



# Effects of dietary starch gelatinization on growth and nutrient metabolism in amazon chicks (*Amazona spp.*)

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## Background

- Optimisation of hand-rearing diets for parrots is important for management of captive populations and conservation programmes
- Starch gelatinization degree (SGD) can influence growth in chicks, with low dietary SGD resulting in higher growth than high SGD in pigeons<sup>1</sup> and broilers<sup>2</sup>
- The impact of SGD of hand-rearing diets on growth and metabolism in macaw chicks is unknown

## Objective

For potential improvement of the nutritional quality of hand-rearing diets for amazons, we evaluated the effect of SGD on growth performance and metabolism in amazon chicks

## Materials and methods

### Animals, diets and feeding

- *Amazona viridigenalis* (n=3), *A. a. lilacina* (3), *A. rhodocorytha* (2), *A. dufresniana* (2), *A. amazonica* (1), *A. barbadensis* (2), *A. a. aestiva* (2); N=15
- Housed in pairs, fed individually
- Start ~13 d (9-17 d) post-hatch
- Dietary contrast 99% SGD vs. 45%, similar nutrient levels on ME basis
- Mixed with water 28:72%, 39°C
- ~10% of body weight, #meals/d decreasing with age

**Table 1.** Composition (% as is) and metabolisable energy (ME) content (MJ/kg) of the standard and low SGD hand-rearing diets for amazons

Parameter	Diet	
	Standard <sup>1</sup>	Low
Moisture	6.4	8.7
Crude protein	21.9	21.0
Crude fat	7.8	8.0
Crude fibre	1.5	1.9
Crude ash	7.2	7.5
Starch	37.5	36.0
SGD <sup>2</sup>	99	40
Sugar	9.2	8.4
ME	10.8	11.9

<sup>1</sup>Nutribird A21, Versele Laga

<sup>2</sup>SGD, starch gelatinisation degree



Feeding an amazon chick.



Crop filled to 100%.



Weighing an amazon chick.

### Parameters measured and calculations

- Growth curves based on daily measured body weight fitted to a logistic growth model<sup>3</sup>
- Feed intake calculated daily as body weight after - before feeding
- Crop emptying rate weekly based on crop filling degree using vision and touch at t=1 to 4 h after first feeding and linear regression
- pH of fresh excreta measured weekly electrochemically after first feeding of the day using a digital pH meter
- Postprandial blood amino acids and acylcarnitines at 40 d of age; ~0.3 ml sample on bloodspot filter paper, ESI-MS/MS analysis<sup>4</sup>

## Materials and methods

### Statistical analyses

- Model for repeated measures included subspecies, diet, age and their interactions, analysed with MIXED procedure of SAS
- Model for growth and crop parameters included subspecies, diet and their interactions, analysed with GLM procedure in SAS

## Results and discussion

- Growth curves were different with higher asymptotic body weights for the HG diet (Table 2). These results are in contrast with observation in young pigeons<sup>1</sup> and broilers<sup>2</sup> and might be explained by the fraction of retrograded starch, since a higher amount of resistant starch corresponds with low starch digestibility

**Table 2.** Cumulative feed intake and growth parameters in macaws fed standard and low SGD hand-rearing diets

Parameter <sup>1</sup>	Diet		P <sup>2</sup>
	Standard	Low	
<i>Growth</i>			
A, g	432	412	*
K, d <sup>-1</sup>	0.150	0.158	NS
t <sub>i</sub> , d	22.6	22.3	NS

<sup>1</sup>ME, metabolisable energy, A, asymptotic body weight; K, growth rate constant; t<sub>i</sub>, inflection point

<sup>2</sup>NS, non-significant, \*P<0.05

- Growth rate constants were similar for both diets (0.150 vs. 0.158 d<sup>-1</sup>, P=0.401), as well as feed delivered (3068 vs. 3006 g DM)
- Although a more acidic excreta was expected for the LG treatment, diet did not affect fresh excreta pH (6.54 and 5.87, P=0.277)
- Crop emptying rate was similar between treatments (22.9 and 23.8 %/h, P=0.201), likely reflecting similar physical dietary structure and relatively empty distal parts of the intestinal tract
- Plasma glycine, methionine and tyrosine were higher in LG group (P<0.05), which implies higher absorption rate of amino acids
- A higher 3OHC4:C2 ratio for the HG group (10.4 vs. 9.5, P=0.013) suggests a higher ketone body synthesis and a less efficient fatty acid oxidation and energy utilization

## Conclusions

High SGD levels improved growth performance in Amazon chicks, which was in contrast with the literature on pigeons and broilers. Furthermore, SGD impacted postprandial lipid metabolism.

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## References

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