

EFFECT OF THE USE OF AMYLASE-CONTAINING GRUEL ON ENERGY INTAKE AND GROWTH OF CONGOLESE INFANTS BETWEEN 4 AND 8 MONTHS OF AGE

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INTRODUCTION

It is generally well recognised that increasing energy density of gruels allows higher energy and nutrient intakes by infants. But previous studies do not permit to conclude about the effect of reducing gruel viscosity (e.g. by incorporating amylases) in free living infants. The objective of this study was to verify whether the use of amylase-containing flour for gruel preparation allows (i) preparation of gruels with higher energy density, (ii) higher energy intakes from gruels and (iii) better infant growth at the beginning of the complementary feeding period.

SUBJECTS AND METHODS

Context: the study took place in the anciently urbanized district of Poto-poto in Brazzaville, capital of The Republic of Congo. In this area feeding practices are characterized by early introduction of gruel (median age: 15 weeks) and family foods (median age: 7 months), low feeding frequency (2 or 3 gruels/day) and utilization of semi-liquid gruels of low energy density (mean: 58 kcal/100g) most often prepared from a fermented maize dough of low nutritional value.

Subjects: 80 infants were selected at random from the district population and were randomly assigned to two experimental groups.

Study design: the study was a controlled trial. Mothers of the two groups of infants were supplied with maize/soybean experimental flour with (A) or without (C) amylase when their infant reached 18 weeks of age, until the age of 32 weeks. They were instructed on how to prepare gruel with the flour, but they were left free to use it at their convenience.

Experimental flours amylase (BAN, Novo Nordisk A/S) in flour A and sugar in both flours were added in adequate amounts to produce gruels indistinguishable in taste and viscosity when prepared at the energy density of 55 kcal/100 g (control gruel) and 135 kcal/100 g (amylase-containing gruel).

Observations: feeding practices and morbidity were followed up weekly during the pre-experimental period (10 to 17 weeks) and during the experimental period (18 to 32 weeks). At 24 weeks of age, a 24-hour quantitative food consumption study was done. Anthropometry was measured at 10, 16, 24 and 32 weeks. Three infants in each group were lost to follow up between 18 and 24 months of age (1 deceased and 5 moved).

Data processing: The dietary and anthropometric data and the information obtained during the follow-up were processed using Epi-Info version 6.

Ethical considerations Permission to conduct the study was obtained from the Congolese Ministry of Health. Parents were informed in local languages about the study and gave their written consent.

RESULTS

During the pre-experimental period, there were no differences in feeding practices and morbidity between groups A and C, except for day-time breastfeeding (table 1). During the experimental period, groups A and C did not differ for morbidity, but in group A frequency of formula consumption was lower and consumption of complementary foods other than the experimental flour was higher (table 1).

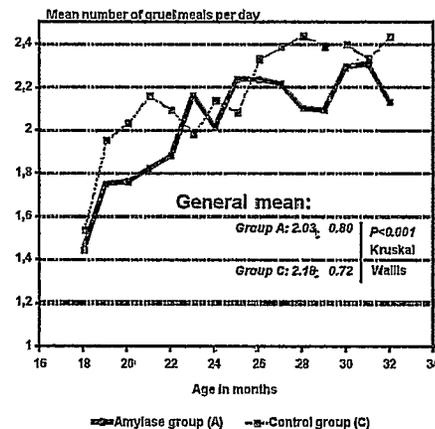
Table 1: Feeding practices and morbidity before and during the flour distribution.

	Pre-experimental period (10-17 wk)			Experimental period (18-32 wk)		
	Amylase group (A)	Control group (C)	P<	Amylase group (A)	Control group (C)	P<
Feeding practices						
Breastfed everyday > 5 feeds/day	100%	85%	0.001	89%	81%	0.01
Breastfed every night	76%	70%	0.05	52%	48%	ns
> 4 feeds / night	51%	46%	ns	51%	49%	ns
Formula	84%	58%	ns	11%	22%	0.001
Other CF (a)	33%	38%	ns	24%	24%	0.01
Morbidity						
Fever (b)	0.43	0.51	ns	1.33	1.00	ns
Diarrhea (b)	0.03	0.23	ns	0.09	0.78	ns
Skin disease (b)	0.17	0.28	ns	0.24	0.22	ns

(a) Complementary food other than the experimental flour
(b) mean number of episodes by infant - ns: non significant

On average respectively 84% and 93% of mothers declared giving their infants gruel prepared from A and C flour every day (P<0.001). The frequency of feeding the experimental gruel was slightly higher in group C (figure 1).

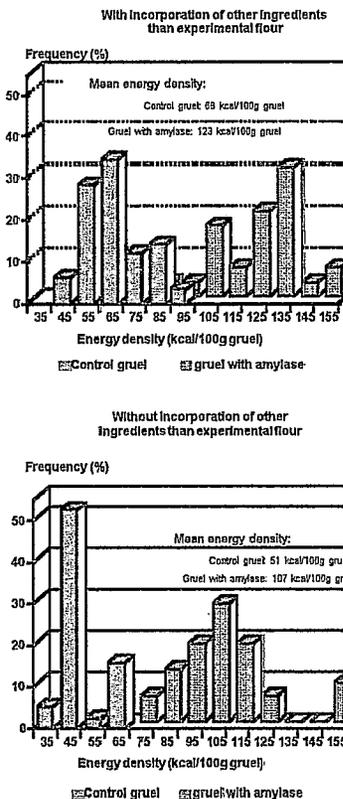
Figure 1: Mean daily frequency of feeding gruel prepared with the experimental flour



Mothers incorporated other ingredients (e.g., sugar, sweetened condensed milk) in 48% of A-flour based gruels and 51% of C-flour based gruels (ns). The proportion of mothers who said the gruel was easy to swallow was similar in both groups (+ 93%).

At 24 weeks of age, respectively 84% and 89% of the infants in group A and C actually consumed gruel prepared with the experimental flour. Additional ingredients were incorporated in 47% of the amylase-containing gruels (A) and in 72% of the control gruels (C). The mean energy density per 100 g of prepared gruel was 114 kcal with the amylase-containing flour (A) vs 61 kcal with the control flour (C) (figure 2).

Figure 2: Distribution of energy density of gruels prepared from experimental flour with and without incorporation of other ingredients at 24 weeks.



The infants' energy intake from experimental flour was 69% higher per meal (15.8 vs 9.3 kcal/kg/meal) and 56% higher per day (31.0 vs 19.9 kcal/kg/d) in group A than in group C (table 2).

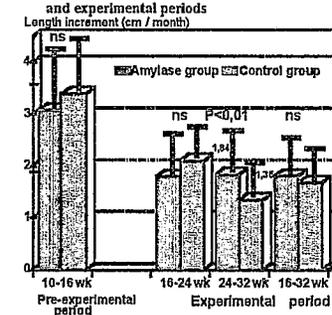
Table 2: Amount of gruel consumed and energy intake from experimental flour for the control group (C) and the group receiving amylase-containing gruels (A)

	Group A		Group C		P<
	n	mean±SD	n	mean±SD	
Mean per meal					
Amount of gruel (g/kgbw)	64	108.5±46.0	73	135.4±65.0	0.05
Energy intake (kcal/kgbw)	64	15.7±7.5	73	9.3±4.9	10 ⁻⁶
Mean per day					
Amount of gruel (g/kgbw)	31	215.0±102.1	33	289.6±146.1	0.05
Energy intake (kcal/kgbw)	31	31.0±18.0	33	19.9±10.3	0.05

(a) Per 4 Month Weight
(b) per kg bw assuming gruels prepared from experimental flour

Mean 16-32-week and 16-24-week length increments did not differ between the groups (figure 3) but the mean 24-32-week increment was higher in group A than in group C (1.84 vs 1.36 cm/mo; P<0.01, t test).

Figure 3: Monthly length increments of infants during pre-experimental and experimental periods



CONCLUSION

In the context of Brazzaville, feeding 4 to 6-month-old infants with gruel prepared from amylase-containing flour had no effect on morbidity and reduced the frequency of consumption of formula. Energy density of the amylase-containing gruels was almost twice that of gruels prepared from the similar flour without amylase. Consequently, energy intake from gruel at the age of 6 months and growth during the 6 to 8 month period were significantly improved.



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