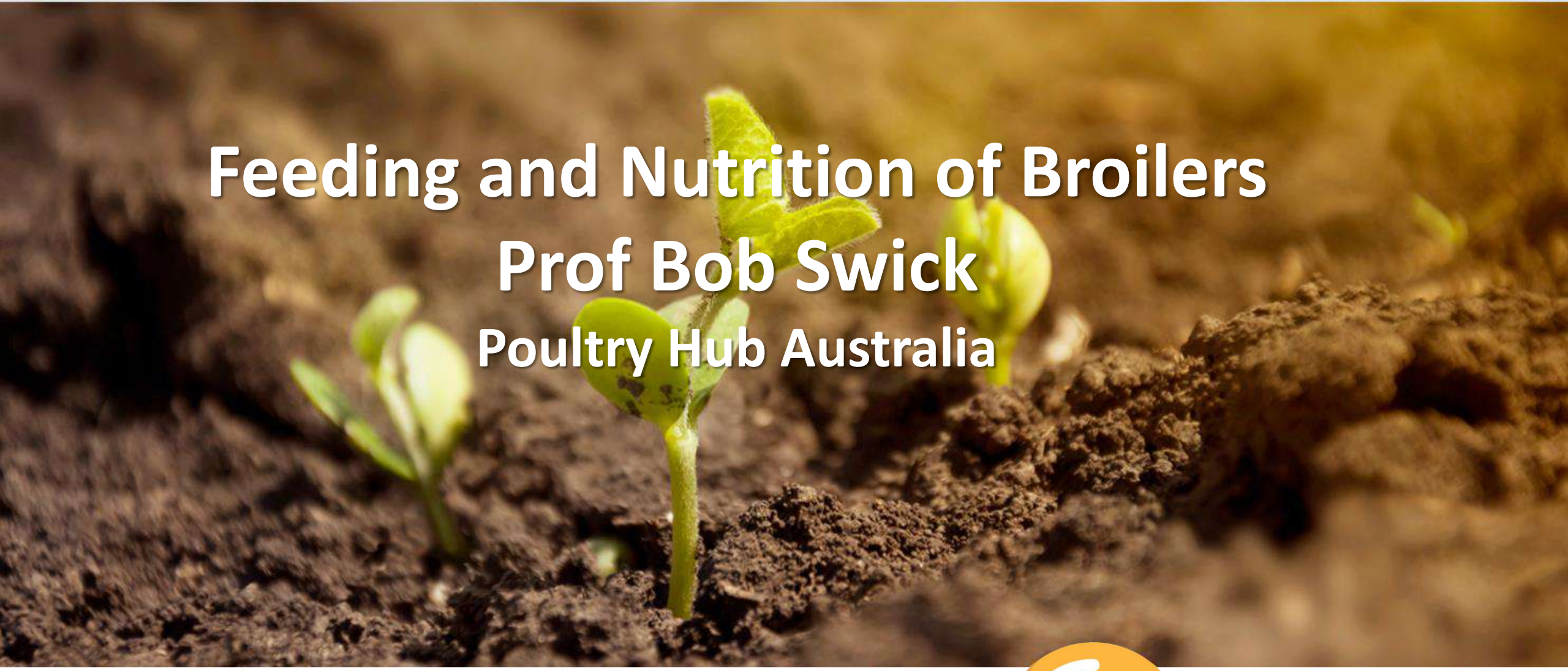

Feeding and Nutrition of Broilers

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Poultry Hub Australia

The SEC PROGRAM

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Agenda

- Breeder company information.
- Feeding programs, number of diets, and texture
- Nutrient requirements
- Synthetic amino acids
- Oil addition
- Phosphate
- Broiler diet composition
- Whole grain feeding

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Breeder company information

- **Most commercial breeders originate from a handful of companies based in the US and UK.**

  Aviagen www.ap.Aviagen.com
  Ross 308, Ross 508, Ross 708; Arbor Acres and Arbor Acres Plus; Indian River

  Cobb-Vantress www.cobb-vantress.com
  Cobb 500, Cobb 700; MV Male, Vantage Male;

  Hubbard www.hubbardbreeders.com
  Premium, Redbro

  Lohmann www.lohmann-breeders.com/lohmann-dual-layer-and-broiler-at-the-very-same-time
  Dual

  Anak
  Others

- **Genetic breeding programs are highly specialised and resource intensive.**
- **The companies genetically select based on growth, efficiency, disease resistance, meat yield, egg production, fertility, resistance to metabolic conditions. They use both traditional and biochemical methods.**

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Feeding programmes

- **Feeding programmes are planned to meet the requirements of**
  - Age
  - Breed/strain
  - Gender
  - Product quality

Typical feeding phases

- **Phases set by amount fed**
  - Starter (0.5 kg)
  - Grower (1.0 kg)
  - Finisher (1.7 kg)
  - Withdrawal (about 0.3 kg). ⇨ **3.5 kg Total allocation**

Amounts vary by producer

- **Approximate ages of feed change**
  - Starter (1-10 days)
  - Grower (11-24 days)
  - Finisher (25-35 or 42 days)
  - Withdrawal (>35 days)

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Feeds and harvest

- Many broiler producers use 4 feeds, which they call starter, grower, finisher and withdrawal (or finisher 2) .
- Some broiler producers use multiple harvesting, usually 3 harvests, first at 1.8-2 kg, second at around 2.5 kg, and the final are males at around 3-3.3 kg.
- This system provides birds of suitable weights for different purposes, and maximizes shed capacity
- Typical harvest weight is 2.5-2.6 kg
- FCR of a flock is usually calculated for a bird of 2.45 kg

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Nutritional features of phase feeding

- Nutrient composition of diets are varied from one phase to the other.
- This attempts to optimize intake of required nutrients.
- Starter diets are of a higher nutritive value than other diets.
- Daily feed intake increases with age.
- Less nutrient dense diets at the finisher/withdrawal phases reduce costs.
- Antibiotics and other additives are excluded from withdrawal diets.

Form of feed and texture for broilers

Age (days)	Feed form and size
0-10	Crumbles
11-24	2-3.5 mm diameter pellets
25 until marketing	3.5 mm diameter pellets

Mash (ground grain protein meal and other mixture

Pellets

Crumbles

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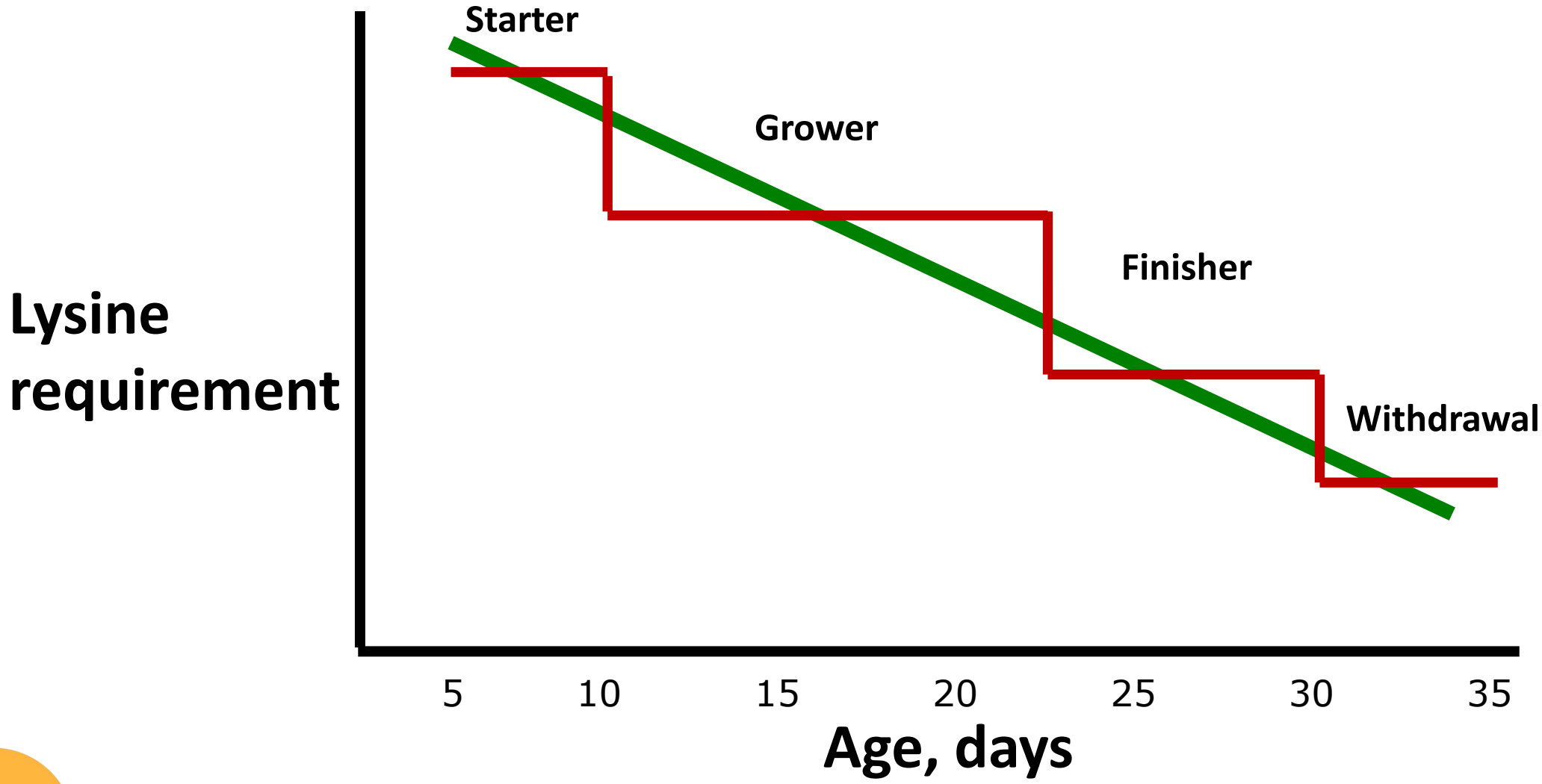
Nutrient requirements



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Broiler nutrient requirements, Ross 308, % unless noted

Aviagen, 2022 Target weight 2.0 – 3.5 kg

	Starter	Grower	Finisher	Withdrawal
AMEn, kcal/kg	2975	3050	3100	3125
Crude protein* (use AA)	23.0	21.5	19.5	18.0
SID Amino acids				
Lysine	1.32	1.18	1.08	1.02
M+C	1.00	0.92	0.86	0.82
Methionine	0.55	0.51	0.48	0.45
Threonine	0.88	0.79	0.72	0.68
Valine	1.00	0.91	0.84	0.80
Isoleucine	0.88	0.80	0.75	0.70
Arginine	1.40	1.27	1.17	1.12
Tryptophan	0.21	0.19	0.17	0.16
Calcium	0.95	0.75	0.65	0.60
Available Phos	0.50	0.42	0.36	0.34
Sodium	0.18	0.18	0.18	0.18
Chloride	0.18	0.18	0.18	0.18
Linoleic acid	1.25	1.20	1.00	1.00
Choline, mg/kg	1700	1600	1500	1450

Comments on nutrient requirements

- Energy content increases with age
- Protein and amino acid contents decline with age
- Key mineral contents decline with age

Ideal protein ratio

Amino acid	Starter	Grower	Finisher
Lysine	100	100	100
Methionine	37	38	40
M+C	70	73	76
Tryptophan	16	17	18
Threonine	64	66	70
Arginine	105	108	110
Isoleucine	65	67	69
Valine	77	77	76
Glycine + Serine	148	148	148

All amino acids are expressed relative to lysine (on a digestible basis).

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Crude protein requirement

- When the “7” main essential amino acids (lys, met, cys, trp, ile, val, thr, arg) are taken into account it is generally not necessary to introduce a minimal constraint for protein.
- A crude protein minimum constraint may be useful if amino acids are not taken into account when formulating. This can reduce the risk of a deficiency.

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Synthetic amino acids

- Three amino acids are widely used in broiler diets: lysine, methionine and threonine.
- Levels are around 2-3 kg/t for L-lysine and D,L methionine, and 500 g kg/t for L-threonine.
- Levels of synthetic amino acids are maximized by not using minimum protein levels.
- L-Valine, L-Arginine and L-Isoleucine are now available and are being used.
- Glycine is also now available and used heavily where meat meal is banned.

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What are synthetic amino acids? Why use?

Amino acid	Method	Date started	Use ‘000 mt/yr
MHA (dry Ca salt of HMTBA)	CS	1958	60
D,L-methionine	CS	1963	1030
L-lysine HCL	F	1978	2350
HMTBA (liquid)	CS	1984	610
L-tryptophan	F	1985	40
D,L-methionine Na (liquid)	CS	1985	?
L-threonine	F	1990	580
L-lysine sulfate	F	1996	?
L-valine	F	2019	20
L-isoleucine	F	2019	1.9
L-arginine	F	2019	?
L-methionine	CS+F	2020	150
Glycine	F	2016	?

CS = chemical synthesis; F = fermentation or biological synthesis

Broiler grower diet with and without amino acids offered

		Percent	
Ingredient		w/AAs	w/o AAs
Corn		59.4	20.3
SBM		32.6	69.8
Oil		3.81	9.73
Limestone		1.43	1.29
MDC Phosphate		1.49	1.24
Salt		0.36	0.36
Vitamin premix		0.05	0.05
Mineral premix		0.08	0.08
Choline Cl 70%		0.09	
L-lysine HCl 78.4		0.28	
D,L-methionine		0.29	
L-threonine		0.14	
Price		$445.10	$571.08

Energy sources for poultry

- **Cereal Grains**
  - —Corn/Maize, wheat, sorghum, barley, triticale, oats, rye rice
- **Cassava/tapioca**
- **Cereal by-products**
  - —Wheat milling (millrun), rice milling (rice bran), corn milling (corn gluten meal), fermentation/brewing (dried distillers grains)
- **Fats and oils**

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Protein sources for poultry

- Whole oilseeds
  - Soybean (full fat, heat treated), canola seed
- Oilseed meals
  - Soybean meal, canola/rapeseed, sunflower, cottonseed
- Animal protein meals
  - Meat and bone meal, bloodmeal, fishmeal, poultry by-product meal, feathermeal

Feeds and diets

Grains

Corn

Wheat

Sorghum

Protein meals

Soybean meal

Rapeseed/Canola meal

Meat meal

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Comments on pattern of ingredients used

- **Energy sources increased with age**
- **Protein sources reduced with age**

Starter diet would have more protein meals than finisher diet

Finisher diet would have more grain than starter diet

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Approximate composition of a typical broiler grower diet

Grains (corn, wheat, sorghum, barley, etc) 50 to 60%
Protein meals (SBM, Canola meal, Meat meal etc) 20 to 30%
Edible oil (< 5%)
Limestone (< 2%)
Phosphate (< 2 %)
Salt (< 5%)
Amino acids (methionine, lysine, threonine) (<1%)
Choline chloride (<0.5%)
Vitamin and trace mineral premix (< 0.25%)
Enzymes (phytase, xylanase others) (<0.1%)
Growth promoters (<0.1%)
Other (mold inhibitors, toxin binders etc) (< 0.1%)

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Ingredients complement each other

Corn is high in energy and it's protein is rich in methionine

Soybean meal is low in energy, low in methionine but rich in lysine

The combination of corn and soybean meal is the most popular and available feed for poultry

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Oil addition

- Oils available for poultry are tallow, poultry oil, canola oil, soybean oil, palm oil, various mixtures and others.
- Tallow and palm oil should not be used exclusively for young chickens, that is in starter diets.
- Levels of added oils should be restricted to 2 to 4% maximum especially in pelleted diets as the oil will result in pellet breakage.

Phosphate sources

- Meat and bone meal
- Inorganic phosphate
  - Dicalcium phosphate
  - Mono dicalcium phosphate
  - Defluorinated rock phosphate
- Phytase

Typical broiler grower diet

Ingredient	Percent
Corn	30.0
Wheat	15.0
Sorghum	16.3
Soybean meal	30.4
Meat and bone meal	3.0
Edible oil	3.6
Limestone	0.65
Salt	0.27
Vitamin and TM premix	0.15
Choline Cl 60%	0.08
L-lysine HCl	0.215
D,L-methionine	0.257
L-threonine	0.071
Phytase	0.01

Nutrient	Percent*
MEn kcal/kg	3100
MEn MJ/kg	12.97
Crude protein	22.2
Crude fat	6.2
Crude fiber	2.5
SID Arg	1.23
SID Lys	1.15
SID Met	0.55
SID M+C	0.87
SID Ile	0.87
SID Thr	0.77
SID Val	0.92
Calcium	0.87
Phosphorus avail	0.44
Sodium	0.18
Chloride	0.25
Choline mg/kg	1600
Linoleic acid	2.5

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*unless otherwise noted

Whole grain feeding

- Feed companies in wheat growing areas now add whole wheat to broiler diet pellets.
- This is achieved either through the addition into the mixer, or a weigh plate and auger.
- Levels added are about 15% in grower, finisher and withdrawal diets.
- The added wheat is included in the formulation and the pellets consist of remaining grain, protein meals, vitamins, minerals, oil.
- This practice improves FCR by 2-3 points and anecdotally is claimed to reduce incidence of wet litter. It increases productivity of the feed mill.
- This system could also be used with sorghum and barley and cracked corn. There are publications in the literature.

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Conclusions

- Nutrient requirements differ between genetic strains; consult breeder information
- Typically, there are 4 phases for broiler but this varies.
- Starter is crumbled pellets and grower, finisher and withdrawal are pellets.
- Amino acids requirements should be on Standard Ileal digestibility basis.
- D,L-methionine, L-lysine and L-threonine are usually added. Other may be added as required.
- Added oil should be limited to less than 4%.
- Saturated fat such as palm or tallow should not be fed exclusively to starting birds.
- Available phosphorus can be derived from meat and bone, inorganic sources and/or phytase.
- Calcium to available phosphorus ratio is around 2:1.
- Corn and soybean meal complement each other with respect to amino acids and energy.
- Whole wheat or other grains may be added to pellets.

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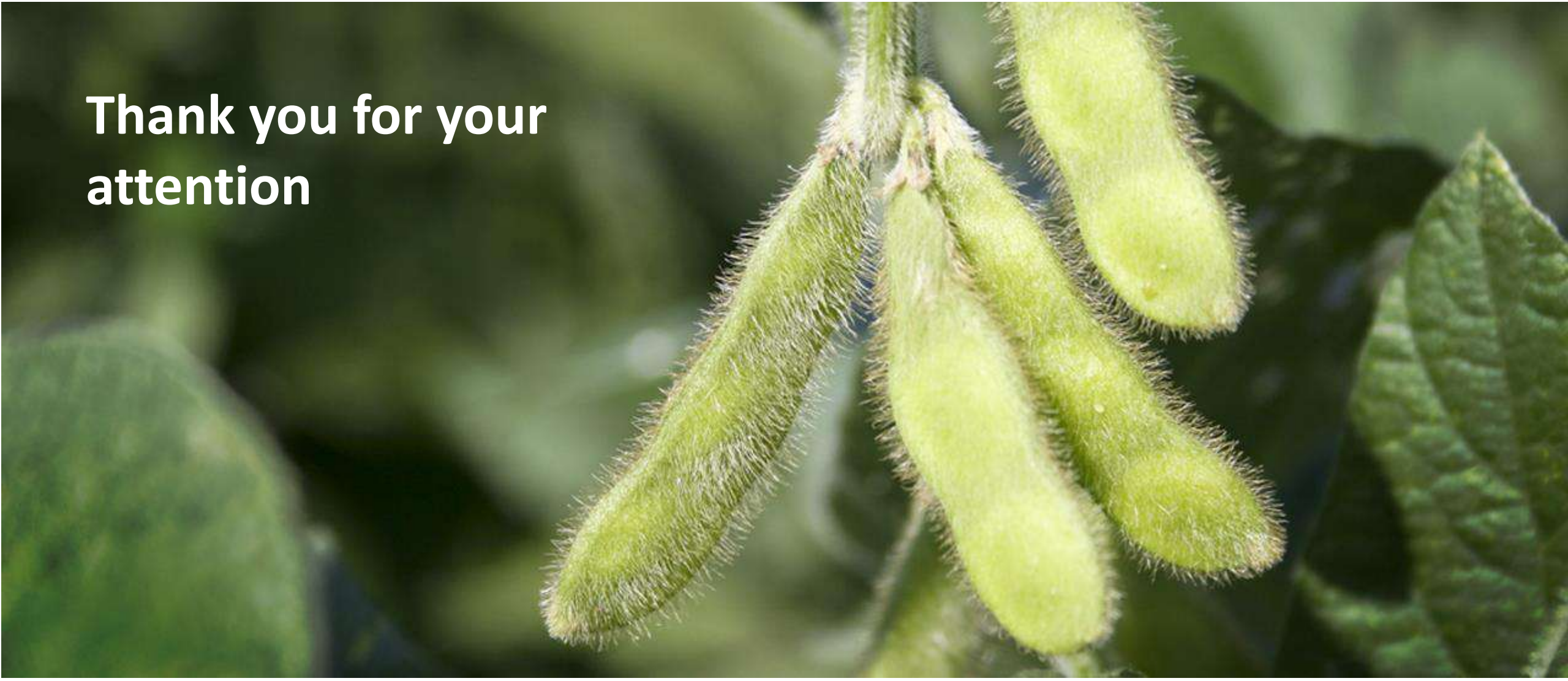
Thank you for your attention



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