

# Bird age and protease effects - what can we already conclude?

Feed proteases - Science into Practice Seminar - Noordwijk  
7-8<sup>th</sup> May 2014

Dr Roselina Angel & Andrew Ball

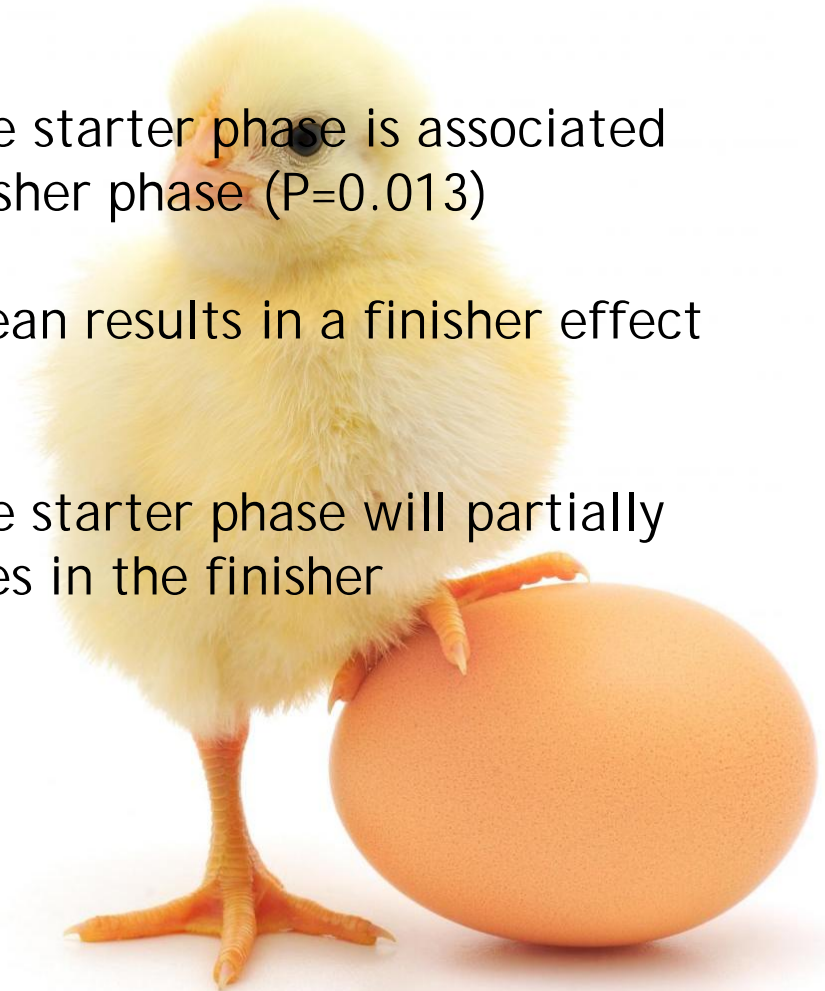
## Introduction and aims:

- Anecdotal evidence suggests the effect of an exogenous protease may be even greater in the young than in the more mature bird
- By optimising protein digestion in the starter phase can we increase bird performance for the remainder of the production cycle?
- What does the literature say?
- Are the trends in all diets/ingredient mixes the same?
- What are the implications for practical application of a protease today and in the future?

# DSM meta-analysis

## Starter effect - carry over

- A strong effect of ProAct in the starter phase is associated with a strong effect in the finisher phase (P=0.013)
- Starter effect 1% above the mean results in a finisher effect 0.2% above the mean
- Optimizing ProAct effect in the starter phase will partially translate to improved responses in the finisher



# Effect of age on protein digestibility?

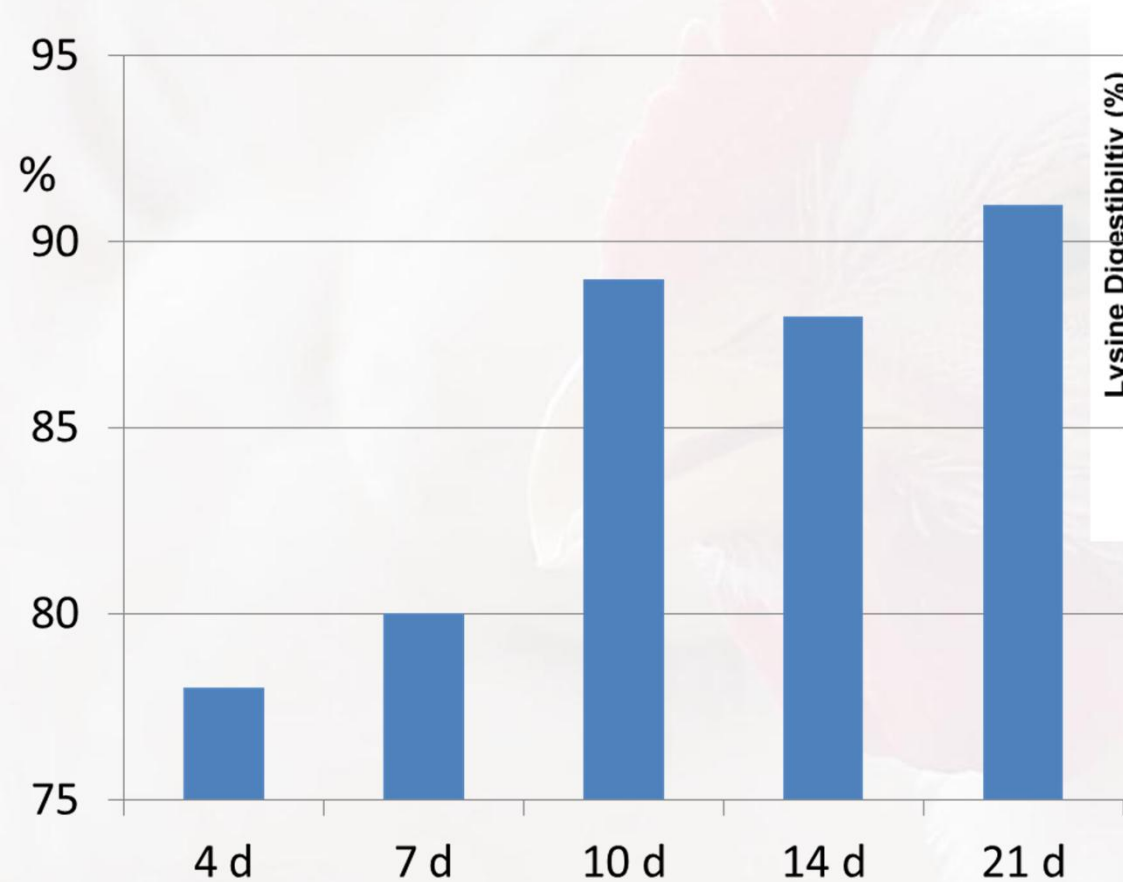
Roselina Angel

Department of Animal and Avian Sciences  
University of Maryland  
College Park, MD, USA

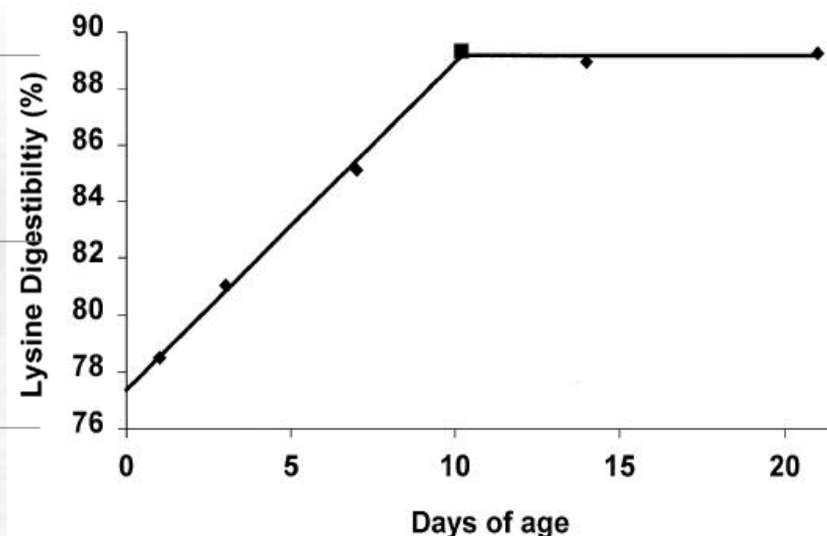


# Impact of age on protein digestibility

## Protein digestibility, chickens

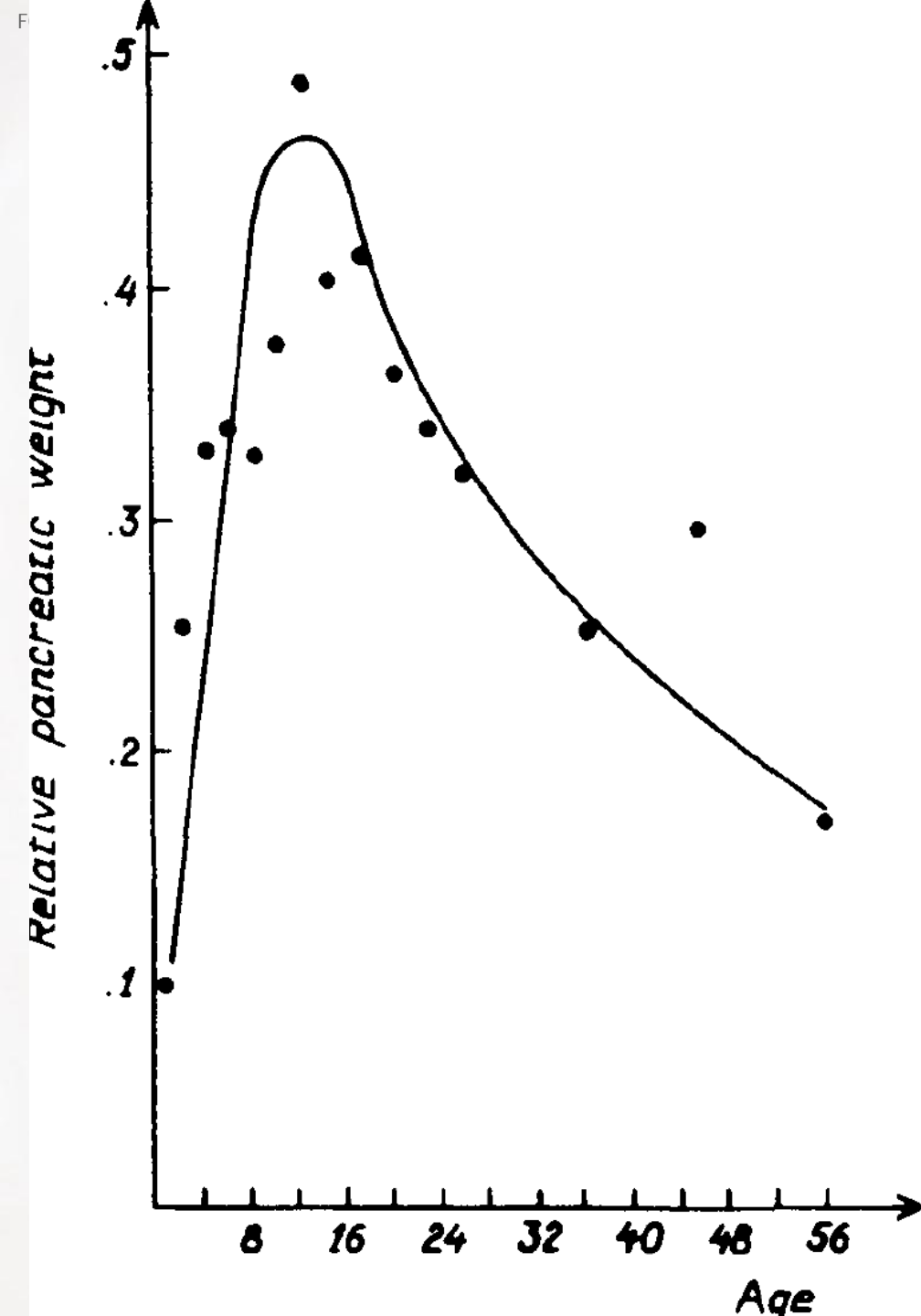


Noy and Sklan, 1997; Corn-SBM diet



Batal and Parsons, 2002  
Chickens, corn-SBM diet

# WHY?

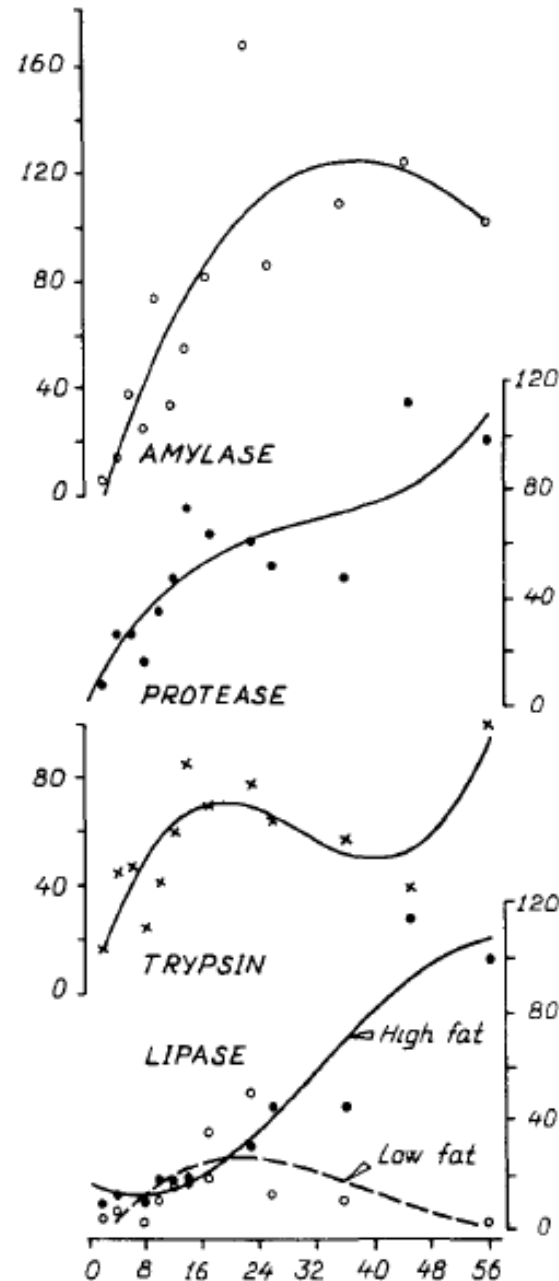
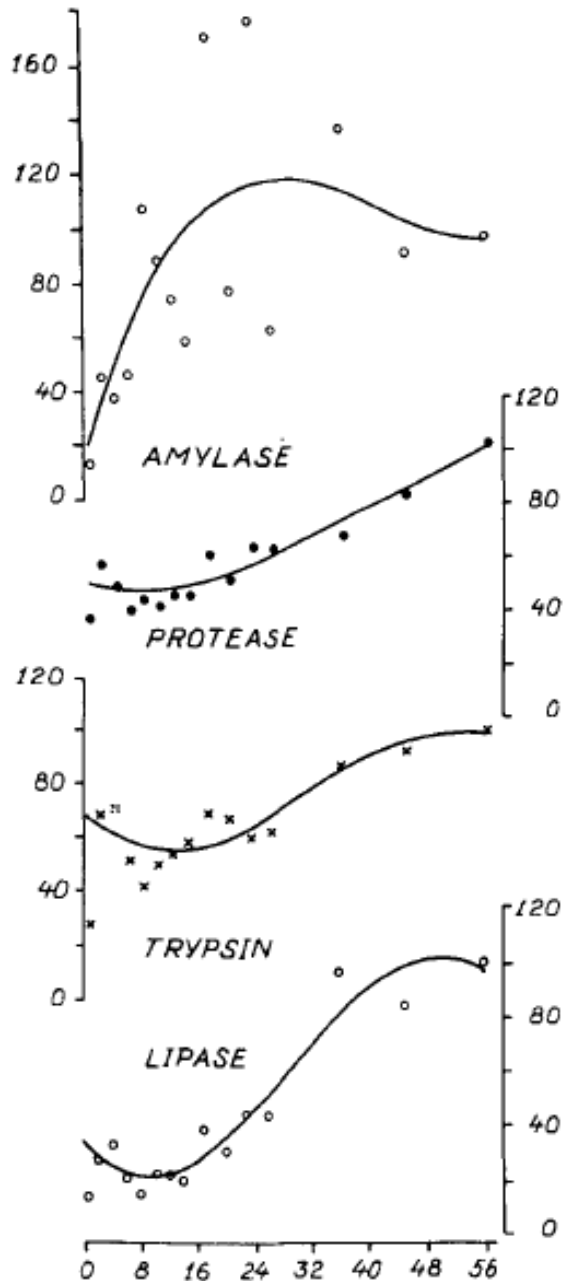


Relative weight is weight  
pancreases as a percent of  
body weight

Krogdahl and Sell, 1989

PANCREATIC ENZYME  
ACTIVITY, %

INTESTINAL ENZYME  
ACTIVITY, %



## Changes in pancreatic enzymes with age

- In Pancreas (left)
- In digesta found in the proximal  $\frac{1}{4}$  of the SI

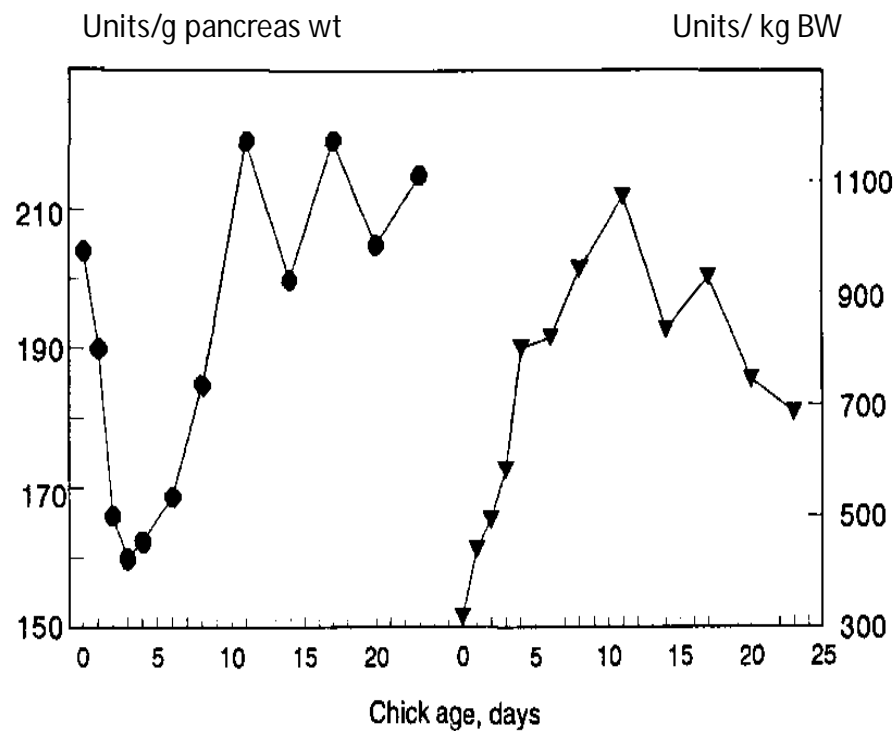
In % related to 100% given to values at 8 wks of age

Calculated as % in pancreatic tissue or as % of digesta content

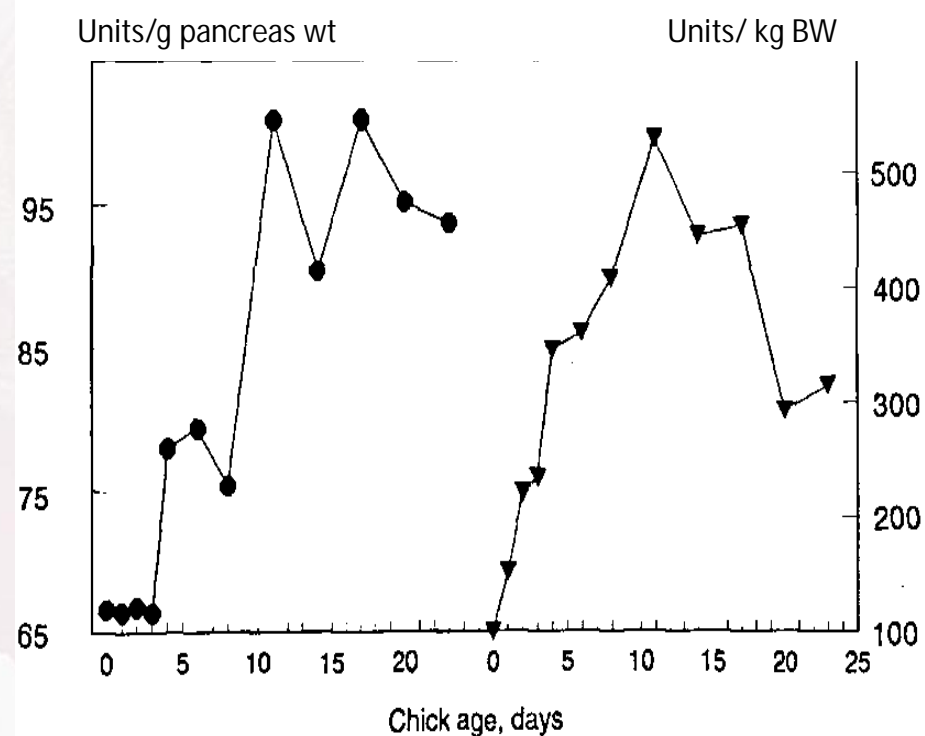
# Impact of age on pancreatic enzyme activity

(Nitsan et al., 1991)

- Trypsin



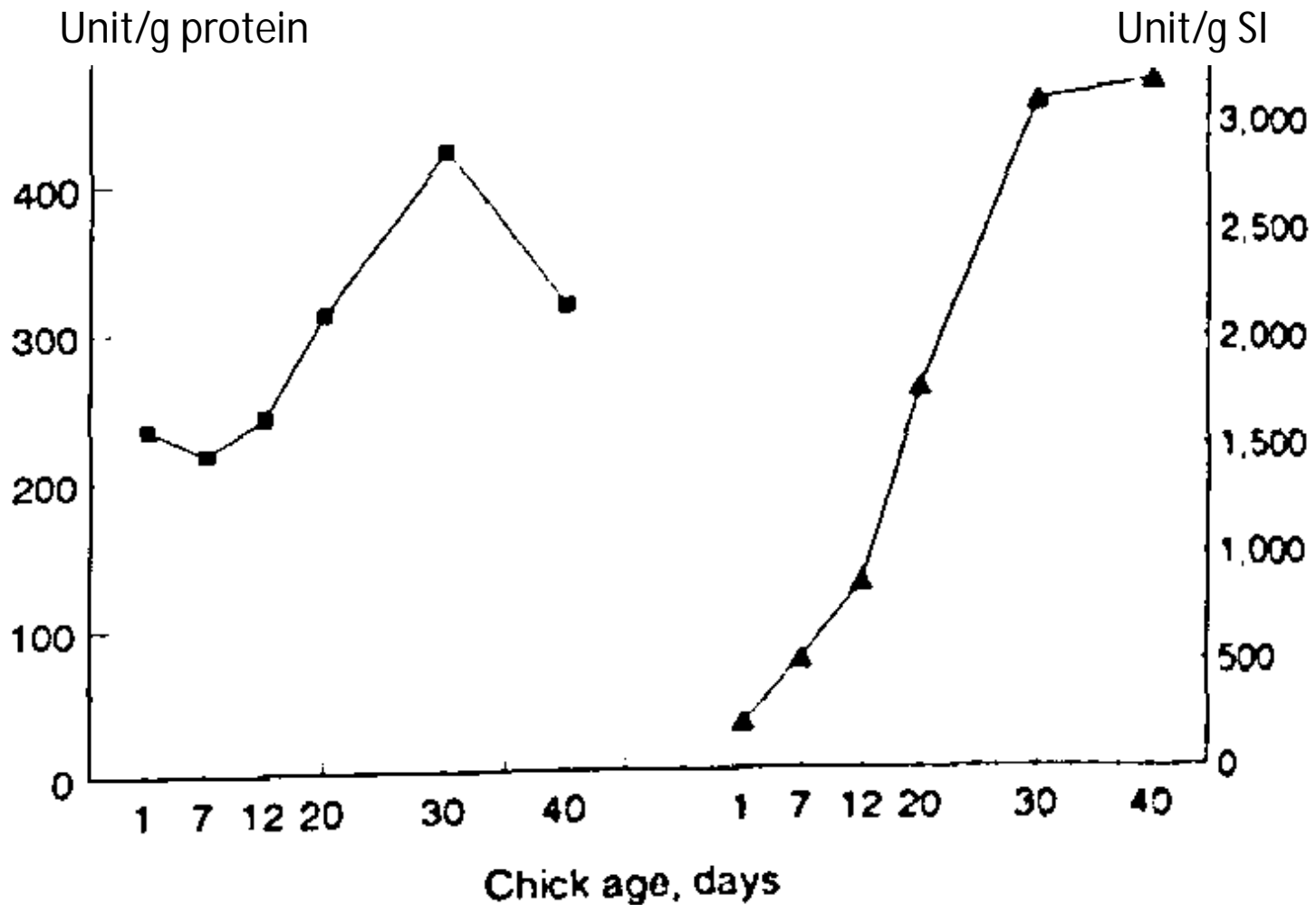
- Chymotrypsin





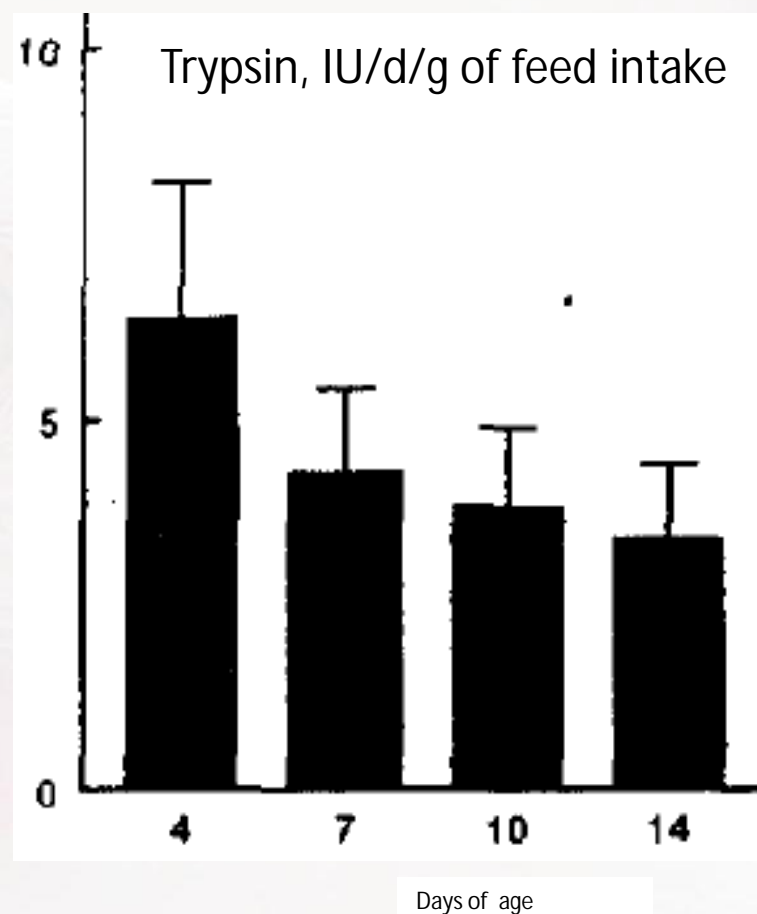
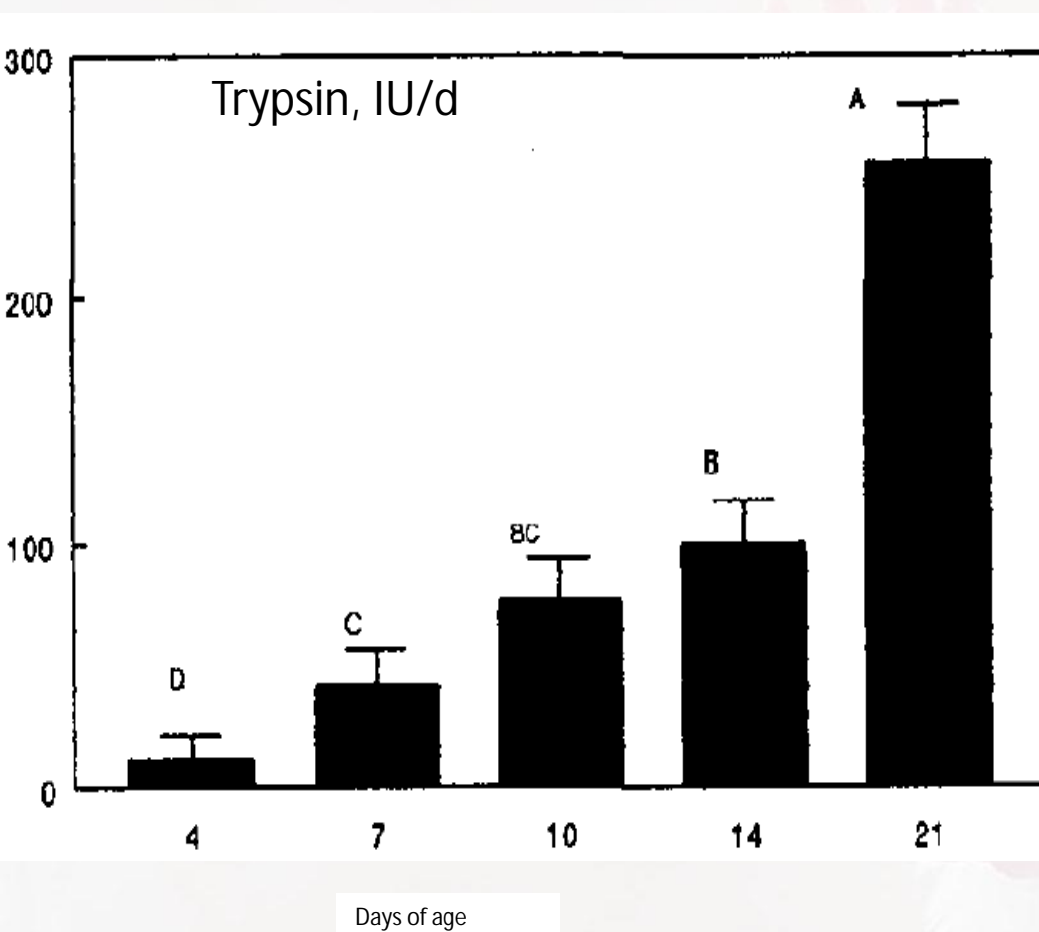
# Development of dipeptidase activities in the small intestine with age (Tarvid, 1991)

## Gly-leu dipeptidase activity



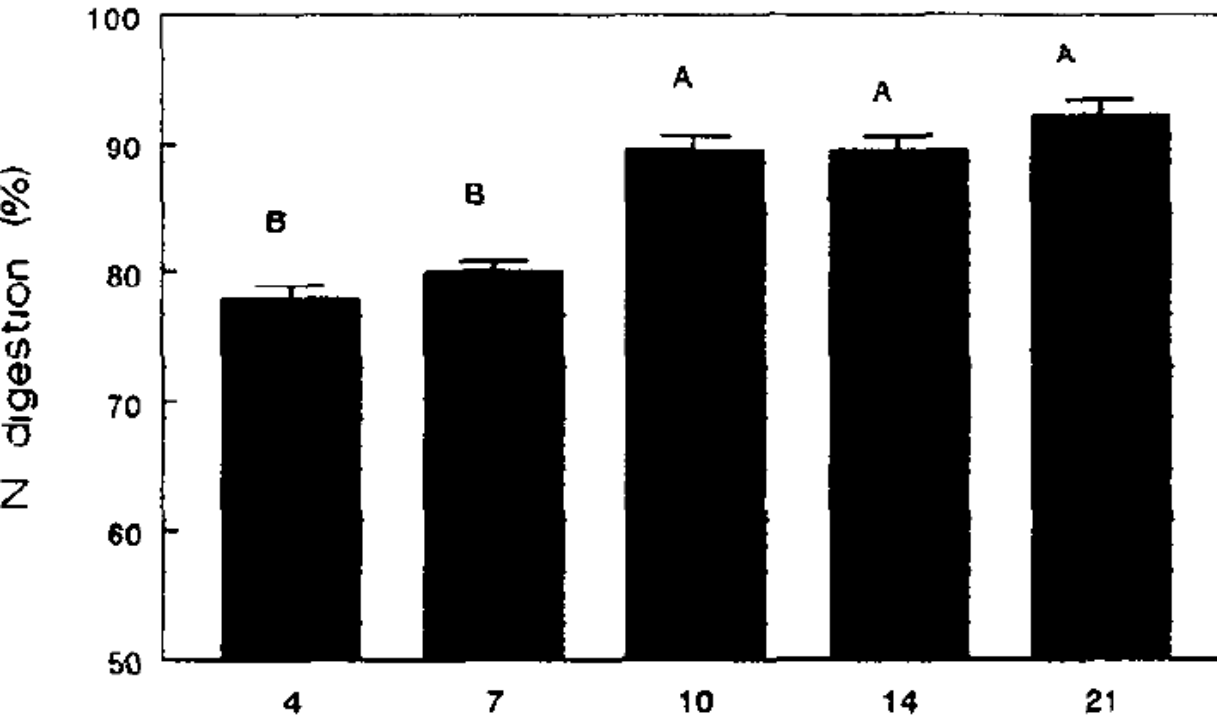
# Daily secretions to the duodenum - chicks

Steady state  $^{141}\text{Ce}$  method analysis enzymes in duodenal digesta

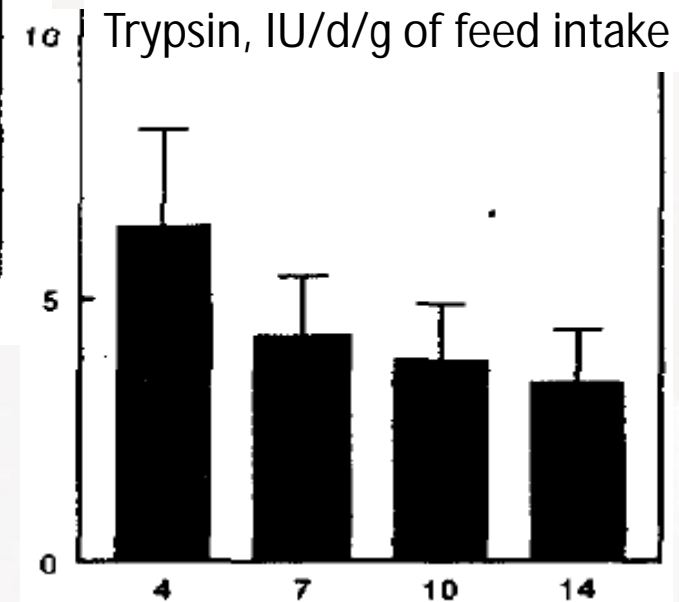
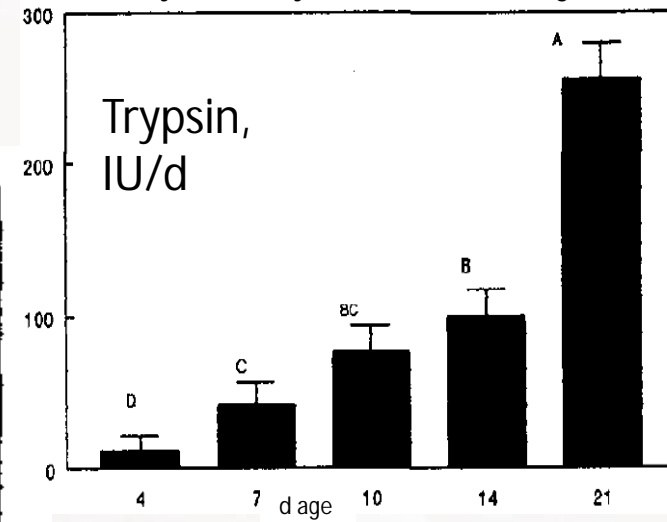


# Digestibility in chicks at different ages fed a corn SBM diet

Steady state  $^{141}\text{Ce}$  method



Analysis of enzymes in duodenal digesta

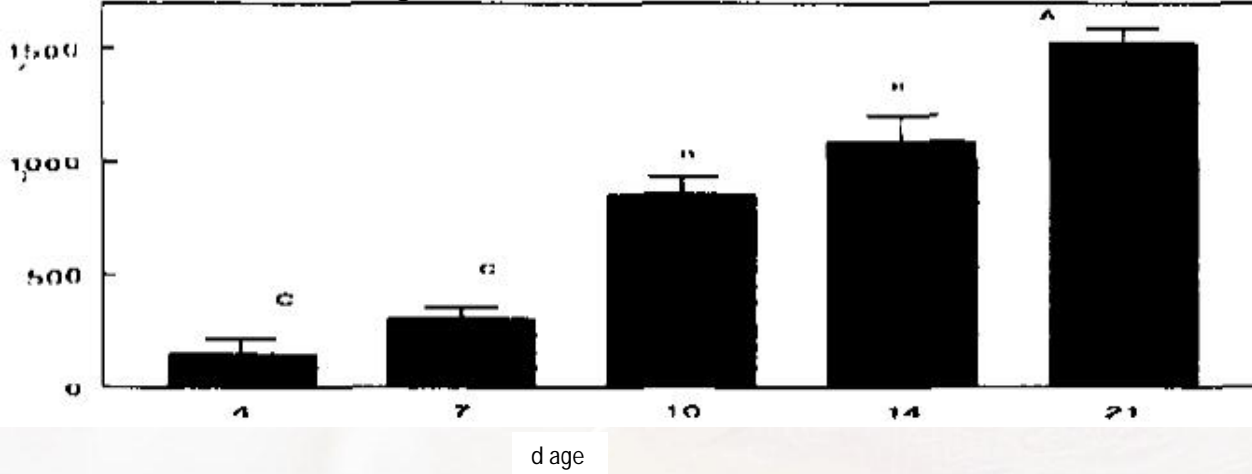


(Noy and Sklan, 1995; 1997)

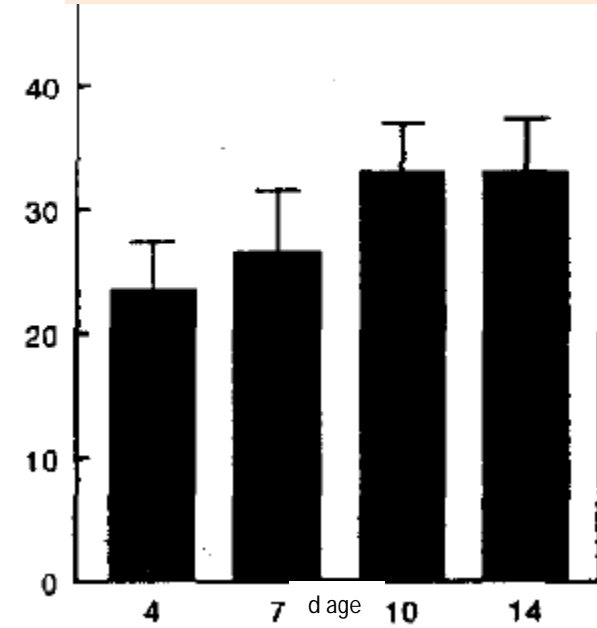
# Daily secretions to the duodenum, chicks

Steady state <sup>141</sup>Ce method analysis enzymes in duodenal digesta

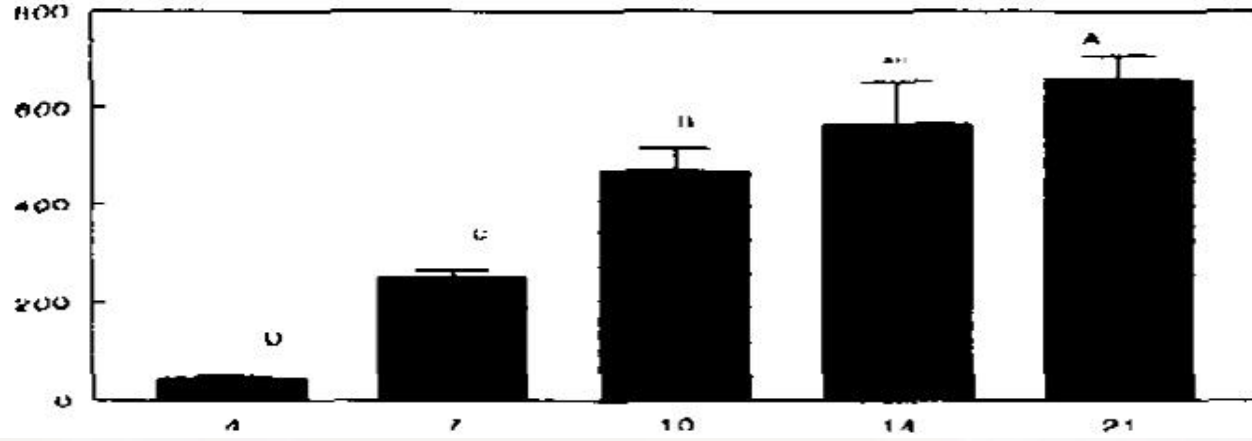
Bile Acids (BA), mg/d



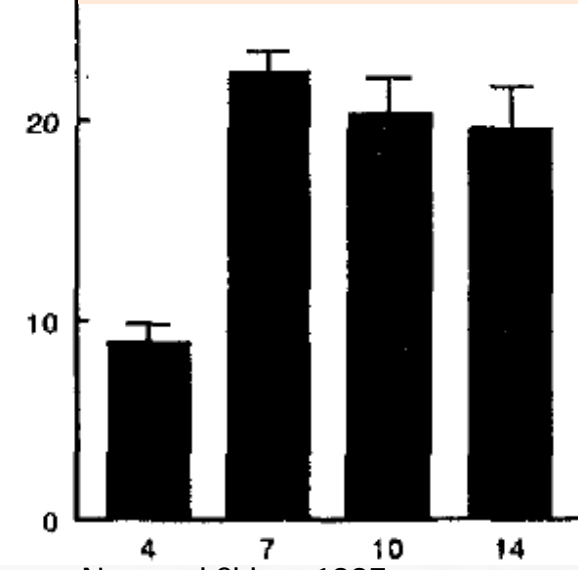
BA, mg/d/g of feed intake



N, mg/d



N, mg/d/g of feed intake

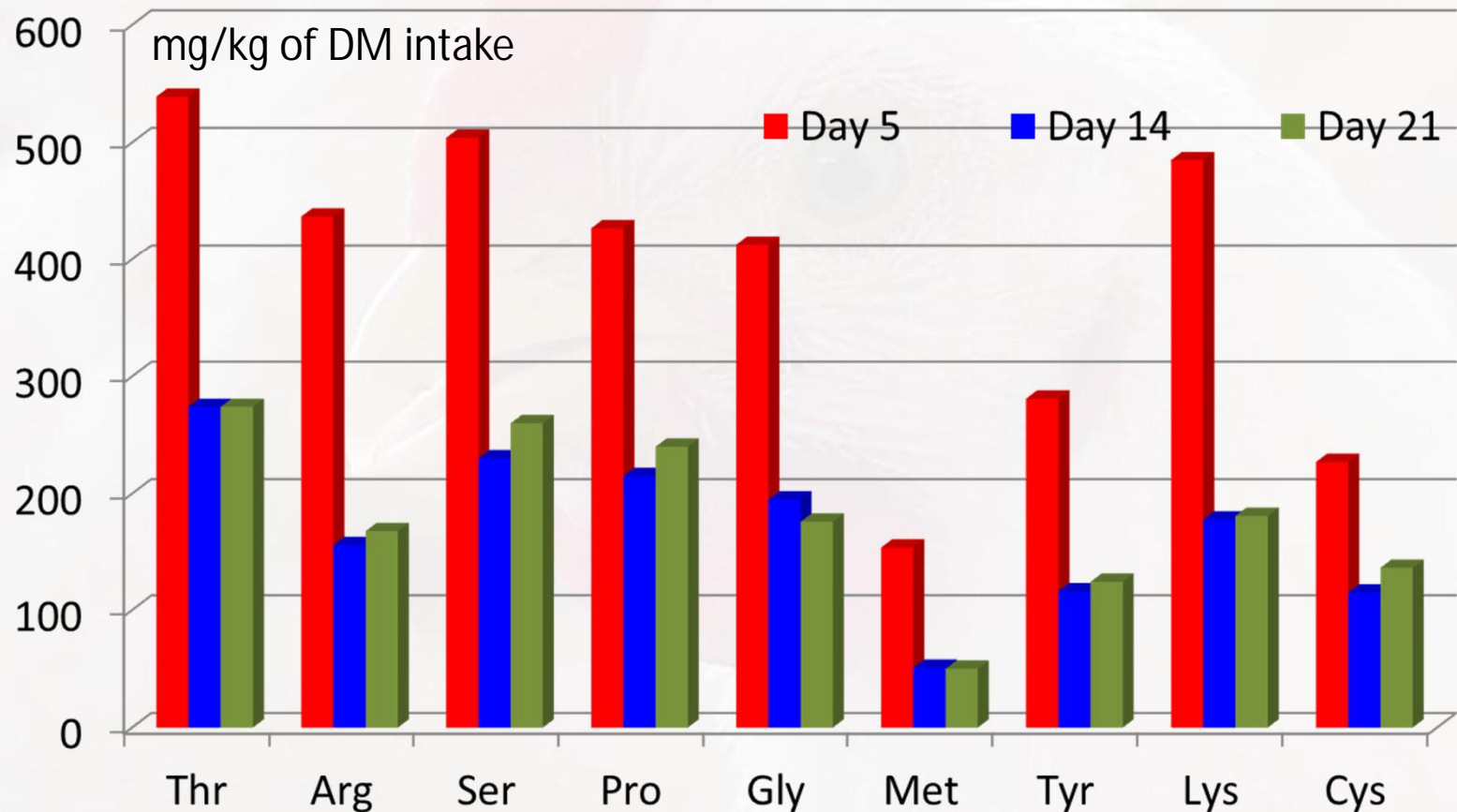


(Noy and Sklan, 1995)

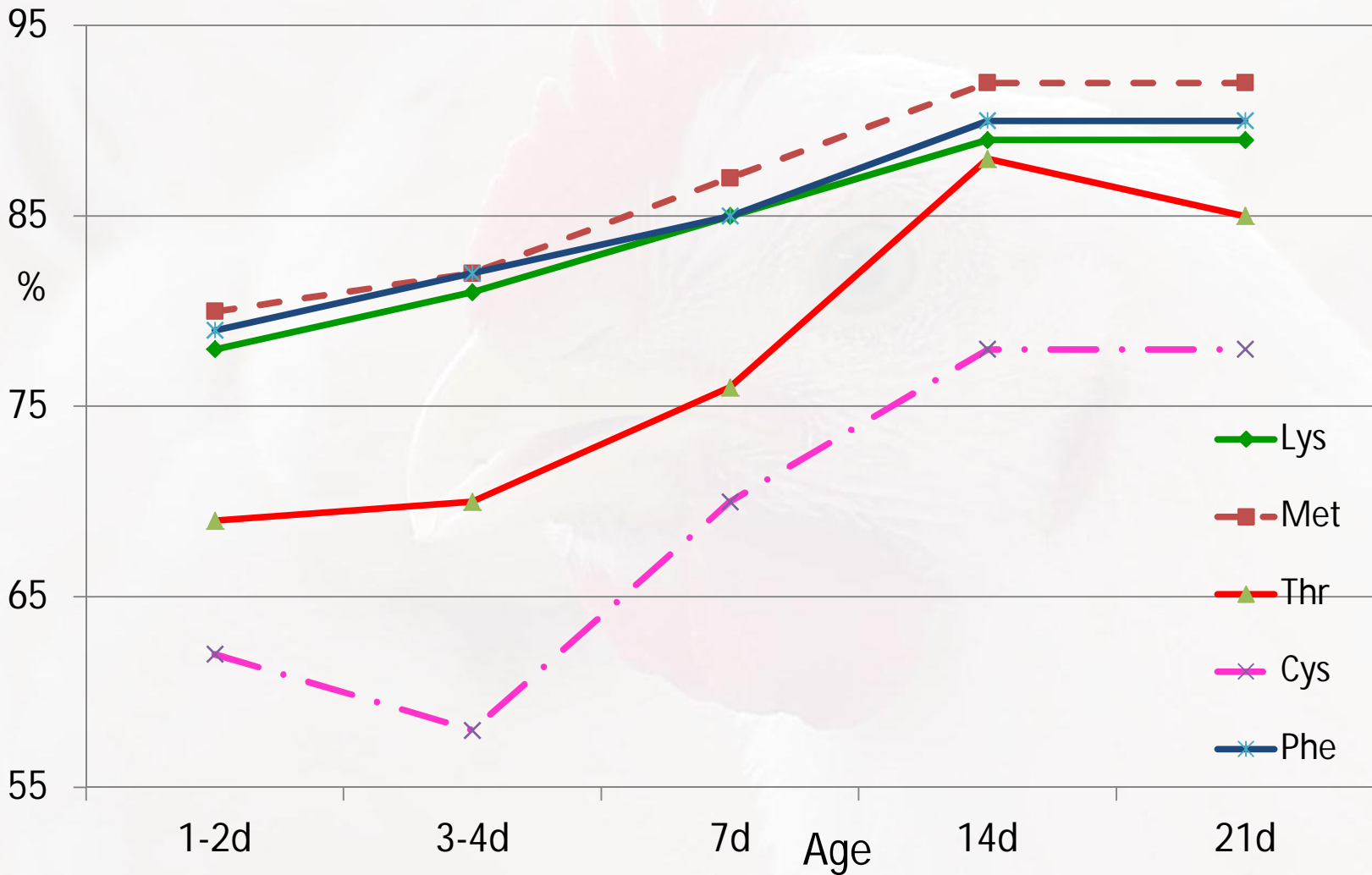
Noy and Sklan, 1997

# Endogenous losses

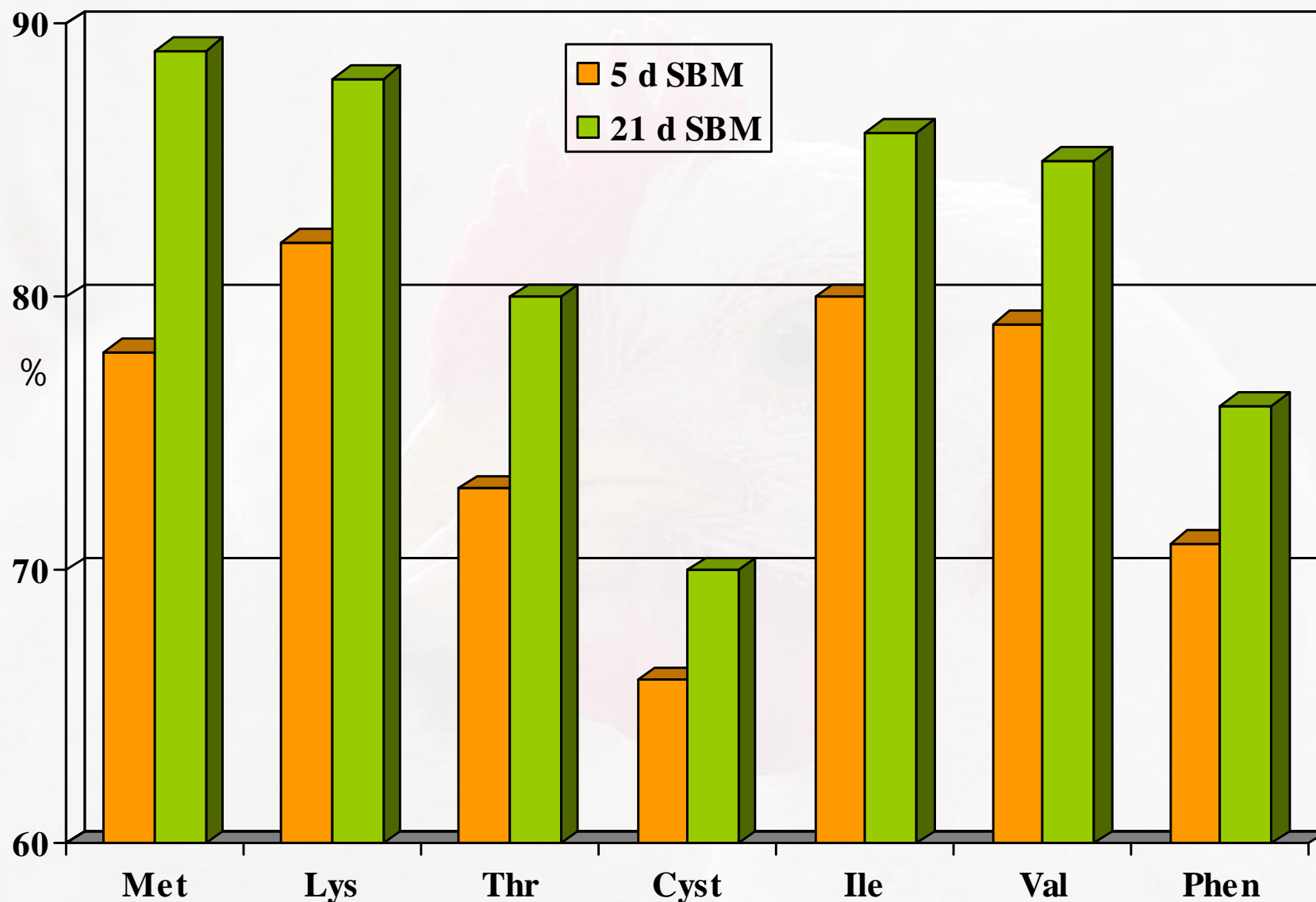
- Endogenous flow, decreases with age (chicks)  
Adedokun et al., 2007



# Effect of age on digestibility of amino acids in a corn-SBM diet, chicks



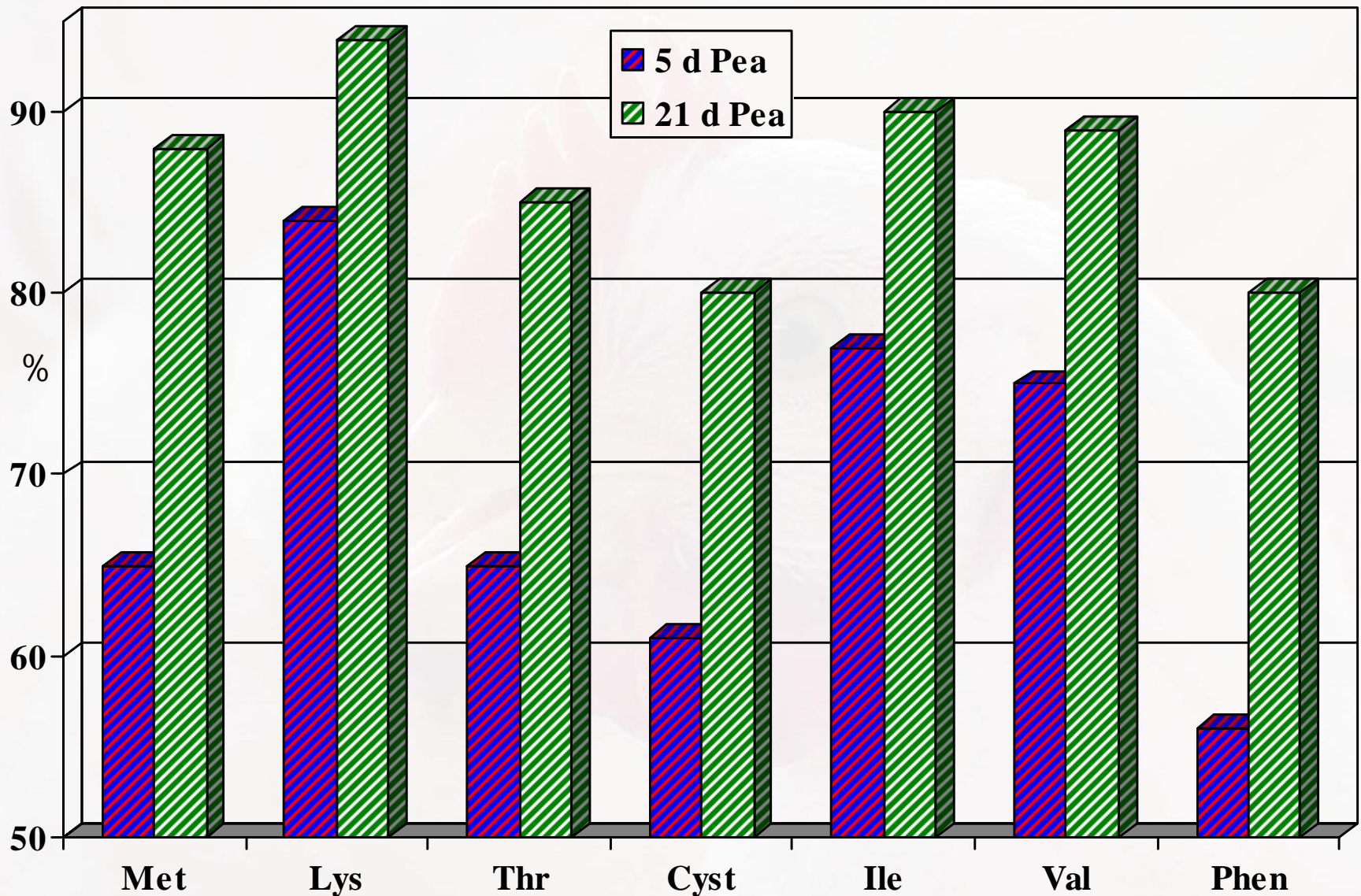
# Impact of age and ingredient on app. AA digestibility



Significantly higher at 21 vs 5 d age for all AA ( $P < 0.05$ )

Rynsburger, 2009

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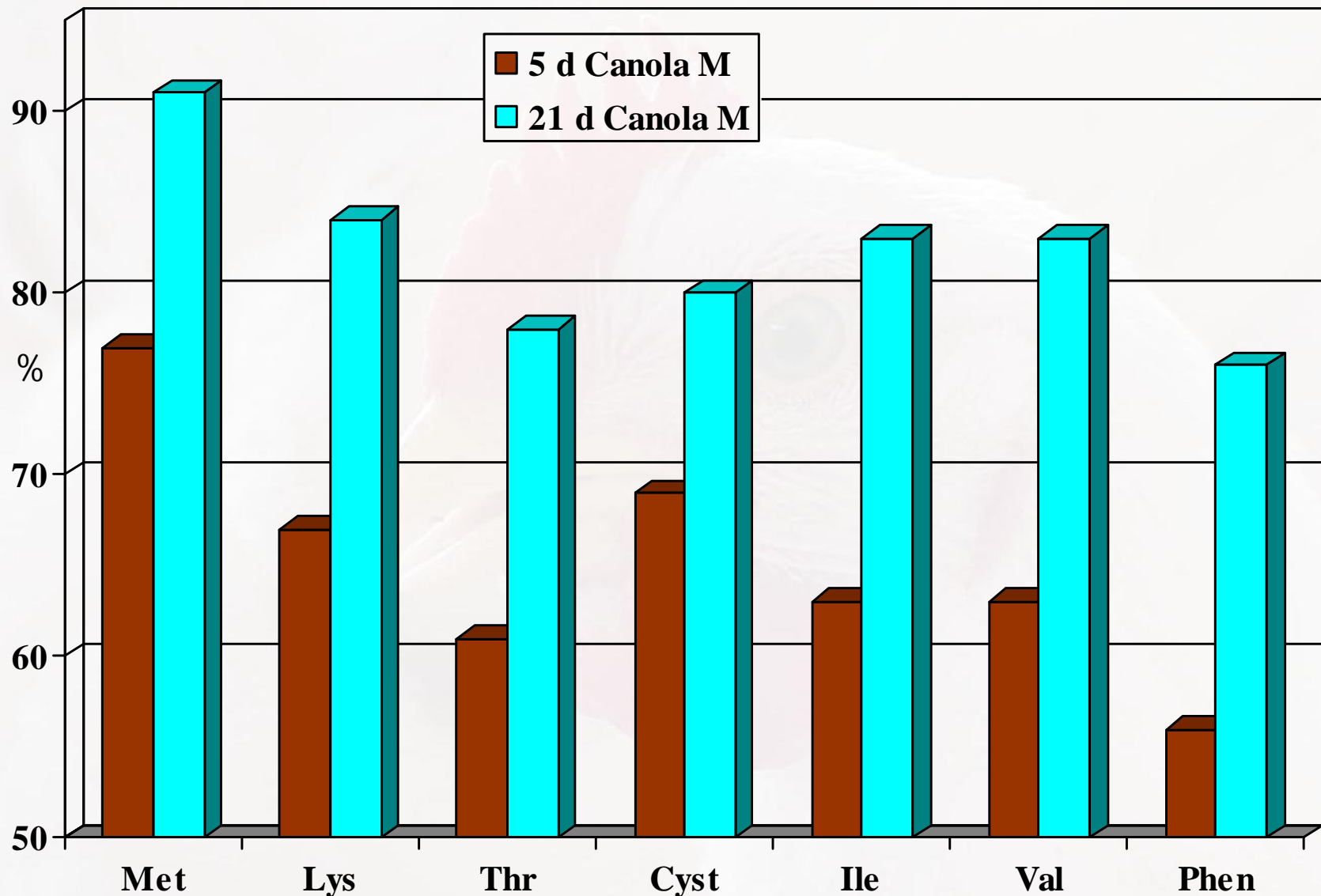


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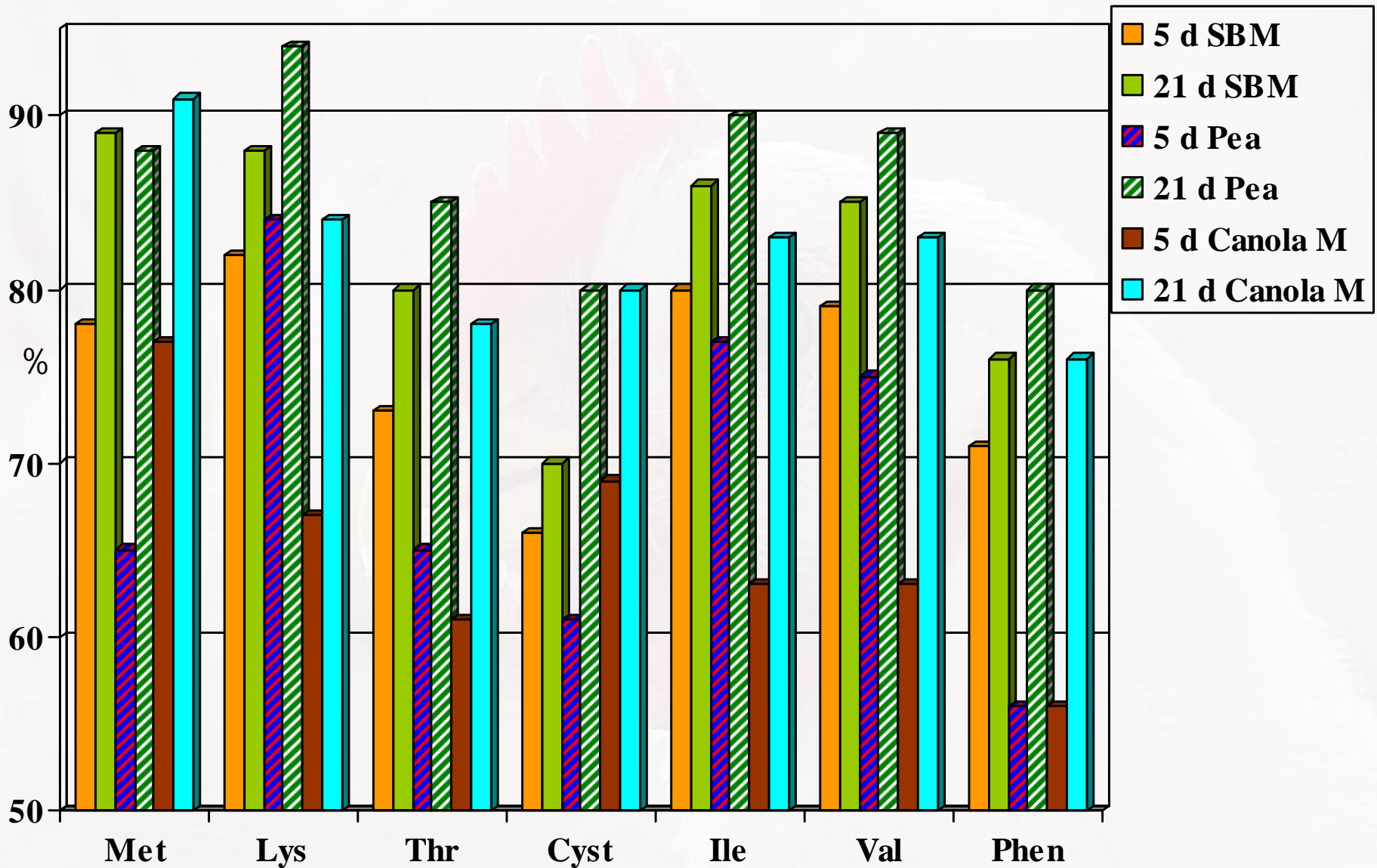
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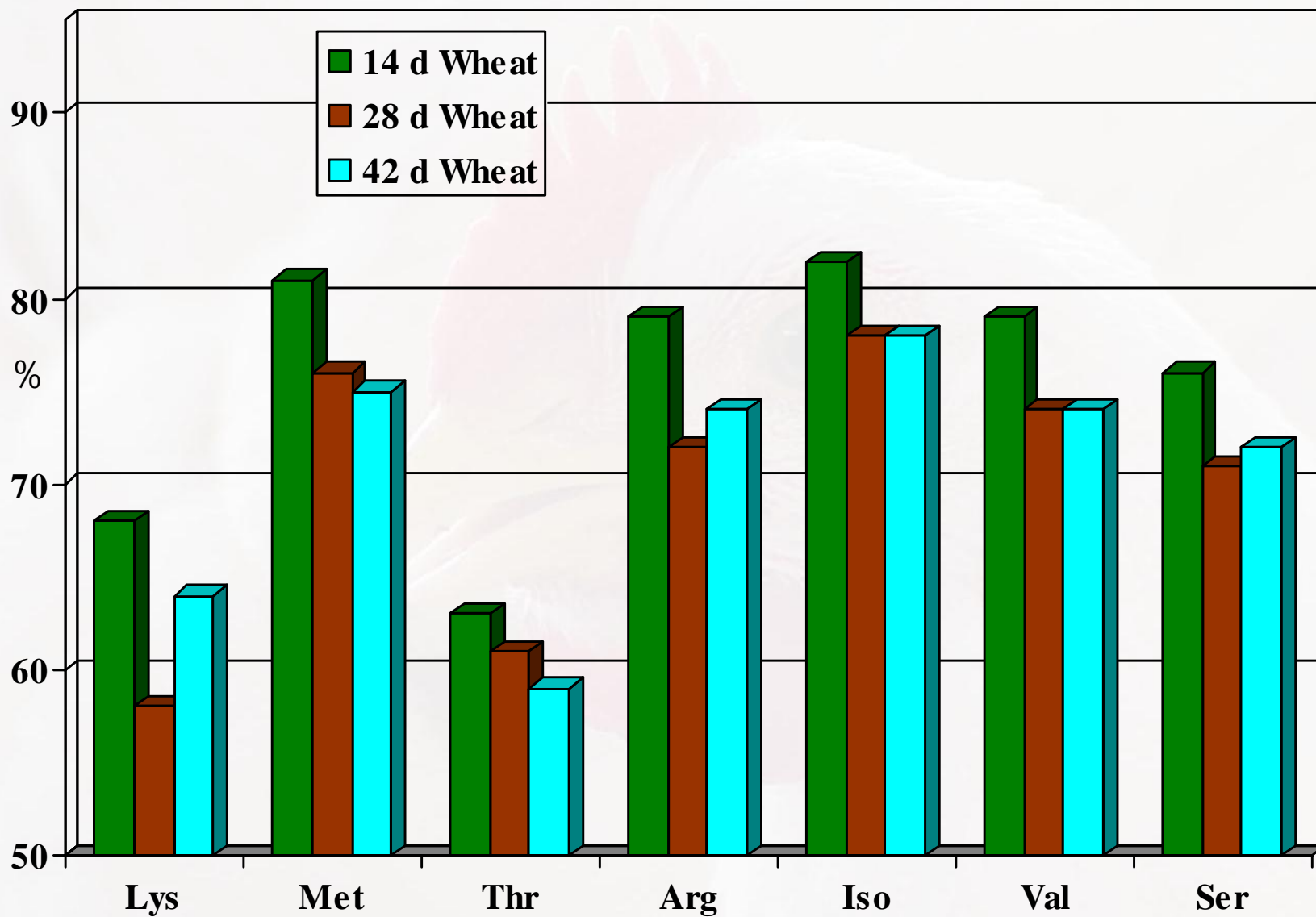


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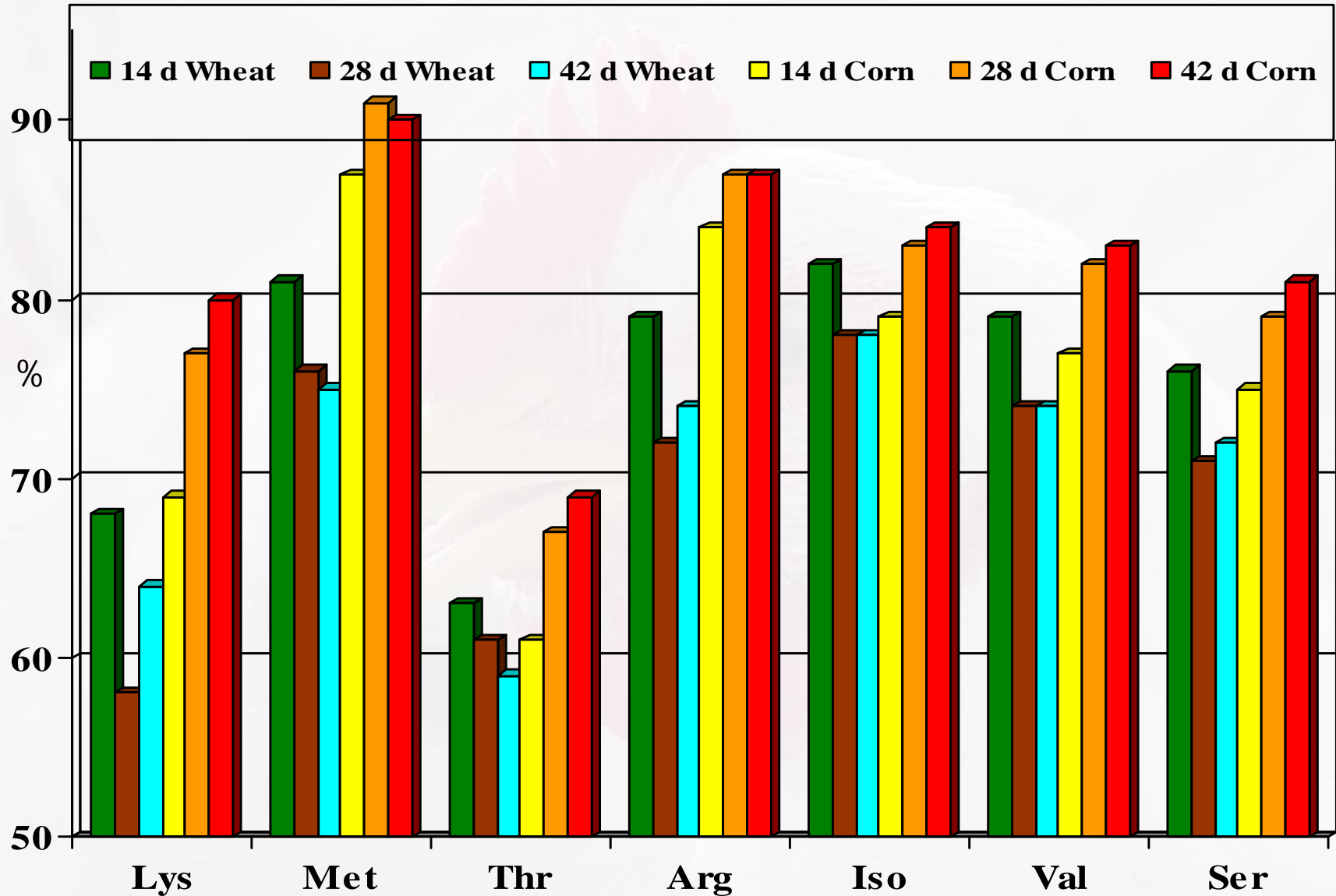
# Impact of age and ingredient on app. AA digestibility

From Huang et al., 2005



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Significantly higher at 21 vs 5 d age for all AA ( $P < 0.05$ ) Rynsburger, 2009

# Implications for optimizing proteases

- Greatest potential impact in young birds BUT this may be partly diet (ingredient) dependent
- Lowering gastric pH (acids, particle size, buffering capacity diet, ...) may potentiate protease efficacy
- Understand ingredients – microscopic structural characteristics, proteins in ingredients, antinutrients, ...
- Interactions with other nutrients and enzymes



Thank you



TIME FOR DISCUSSION!





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