

# Can complementary feeding influence obesity development?

**An unbalanced diet for excess calories and nutrients during the first years of life could have long-term consequences, promoting the development of obesity, hypertension, etc.**

**Rolland-Cachera et Al. F. Influence of macronutrients on adiposity development: a follow up study of nutrition and growth from 10 months to 8 years of age. *Int J Obes Relat Metab Disord* 1995;19:573-8;**

**Gunther et Al. Protein intake during the period of CF and early childhood and the association with BMI and percentage body fat at 7 y of age. *Am J Clin Nutr* 2007;85:1626-33.**

**Pearce J et Al. Timing of the introduction of complementary feeding and risk of childhood obesity: a systematic review. *Int J Obes (Lond)*. 2013 Oct;37(10):1295-306.**

**Etc.**

**The aims of complementary feeding recommendations must not only consider short term growth and how to correct nutritional deficiencies, but also promote an optimal health status in childhood and adulthood.**

# Mechanisms that can influence obesity development during CF time.

## Programming

The results of a stimulus that, if presents during a specific window of growth, leaves a persistent anatomic or metabolic changes.

Lucas A Programming by early nutrition in man. In: The childhood Environment and adult disease. Wiley, Chichester CIBA Foundation Symposium, 156; 1991:38-55.

**Insufficient iron intake during the first years of life**

## Tracking

Continuation of a dietary pattern established in infancy, so the ultimate effect on disease risk is due to an additive effects from repeated exposure.

Adair L. How could complementary feeding patterns affect the susceptibility to NCD later in life? *NMCD* (2012) 22, 765e769

**A high salt diet or a high sugared soft beverages during the CF period**

## Timing

### Is early introduction of solid foods promoting overweight?

#### Systematic reviews:

No clear association between the timing of the introduction of complementary foods and childhood overweight or obesity but there is some evidence that very early introduction (at or before 4 months), rather than at 4-6 months or >6 months, may increase the risk of childhood overweight.

Moorcroft et Al. *Matern Child Nutr* 2011;7(1):3e26.

Pearce et Al. *Int J Obes (Lond)*.2013 Oct;37(10):1295-306.

Weng et Al. *Arch Dis Child* 2012;97:1019–1026.

especially true when infants are formula-fed

Huh et Al. *Pediatrics*. 2011;127(3):e544–e551.

# How early introduction of solid foods promote overweight?

**Increase daily total energy**

**More rapid weight gain**

**Excess of some nutrients intake (protein and simple sugar) and insufficient of others (fat)**

**Cluster of socio-economic factors (low SES, young mothers, etc)**

# Is there a correlation between protein intake in infancy and obesity in later age?

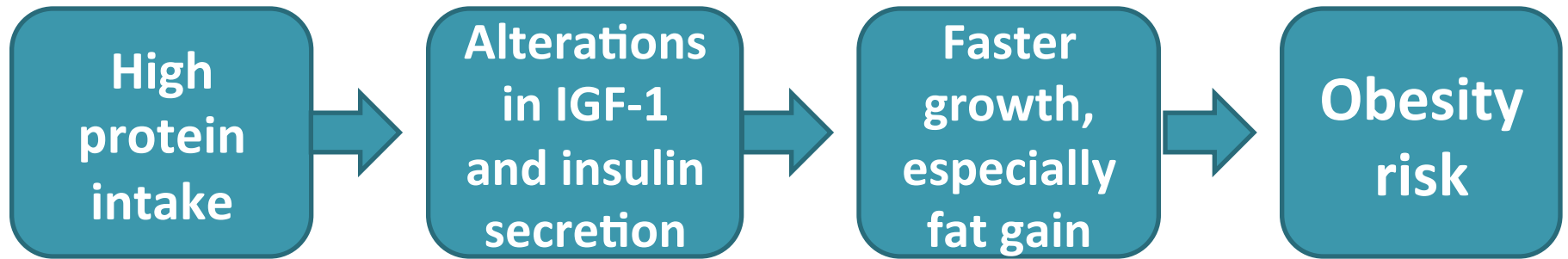
## Positive correlation

Rolland Cachera et Al. Influence of macronutrients on adiposity development: a follow up study of nutrition and growth from 10 months to 8 years of age. *Int J Obes Relat Metab Disord* 1995;19:573-8. Scaglioni et Al. Early macronutrient intake and overweight at five years of age. *Int J Obes Relat Metab Disord* 2000;24:777-781. Gunther et Al. Protein intake during the period of complementary feeding and early childhood and the association with body mass index and percentage body fat at 7 y of age. *Am J Clin Nutr* 2007;85:1626-33. Ohlund et Al. BMI at 4 years of age is associated with previous and current protein intake and with paternal BMI. *Eur J Clin Nutr* 2010;64:138e45. Etc.etc.

## No correlation

Dorosty et Al Factors associated with early adiposity rebound. *Pediatrics* 2000;105:1115-1118. Hoppe et Al. Protein intake at 9 mo of age is associated with body size but not with body fat in 10-y-old Danish children. *Am J Clin Nutr* 2004;79:494-501.

# Biochemical pathway related to the relation between protein intake and the subsequent increase of BMI



**Gunther et Al. Protein intake during the period of complementary feeding and early childhood and the association with body mass index and percentage body fat at 7 y of age. *Am J Clin Nutr* 2007;85:1626-33.**

**Hoppe et Al. Animal protein intake, serum insulin-like growth factor I, and growth in healthy 2.5-y-old Danish children. *Am J Clin Nutr* 2004;80(2):447e52.**

From Adair, modified)

## How can reduced fat intake during the first 2 years of life promote obesity development?

Low-fat diets are reported in young children from developing and industrialized countries, and obesity is present in the two contexts.

These observations suggest a specific role of fat restriction in programming later risks. Low-fat intakes in early life may promote adaptive metabolism to prevent underweight, but such anticipatory strategy may increase the susceptibility to develop obesity in individuals exposed to high-fat diets later in life.

Hales CN, Barker DJ. The thrifty phenotype hypothesis. *Br Med Bull* 2001; 60: 5–20.

Hoffman et Al. Why are nutritionally stunted children at increased risk of obesity? Studies of metabolic rate and fat oxidation in shantytown children from Sao Paulo, Brazil. *Am J Clin Nutr* 2000; 72:702–707.

Leonard et Al. Reduced fat oxidation and obesity risks among the Buryat of Southern Siberia. *Am J Hum Biol* 2009; 21: 664–670.

Sawaya et Al. Mild stunting is associated with higher susceptibility to the effects of high-fat diets: studies in a shantytown population in Sao Paulo, Brazil. *J Nutr* 1997; 128(Suppl 2): S415–S420.

## Sugar intake

### **BMI-Z-score at 7 years associated to added sugar intake between 1 and 2 years of age**

**Herbst et Al. Direction of associations between added sugar intake in early childhood and body mass index at age 7 years may depend on intake levels. J Nutr. 2011; 141(7):1348–1354.**

### **Prevalence of obesity at 6 years in children who consumed Sugar-sweetened beverages (SSBs) during infancy twice as high as that among children who did not consumed SSBs (17% vs 8.6%)**

**Pan et Al. A longitudinal analysis of sugar-sweetened beverage intake in infancy and obesity at 6 years. Pediatrics 2014 Sep;134 Suppl 1:S29-35.**



## How can sugar intake during the first 2 years of life promote obesity development?

**High SSBs intake is not compensated for by a lower energy intake from other sources such as foods.**

**Malik et Al. Intake of sugar-sweetened beverages and weight gain: a systematic review. Am J Clin Nutr. 2006;84(2):274–288.**

**Baby beverages have are often sweetened with fructose which has a lower satiating power as compared to glucose.**

**Fructose sweetened beverages decrease leptin levels and increase ghrelin levels.**

**Teff et Al. Dietary fructose reduces circulating insulin and leptin, attenuates postprandial suppression of ghrelin and increases triglycerides in women. J Clin Endocrinol Metab 2004 Jun;89(6):2963-72.**