Distillers Co-Products Animal Feed Updates Research Perspective

B. W. Parsons

Department of Poultry Science, University of Arkansas

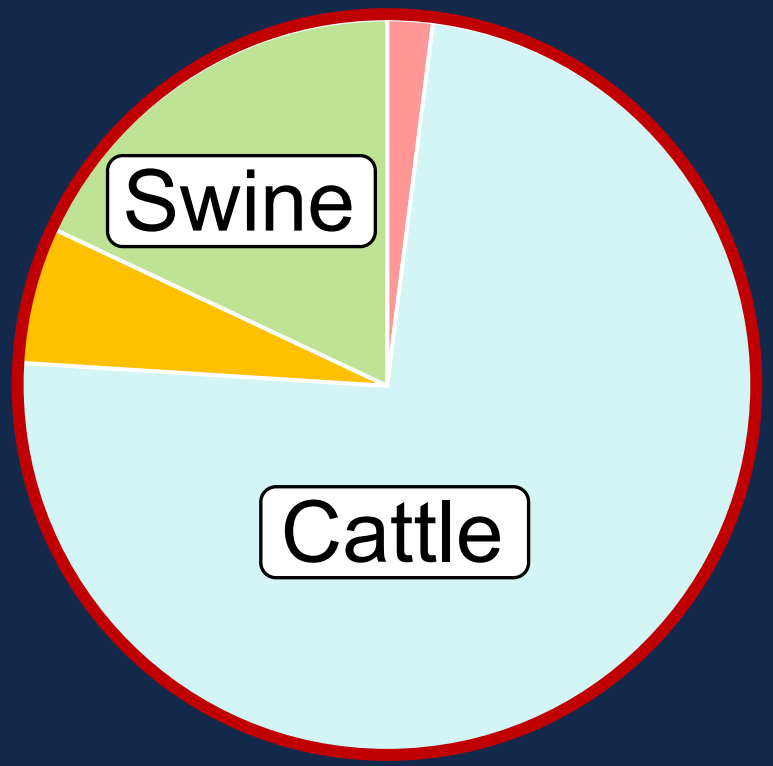
Nutritional Value of Distillers Co-Products for Poultry

- 1. Current usage in poultry diets
- 2. Nutritional value of DDGS
- 3. Improvement in nutritional value from new technologies

Current Usage in Poultry Diets 2023

- DDGS usage in poultry diets varies among companies and among nutritionists

6% Poultry



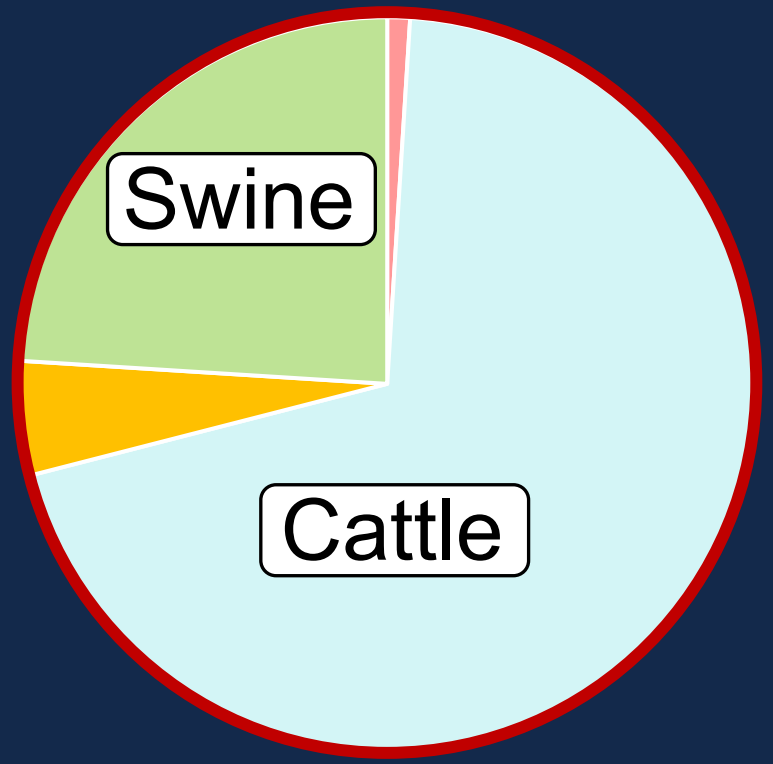
RFA, 2023

Current Usage in Poultry Diets 2025

- DDGS usage in poultry diets varies among companies and among nutritionists

DDGS Use

5% Poultry



RFA, 2025

Why is DDGS Use in Poultry Low?

- Estimated poultry account for up to 67% of soybean meal consumption

Historically

- Product variability
- Fiber content
- Pelleting

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Price relative to other feedstuffs

In Poultry We Are Penny Pinchers

- We use “least-cost” formulation programs
  - Takes into account:
    - Required level of nutrient in diet
    - Available nutrient content in feedstuff
    - Price of the ingredient

We have tighter profit margins than other industries

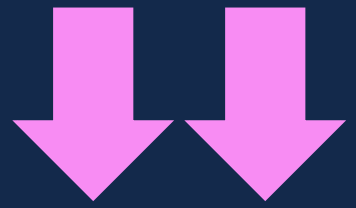
Example Least-Cost Software

- 1. Nutritionist inputs nutrient levels in feedstuffs

Nutrient Name	Code	Quantity	Unit
Calcium	0.05	0.0100	%
Cr Protein		51.6900	%
Ileal Digestible Arginine	daa4	2.1300	%
Ileal Digestible Cystine	daa7	0.7600	%
Ileal digestible glycine		1.6700	%
Ileal digestible glycine + serine		3.9700	%
Ileal Digestible Histidine	daa2	1.2700	%
Ileal Digestible Isoleucine	1.89	1.8900	%

Example Least-Cost Software

- 2. Nutritionist chooses nutrient levels for diet



Sel	Nutrient Name	Code	Unit	Actual	Prv Actual	Min	Max
☑	ADF	61	%	**3.525**	3.812		
☑	Calcium	0.05	%	**0.950**	0.950	0.950	1.000
☑	Chloride	37	%	**0.319**	0.320		
☑	Choline	54	mg/kg	**1,819.651**	1,981.658		
☑	Cr Fat		%	**3.230**	4.085		6.000
☑	Cr Protein		%	**23.786**	24.035	23.000	
☑	Dry Matter	05	%	**84.687**	89.297		
☑	Ileal Digestible Arginine	daa4	%	**1.453**	1.555	1.400	
☑	Ileal Digestible Histidine	daa2	%	**0.584**	0.589	0.400	
☑	Ileal Digestible Isoleucine	1.89	%	**0.935**	0.966	0.720	
☑	Ileal Digestible Leucine	daa5	%	**1.960**	1.899	1.200	
☑	Ileal Digestible Lysine	daa2	%	**1.320**	1.320	1.320	

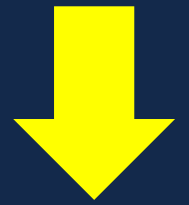
Example Least-Cost Software

- 3. Input feedstuff price

Ingredient Name	Code	Act %	Act Wgt	Prev %	Min %	Max %	Cost
Fat, poultry		**3.252**	**65.036**	3.346			17.00
anticoccidial		**0.050**	**1.000**	0.050	0.050	0.050	8,000.00
Corn fermented protein				5.000		5.000	400.00
Corn grain	4-02-935	**47.048**	**940.964**	45.287			171.00
Soybean meal without hulls sol extr	5-04-612	**38.151**	**763.024**	34.878			342.50
Corn distillers grain with solubles	5-28-236	**8.000**	**160.000**	8.000		8.000	187.00
Limestone, ground	6-02-632	**1.510**	**30.208**	1.567			100.00

Example Least-Cost Software

- A “shadow price” tells the nutritionist the “value” of the feedstuff



Ingredient Name	Code	Act %	Act Wgt	Prev %	Min %	Max %	Cost	Low Cost
Fat, poultry		**3.252**	**65.036**	3.346			17.00	-248.98
anticoccidial		**0.050**	**1.000**	0.050	0.050	0.050	8,000.00	
Corn fermented protein				5.000		5.000	400.00	310.33
Corn grain	4-02-935	**47.048**	**940.964**	45.287			171.00	136.59
Soybean meal without hulls sol extr	5-04-612	**38.151**	**763.024**	34.878			342.50	266.03
Corn distillers grain with solubles	5-28-236	**8.000**	**160.000**	8.000		8.000	187.00	
Limestone, ground	6-02-632	**1.510**	**30.208**	1.567			100.00	-4,227.09

How to Increase “Shadow Price”

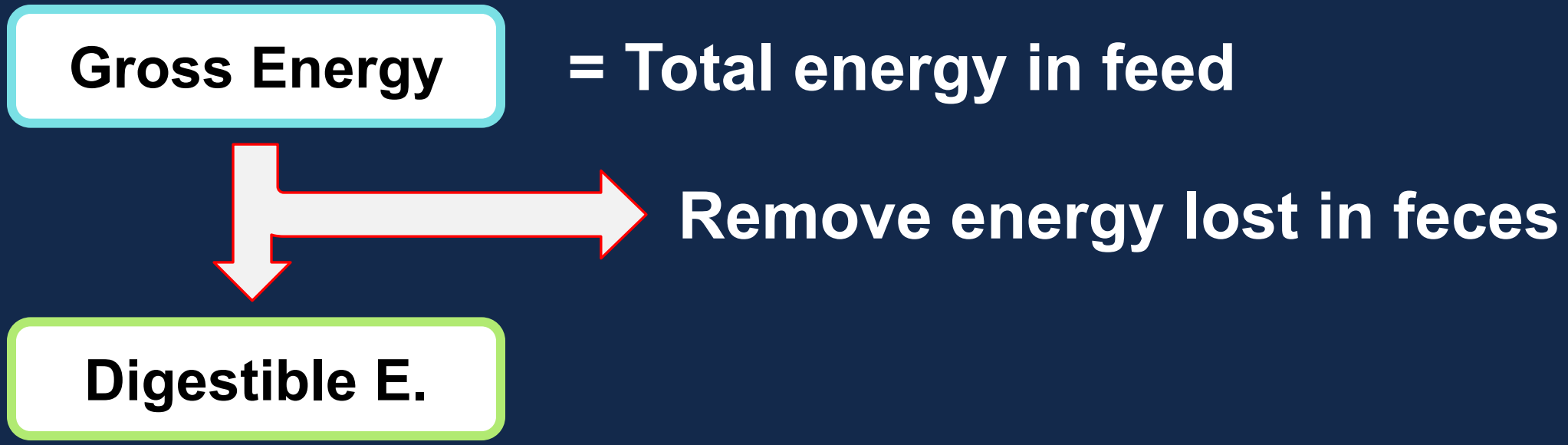
- The 3 most useful / key components in DDGS are:
  - Available energy content (ME)
  - Digestible amino acids
  - Available phosphorus

Metabolizable Energy

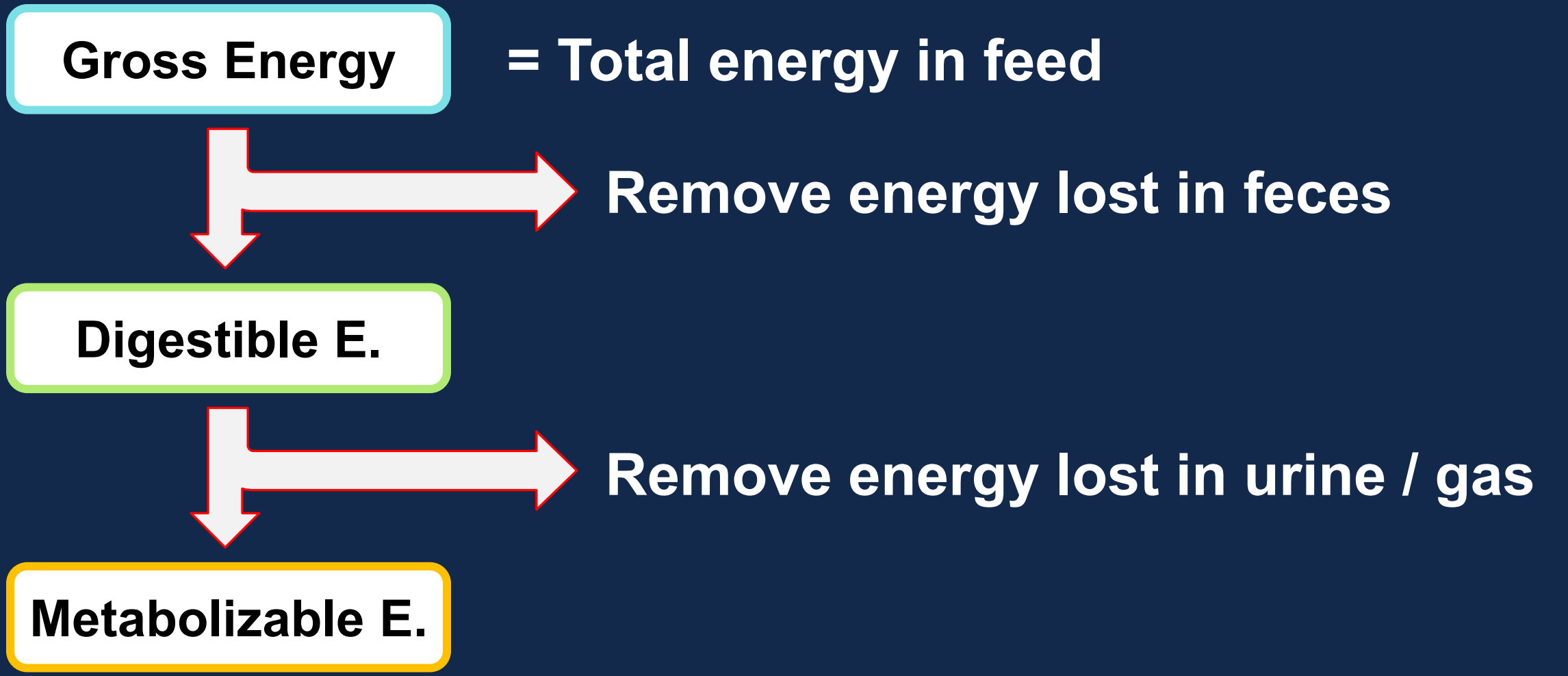
Metabolizable Energy

Gross Energy = Total energy in feed

Metabolizable Energy



Metabolizable Energy



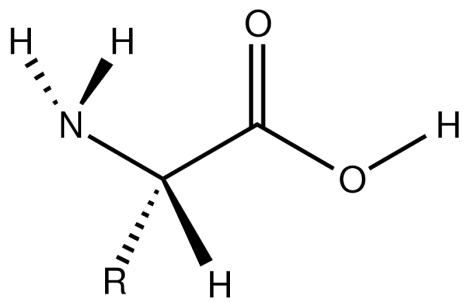
True Metabolizable Energy Content of OLD DDGS (kcal/kg; ≈88% DM)

Study	# of samples	Mean TME_n	Range
Lumpkins and Batal (2005)	1	2900	-
Batal and Dale (2006)	17	2820	700
Parsons et al. (2006)	20	2858	447
Fastinger et al. (2006)	5	2864	563
Weighted mean	43	2845	-

Summarized by Waldroup (2007)

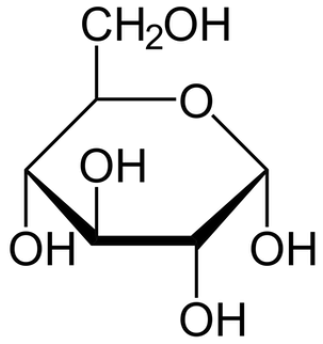
Lipids are a Dense Source of Metabolizable Energy

Protein



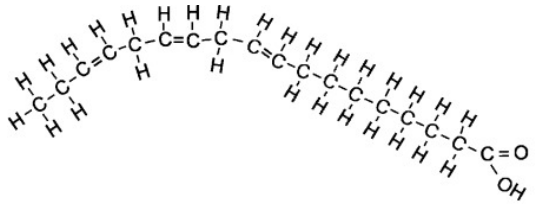
4 kcal/g

Carbohydrate



4 kcal/g

Lipid



9 kcal/g

ME content is Current DDGS is often lower than Old DDGS

Study	# of samples	Crude fat (%)	Mean TME_n[1]
Old DDGS	43	9.8	2,845
Parsons et al. (2023;2024)	6	6.8	2,592

[1]kcal/kg 88% DM basis

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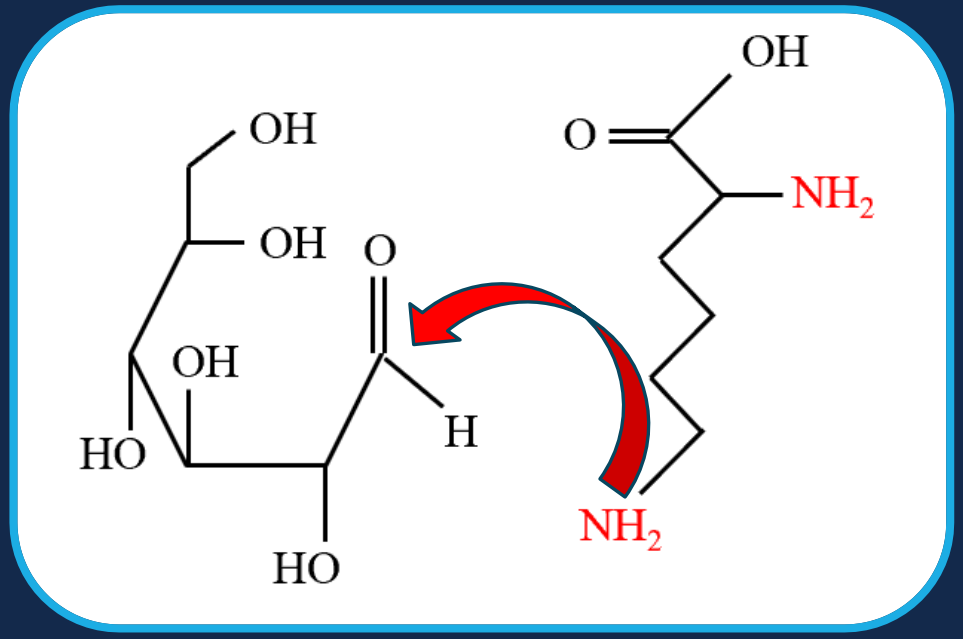
3 percentage unit reduction in fat
250 kcal/kg reduction in ME

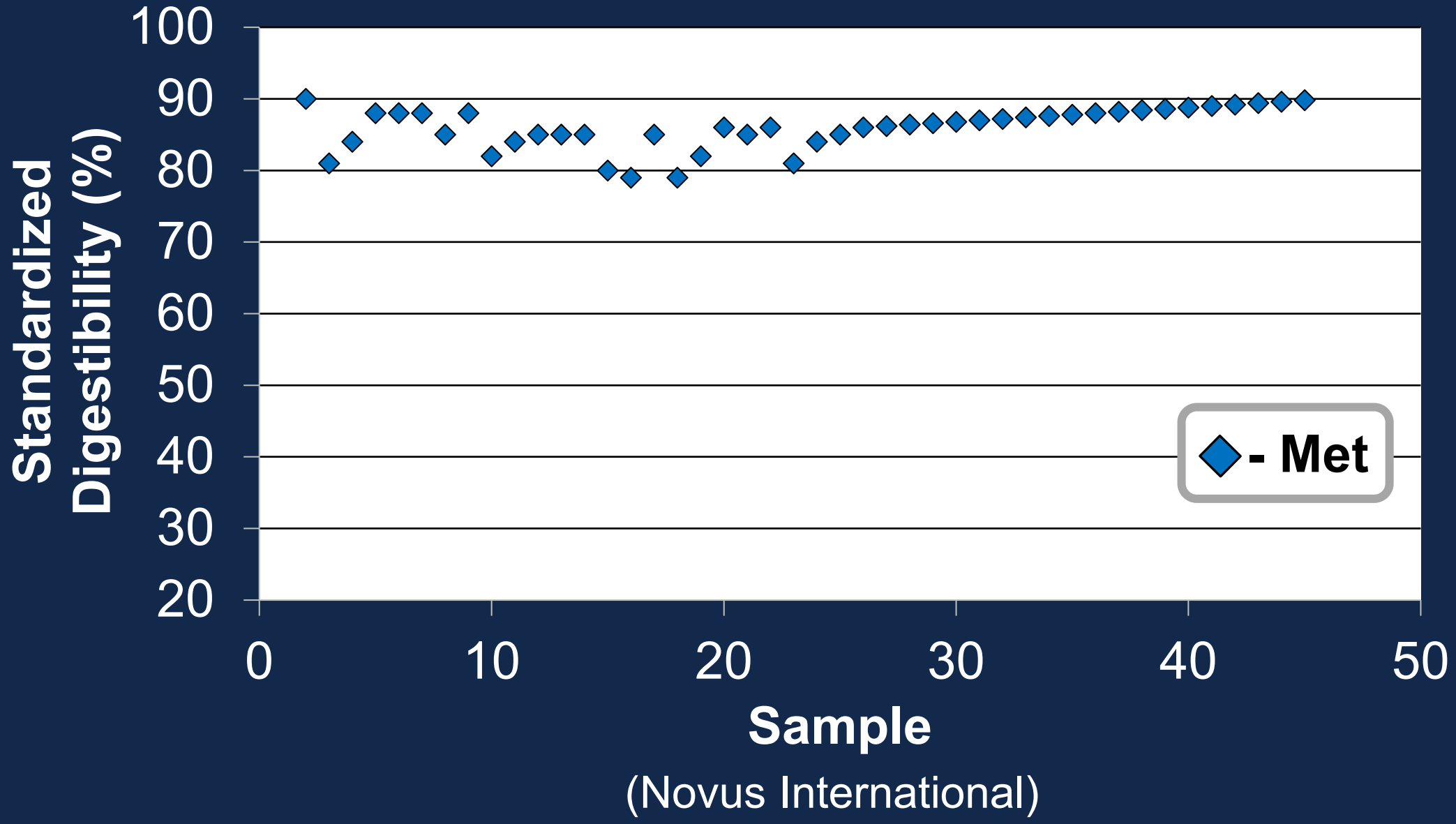
Amino Acids

Amino Acid Digestibility

- Amino acids are a vital part of poultry diets
- Three most limiting AA in broiler diets in U.S. are:
  - Methionine + Cysteine
  - Lysine
  - Threonine

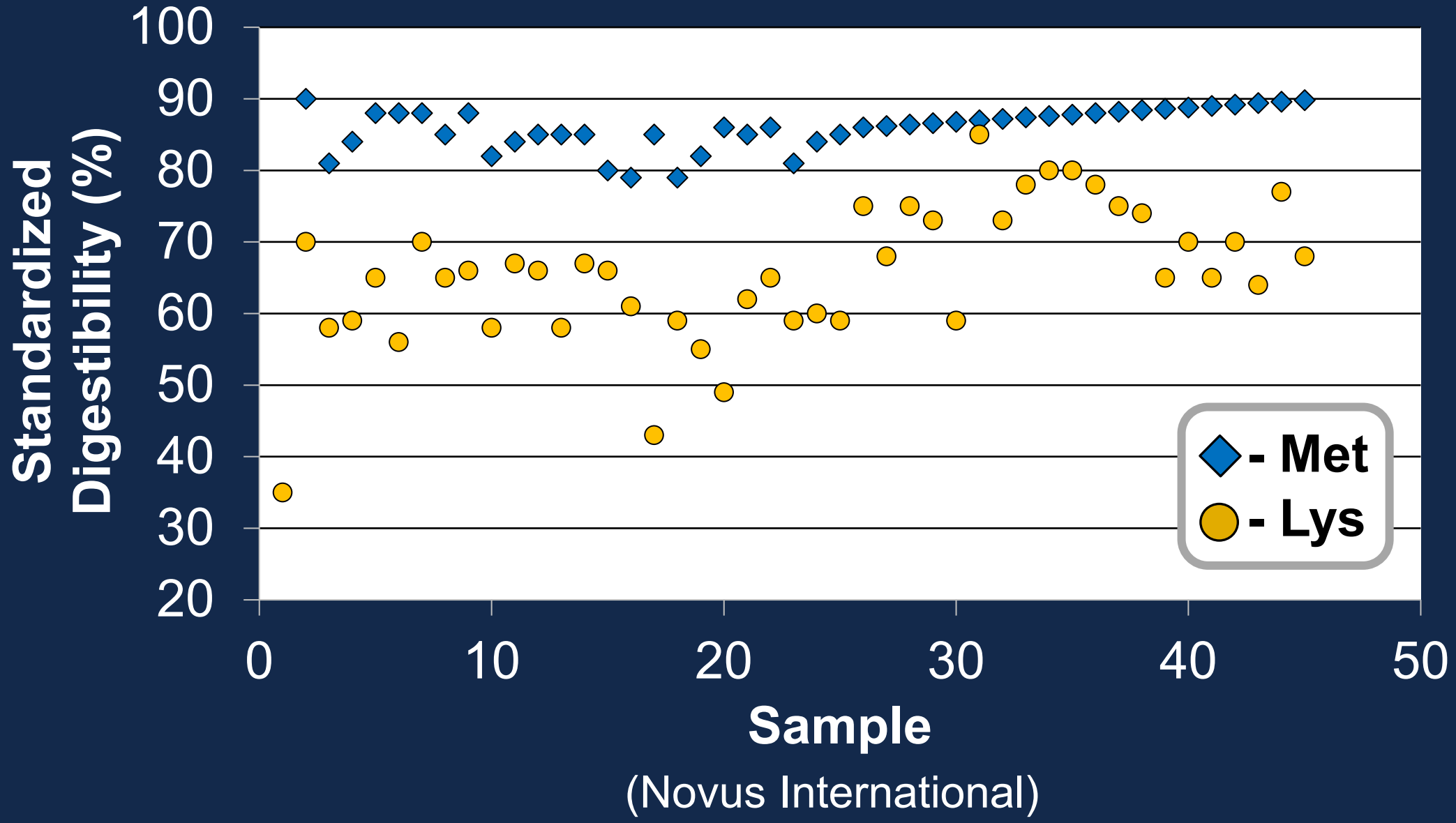


AA Digestibility: Methionine



(Novus International)

AA Digestibility: Lysine



(Novus International)

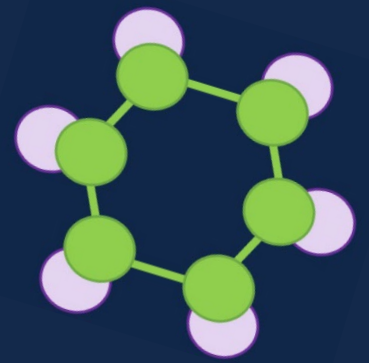
Phosphorus

Phosphorus Availability

- After energy and AA, phosphorus is the next most costly component/nutrient
- Poultry are highly efficient at absorbing non-phytate P
  - ➢ Phytate P is mostly unavailable

Plants:

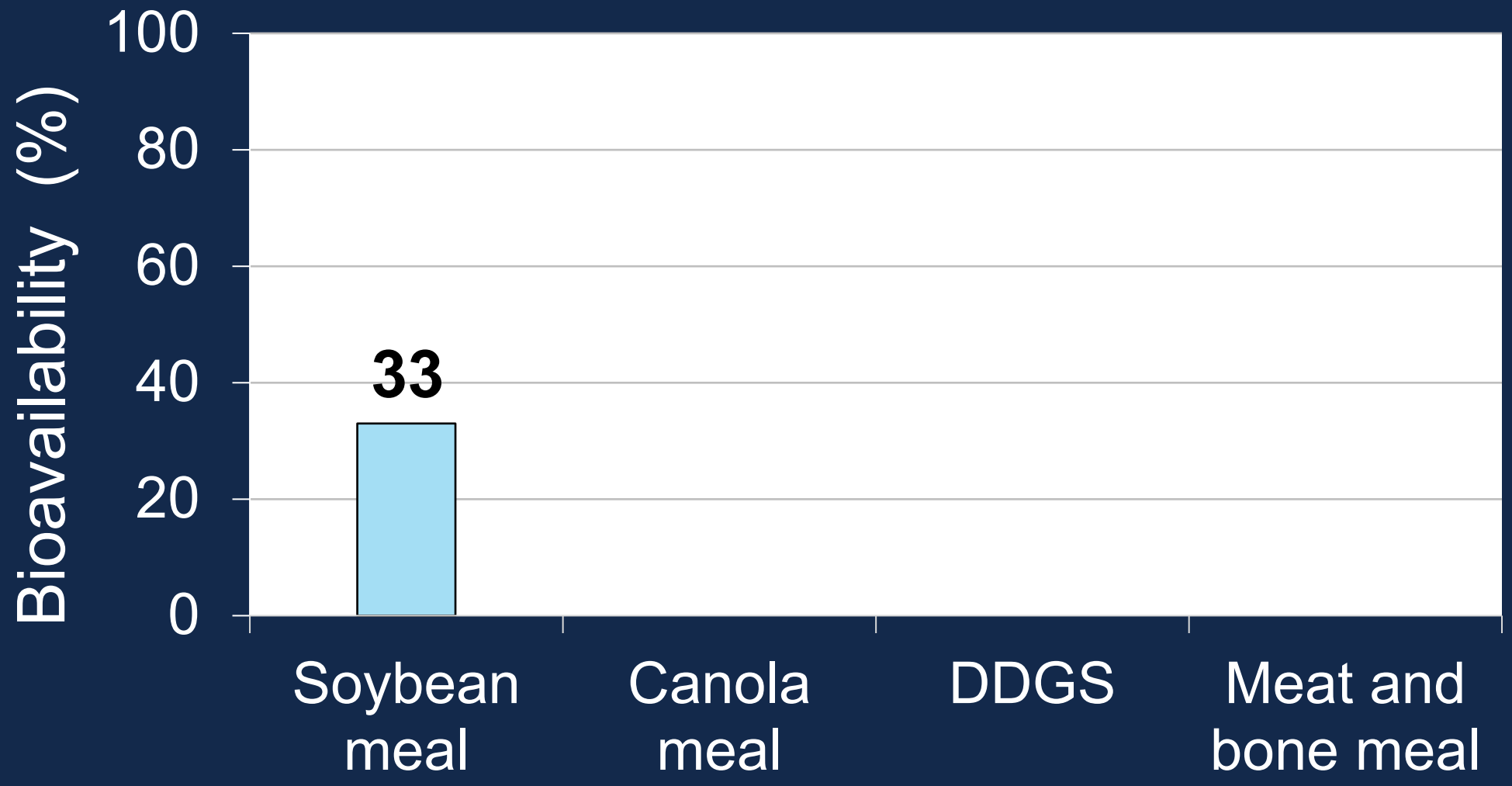
PO_4^{3-}



1/3 NPP

2/3 Phytate P

P Bioavailability in Feedstuffs



Hanna et al. (2018), Munoz et al. (2020), Parsons et al. (2023/2024)

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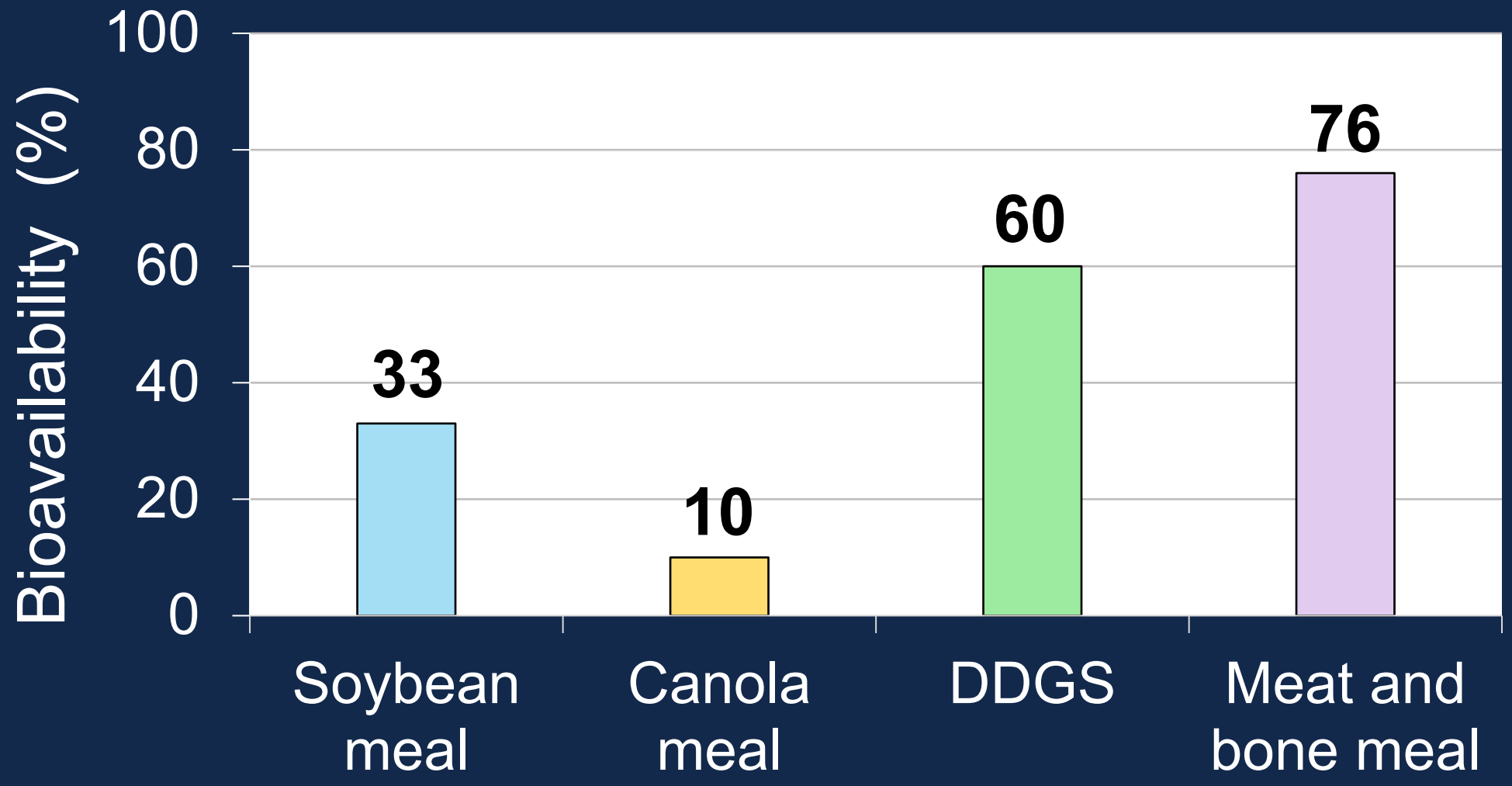

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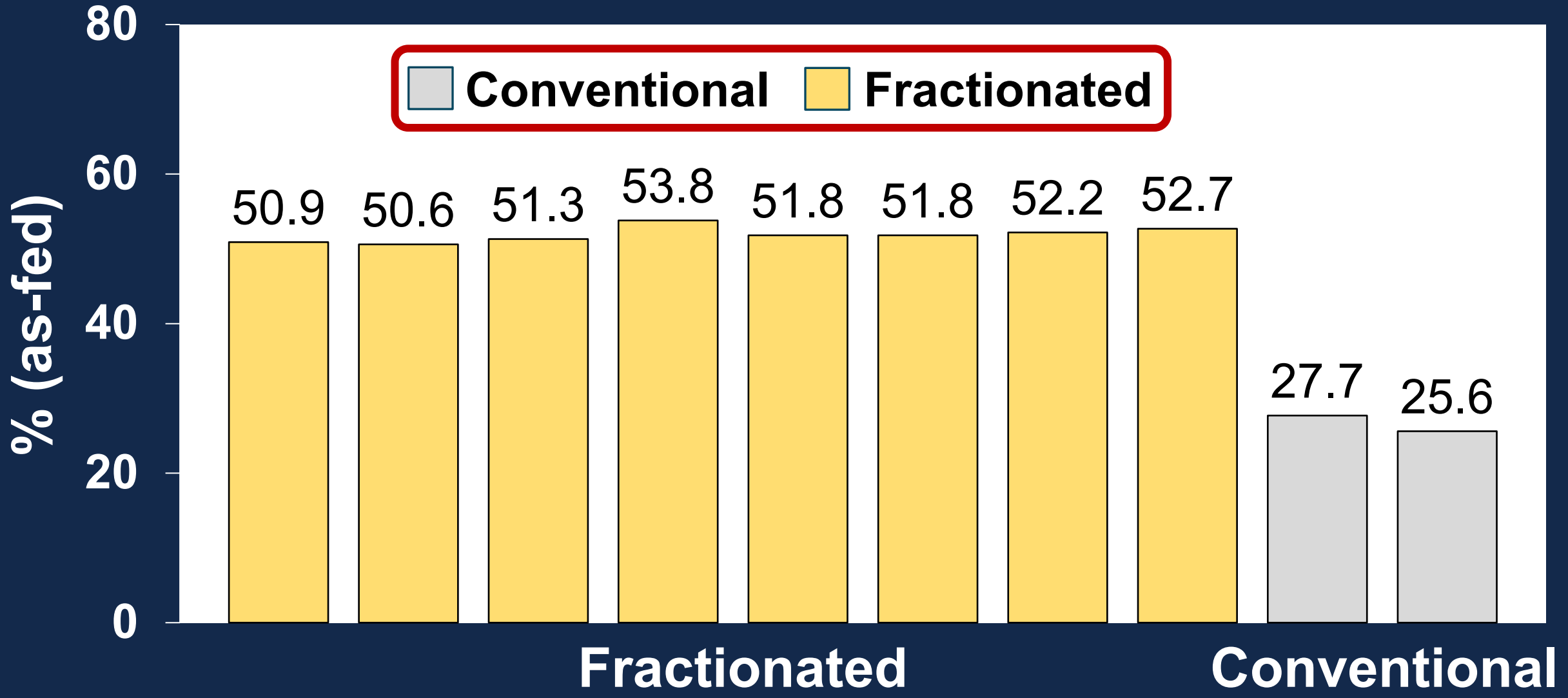
Improvements in Nutritional Value

1. Fractionation Systems

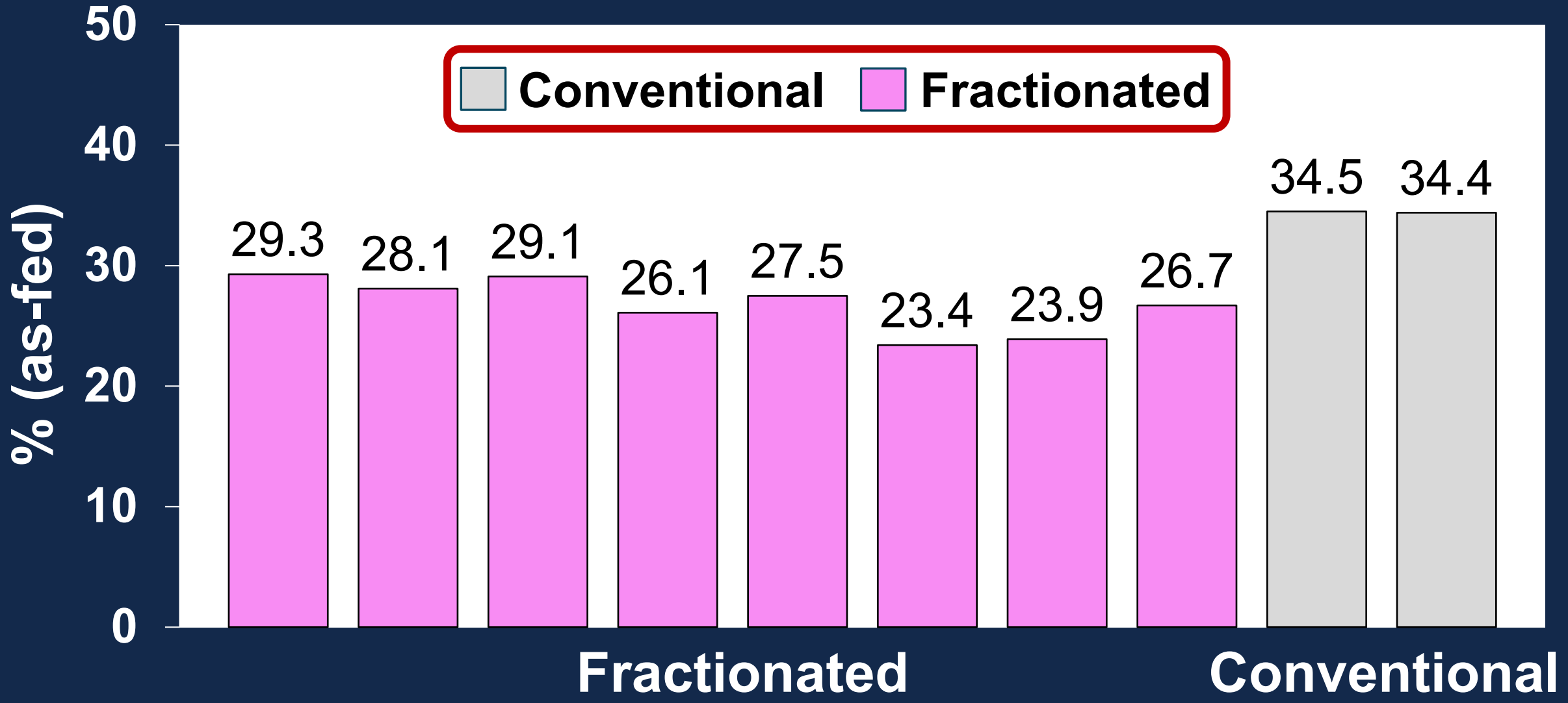
- Fractionation systems typically increase protein and reduce fiber
  - Poultry are good at digesting protein
  - Fiber utilization: cattle > pigs > poultry
- Front-end vs. Back-end fraction
  - Variations among systems; both improve quality

Increased Protein from Fractionation



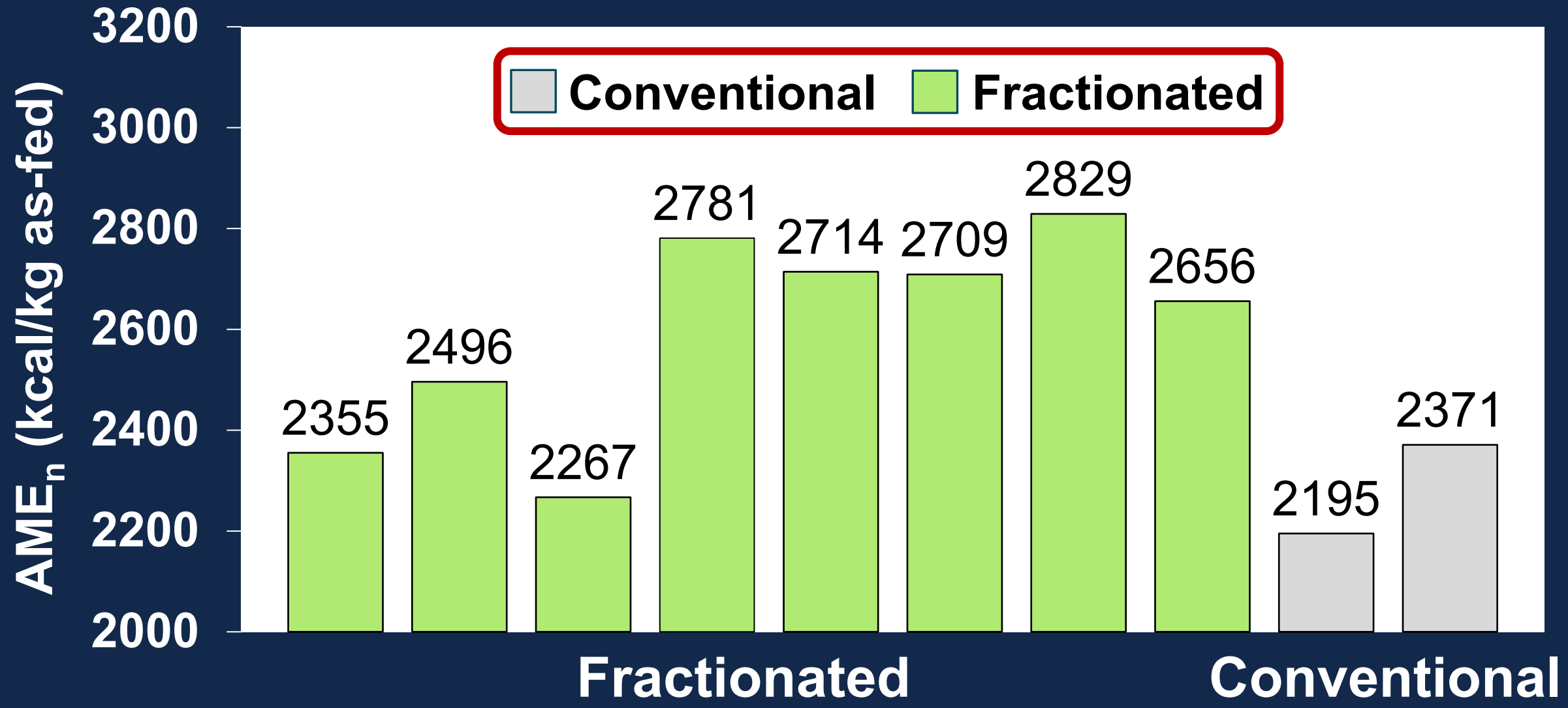
Parisi et al. (2024)

Reduced Fiber from Fractionation



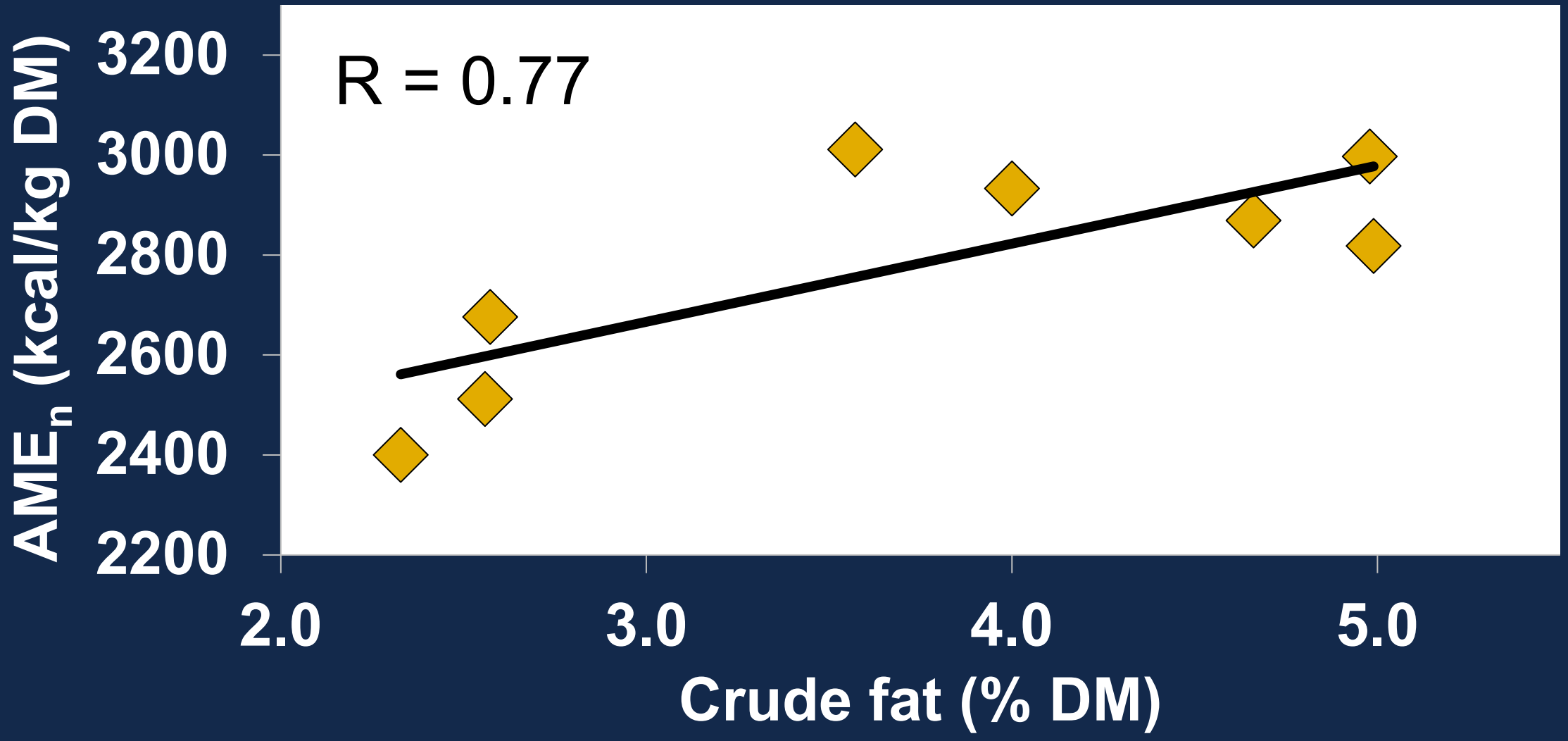
Parisi et al. (2024)

Altered ME from Fractionation



Parisi et al. (2024)

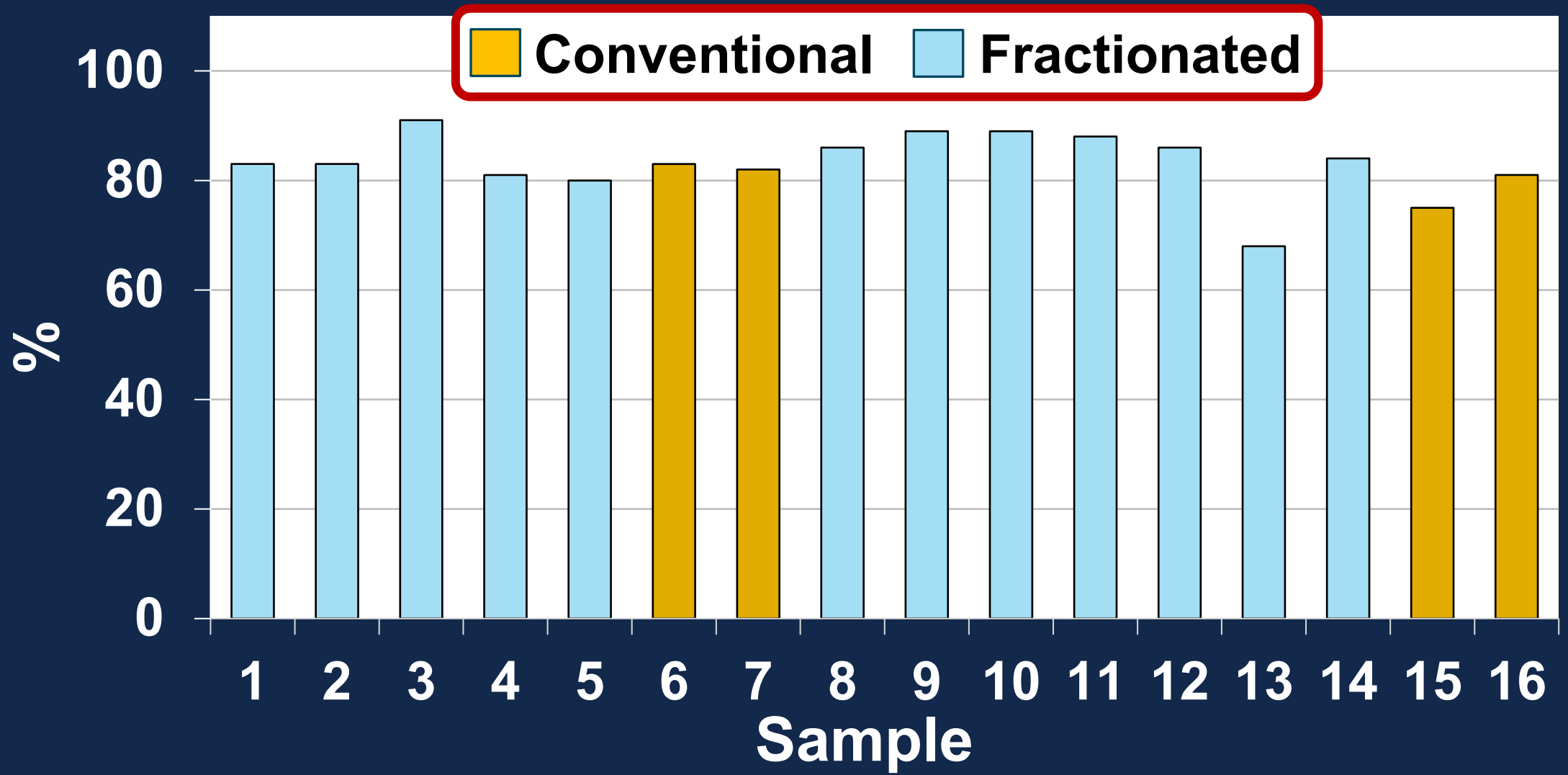
Correlation Between Oil and ME of Fractionated Samples



2. Milder Drying Processes

- Historically we see reduced digestibility of Lys in pigs and chickens in DDGS due to heat damage
- Milder drying is improving Lys digestibility

Lysine Digestibility



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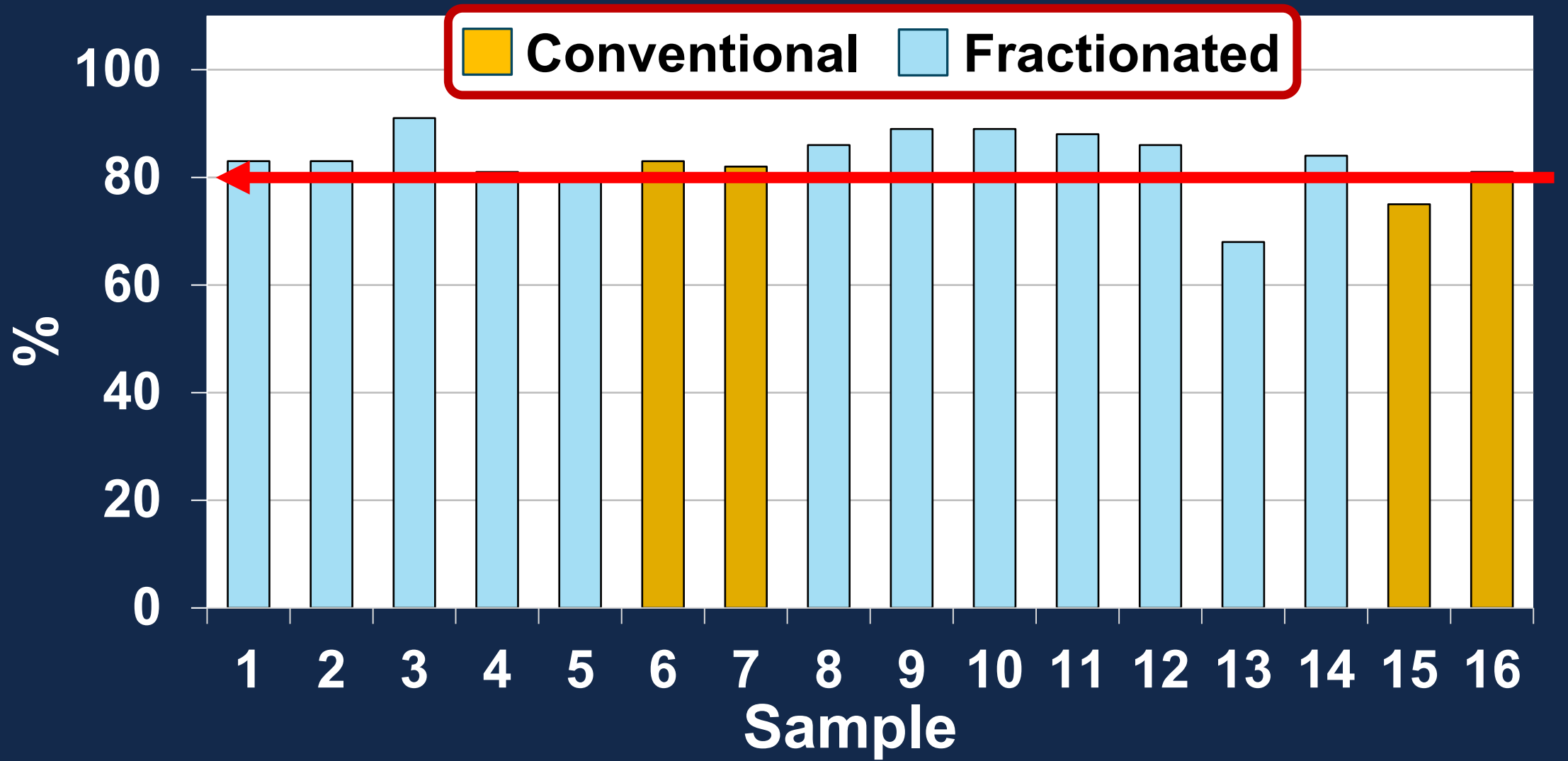
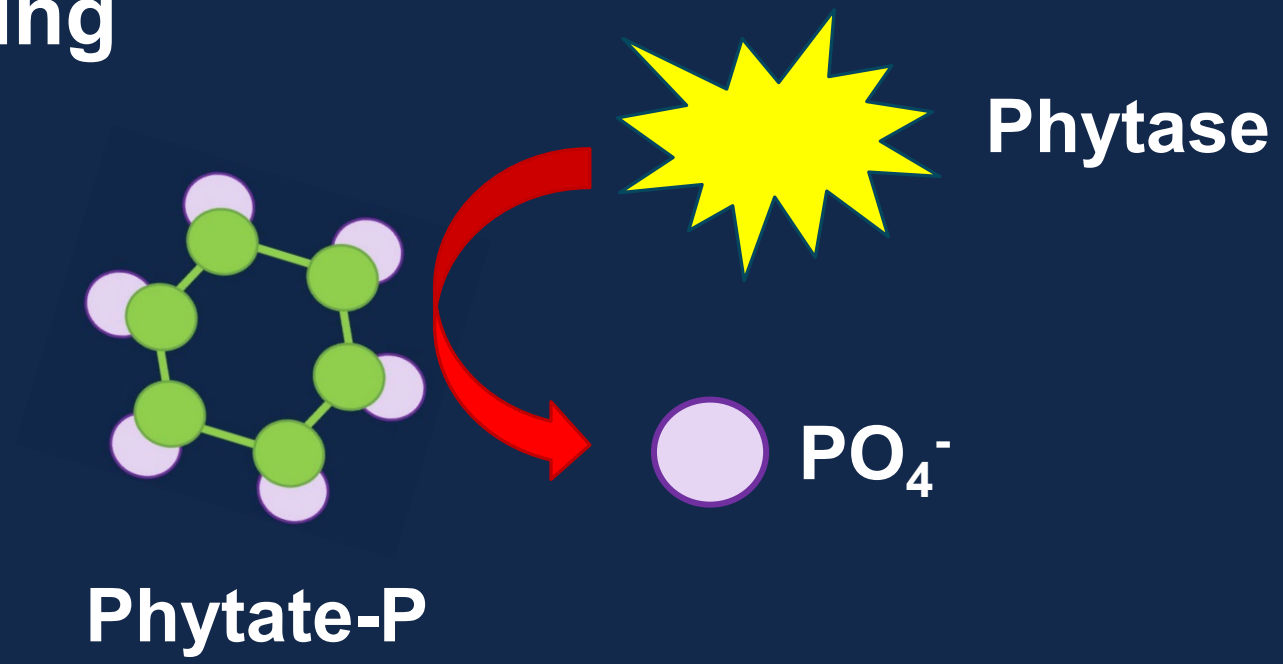


Parsons et al. (2023)

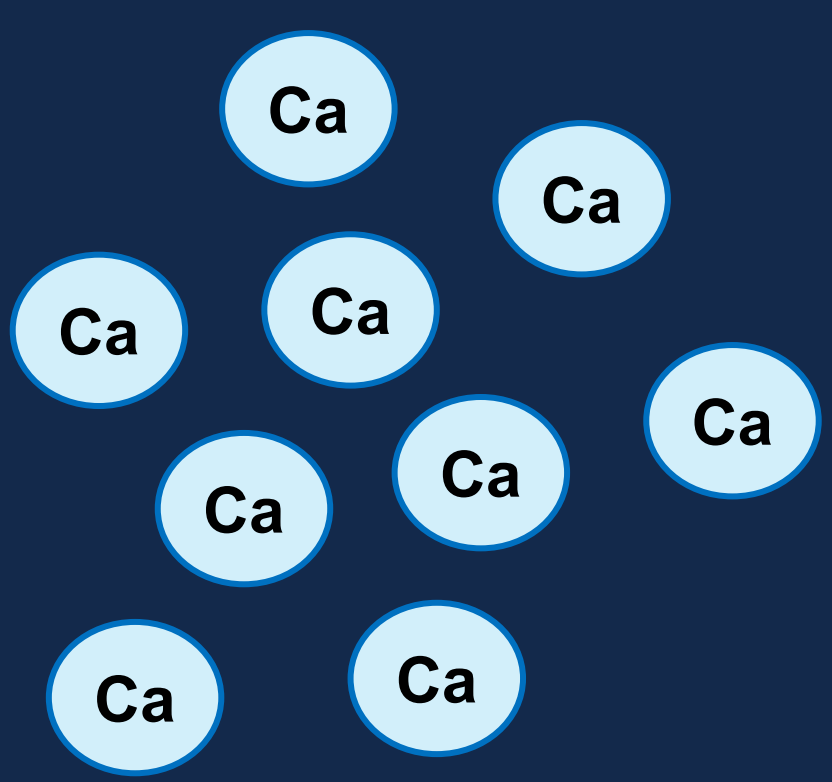
3. Improved P Availability - Phytase Use During Fermentation

- Poultry have poor use of phytate-P in commercial diets
- For phytate-P to be absorbed, it must be released from the inositol ring

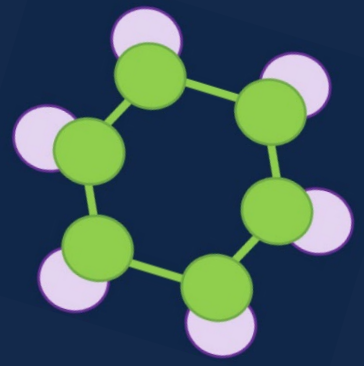


Calcium – Phytate Interaction

- In the GI tract of pigs and chickens, Ca will bind to phytate, reducing the ability of phytase to release P



Solutibility



Phytase

Calcium – Phytate Interaction

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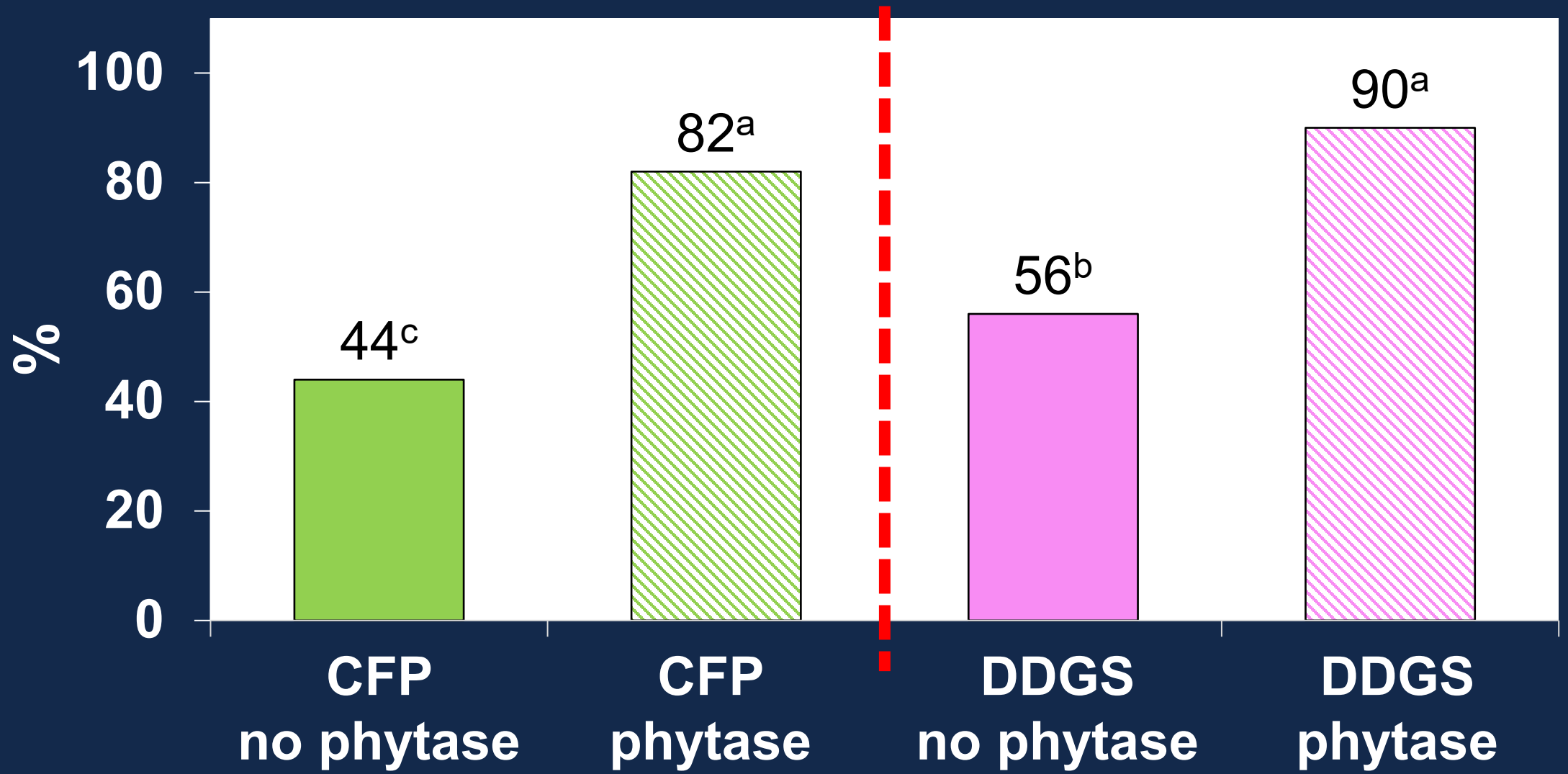
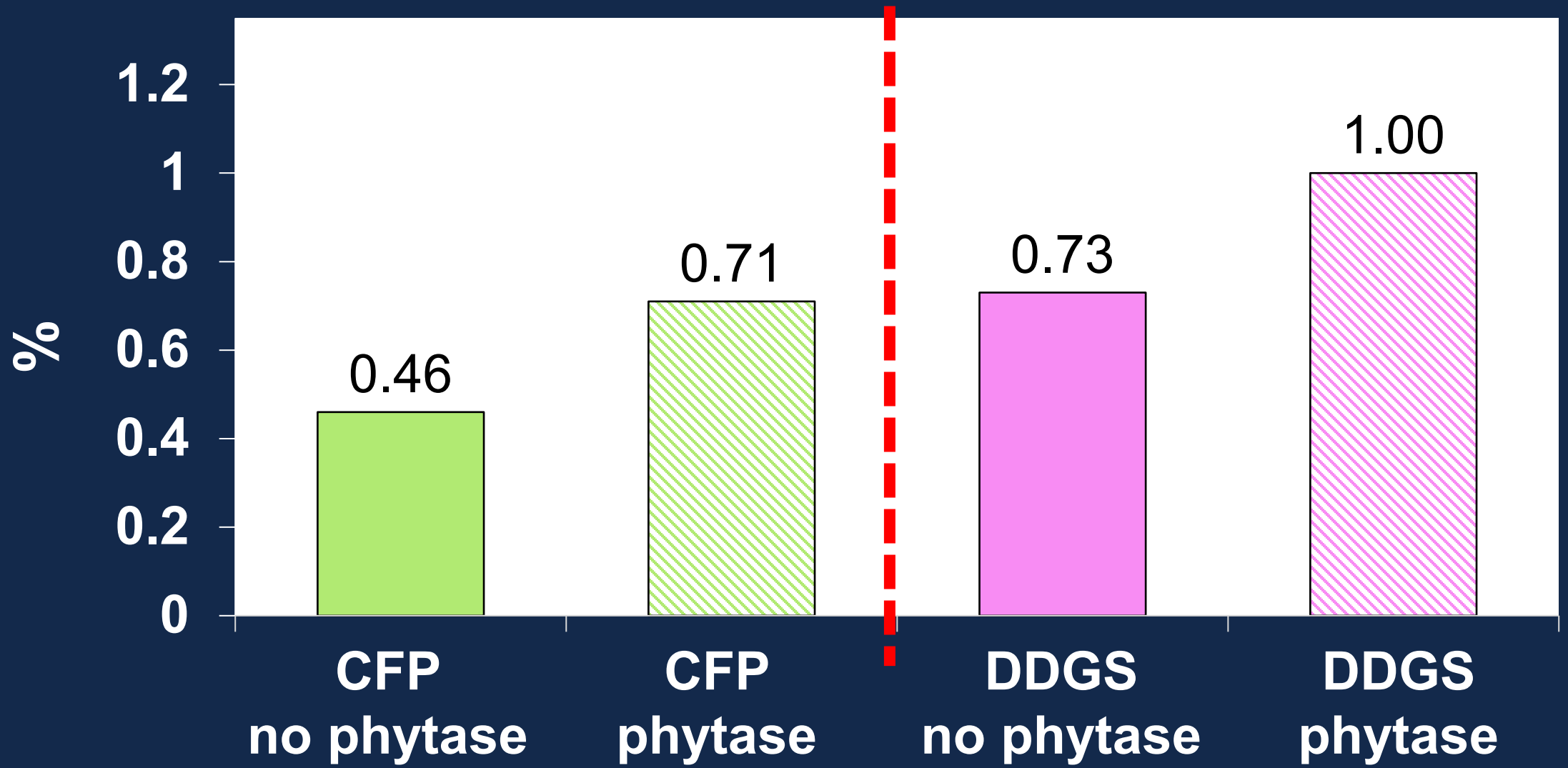
- Adding phytase during fermentation at ethanol plants:
  - Destroys phytate before animals consume it
    - Prevents Ca-phytate interactions
  - Maximizes availability of P

P Digestibility (%)



Parisi et al. (2026)

Available P content (%)



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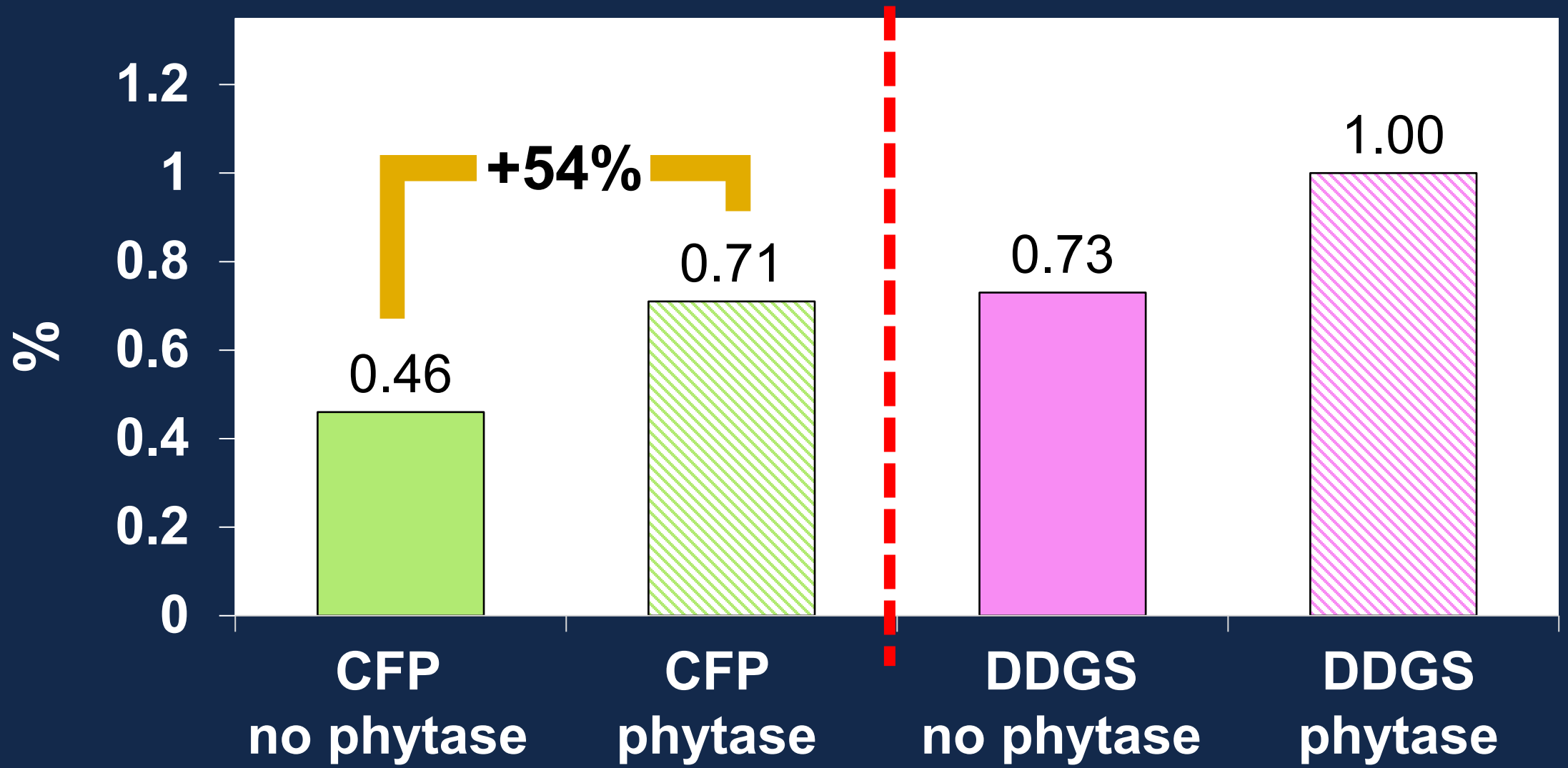

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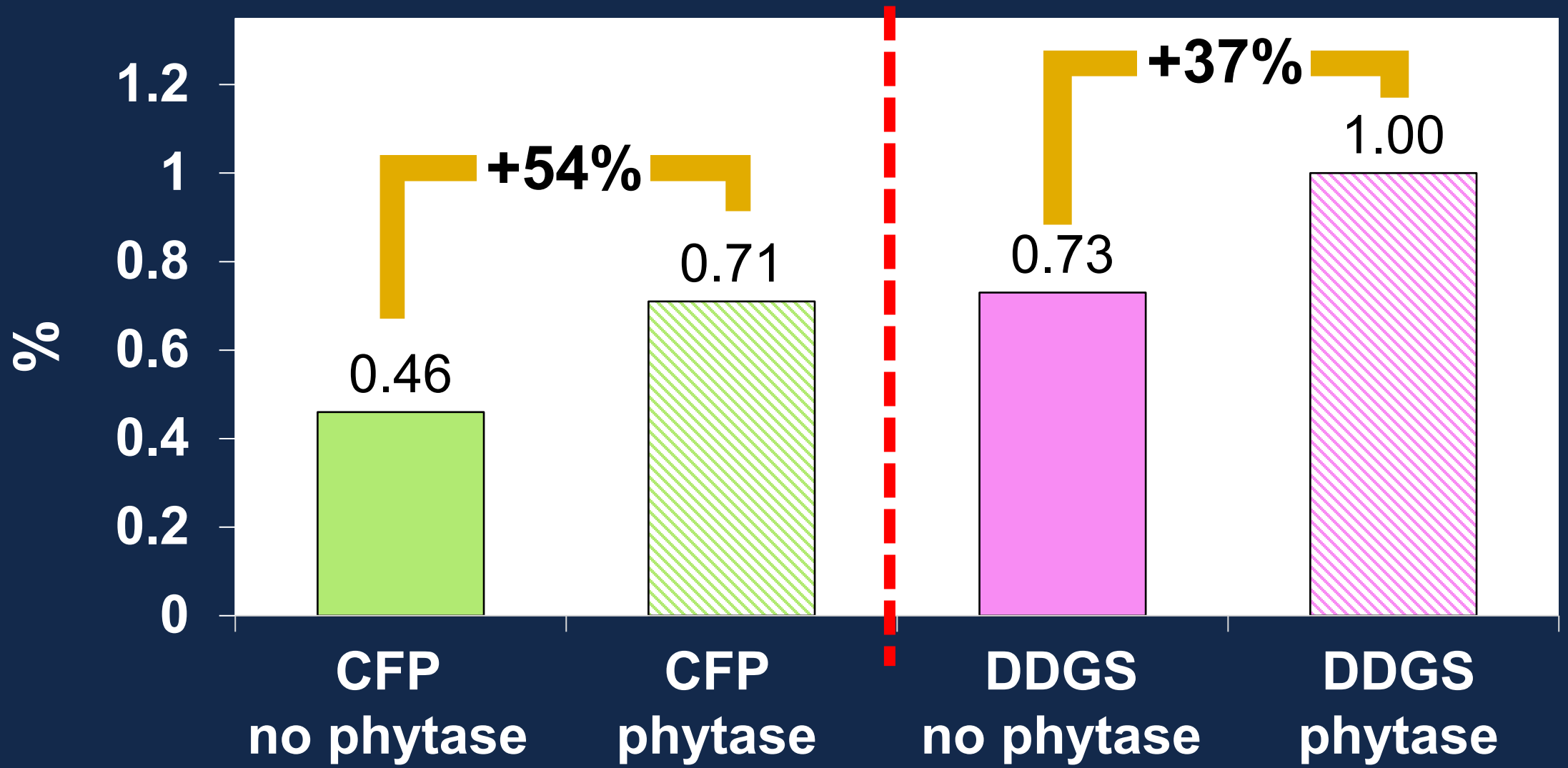

Parisi et al. (2026)

Insights From Commercial Poultry Nutritionists

Use of Fractionated Products

- Many of the largest poultry companies in the US are using fractionated DDGS products to some extent
  - Dietary inclusion rate ranges from 1 to 7%
  - Fractionated products fit well in our broiler diets

Main Complaint:
Want a consistent supply

Use of Conventional DDGS

- Nutritionists using DDGS include about 4-5% in diets
- Love DDGS for breeder diets
  - ➢ Inclusion ranges from 3 to 20% among companies



Summary / Key Points

- 1. ME in DDGS has gone down, but overall quality is substantially better

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- 1. ME in DDGS has gone down, but overall quality is substantially better
- 2. Fractionation improves nutritional quality
- 3. Oil levels in both unfractionated and fractionated products are important
- 4. Enzyme use during fermentation matters
  - Phytase substantially improves available P
  - What about other enzymes?

Thank You!

Questions?