Poultry TechniClass - Series 9:

Disease Challenge & Vaccination Strategies in Broilers

SCIENCE and PRACTICE

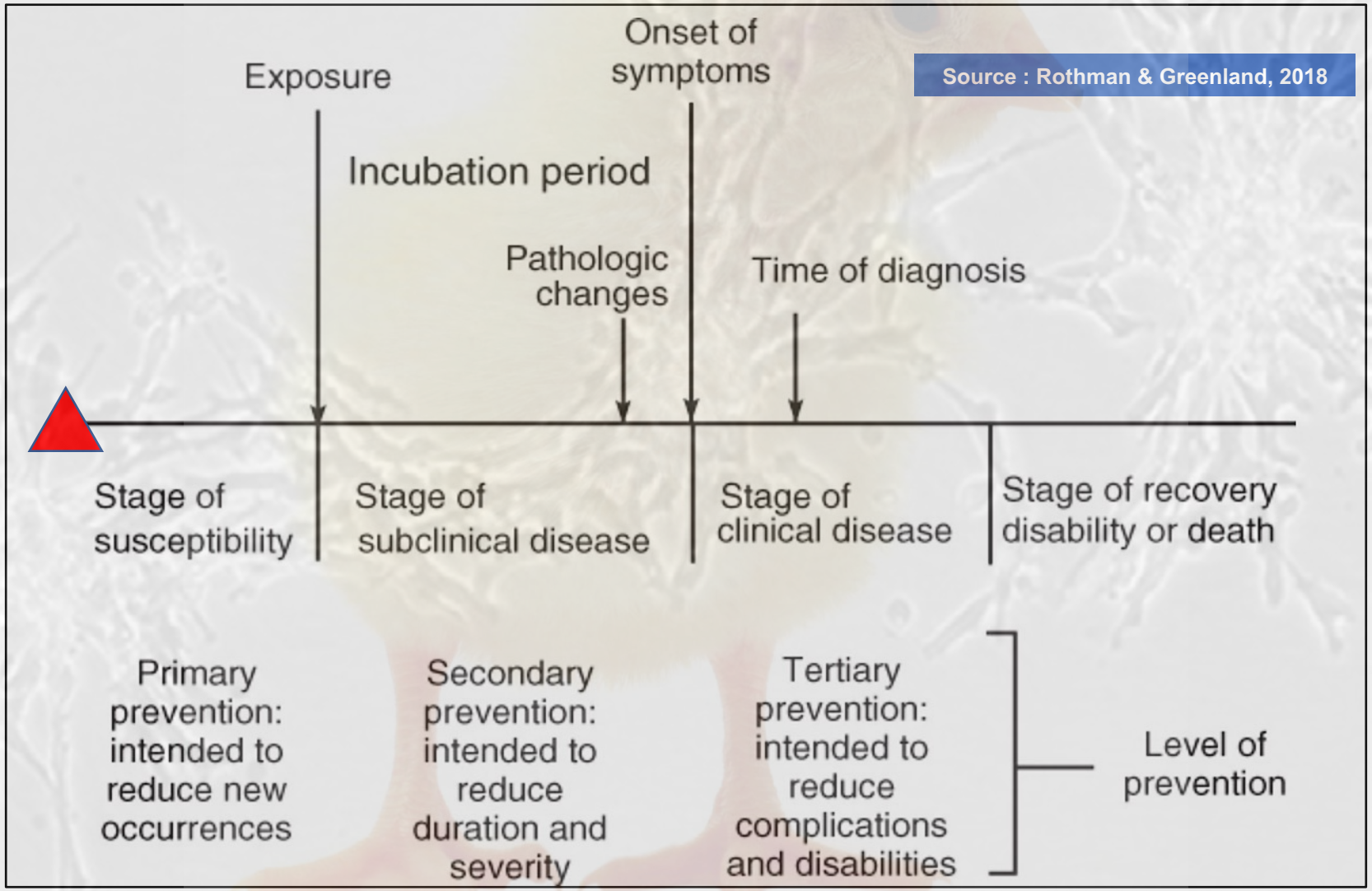
Prepared for:

POULTRY INDONESIA

Jakarta, November 24th 2022

Early Challenge of Infectious Diseases

Airborne, Endemic & Vertically Transmitted Diseases



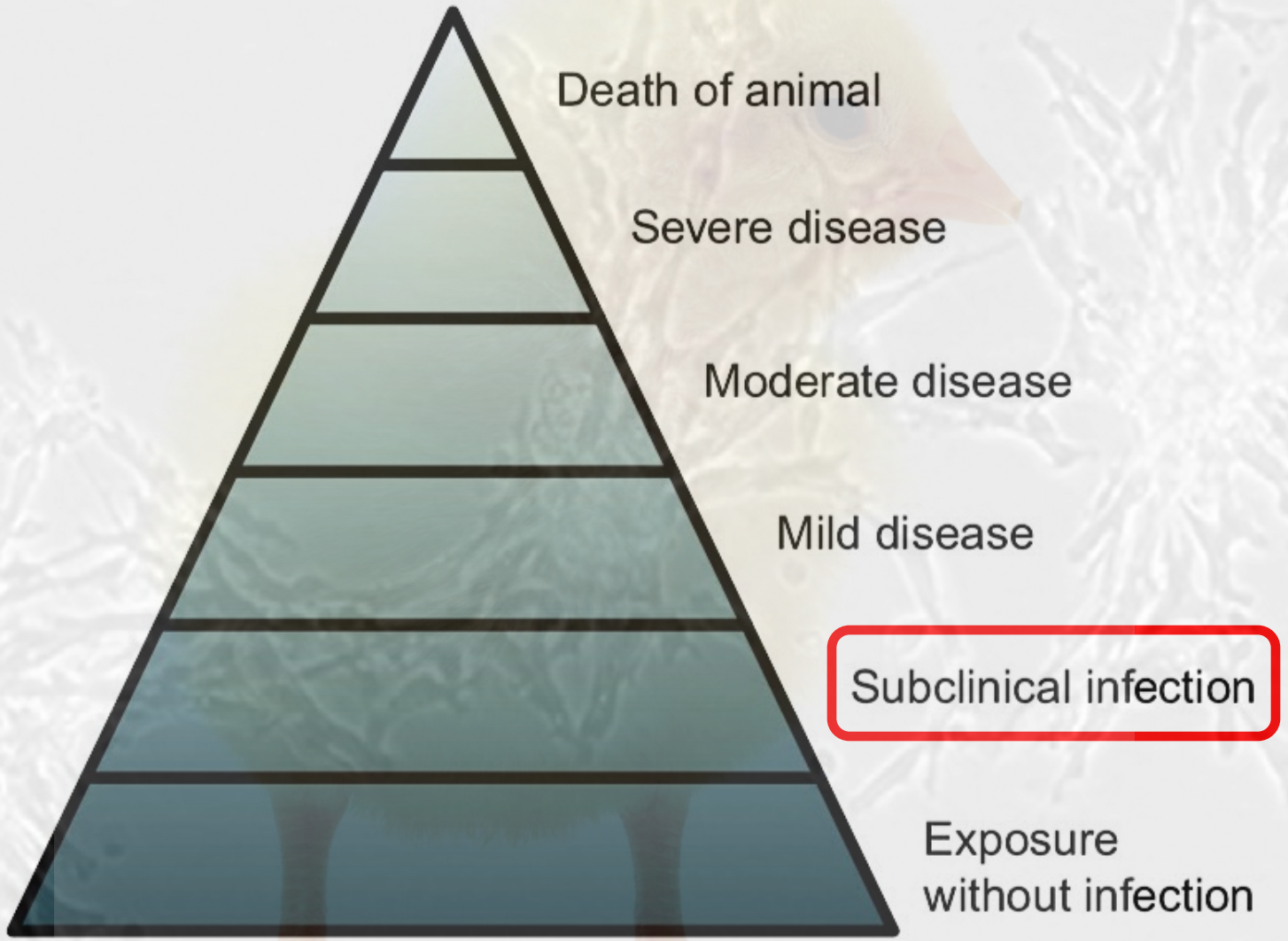
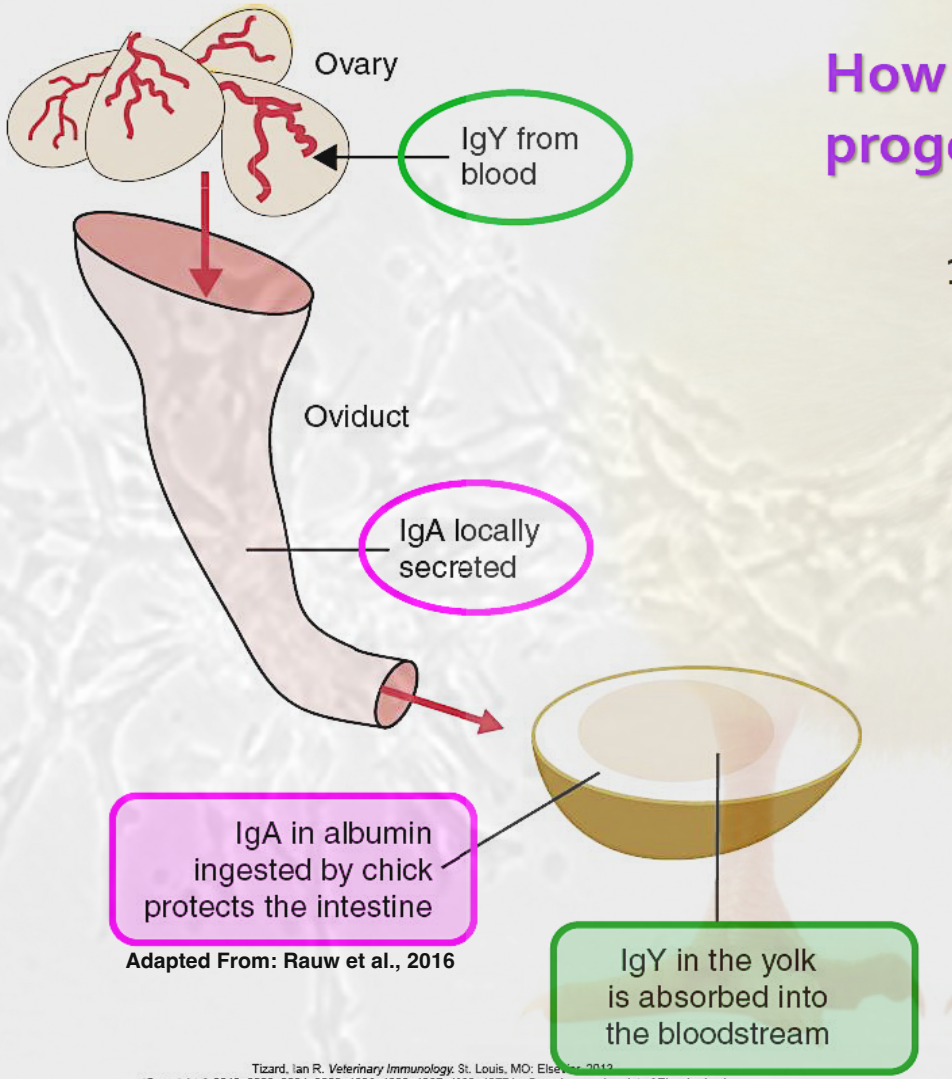


FIGURE 3.1 The iceberg concept of viral infection and diseases.

Source: Fenner F et al., 2016

- Maternal Derived Antibodies (**MDA**) or Passive Immunity is the naturally transfer of antibodies from immunized breeder hens to the progeny through the egg
- To protect young chicks against pathogens during a period (1-2 weeks and less than 4 weeks) where their immune system is not fully mature.



Adapted From: Rauw et al., 2016

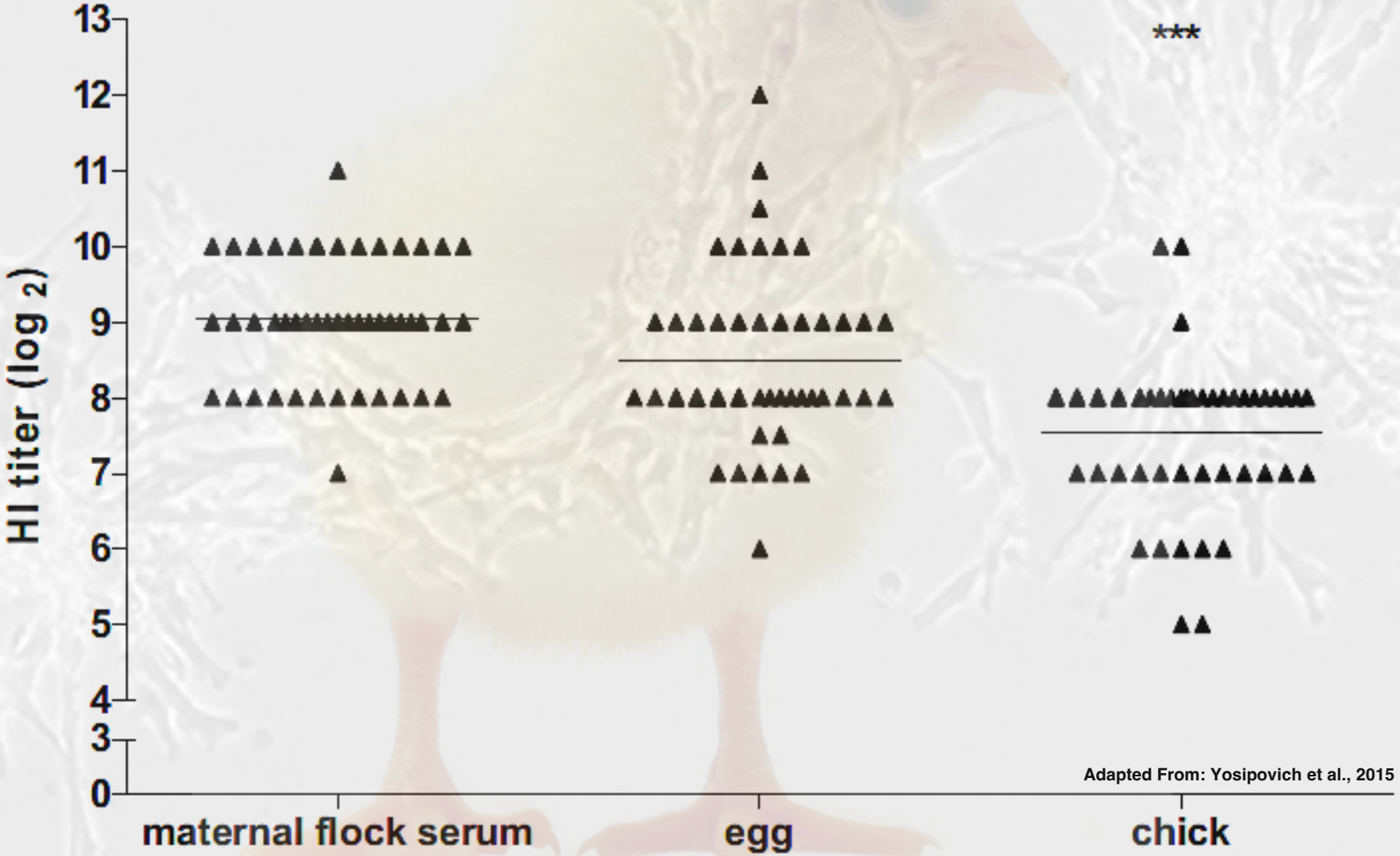
Tizard, Ian R. *Veterinary Immunology*. St. Louis, MO: Elsevier, 2013.
(Copyright © 2013, 2009, 2004, 2000, 1996, 1992, 1987, 1982, 1977 by Saunders, an imprint of Elsevier Inc.)

How MDA are transferred from the hen to the progeny ?

1. MDA transfer from the hen to the egg
   - **IgG(Y)** are secreted by the chicken ovarian into the developing ova or egg yolk
   - **IgA and IgM** are produced locally in the magnum in the oviduct and transfer to the albumen

Immunoglobulins in Poultry			
	Ig A	**Ig G (Y)**	**Ig M**
Function	mucosal immunity	long lasting circulating	early protection
Time to appear after contact with antigen	3 – 7 days	2 – 5 days	3 – 7 days
Time to get maximum level	18 – 23 days	5 days	5 – 7 days

ND IgY: Maternal - HE - DOC Serum



Transfer of Maternal Ig to Offspring

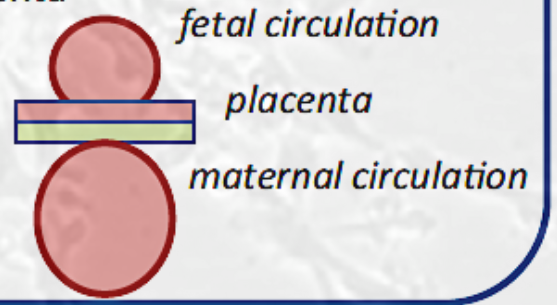
Fetal stage – mother to embryo immunoglobulin transport

FISH & BIRDS	PRIMATES & RODENTS	DOG, CAT, MINK	RUMINANTS, PIGS, HORSES
Active transport /yolk sac	Active transport Hemochorial placenta	Limited transport Endotheliochorial placenta	No transport Epitheliochorial placenta







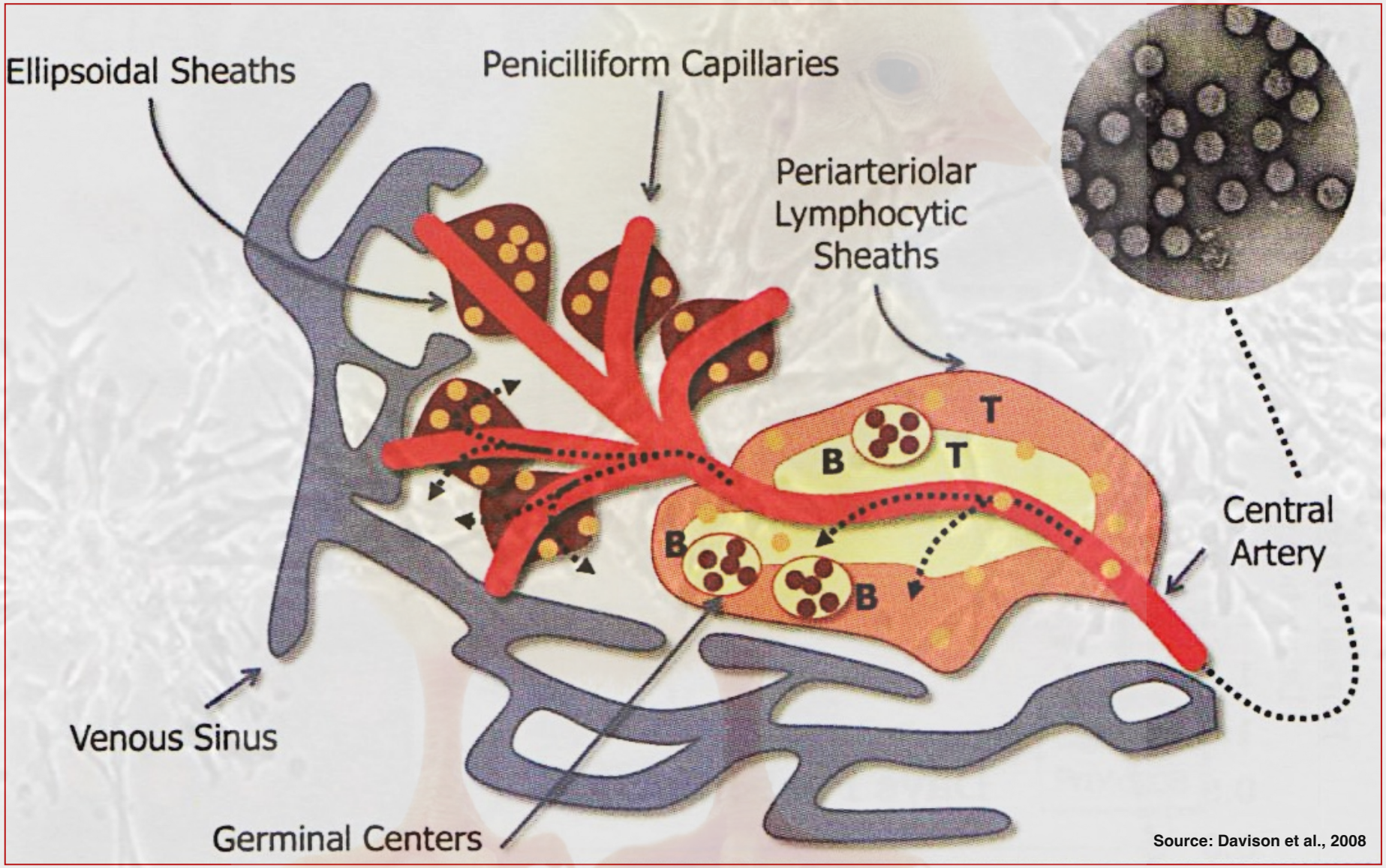


Neonatal stage – circulating immunoglobulins

IgM (fish) **IgY** (birds)	**IgG**	**IgG** (low levels)	No circulating Ig's
Gut uptake: (open gut)			
No	**No**	**Yes** (< 36 h after birth)	**Yes** (< 24 h after birth)

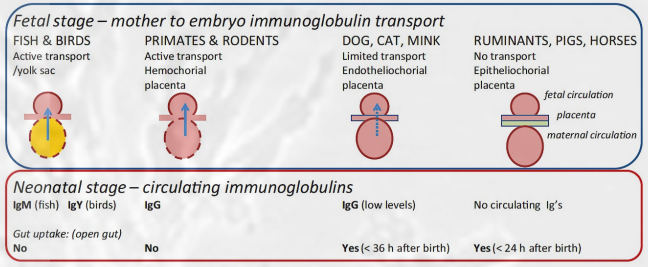
Adapted From: Dijk et al., 2018

PERSISTENT INFECTION of VIRUSES



Pathogenesis of IBDV in Modern Birds

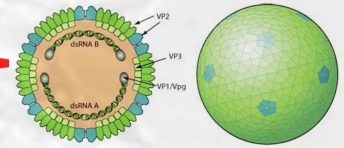
Fecal …. Oral/Inhalation



Adapted From: Dijk et al., 2018

Virus replicates in gut epithelium and associate with macrophages/DCs and lymphoid cells

Results in primary viremia through portal circulation



Virus spreads to Bursa Fabricius (11 hours post-inoculation)

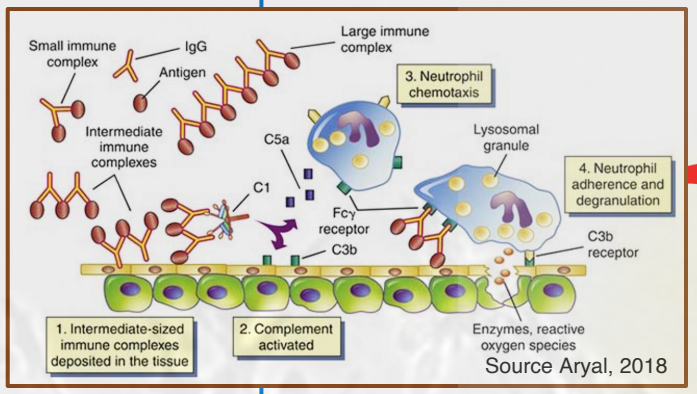
Active replication of virus in bursal follicles and B-cells

Spreads to bloodstream and causes secondary viremia

Leads to cause lesions in organs like muscles & kidney causing clinical signs & death

Source: Sharma et al., 2000; Shah et al., 2021; Chen et al., 2022

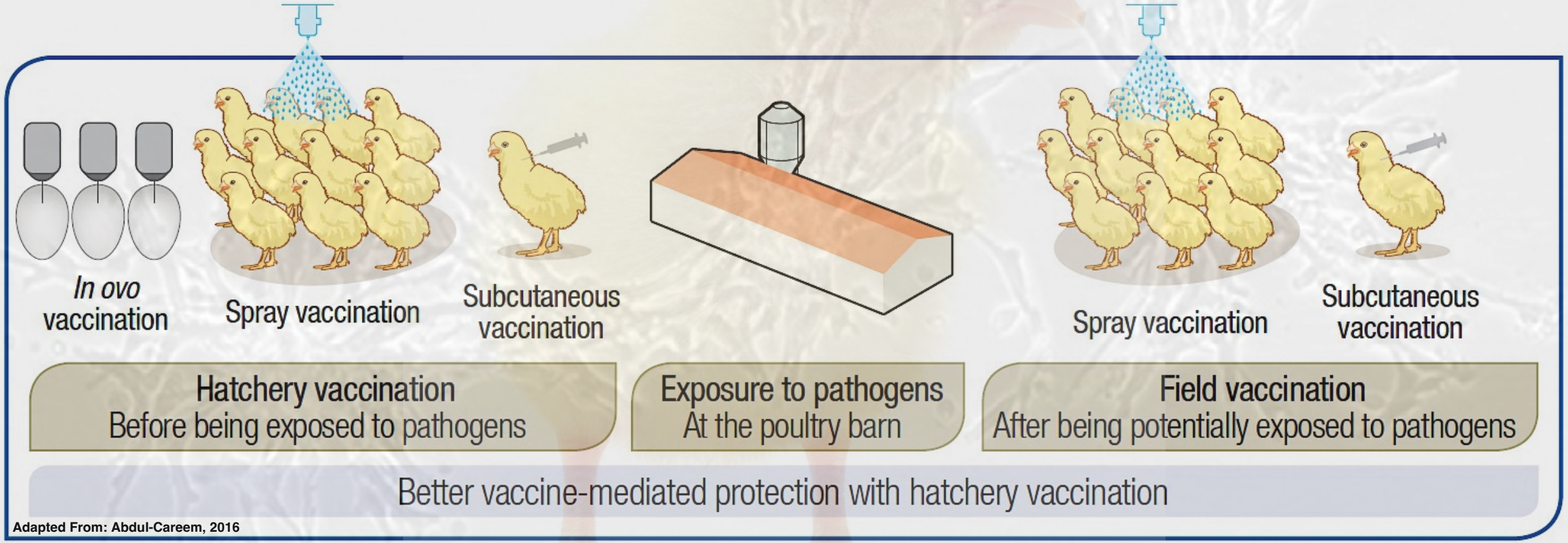
IBD Hypersensitivity Type-3 (Arthus Reaction)



Source Aryal, 2018

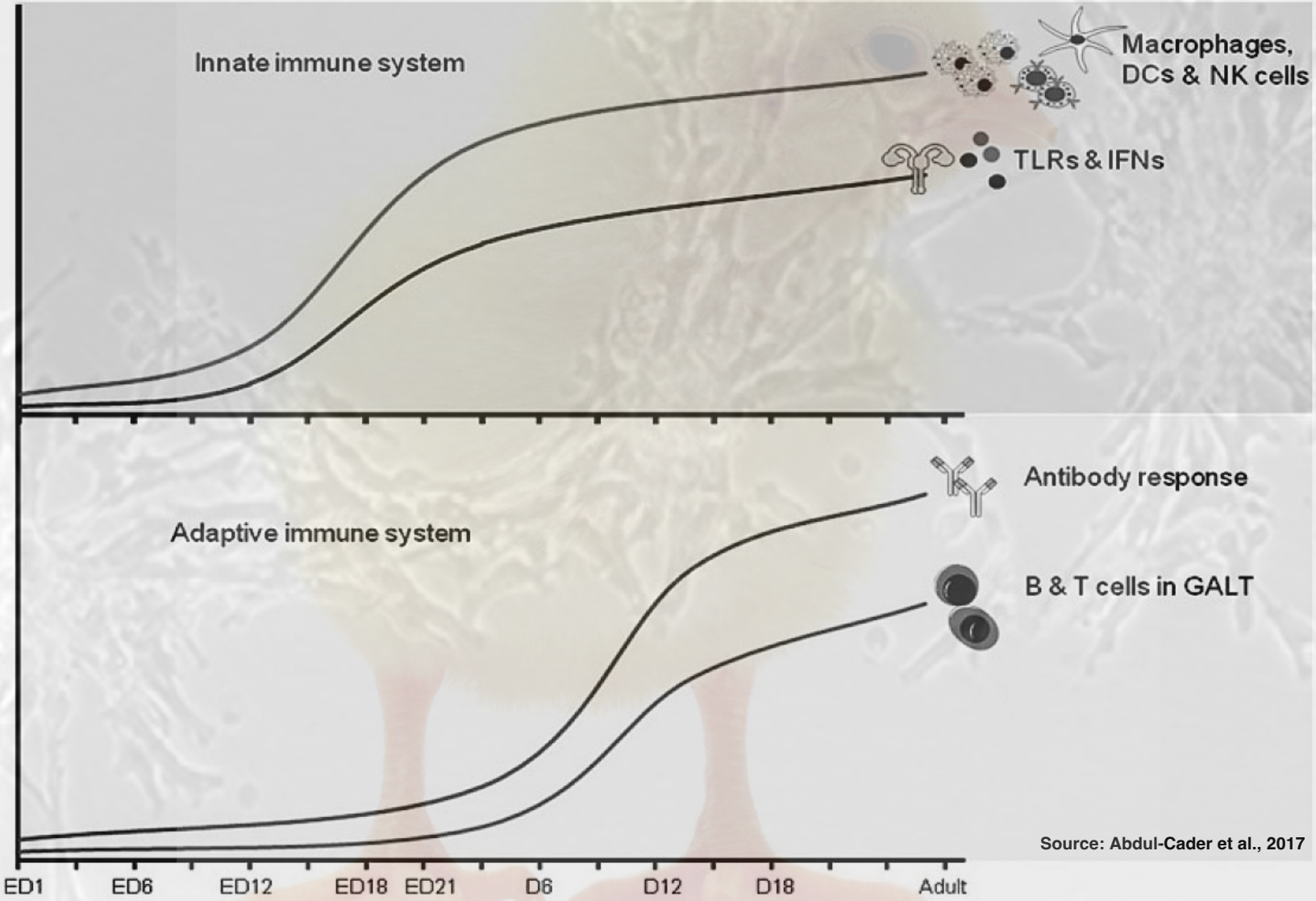
Source Tizard, 2013

Field vs Hatchery Vaccination



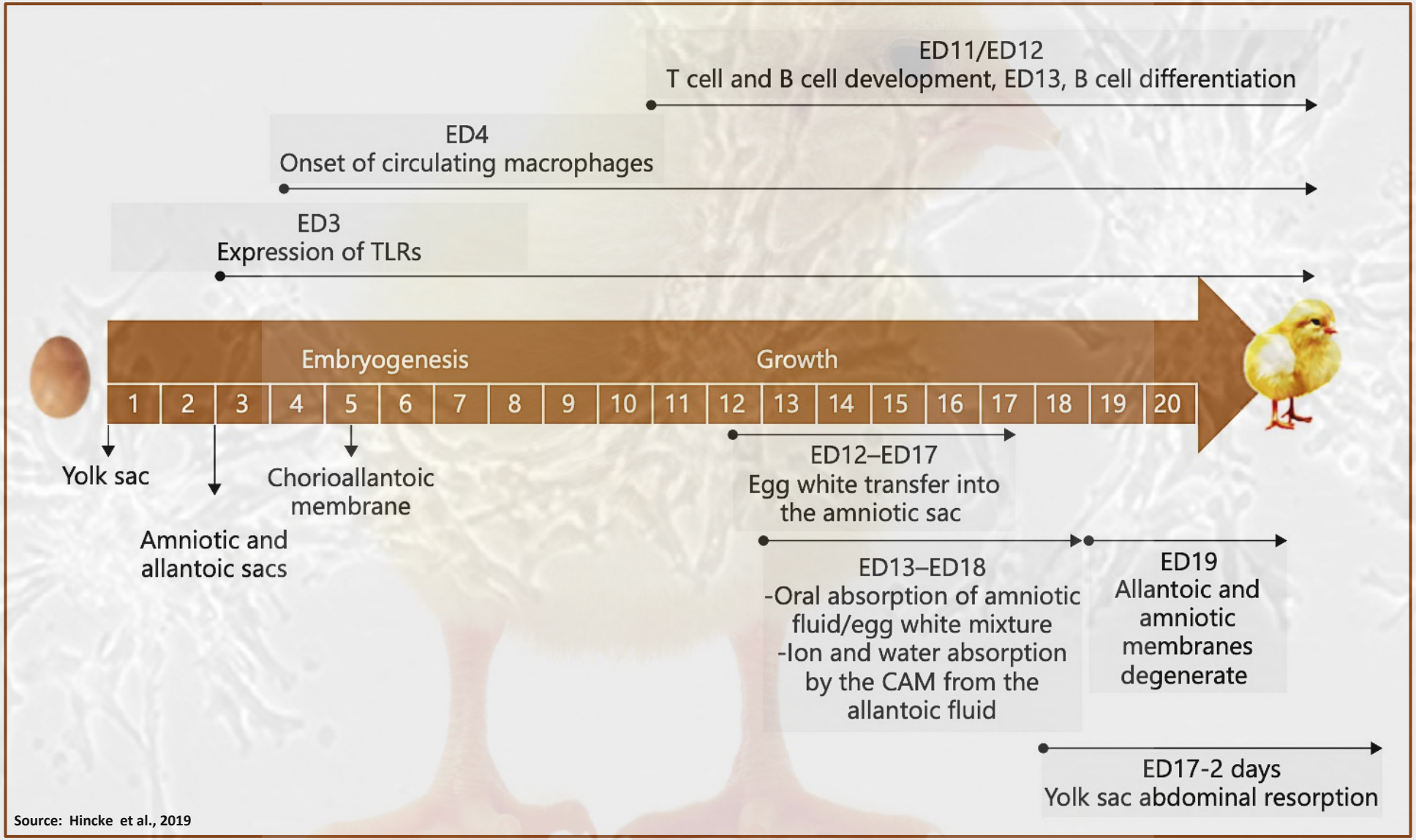
Adapted From: Abdul-Careem, 2016

Development of Avian Immune System



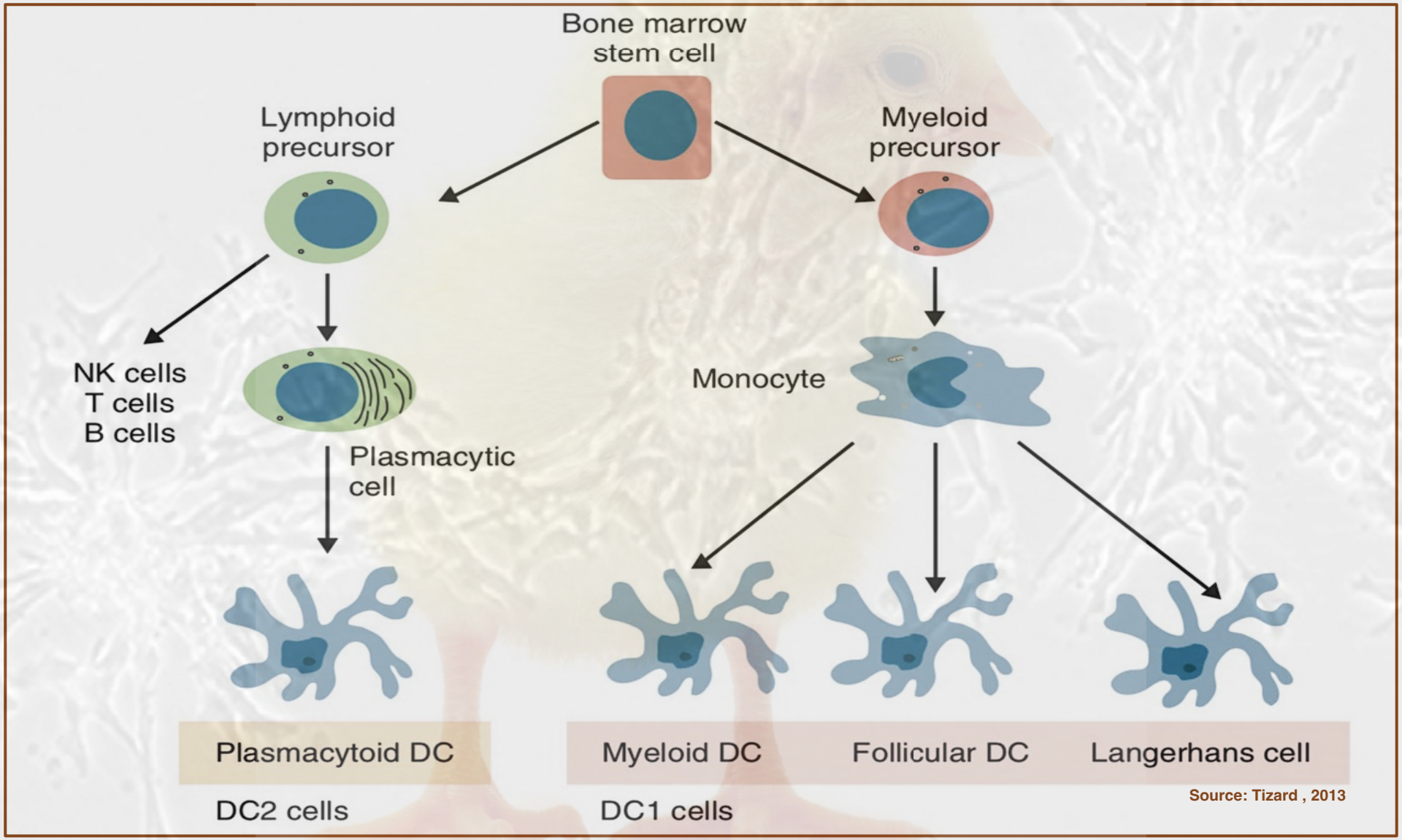
Source: Abdul-Cader et al., 2017

Development of Avian Immune System

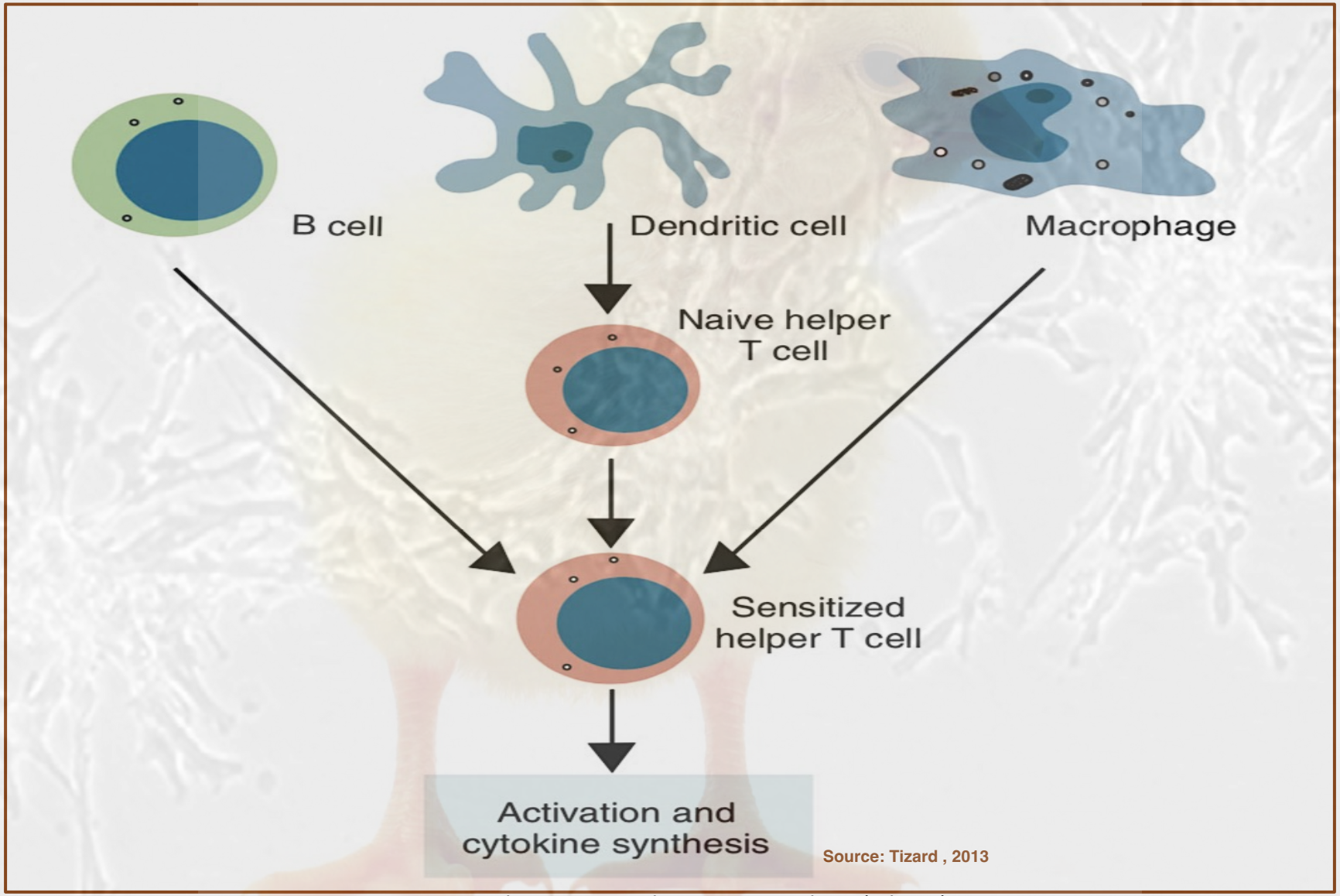


Source: Hincke et al., 2019

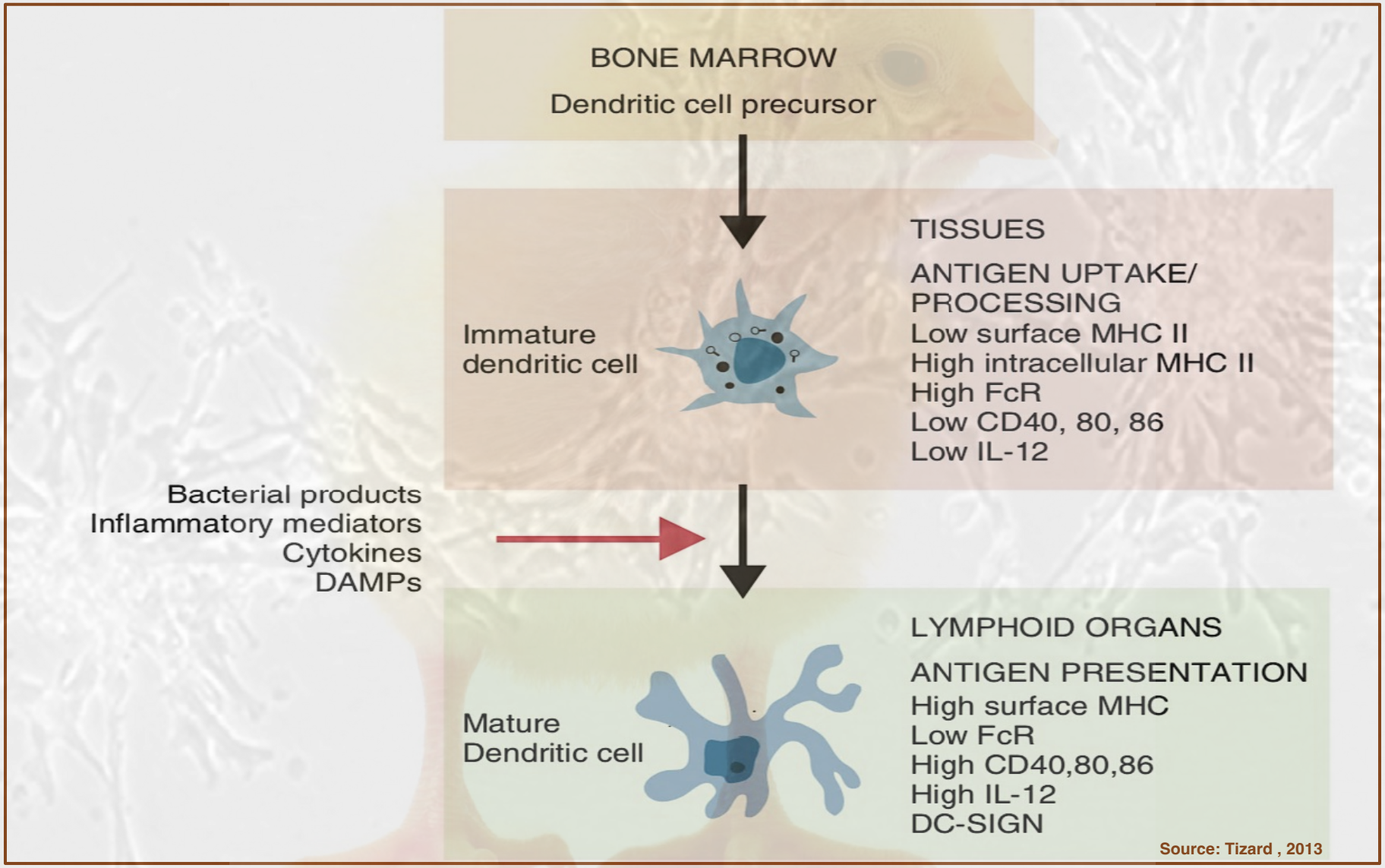
Avian Dendritic Cells



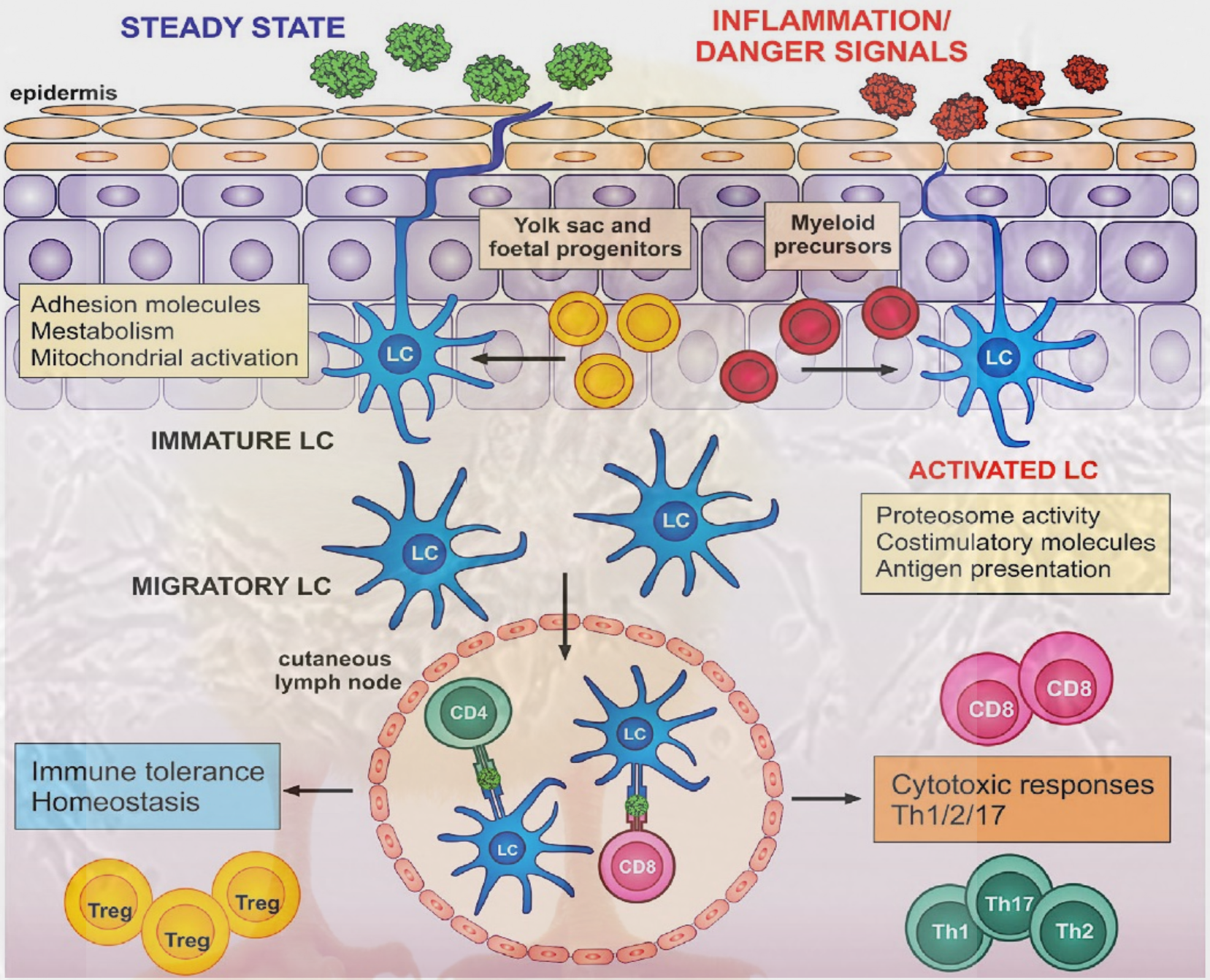
Avian Dendritic Cells



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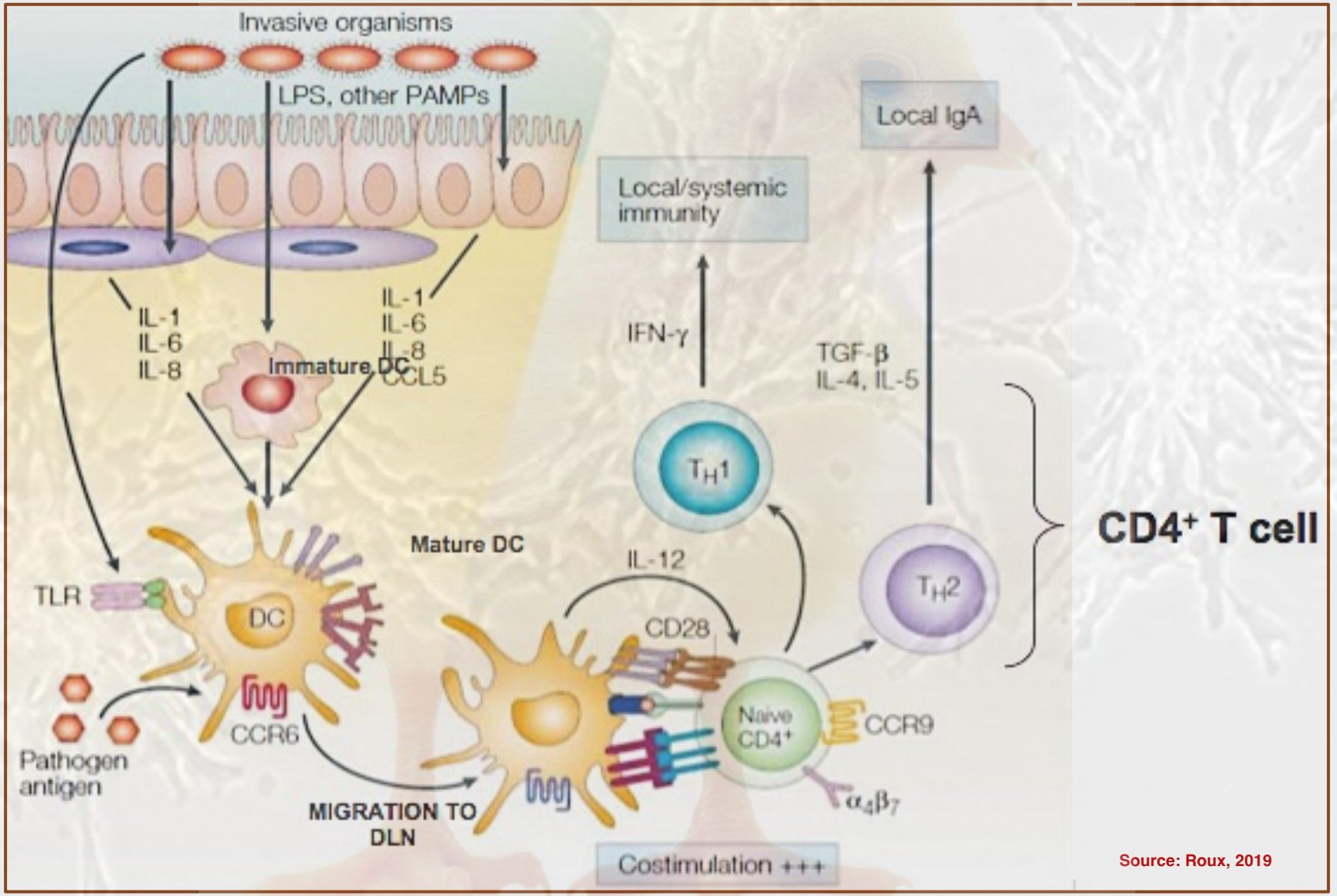


Langerhans Cells

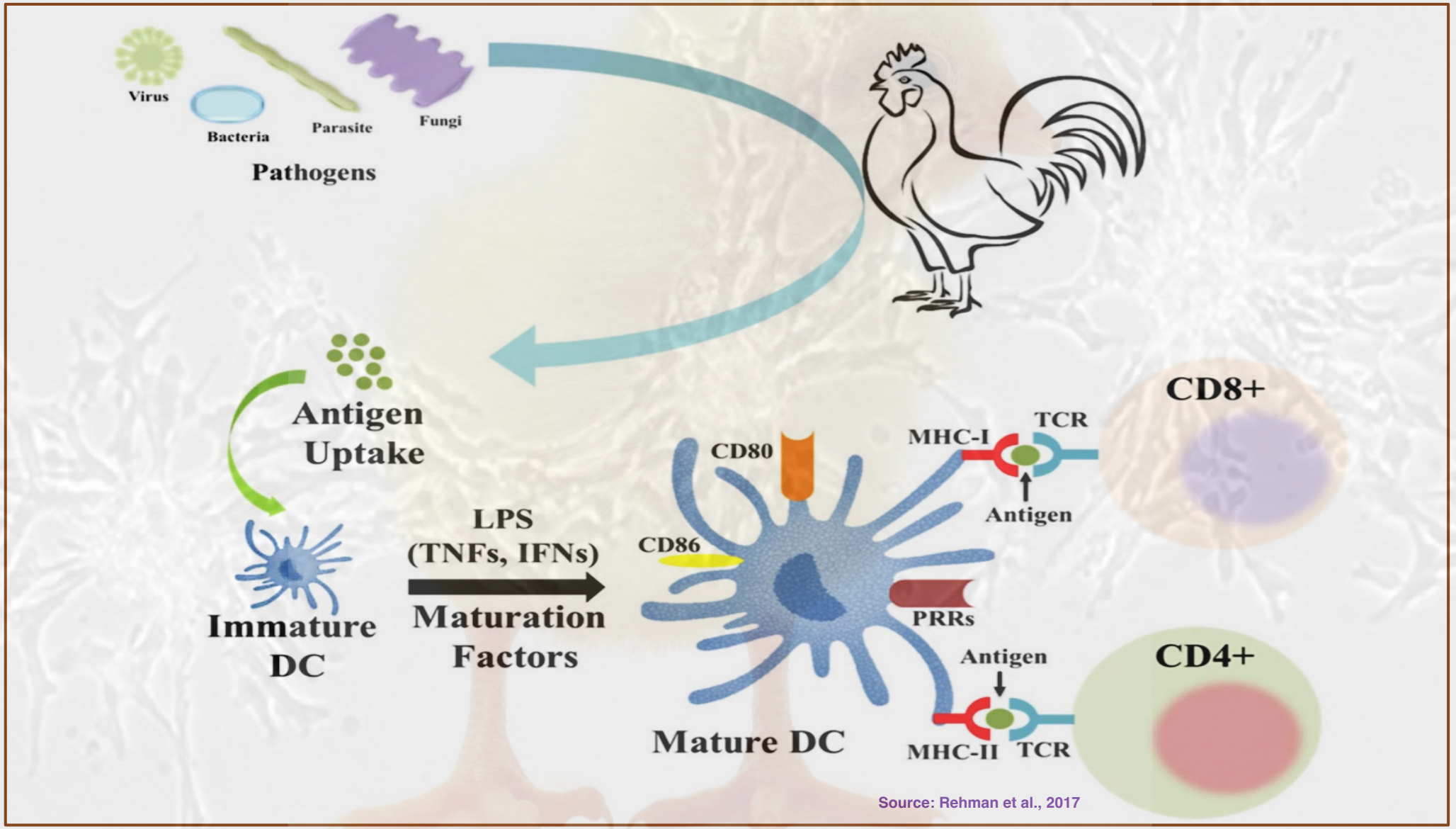


Adapted From: Clayton et al., 2017

Role of Avian Dendritic Cells in HV

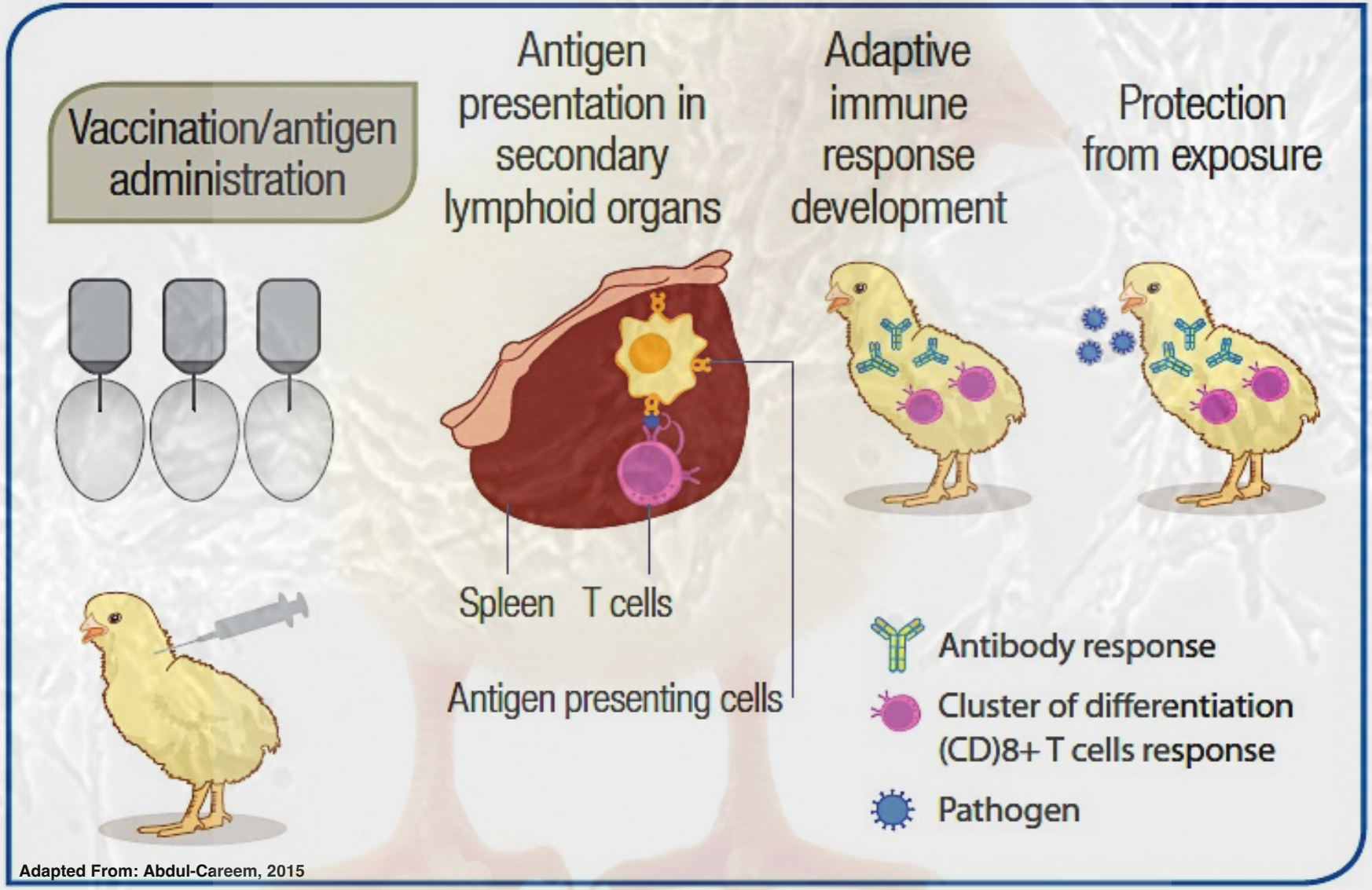


Role of Avian Dendritic Cells in HV



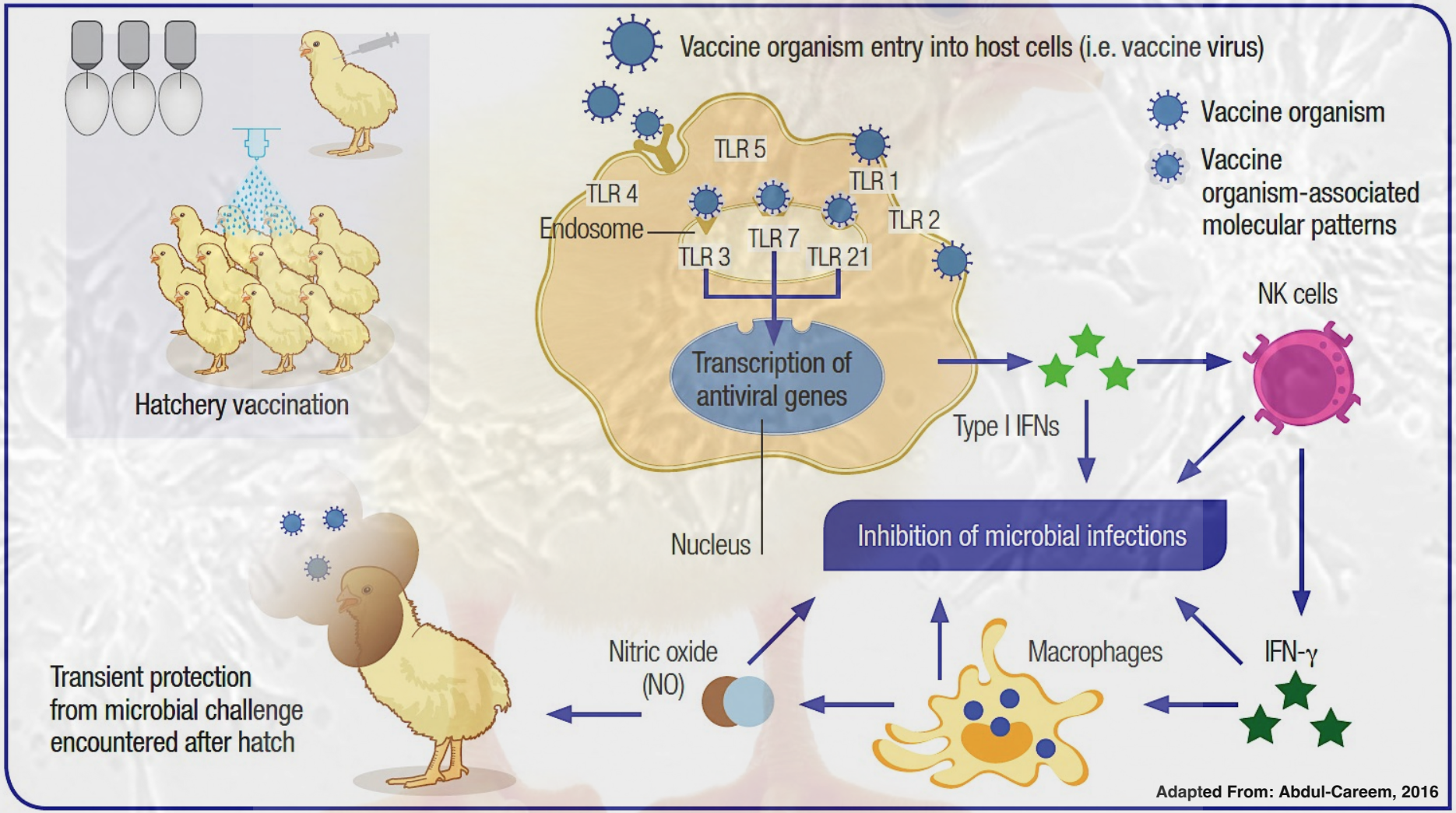
Source: Rehman et al., 2017

General Principles of HATCHERY VACCINATION

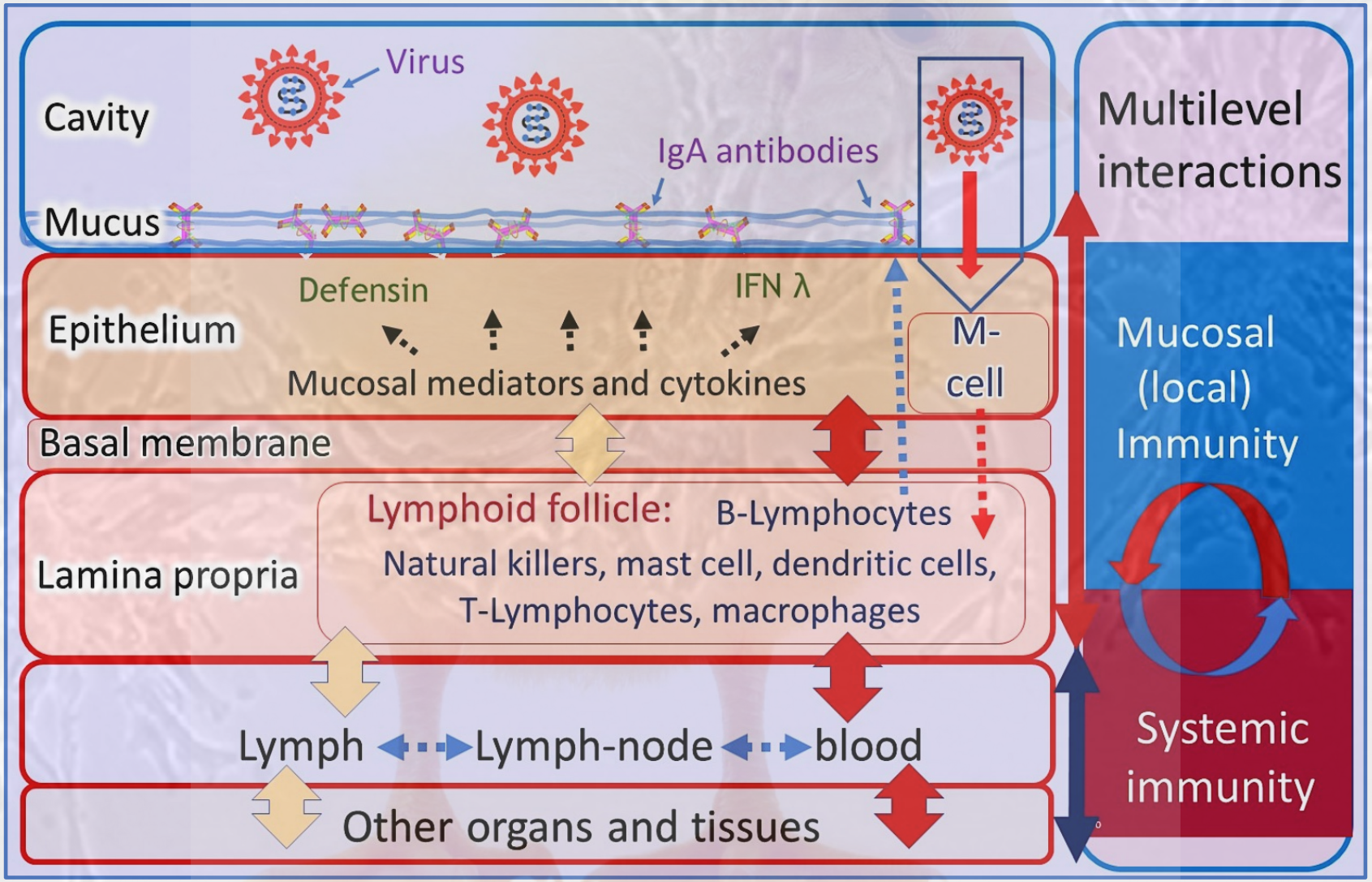


Adapted From: Abdul-Careem, 2015

Early Immune Responses to Hatchery Vaccination

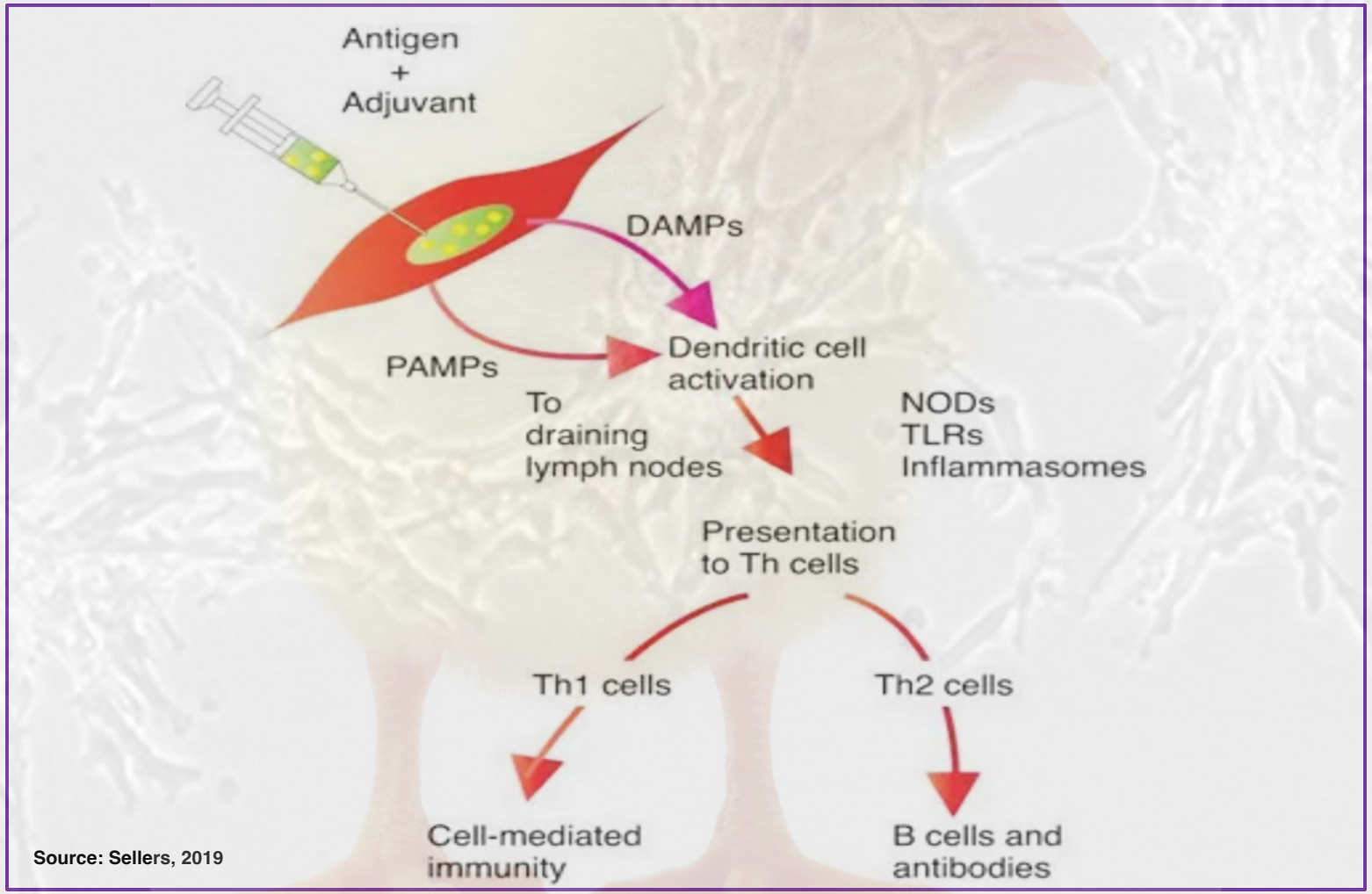


Early Immune Response to Live Vaccines



Adapted From: Mestecky *et al*, 2015

Immunology of Hatchery Vaccine
Killed Vaccine



Source: Sellers, 2019


THANK YOU
FOR YOUR KIND ATTENTION