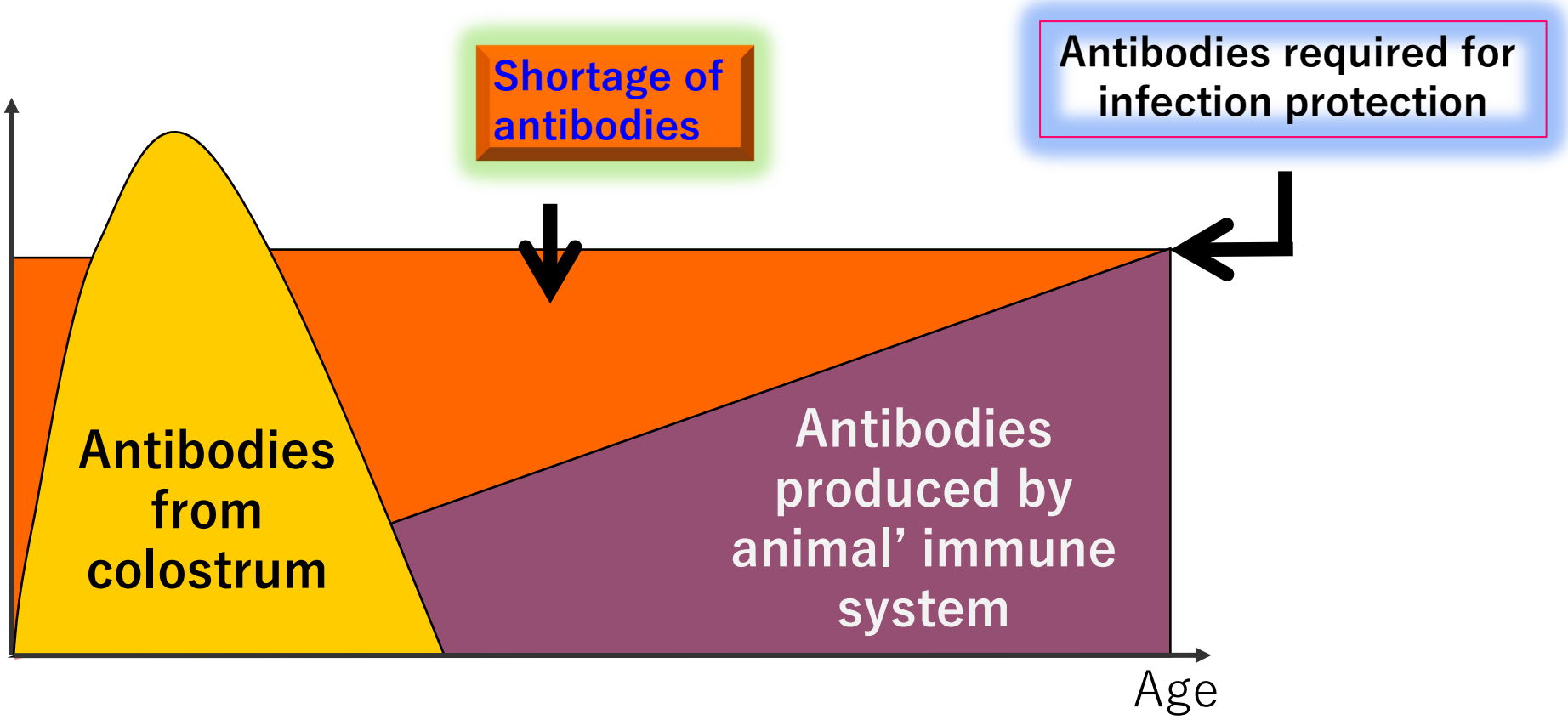
How do Antibodies work in the immune system ?



Concept

Importance of Immunoglobulin (Antibodies)

Change in the amount of antibodies in animal' body



Concept

Application of Specific IgY as Functional Ingredient

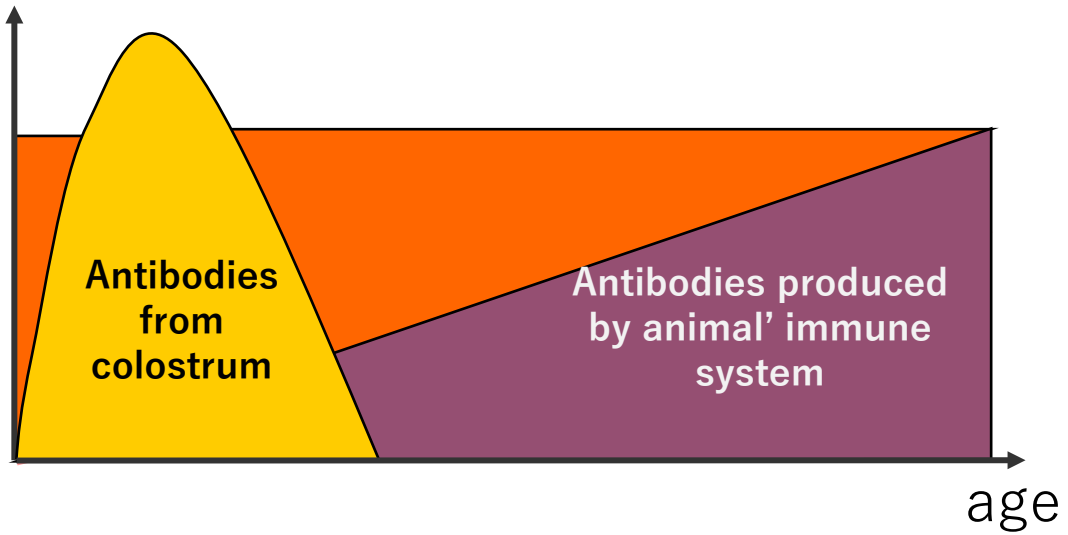
Characteristics of Specific IgY

Additional Specific IgY to support immunity along with colostrum

Active ingredient＝ Immunoglobulin Yolk : IgY

☆ Specific IgY given within 2 days of birth shift to the blood stream.

☆ After 3 days of birth, milk does not contain antibodies therefore the shortage of antibodies occurs in the intestinal tract.



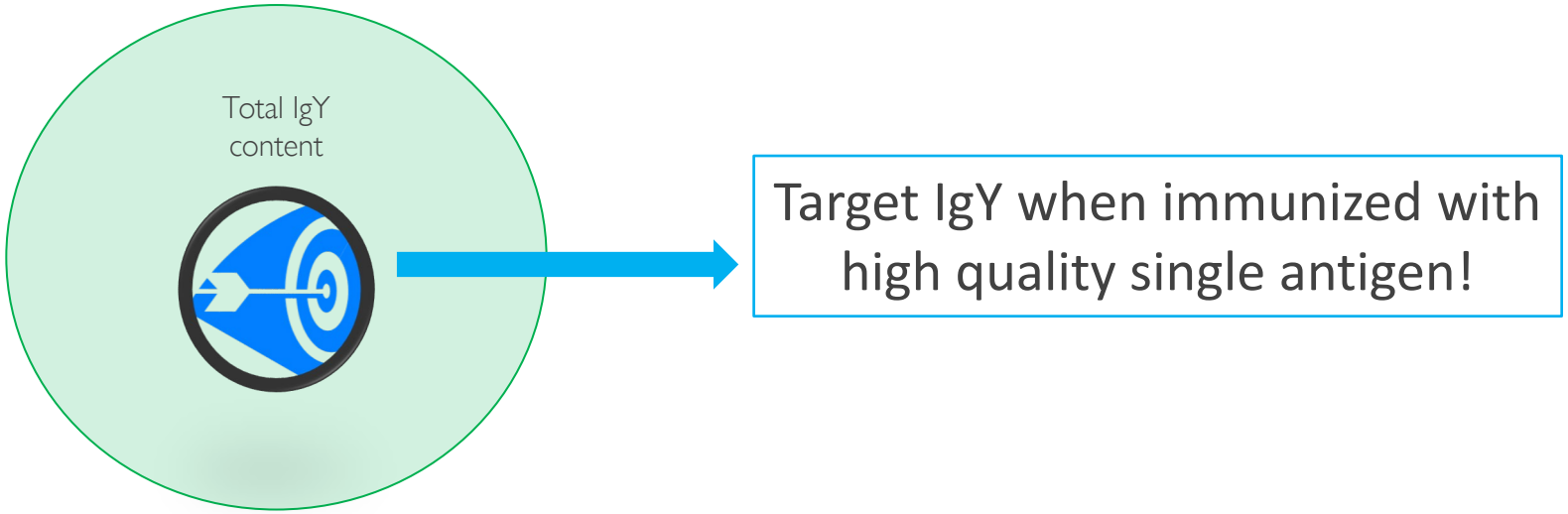
IgY Quality – What else make us different?

- Single antigens → Importance of the right target antigens:
  - From production to target animals!
  - To make one antibody we need to immunize animals with that antigen!
  - Using single antigen is the only way ***to ensure consistent quality of antibody products***.
  - Different antibodies bind to pathogens and neutralize them!

- Standardized antibody levels!!
- Without standardized antibody titer the product can not delivery constantly the same results
  → Customers need standard antibody level each delivery!
- IRIG know-how → Reliable methods of measuring antibody titer

IgY Quality – What else make us different?

- Different antibodies or total Ig?
  - Some products such as plasma and colostrum may contain high concentration of Ig;
  - Unclear regarding the titer of different Ig
  - May be low and in inconsistent or unbalanced levels.



Gastrointestinal stability of IgY

The IgY concept: Scientific Information

Stability of IgY in gastrointestinal tract of animal

Calf: The Journal of Veterinary Medical Science (1996, 58: 365-367)

Piglet: American Veterinary Medical Association (1993, 54: 867-872)

- Assumptions: IgG is not stable under acidic conditions and easily "damaged" already in the stomach.
- ETEC and rotavirus mostly proliferate in the small intestine – major cause of diarrhea and death in animal.
- "Successful passive immunization":
- Antibodies must pass safely through the stomach and exert their function in the small intestine.

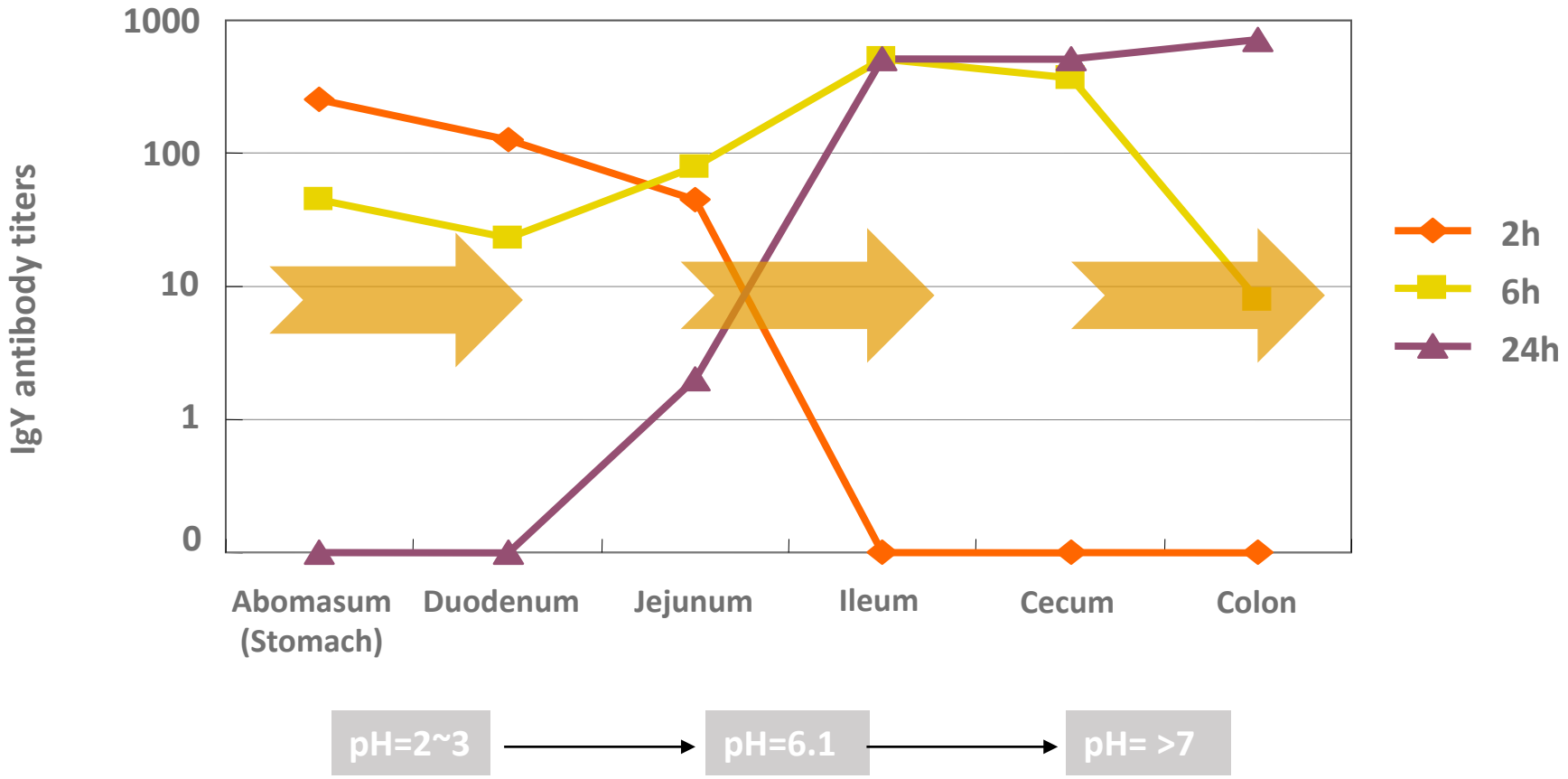
The IgY concept: Scientific Information

J.Vet.Med.Sci.58(4): 365-367,1996

- IgY antibody administration was done at day 7 after birth.
- Ingesta samples were collected at 2, 6, and 24 hours after antibody administration.
- Antibody titer in the gastrointestinal tract of young animal measured by ELISA.

Stability of IgY in the gastro-intestinal tract in calf

J.Vet.Med.Sci.58(4): 365-367,1996



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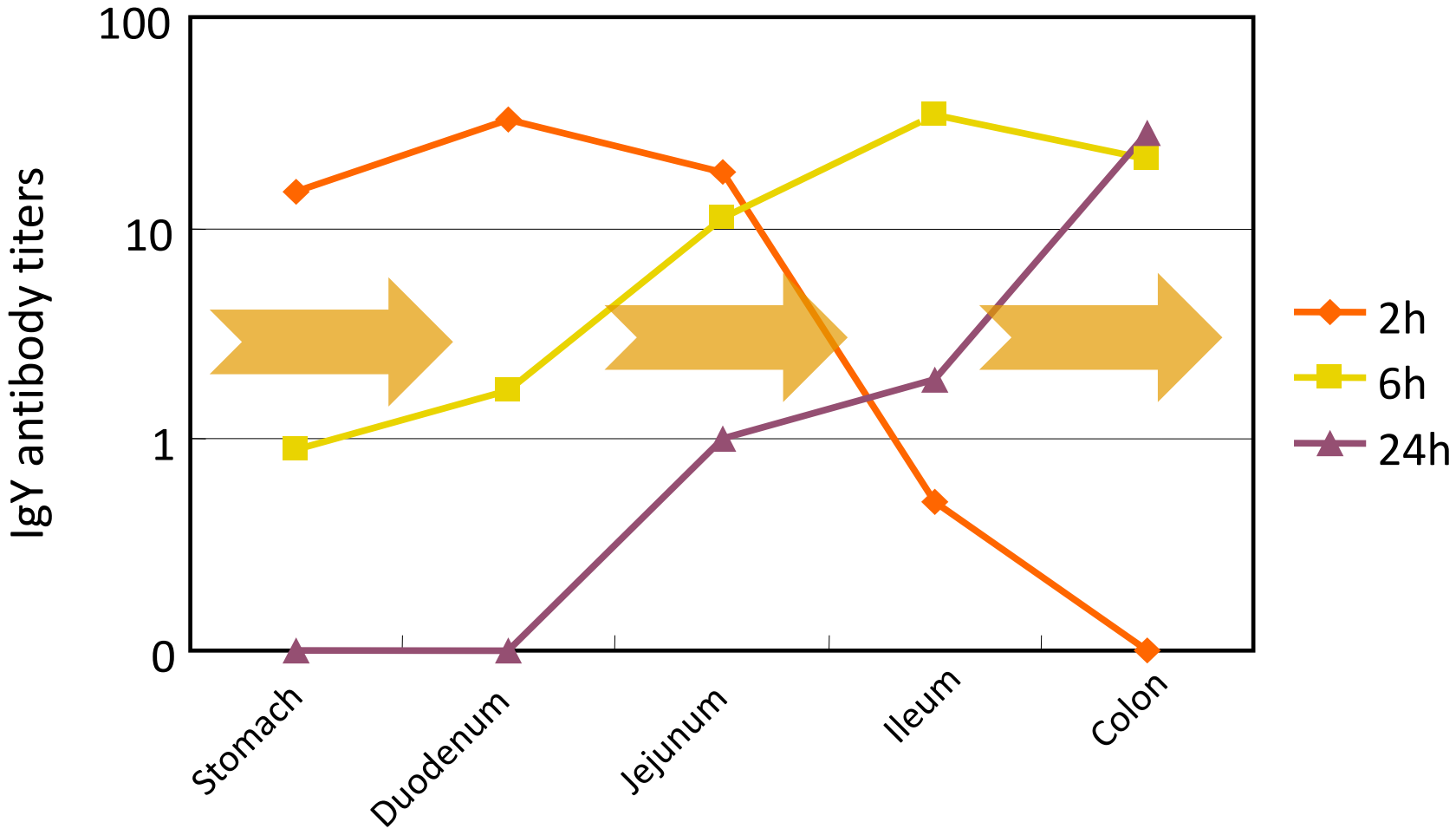

IgY antibody for animals care

For pigs

- Porcine Rotavirus
- Transmissible gastroenteritis virus (TGEV)
- Porcine epidemic diarrhea virus (PEDV)
- *E. coli* (Fimbriae types: K88, K99, 987P, F18, O141)
- *Salmonella* Typhimurium
- *Clostridium perfringens* (Serotypes A, C)

For calves

- Bovine Rotavirus (G-types: 6, 10)
- Bovine Coronavirus
- *Salmonella* Typhimurium, *Salmonella* Dublin
- *E. coli* (Fimbriae types: K99, F41)
- *Clostridium perfringens* (Serotypes A, C)
- *Cryptosporidium parvum*

For pets

- Parvovirus
- Periodontal disease (Porphyromonas gingivalis)
- Giardiasis (*Giardia intestinalis* (lamblia))

For chickens and pigeons

- *Clostridium perfringens* (Serotypes A, C)
- *Salmonella* Enteritidis

For fish

- Koi herpes virus
- Gold fish herpes virus
- *Aeromonas hydrophilia*
- *Aeromonas salmonicida*
- *Flavobacterium psychrophilum*
- *Edwardiella tarda*

IgY antibody for human health care

Oral care:

- Dental caries: *Streptococcus mutans*, cell-associated glucosyltransferase
- Periodontal disease: *Porphyromonas gingivalis*, gingipains
- Candidiasis: *Candida albicans*

Gastrointestinal care:

- Gastric ulcer: *Helicobacter pylori*, urease
- Rotavirus enteritis: Human Rotavirus
- Norovirus infection: Norovirus
- Influenza infection: Influenza virus, A-types: H1N1, H3N2, and B-types
- Metabolic syndrome: Lipase