

Plumpy 'nut: history and evolution

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(With support from Nutriset)



Origin of plumpy' nut: failed attempts to produce a solid F100-like bar

F100 fat content very high: > 30%

- **Low viscosity fat: the bar melts in hot climates**
- **High viscosity fat: the bar tastes like a candle if melting point is above 37°C**

Solutions to solve the “fat problem”

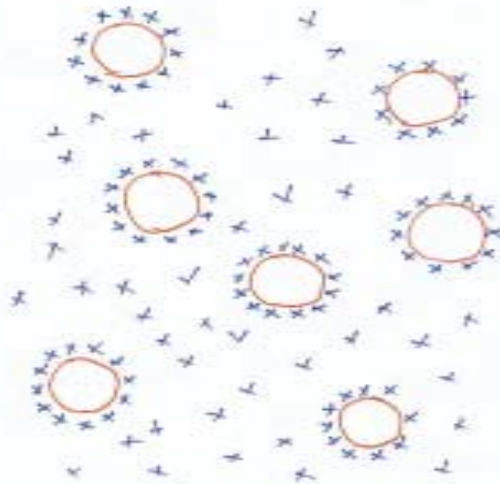
Either change completely the formulation (CHO) and use sophisticated technology to get a bar adapted to hot climates...

... or prepare a spread and forget about the rigidity problem at high temperature

Second solution proposed and patented by Nutriset in 1997. Very flexible formulation

What is the difference between a powder and a spread ?

POWDER



SPREAD



Spread or powder ?

Foods with a high fat content such as F100 can be produced either as a powder (fat in powder) or as a spread (powder in fat) with the same nutritional formulation

Main constraint: use a fat ingredient with the right melting point

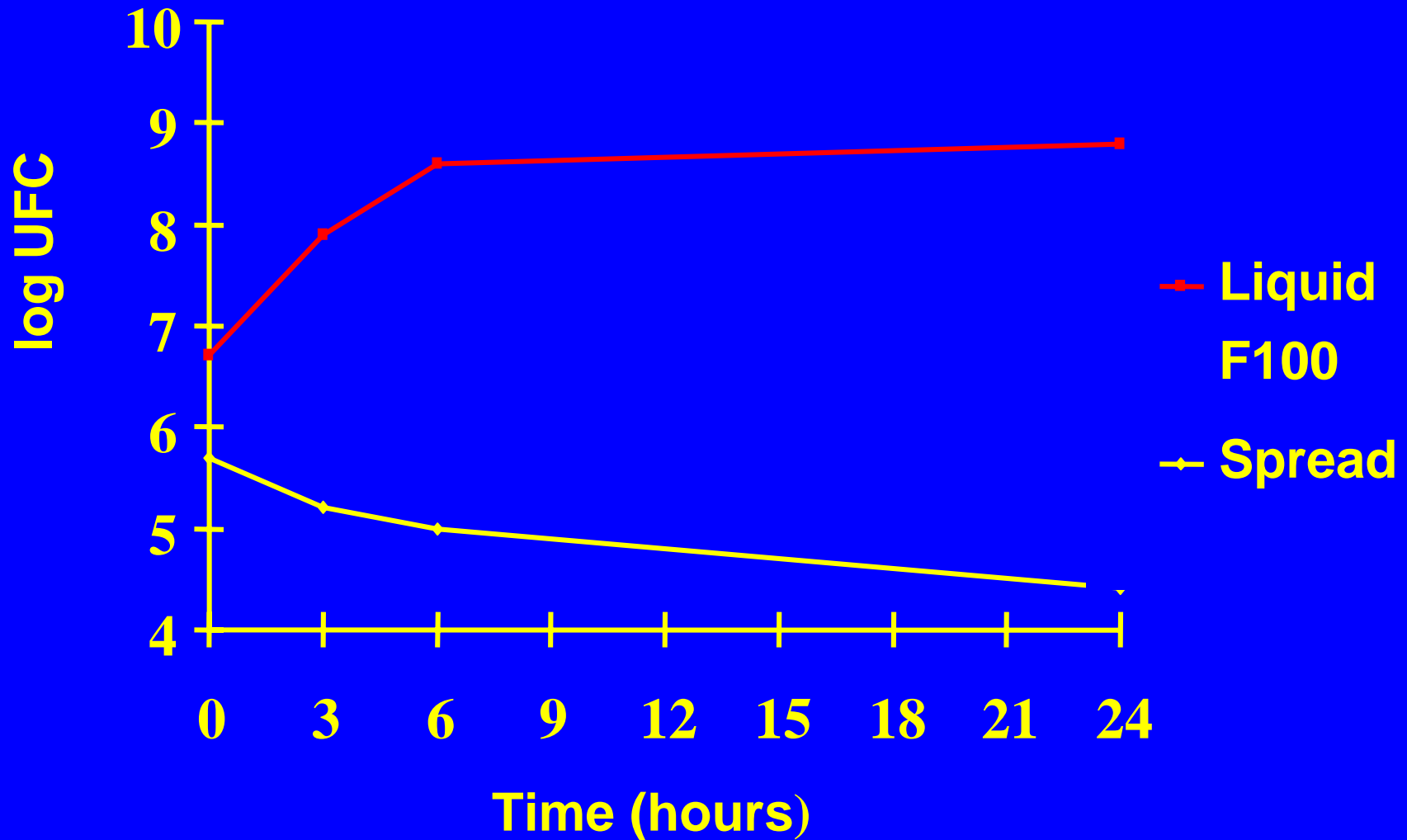
Simple solution: replace some of the dried skimmed milk in the F100 formula with peanut butter

Spreads:

Simple technology

Lower surface to volume ratio: reduced exposure to oxygen and longer shelf life compared to powders such as locally made high energy milk

A spread does not contain water and bacteria do not grow in it



Question: What about osmolarity ?

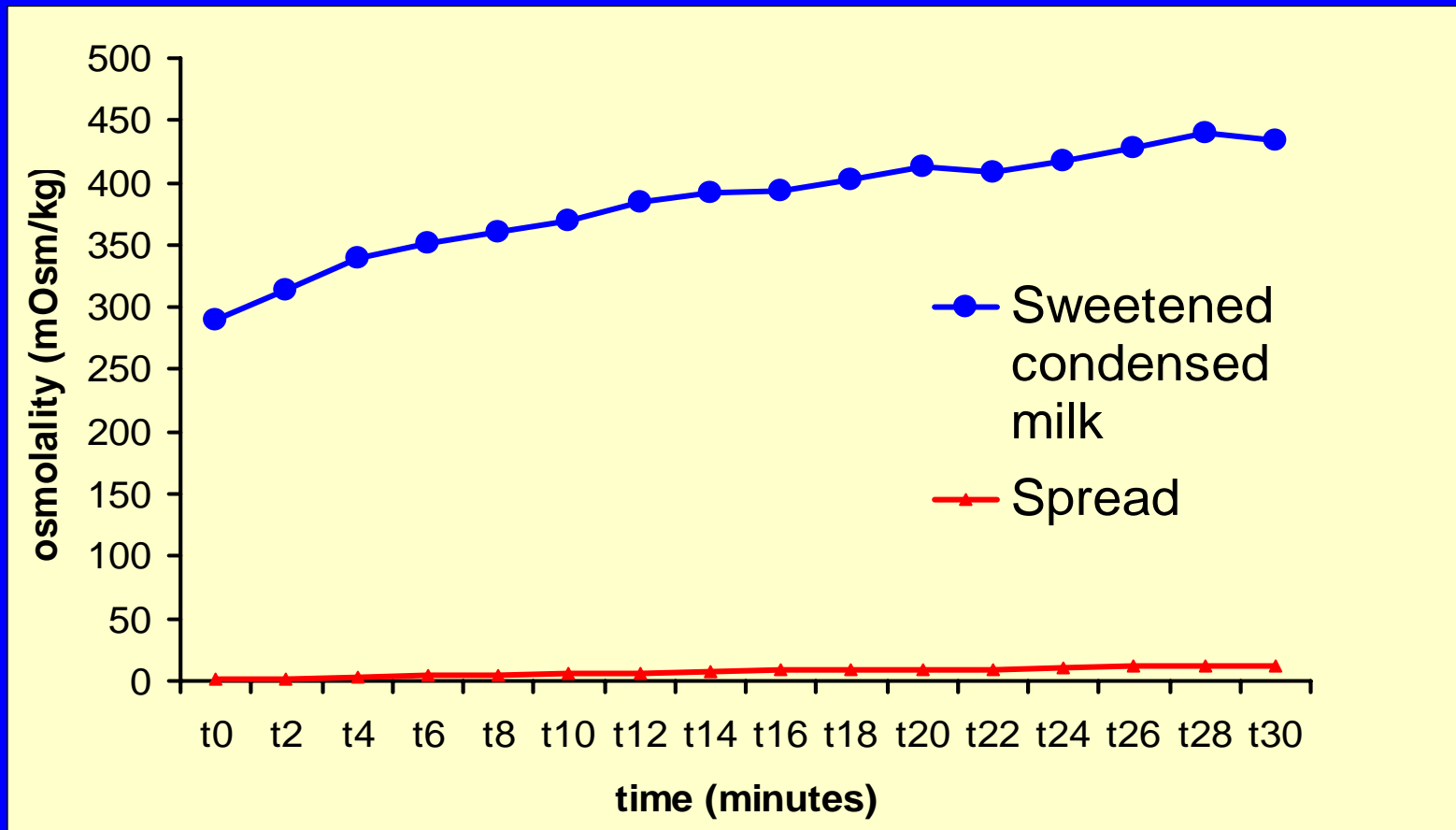
A spread looks like and tastes like condensed sweet milk.

Condensed milk not suitable for feeding children because of its osmolarity

What about a spread ?

Osmolarity in relation to time of spread and condensed milk

(Briend A and Briend A, unpublished)



Chewing tests

Question:

Does osmolarity of plupmy'nut increase after chewing ?

Answer:

Routine chewing only slightly increase osmolarity

After dilution (1kcal/1 ml) osmolarity \ll 100 mOsm/L

How fast a spread is broken up *in vivo* ??

(A Briend, unpublished results, 1998)

Healthy (??) adult volunteer

Radio opaque spread

Spread observed in the stomach by X ray

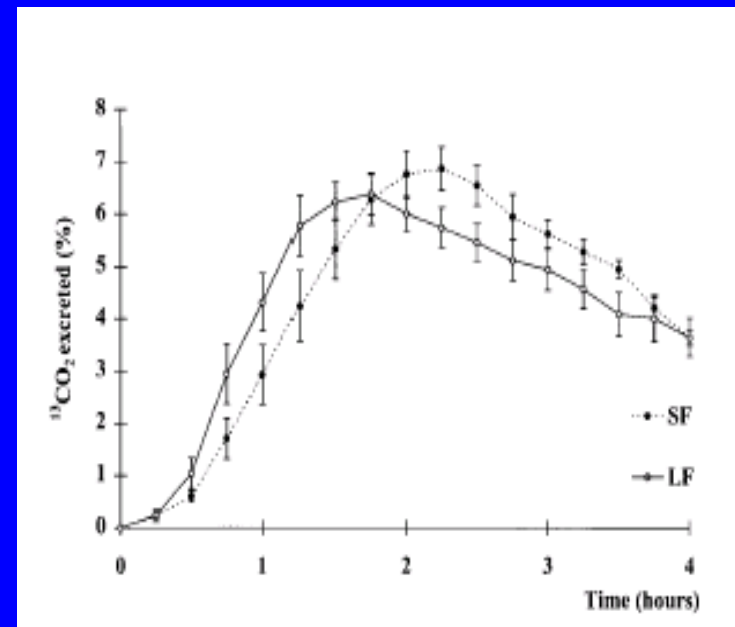
Slow release, slow disintegration (several hours)



How fast a spread is broken up *in vivo* ?? (Achour L et al, EJCN, 2001)

Addition of [^{13}C] glycine in a spread to measure gastric emptying of the water soluble fraction

Slower gastric emptying with a spread compared to F100



Question: What about osmolarity ?

Answer:

Plumpy'nut is a solid food, not a watery solution

Yet, for more safety, plumpy'nut was formulated with little sugar and malto dextrin + whey powder instead

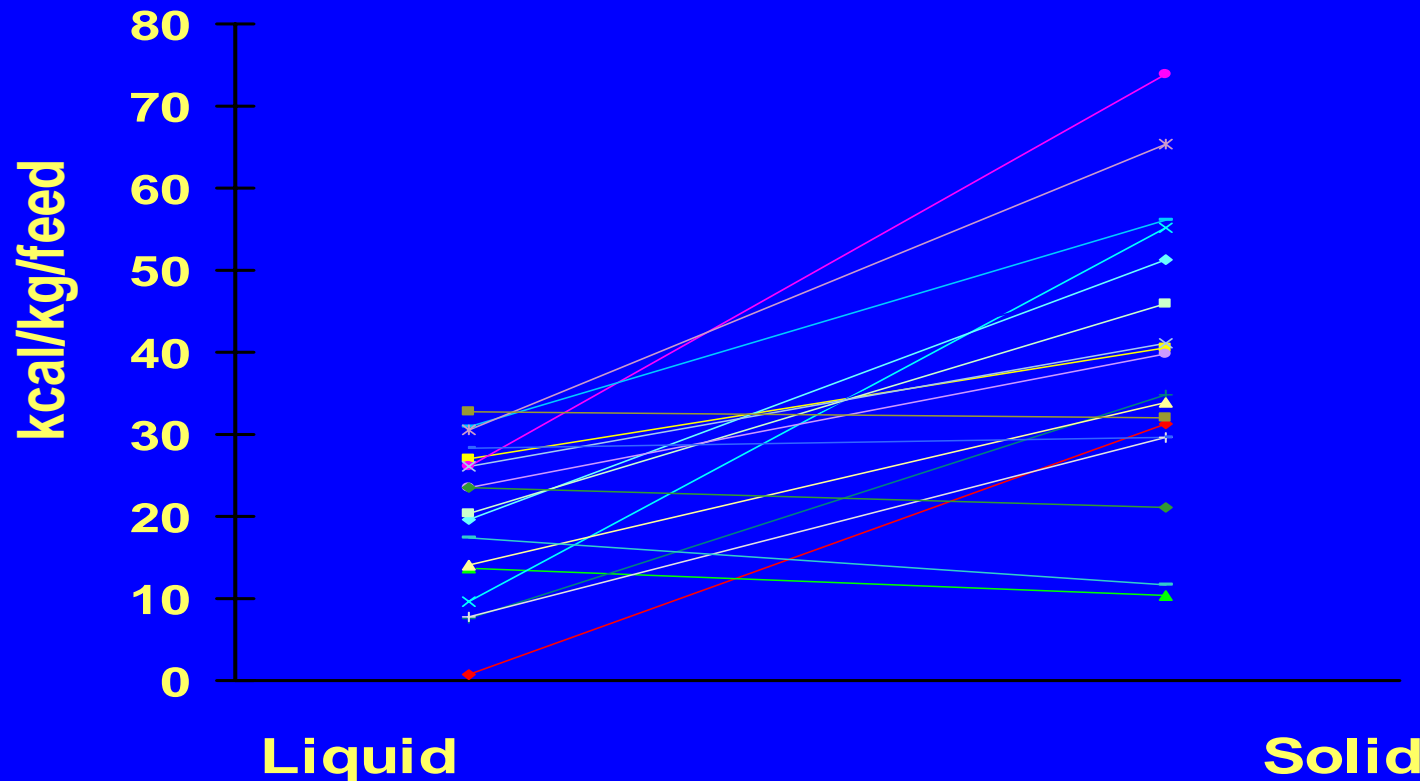
Question: how a spread will be accepted compared to a liquid F100 ?

Test on a single meal (Tchad, 1997, ACF, unpublished)

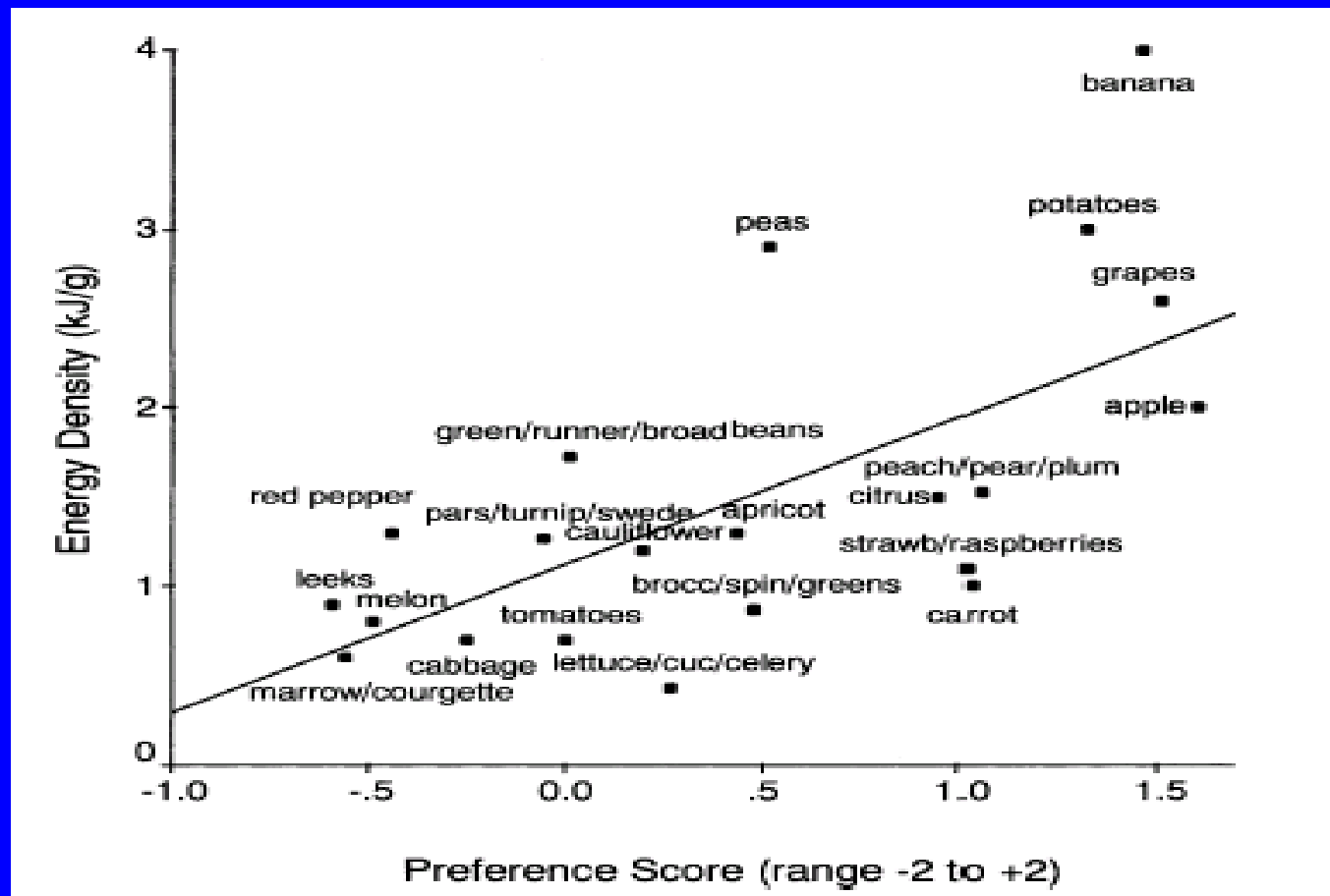
- **Feedback: excellent acceptability**
- **No reduction of energy intake in the next meal**

A second trial in Tchad (1998) showed that a spread is well accepted compared to F100 (Briend *et al*, Lancet 1999)

Tchad: Energy intake of liquid vs solid food, each child being his own control



Correlation between energy density and preference score in 4-5 year old children (Gibson and Wardle, Appetite, 2003).



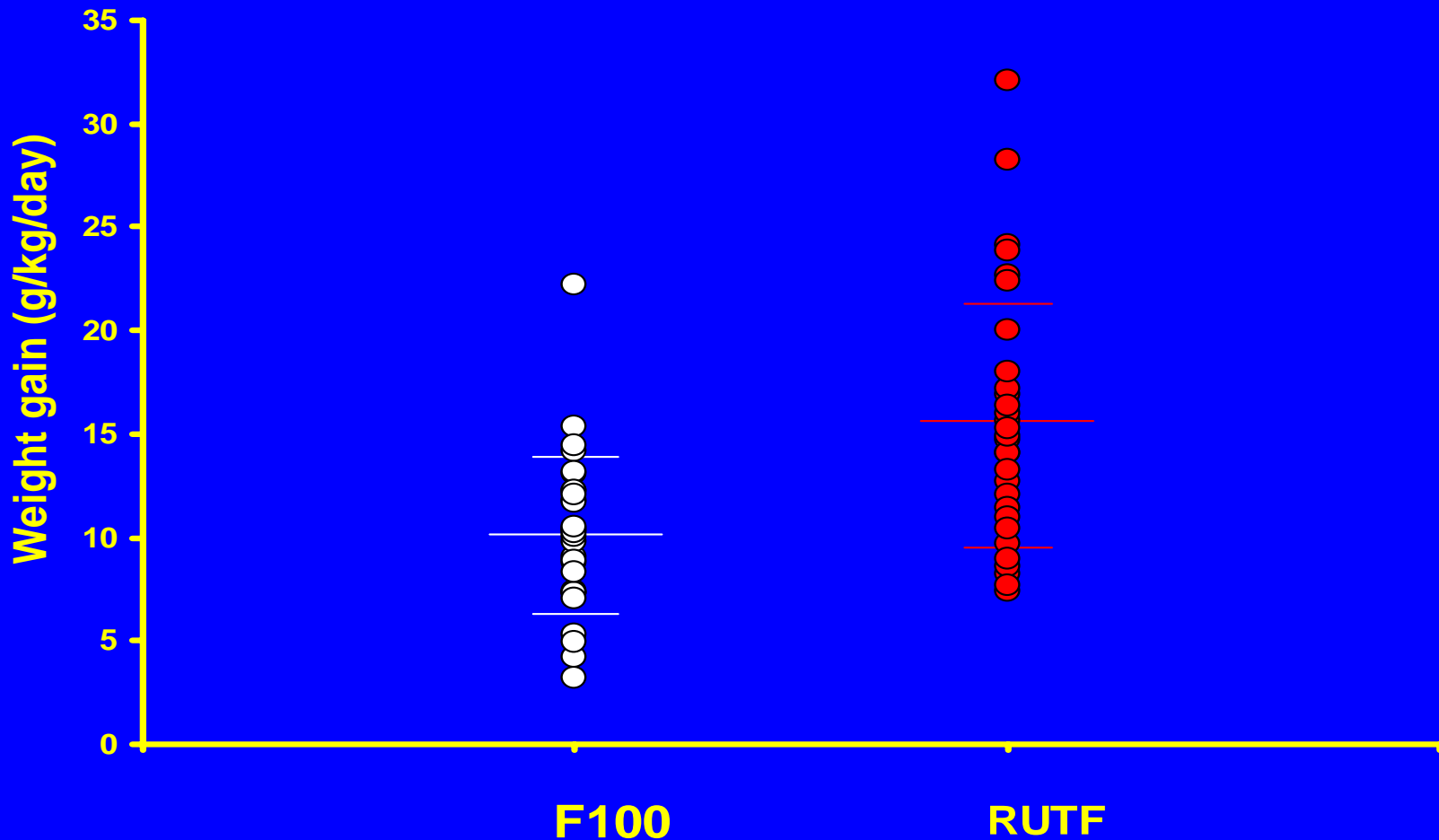
What about weight gain ?

- **Randomised trial in Dakar, Senegal (Diop *et al*, AJCN, August 2003)**
- **2 groups of children:**

Local meals (3 times a day) and F100 or RUTF (3 times a day)

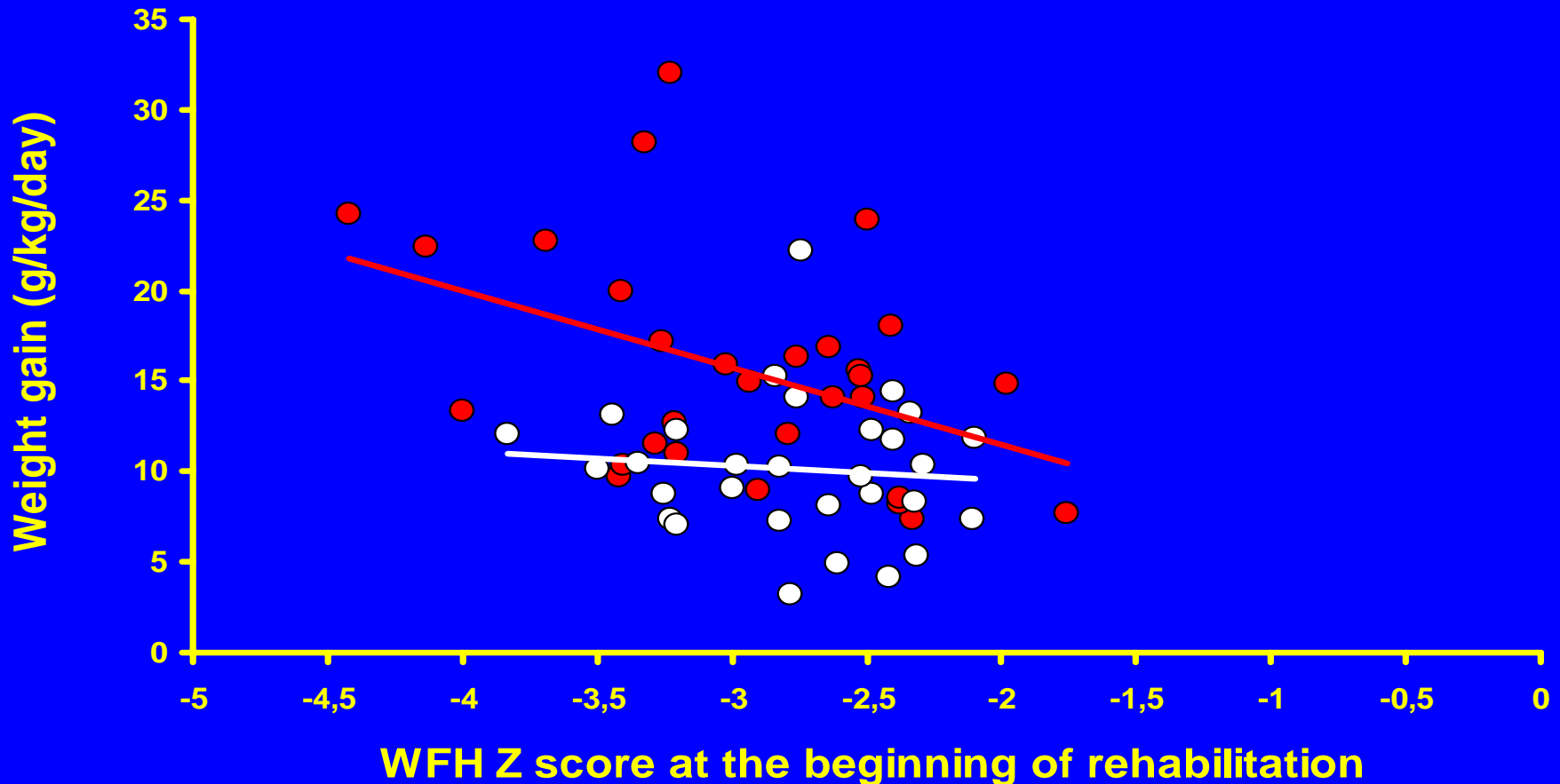
Weight gains in F100 and RUTF groups

Mean : 10.1 vs 15.6 g/kg/day, $P < 0.001$



Difference in weight gain in favour of RUTF significantly more important for the most wasted children

($P < 0.05$ for interaction term)



RUTF compared to F100

- Safer to use : can be used at home
- About 33% less Na
- Preferred by children
- Results in higher weight gain, especially in most undernourished children

Rationale for still using F100 ??

Young children and sick children who cannot take plumpy 'nut cannot get undiluted F100 either

What future for spreads ?

Local production

- **Possible if sugar is used instead of dextrine maltose. Even better acceptability. Same results for home treatment**

Other formulations

- **Peanut free spread**
- **Milk free spread**

Other applications: prevention of malnutrition +++