

THE UNIVERSITY OF SYDNEY

# The Evolution of Poultry Disease

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# Disease to have emerged in the last 30 years

## Re-emerged/developed

- Marek's Disease
- Inclusion Body hepatitis
- Necrotic Enteritis
- Histomoniasis
- Newcastle Disease
- Femoral Head necrosis
- Infectious Bursal Disease

## Emerged

- Chicken Anaemia Virus
- Infectious Stunting Syndromes
- Spiking Mortality
- Broiler Ascites
- Broiler Leg Weaknesses
- Cellulitis
- Spotty Liver Syndrome
- Dysbacteriosis

# Why?

- Many have developed along with intensification and changes in husbandry
  - Marek's, IBD, ND
- Genetic changes in the bird
  - Ascites, leg weakness,
- Changes in hygiene
  - CAV, IBH, ISS
- Changes in production system
  - Necrotic Enteritis, Spotty Liver, Dysbacteriosis

# Why these diseases?

- Intensification favours highly infectious and transmissible disease agents
- Genetic selection for production traits are not always balanced by survival/ viability characteristics
- Removal of “natural” infection pathways by improved hygiene has allowed previously hidden pathogens to express in young chicks with no maternally derived protection
- Reversion to older systems and the removal of antibiotic cover has allowed old pathogens to re-surface

# Broiler Ascites Syndrome

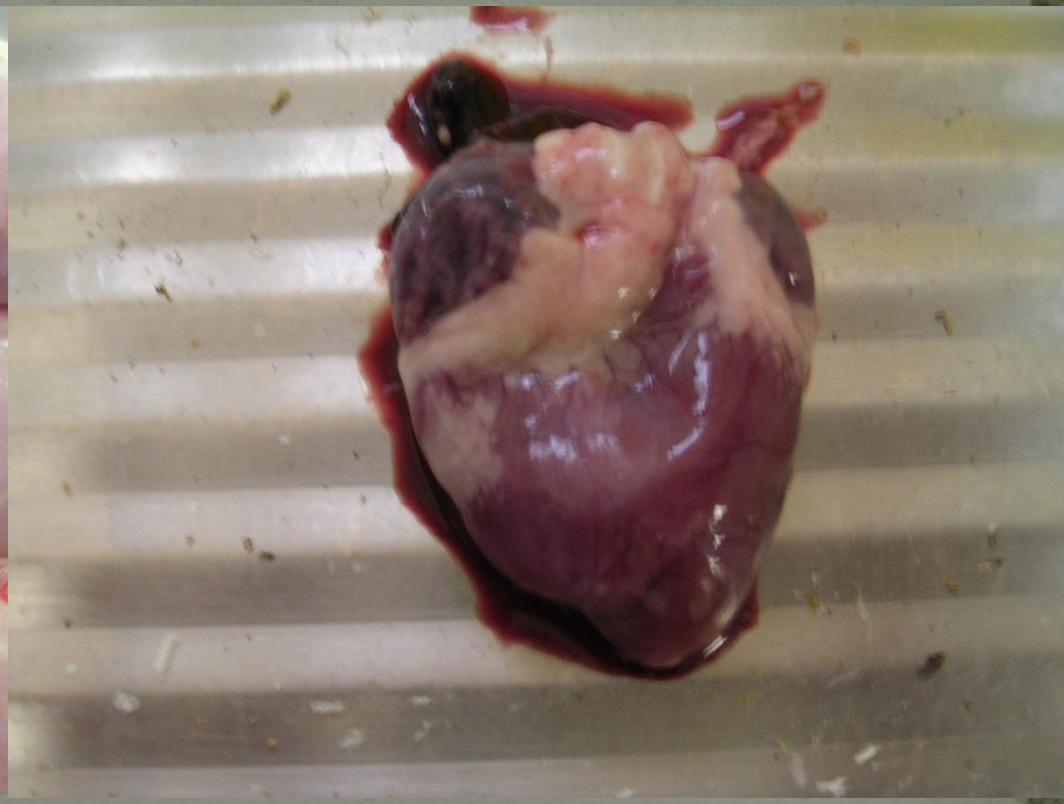
- The genetic aspect to this disease was obvious to us early in Australia
- Related strongly to breeds with “improved” breast yield, rather than growth rate, as was pushed by other researchers.
- Prolonged selection for muscle characteristics developed a bird with a relative deficit in cardio-respiratory capacity







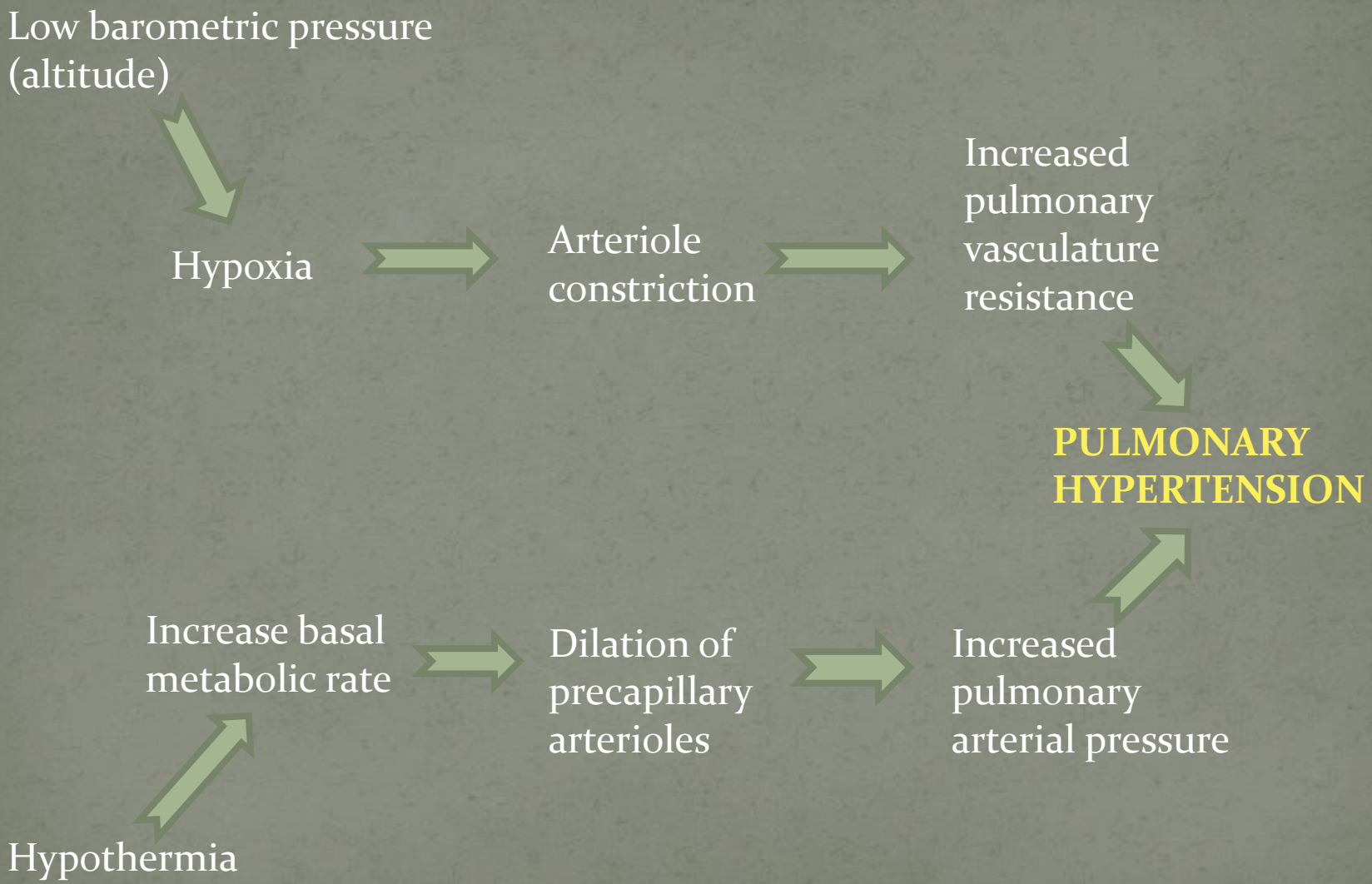


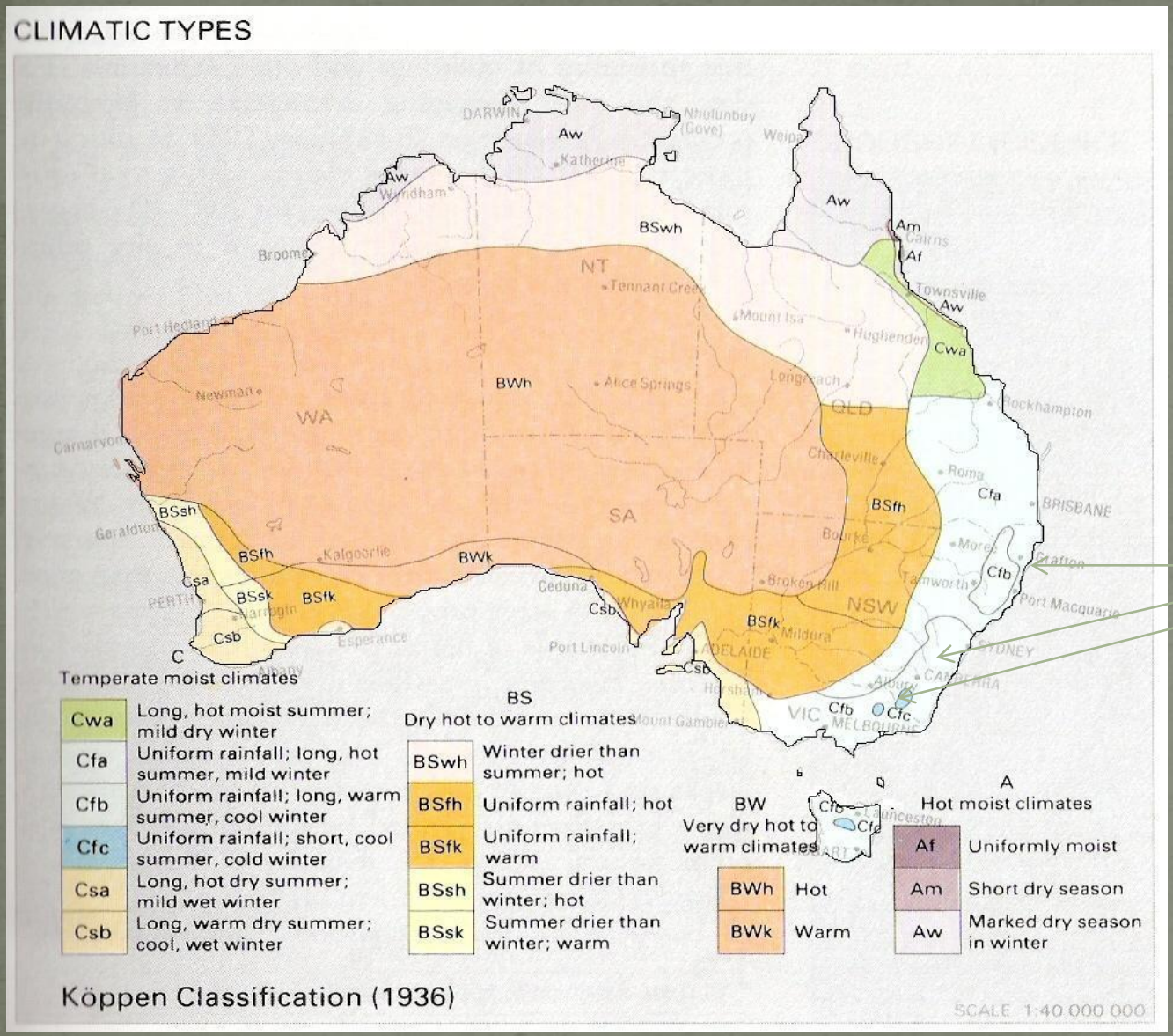


# Ascites continued

- Pathogenesis involves pulmonary hypertension as a result of increased cardiac output needed to support rapid massive muscle growth
- Two different pathogeneses lead to the same outcome
  - High altitude (>1800 m)
  - Cold temperatures (low altitude)
- At sea level, slight cool stress leads to an enormous increase in cardiac output to meet temperature homeostasis and an a consequent right-sided congestive heart failure
- Air quality is totally unimportant at sea level with this syndrome; cool early temperature however is the key

# Two environmental problems – same end result





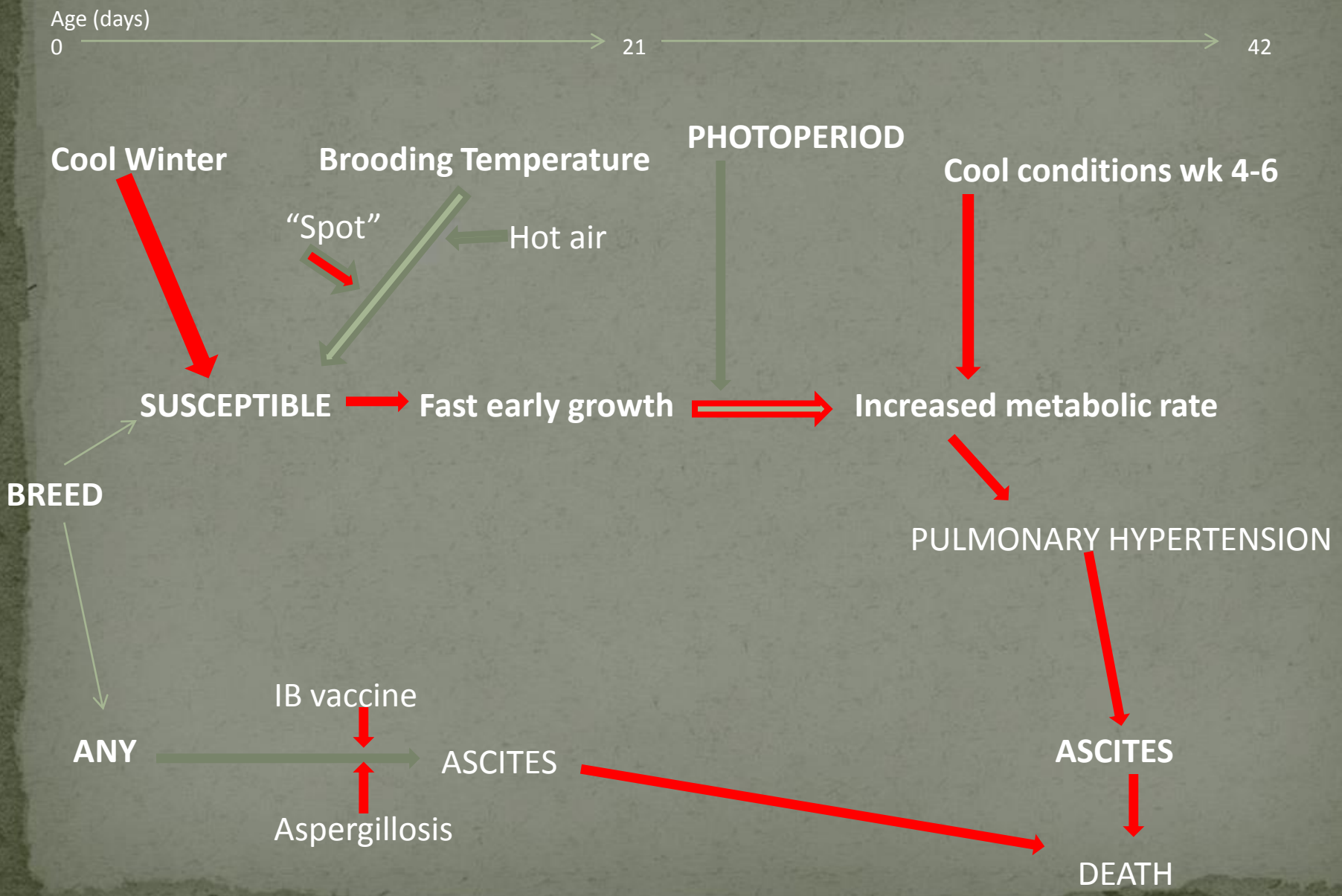

Ascites distribution

**"Cool Winter" areas**

Cfb & Cfc climates most at risk in winter

Reproduced from the *Macquarie Illustrated World Atlas* (1984) with the permission of The Macquarie Library Pty Ltd, publishers of the Macquarie range of reference books.

# Ascites – Path Model



# Future?

- The desire for more breast meat continues
- Breeders are selecting against the syndrome
  - This may help at altitude where this matters but maybe not at sea level where the problem is hypothermia
- Expect this syndrome to be with us for a long time yet

# Marek's Disease

- Has evolved as a major problem WITH the development of the industry
- Accompanied intensification
- Highly infectious, airborne over long distances, timing of infection is important

# Evolution of Marek's Disease

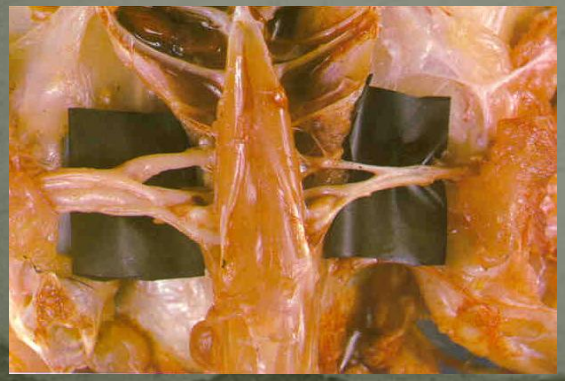
From: S. Walkden-Brown

"Classical"disease predominates - Paresis/paralysis

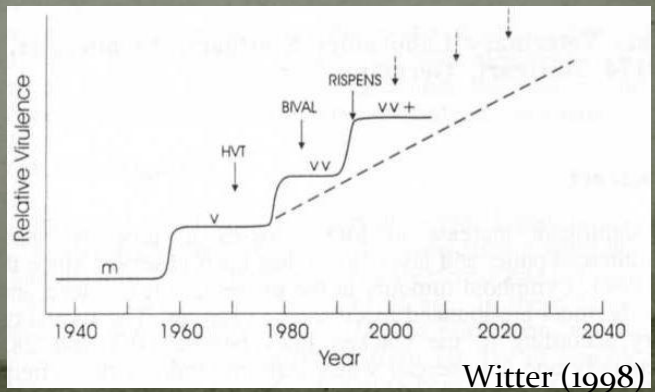
"Acute" disease predominates - Lymphomas in multiple tissues

Vaccine introduced

| 1907-1950 | 1950-1970 | 1970-Present |
|---|---|---|
| • Classical disease<br>• Widespread<br>• Sporadic occurrence | • Acute disease<br>• Spread worldwide | • Initial control<br>• Evolution of increasingly virulent strains |








Witter (1998)

# Marek's Disease Continue



- Epidemiologic changes occurred in the industry allowing re-emergence of MD as a major problem in Australia since 1991
  - Growing broilers to an older age
  - Introduction of new breeds (importation)
  - Deregulation of the layer industry

# Improved hygiene

- While hugely beneficial, concrete floors and good hygiene in broiler breeder flocks has lead to some interesting "new" diseases
- Viruses that have probably been with us forever without much expression – due to "natural" exposure in young breeders with development of immunity prior to lay
- Elimination of these has left flocks with no immunity:

  ⇒ infection during lay and vertical transmission

  ⇒ no maternal antibody ⇒ susceptible chicks

# Examples

- Classically CAV and FAV (IBH)
- Infectious Stunting Syndrome viruses may follow the same pattern

# Infectious Stunting Viruses

- Numerous viruses incriminated (entero-, parvo-, picorna-, reo-, rota-, toga and astro-)
- “Pale bird syndrome”, “Helicopter chicks”, “Runting Stunting Syndrome”, “Malabsorption Syndrome”
- Worldwide – appeared in the 1970’s; Australia in 1980’s
- Transmissible
- Can’t fulfill Koch’s postulates

# ISS – clinical appearance

- Very uneven flock, high culling rate, poor feed conversion
- Three forms:
  - Enteric
  - Pancreatic
  - Proventriculitis
- See Rod Reece's presentation at AVPA

# A little older – runts more obvious

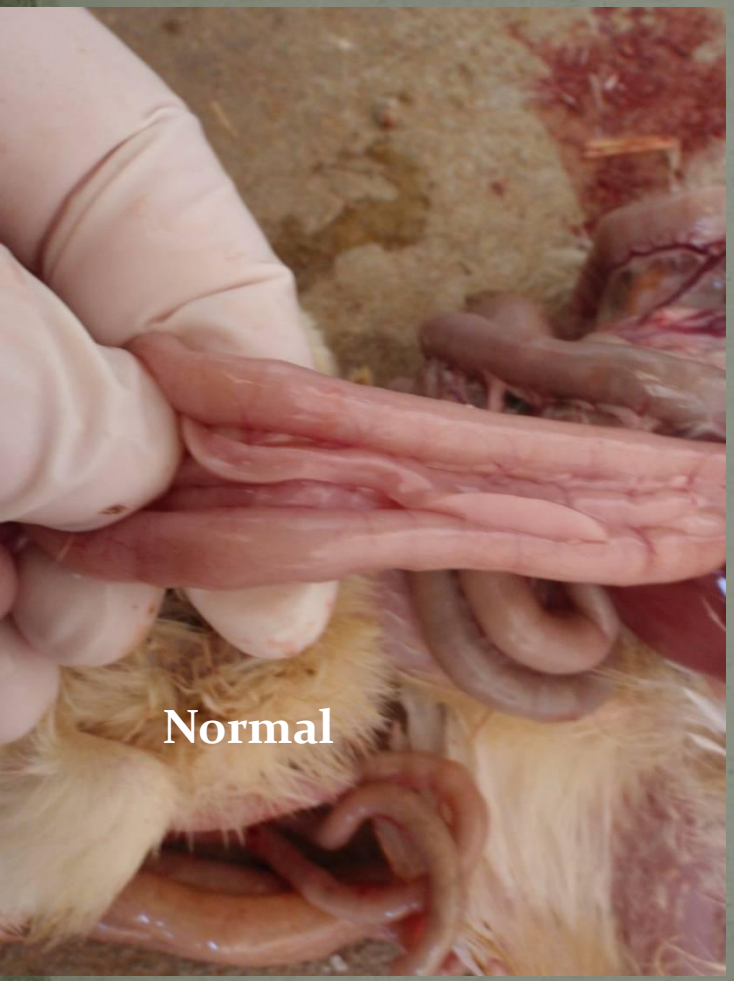


# Distended, pale intestines

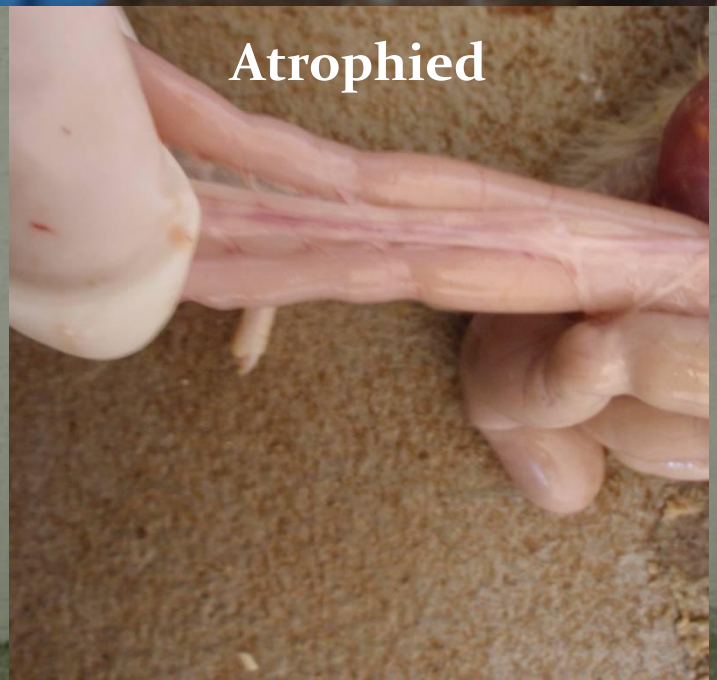




# Pancreatic atrophy





# ISS - epidemiology

- Often linked to young breeder flocks
  - May suggest vertical transmission or lower levels of maternal protection
- High density feed, marginal vitamin levels and mycotoxins can exacerbate it
- May also be immunosuppressive (?)

# Thymic atrophy – associated with ISS






# ISS – what's it really doing?

- ISS outbreaks occur sporadically
- Shows the virus(es) is commonly present in broiler environments
- Is there a "sub-clinical" level of infection that causes issues we can't readily see?
  - Poor digestion and marginal deficiencies (e.g. Vit D)
  - Immunosuppression
  - Low level "rickets"-like conditions which may associate with broiler leg problems (weakness, Femoral head necrosis, twisted tibia)
  - ?????

# Conclusion

- The dynamic nature of the poultry industry offers opportunities for infectious and non-infectious diseases to emerge or modify
- Seemingly inconsequential management changes can have major influences
- Commercially “sensible” decisions can have unpredictable biological consequences