

## English Summary

### *Background*

Complementary feeding (CF) is typically introduced around the age of 4-6 months, and the CF period continues until the infant receives the family diet sometime between 12 and 18 months of age. The CF period is characterised by rapid cognitive and metabolic development and a high growth velocity. A suboptimal diet during this period may therefore have serious long term effects. However, both knowledge about optimal diet and descriptive data on the dietary intake early in life are sparse. Several studies have shown that a high growth velocity during early childhood is a risk factor for developing overweight, type 2 diabetes, and cardiovascular disease. Diet has a strong influence on growth velocity during the CF period. Therefore, the association between diet, early growth, obesity and other life style disorders needs to be studied further.

### *Objectives*

This thesis addresses the issues of determinants for growth and overweight in early childhood. The specific objectives of the three included papers were:

- I) Examine the relation between blood glucose and insulin concentration, anthropometric measurements, growth, breastfeeding practice and complementary feeding in 9 month old infants.
- II) Analyse how IGF-I and IGFBP-3 concentrations at 9 months of age is related to diet and growth with special emphasis on the role of the IGF-I and IGFBP-3 in regulation of linear growth and in the early development of obesity.
- III) Examine determinants for change in weight, length, BMI, waist circumference and skinfold thickness between 0 and 18 months of age.

Paper I, II and III were based on data from the SKOT cohort. In the Danish SKOT cohort healthy term infants were included at 9 months of age, with follow-up at age 18 and 36 months. Total 330 infants were included in the cohort. Measurements included weight, length, skinfold thickness,

waist circumference, 7 day food records, interview, questionnaire and blood sampling (not at 18 months). In this thesis data from the two first examinations at 9 and 18 months are presented.

### ***Results***

Paper I showed, that infants not being breastfed at 9 months of age had higher insulin concentration than partly breastfed infants. There was a strong negative association between daily numbers of breast feedings and insulin concentration. Insulin concentration was positively associated to waist circumference and change in Z-score for weight-for-age between 5 and 9 mo. Glucose concentration was highest among those with weight catch-up or catch-down growth between birth and 9 months of age. Furthermore, glucose concentration was positively associated with sum of skinfold thickness.

Paper II showed, that infants not being breastfed at 9 months of age had higher IGF-I concentration than infants who were still partly breastfed. There was a very strong negative association between daily number of breast feedings and IGF-I concentration. IGF-I concentration was positively related to increase in weight, length and BMI between birth and 9 mo. Between 9 and 18 months of age increase in length was positively and increase in BMI was negatively related to IGF-I concentration.

Paper III showed, that duration of any breastfeeding was negatively associated with both weight and length at 18 mo of age, and this effect seemed to be strongest during the first 9 mo. The children who were classified as more active were heavier and longer at 18 mo of age, compared to children classified with the same activity level as their peers. Duration of total sleep was negatively associated with waist circumference at 18 mo of age, and pregnancy weight gain was positively associated with skinfold thickness at 18 mo of age.

### ***Discussion***

Paper I and II showed negative associations between breastfeeding and insulin and IGF-I concentration at 9 months of age. Ad hoc analysis showed positive correlation between insulin and IGF-I concentration. The differences in insulin and IGF-I concentration could be attributable to factors in breast milk modulating the hormone profile in the breastfed infants, an effect of the composition and amount of complementary foods, an effect of variation in body composition, or a combination of all.

Insulin and IGF-I have a stimulating effect on growth. In accordance with this we found a positive association between insulin concentration and weight gain from 5 to 9 months of age, and between IGF-I concentration and weight gain from 0 to 9 months of age. Although IGF-I concentrations at 9 months of age were negatively associated with change in BMI during the following 9 months we speculate, that this could reflect an early adiposity rebound and thereby an increased risk of overweight and obesity later in life.

Preliminary Paper III showed in univariate analyse an inverse association between duration of any breastfeeding and weight at 18 months of age. In multivariate analyses controlling for weight at birth and 9 months of age, duration of any breastfeeding was no longer associated with weight at 18 months of age. This could be interpreted as the weight increase between birth and 9 months of age partly explained increased weight at 18 months of age by shorter duration of any breastfeeding.

### ***Conclusion***

In apparently healthy Danish infants 9 months of age breastfeeding had a strong negative effect on insulin, IGF-I and IGFBP-3 concentration in the blood. Several strong associations were found between insulin, glucose, IGF-I and IGFBP-3 concentration and anthropometry, growth and diet. The importance of high insulin, glucose, IGF-I and IGFBP-3 concentration at 9 months of age for later risk of developing overweight, type 2 diabetes, and cardiovascular disease remains to be elucidated. In the SKOT cohort the amount of data collected, allows for plenty of further studies.