

# **The use of the pre - starter diet in broiler nutrition**

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## **INTRODUCTION**

Increased attention is now being given to the nutritional needs of the chicken during the first week post - hatching , not only because this period has become recognized as being ever more critical in the development of modern broilers but also because broilers are reaching market weight in a shorter period . As a strategy to compensate for an initially immature digestive system , interest in the use of pre - starter diets has been arisen , with the goal of providing either a higher concentration of nutrients or more digestible ingredients facilitate nutrient utilization during the first week of life . Research has shown clear evidence of increased performance of chicks by the inclusion of certain carbohydrates and protein sources in the pre starter For the modern meat - type , fast growing chickens , the use of a pre - starter diet may become one important strategy to achieve flock uniformity . enhance growth performance during the first week , and improve livability at the end of the production cycle .

Broiler nutrition is based on phase - feeding or multiphase nutrition , which based on fulfilling nutritional requirements of broilers in specific moments of their life cycle , for the purpose of nutrition optimization , i.e. " filling of feed components to broiler needs in certain growth stage . According to this , this new early - life fed diet is recently recommended . As early as 1974 , poultry nutritionists brought up the concept of a pre - starter diet for broiler chicken , with the goal of boosting the growth rate of chicken during the initial phase of its productive life . Some of the first published work regarding per - starter diet originated in India . During the seventies of the last century broiler chickens fed the pre - starter diets showed improved body weight gain and feed conversion at 3or 4 weeks of age , but they were not able to maintain the initial growth rate , and no differences were observed in performance at the

market age , which was 10 weeks of age at that time in India ( Sahoo and Rao , 1974 ; Mathur , 1976 ) . The conclusions of the authors were that the use of pre - starter diets was not beneficial . Due to genetic selection , and a variety of improvements in husbandry , nutrition and health , the market age broiler chickens has been gradually reduced in the last decades . In the last 10 years , interest in early nutrition research has increased due to correlation between 7 - d - old weight and final weight . Some researchers have noted that a pre - starter feeding period system is very necessary for helping chicken growth rate ( Nobakht , 2001 ) . Since growth of broilers during the first week of life plays an important role in subsequent growth and performance and it represents about 20 % of the life span of broilers , when the highest growth rate takes place ( Gonzalez and Saldanha , 2001 ) ; the body weight is increased two - threefold and considerable changes in gut and muscle weight and morphology are observed .

At hatch young chick faces two basic challenges : the first one is the immature functional capacity of the digestive system , and the second one is the drastic nutritional change from yolk sac ( lipid - rich ) to a carbohydrate rich exogenous diet . The digestive adaptation to the exogenous nutrients requires a specific diet for the first 7 or 10 days after hatch . During this period of life , nutritional besides environmental and health requirements should be met carefully to help the young chick to cope with these critical transitions as easy as possible . This topic will briefly cover the need for a pre - starter diet during the transition period from embryo to post hatching . The gastrointestinal development : The gastrointestinal development plays an essential role in the early stages of chick growth ( Nitson et al . , 1991 ' : Nir et al . 1993 : Dibner et al . 1996 ) , The development of the gut occurs throughout incubation ( Romanoff 1960 ) . The functional abilities of the gut only begin to develop about the time the amniotic fluid is orally consumed by the 16 or 17 day - old embryo . Immediately after post - hatch , the chick draws from its limited body reserves and undergoes rapid physical and functional development of the gastrointestinal tract in order to digest and assimilate nutrients . The transition period from embryo to post - hatching is critical to normal development of the bird . Practices normally adopted at first days after

hatching may affect bird development , more specially digestive , immune and Thermoregulatory systems , although these system's anatomically complete at the end of the incubation period , they suffer considerable morpho physiological changes after hatching . The development of the small intestine : According to Noy and Sklan ( 1997 ) , the ingested nutrients stimulate intestinal development , and therefore , feed supply tends to increase absorption surface , as well as , the potential to assimilate nutrients . consequently , bird growth . The most evident changes that take place are : increase of intestinal length , villus height and density due to the increase of numbers of enterocytes goblet cells , and enteroendocrine cells ( Imondi and Bird , 1966 : Baranyiova . 1972 Baranyiova and Holman 1976 )

Noy and Sklan ( 1998 ) , Sklan ( 2001 ) reported a faster small intestine development when compared to body weight during the last third of incubation period- because of rapid enterocytes proliferation and differentiation ( Geyra et al . , 2001 ) reaching the maximum relative development between the 4th and gth day after hatching . In addition , the intestinal crypts are clearly defined several days post - hatch , increasing in both cell numbers and size ( Geyra et al . , 2001 \* : Uni et al . , 2000 ) . In contrast , other organs of the digestive system , as gizzard and pancreas , did not show the same growth rate ( Uni et al . , 1999 ) . The maturation of the small intestine is essential to optimize broiler growth as digestion and absorption rates are directly influenced by cell proliferation and differentiation rates , as the higher the villi and their density , the larger is the area of surface for digestion and absorption ( Boleli et al . , 2002 ) . Table 1 shows the digestive organ morphometry of chicks at 7 days of age fed pre starter diets containing different carbohydrate and protein sources . Diets containing alternative carbohydrate sources caused changes in some aspects of the gastrointestinal tract , and the alterations were related to bird performance . The carbohydrate sources resulted in higher small intestine density compared with the protein sources , the difference being significant for corn gluten meal ( Sorbora et al . , 2003 ; Longo et al . , 2007 )

**Table 1.** Digestive organ morphometry (% live weight) of chicks at 7 days of age fed pre-starter diets containing different carbohydrate and protein sources:

Item	Provent-riculus	Gizzard	Liver	Pancreas	Small intestine	Small intestine (cm)	Density (mg/cm)
Control	0.93	4.42	4.35	0.48	4.17 <sup>ab</sup>	89.13 <sup>a</sup>	89.86 <sup>abc</sup>
Cassava starch	1.02	4.23	4.10	0.48	4.50 <sup>d</sup>	87.88 <sup>ab</sup>	96.82 <sup>ab</sup>
Sucrose	0.95	4.13	4.30	0.48	4.33 <sup>ab</sup>	88.00 <sup>ab</sup>	96.25 <sup>ab</sup>
Corn gluten	1.03	4.60	4.58	0.51	4.06 <sup>ab</sup>	80.88 <sup>ab</sup>	81.43 <sup>c</sup>
Blood plasma	1.05	4.31	4.56	0.49	3.64 <sup>b</sup>	77.00 <sup>b</sup>	84.28 <sup>bc</sup>

Source: Longo F.A. et al., (2007).

Pre - Starter products : Use of special pre - starter products , some of which contain more digestible materials , have been shown to be effective in promoting early development of broilers and improving subsequent processing performance . Broiler chicks have significant potential for development at this age and the response to increased nutrient levels in this period is well established Feeding a pre - starter product to supply levels of amino acids above AA + recommendations will provide an additional growth response .

Some features of pre - starter products :

- Use of highly digestible ingredients .
- High nutrient levels , especially amino acids , vitamin E and zinc
- Use of pre- and pro - biotics .
- Immunity stimulants ; essential oils , nucleotides .
- Intake stimulants , feed form , high sodium , flavors .

The nutritive value of the pre - starter feed : Vieira et al . ( 2006 ) concluded that a ME value of 3000 kcal / kg is recommended in pre - starter diets of

broilers Table 2. The levels of protein between 22 and 24 % seems adequate to pre - starter diets ( Rocha et al . , 2003 ; Stringhini et al . , 2001 ) when fed from 1-7 days of age ( Araujo et al . , 1999 ; Stringhini et al . , 2003 ) , according to Stringhini et al . ( 2009 ) low protein pre - starter diets supplemented to attend 22 or 24 % crude protein amino and levels , were indicated for better results in performance Table 3. Concerning mineral requirement . Maiorka et al . ( 1998 ) have shown that approximate value of 0.40 % of sodium in the diet increased weight gain , feed and water intake , and resulted in better feed conversion in chicks . Similar results were found by Vieira et al . , ( 2003 ) , who estimated a range from 0.38 to 0.40 % of sodium requirements for this phase .

Many studies indicated that sodium supplementation in the first week of life stimulated feed intake and modified weight gain and feed conversion ratio ( Borges et al . , 2002 ; Maiorca et al . , 1998 , 2004 ; Ribeiro et al . , 2004 ) Table 4 .

**Table 2.** Performance of broilers fed different energy levels in the pre-starter diets at 7 days of age.

Energy level (kcal\ kg)	Feed intake (g\bird)	Weight gain (g\bird)	Body weight (g\bird)	FCR (g\g)
2870	146.0	131.9	180.0	1.106
3000	142.4	137.6	185.5	1.039
3100	141.8	135.0	182.3	1.054

Source: Vieira et al. (2006).

**Table 3.** Performance of broilers fed pre-starter diets containing different levels of crude protein and amino acids at 7 days of age.

Treatments	Feed intake (g\bird)	Weight gain (g\bird)	FCR (g\g)
20% CP non-supplemented	92.1	70.7	1.321 <sup>a</sup>
20% CP + Meth	96.3	81.5	1.204 <sup>ab</sup>
20%CP+Met+Lys+Thr to 22%CP	78.0	73.3	1.102 <sup>b</sup>
20%CP+Met+Lys+Thr+Trp to 24%CP	91.7	84.1	1.106 <sup>b</sup>
22%CP non-supplemented	91.2	76.8	1.242 <sup>ab</sup>
22%CP+Meth	91.8	85.9	1.123 <sup>b</sup>
22%CP+Meth+Lys+Thr+Trp to 24%CP	90.3	80.9	1.145 <sup>b</sup>
22%CP+Meth+Lys+Thr+Trp to 26%CP	98.5	85.1	1.103 <sup>b</sup>

Source: Stringhini et al. (2009).

**Table 4.** Performance of broilers fed different levels of sodium in the pre-starter diets at 7 day of age.

Sodium level %	Feed intake (g\bird)	Weight gain (g\bird)	Body weight (g\bird)	FCR (g\g)
0.12	138 <sup>b</sup>	96 <sup>b</sup>	137 <sup>b</sup>	1.43 <sup>a</sup>
0.24	145 <sup>ab</sup>	115 <sup>a</sup>	156 <sup>a</sup>	1.26 <sup>b</sup>
0.36	147 <sup>a</sup>	119 <sup>a</sup>	160 <sup>a</sup>	1.23 <sup>bc</sup>
0.48	140 <sup>ab</sup>	116 <sup>a</sup>	157 <sup>a</sup>	1.20 <sup>c</sup>

Source: Ribeiro et al., (2004).

### Impact of pre - starter on growth :

The formulation of specific pre - starter diets to meet the changing demands of the developing chick is critical . Specific pre - starter diet during this developmental period can lead to improvements in 7 - day weights of up to 21 % and final 42 - day weights by 9 % , as shown in Table 5. The accelerated growth rate seen in birds on a pre - starter diet continues through to market may indicate the application of an effective pre - starter be used to allow birds to grow closer to their genetic potential ( Groenewegen , 2010 ) .

**Table 5.** Impact of a pre-starter on growth of male broiler.

	Age ( days)				
	4	7	21	33	42
Pre-starter (0-4d)	117	190	820	1900	2670
Conventional	87	150	700	1700	2450
Improvement	34%	21%	17%	12%	9%

*Source: Groenewegen (2010).*

### **CONCLUSION**

The digestive system of the young chick is immature which limits the nutritional requirements due to the difficulty in absorbing certain nutrients , to compensate for this limited ability of absorption a pre - starter diets have being used to enhance growth during the first week of life and to improve livability at the end of the production cycle ,

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## استخدام العطف البادئ في تغذية الدجاج اللاحم

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### ملخص البحث

أثبتت العديد من الدراسات الأثر الإيجابي لاستخدام عليقة قبل البادي في أداء كتاكيت اللحم بنهاية الأسبوع الأول من العمر والوزن النهائي عند عمر التسويق وذلك نتيجة تحفيزها للتطور التشريحي والوظيفي للجهاز الهضمي خلال الأسبوع الأول من عمر الكتكوت . يعتبر الأسبوع الأول من عمر الكتكوت هو الأكثر أهمية من أي وقت مضى في نمو الكتاكيت الحديثة التي بسرعة النمو ، فالجهاز الهضمي لكتكوت دجاج اللحم غير مكتمل التطور مما يحد من الاستفادة من المواد الغذائية بسبب صعوبة هضم وتمثيل بعض العناصر الغذائية ، وكاستراتيجية التعويض عن القدرة المحدودة للجهاز الهضمي غير الناضج نشأت فكرة استخدام خلطة علفية بمواصفات خاصة لتعزيز قصو الكتاكيت خلال الأسبوع الأول من العمر ، تحتوي الخلطة العلفية الجديدة على تركيزات عالية للعناصر و الزنك إضافة إلى البريميوتك والبروبيوتك E الغذائية خاصة الأحماض الأمينية وفيتامين والمحفزات المناعية مثل الزيوت الأساسية والنيوكليوتايديز باستخدام مواد تتميز بتصب هضم عالية . وأدي استخدام برنامج تغذية يعتمد على عليقة قبلى بادئ ادي لي زيادة وزن الكتكوت عند عمر % سبعة أيام بنسبة 21 % وعند عمر 42 يوما بنسبة 9% .