



Uppsala Longitudinal Study of Childhood Obesity (ULSCO)

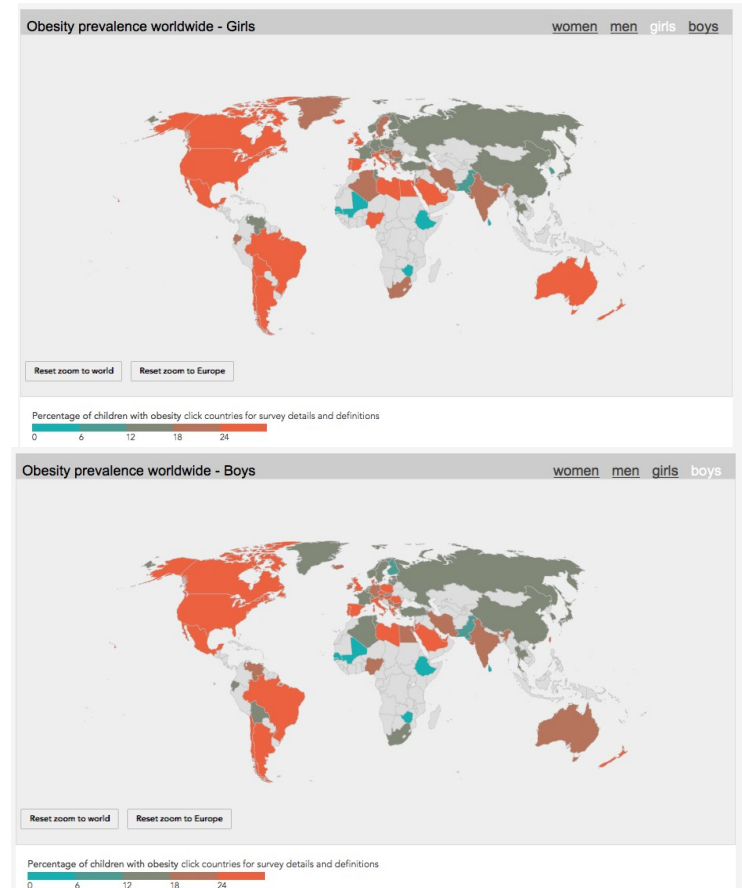
Anders Forslund and Peter Bergsten

Department of Medical Cell Biology
Department of Women's and Children's Health
Uppsala University

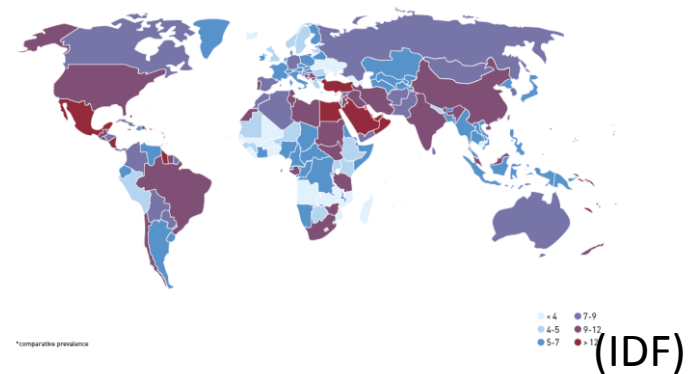
Academic Children's Hospital, Uppsala

Urgency

- Childhood obesity
- Obesity-related complications; CVD, T2DM, T1DM



(World Obesity Federation)





Search

Advanced search

Global Strategy on Diet, Physical Activity and Health

[Global Strategy Diet & Physical Activity](#)

[Development of the Global Strategy](#)

[Childhood overweight and obesity](#)

[Documents & publications](#)

[Related links](#)

Childhood overweight and obesity

Childhood overweight and obesity on the rise

Childhood obesity is one of the most serious public health challenges of the 21st century.

The problem is global and is steadily affecting many low- and middle-income countries, particularly in urban settings. The prevalence has increased at an alarming rate. Globally, in 2010 the number of overweight children under the age of five, is estimated to be over 42 million. Close to 35 million of these are living in developing countries.

Overweight and obese children are likely to stay obese into adulthood and more likely to develop noncommunicable diseases like diabetes and cardiovascular diseases at a younger age. Overweight and obesity, as well as their related diseases, are largely preventable. Prevention of childhood obesity therefore needs high priority.

[What is overweight and obesity?](#)

[Why does it matter?](#)

[What are the causes?](#)

New

Monitoring and evaluating population sodium consumption

[Strategies to monitor and evaluate population sodium consumption and sources of sodium in the diet: report of a joint technical meeting convened by the Government of Canada](#)

Information sheets:

[Global recommendations on physical activity for health](#)

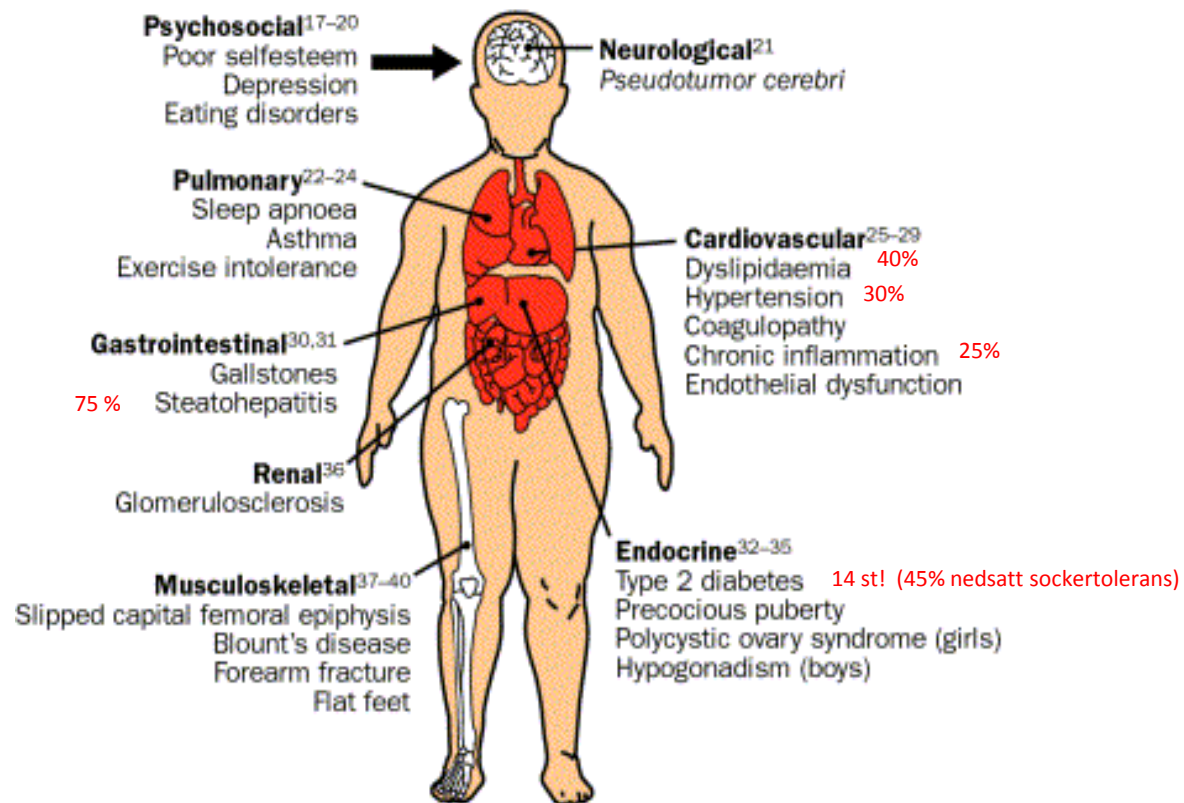
[Physical activity and young people](#)

[Physical activity and adults](#)

[Physical activity and older adults](#)

Barnfetma och dess komplikationer har ökat epidemiskt i Europa (ref EU, WHO)

Barn med fetma i Uppsala har följande komplikationer





UPPSALA
UNIVERSITET

Uppsala Longitudinal Study of Childhood Obesity (ULSCO)

PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Uppsala Longitudinal Study of Childhood Obesity: Protocol Description
Anders Forslund, Johan Staaf, Joel Kullberg, Iris Ciba, Marie Dahlbom and Peter
Bergsten

Pediatrics; originally published online January 13, 2014;
DOI: 10.1542/peds.2013-2143



AKADEMISKA
SJUKHUSET



UPPSALA
UNIVERSITET

Longitudinal work

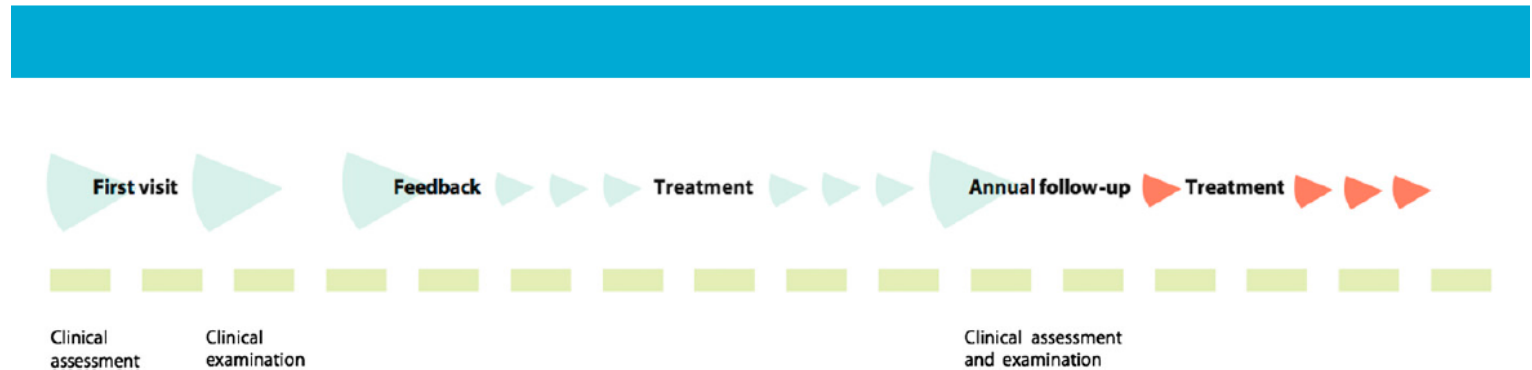


FIGURE 1

Time chart of visits by subjects at the pediatric obesity clinic and specified times when assessments and examinations are conducted within the ULSCO cohort. Red arrowheads indicate a potential new treatment strategy and/or research focus.



AKADEMISKA
SJUKHUSET



UPPSALA
UNIVERSITET

Procedures and assessments



Sensormedics Vmax-system ®



Inbody S20 ®



Harpenden kaliper ®



AKADEMISKA
SJUKHUSET



UPPSALA
UNIVERSITET

Procedures and assessments



Accelerometer



6-minute-walk-test



AKADEMISKA
SJUKHUSET

Biobank – for 1 subject

		FFA Ins, C-peptid			
		1	2	3	4
<u>Fasted</u>	1 EDTA	250	250	250	600
(-15, -5)	1 P800	250	250	400	

GLP-1

During OGTT from every timepoint

(min 5, 10, 15, 30, 60, 90, 120, 150, 180):

1 EDTA	250	250	800
1 P800	250	250	400



UPPSALA
UNIVERSITET

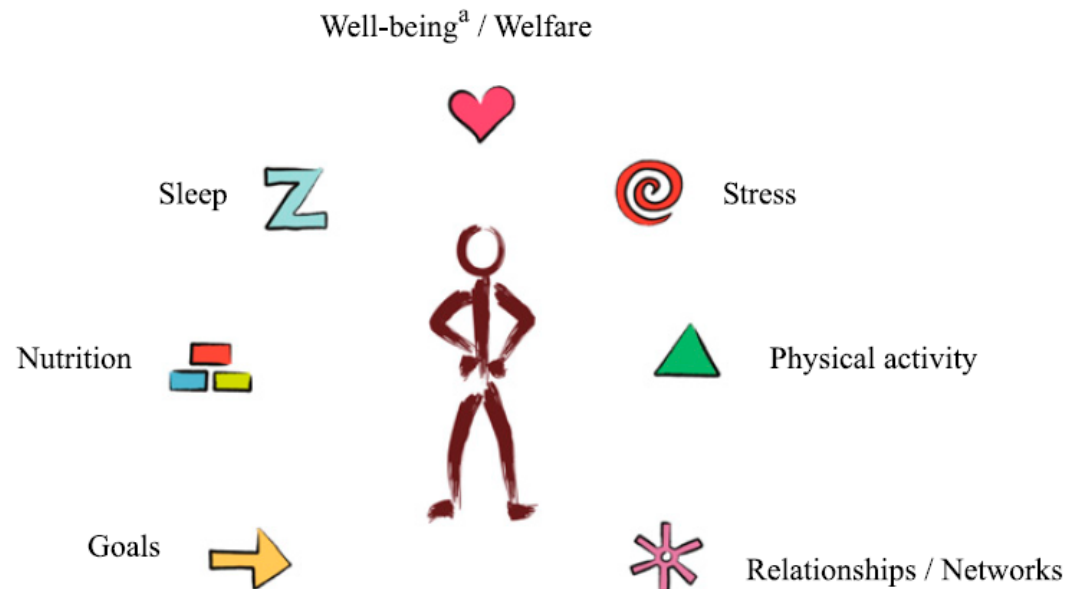


FIGURE 2

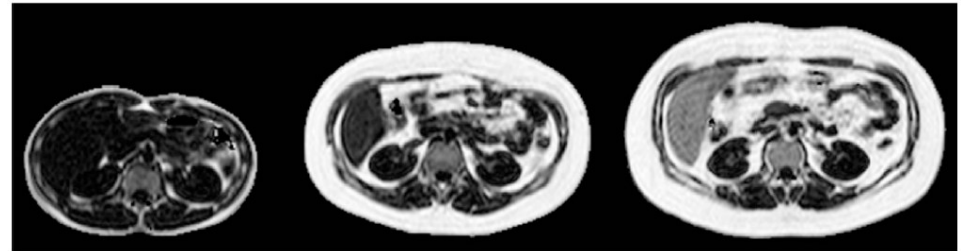
Areas covered by the ULSCO cohort questionnaires that address factors contributing to development of obesity. ^aIncludes determining the psychological and psychiatric status of the subject.



AKADEMISKA
SJUKHUSET

Procedures and assessments

- Obese, overweight and normal weight children, 5-18 years; regional referral center
- Longitudinal, annual visits
- Patient history (T2DM heredity)
- Questionnaires (food, physical activity)
- Procedures
 - Anthropometry, MRI
 - OGTT
 - Clamps
 - Indirect calorimetry
- Blood analysis
 - Glucose
 - Insulin, glucagon, GLP-1
 - Free fatty acids (FFAs), palmitate
- Genetic analysis
- Treatment: life-style, metformin
- Tissue repository, biobank (whole blood, plasma)

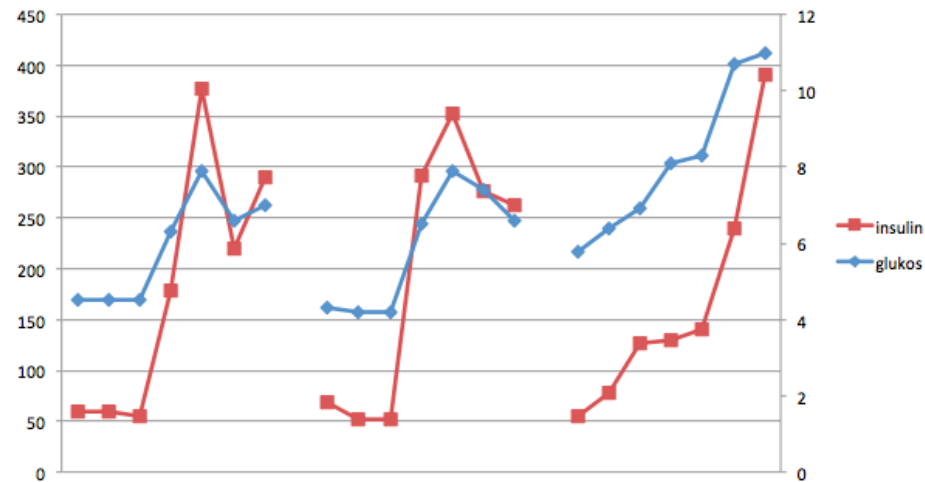


(Forslund et al, *Pediatrics*, 2014)

ULSCO

- Cohort
 - Obese: 690
 - Obese, second visit: 135
 - Normal weight, first visit: 110
- Glucose tolerance
 - Obese, NGT: 35%
 - Obese, IFG: 20%
 - Obese, IGT: 41%
 - Obese, T2DM: 4%

- Obese 15-year-old girl)
- First visit 2009





UPPSALA
UNIVERSITET



**THEME [HEALTH.2011.2.4.3-2]
[Development of novel treatment strategies
based on knowledge of cellular dysfunction]**

Grant agreement for: Collaborative project

Annex I - "Description of Work"

Project acronym: Beta-JUDO

Project full title: " Beta-cell function in juvenile diabetes and obesity "

Grant agreement no: 279153

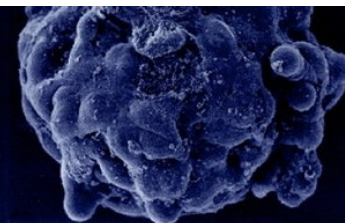
Version date: 2012-01-30



AKADEMISKA
SJUKHUSET

betaJUDO

BETA-CELL FUNCTION IN JUVENILE DIABETES AND OBESITY

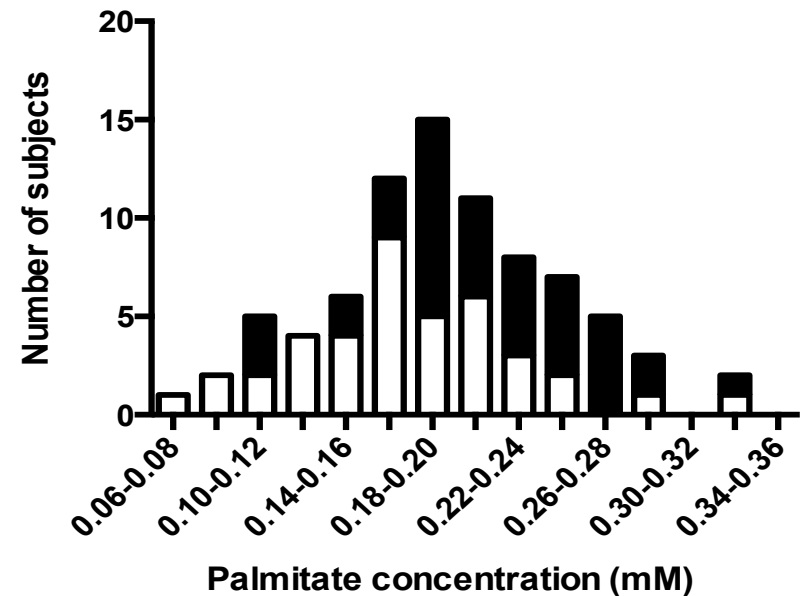


Obese children and FFAs

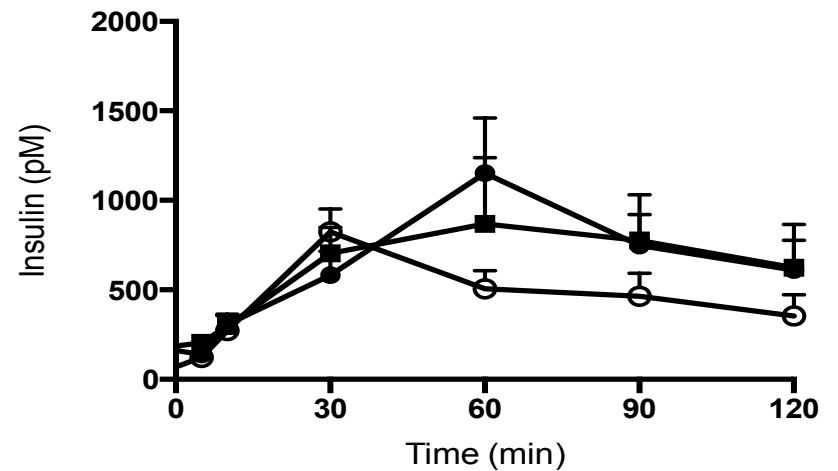
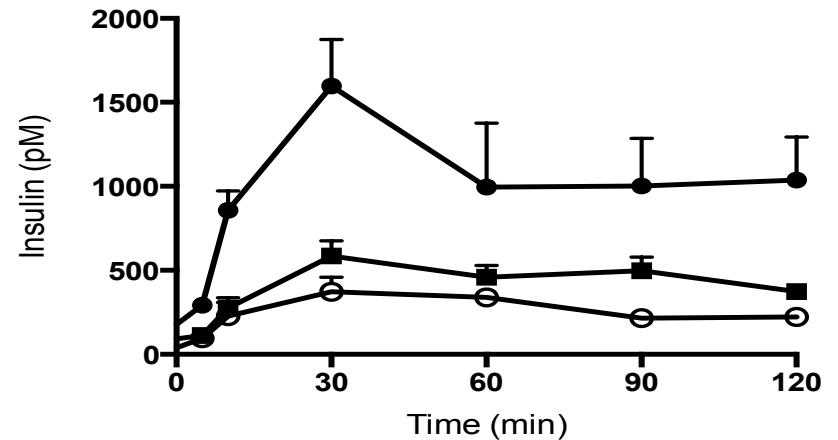
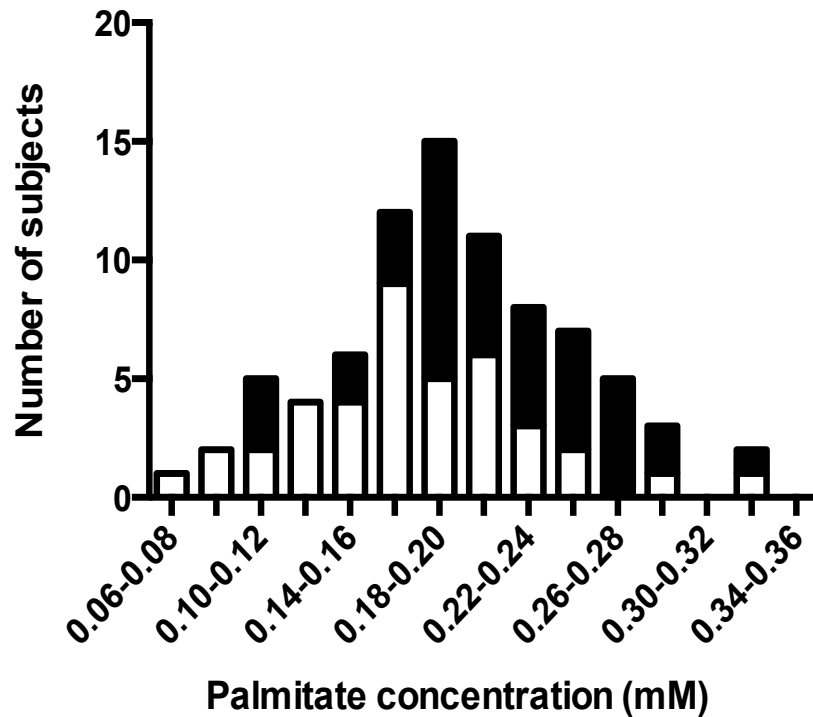
Table 3 FFA levels of study population

FFA	
Palmitoleic acid	1.25±0.10 (0.24–3.83)
Palmitic acid	5.46±0.19 (2.61–8.66)
Linoleic acid	2.41±0.16 (0.30–5.64)
Oleic acid	8.96±0.43 (3.10–18.05)
Stearic acid	2.17±0.12 (0.29–4.10)

Results are given as mean±SEM (in milligram per deciliter) and range



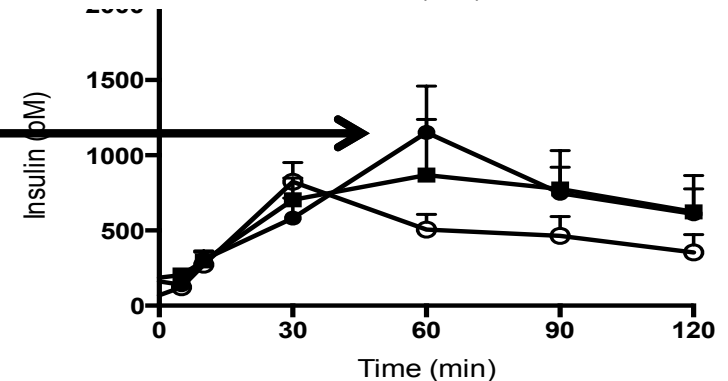
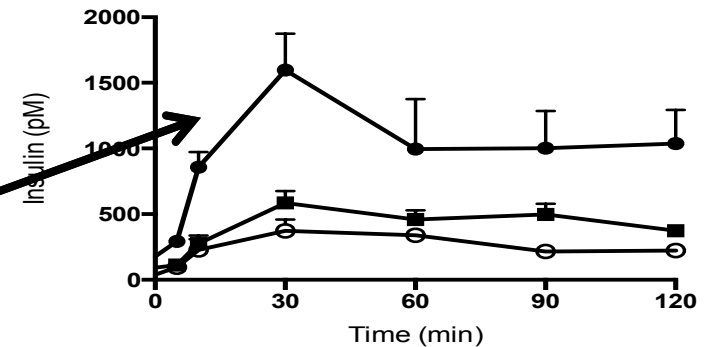
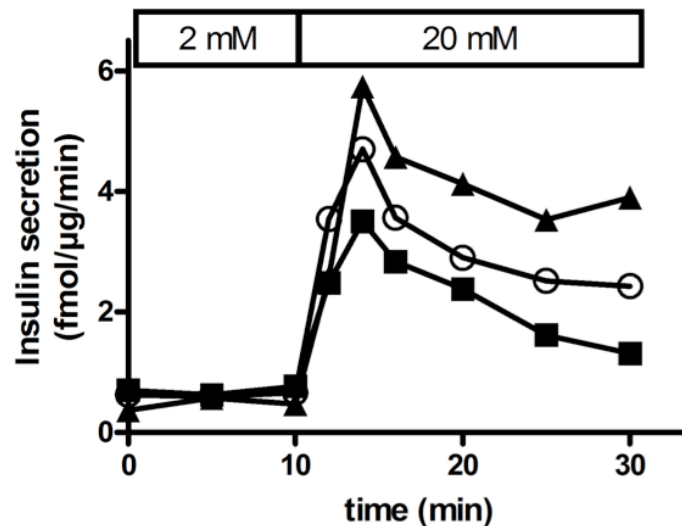
Obese children and palmitate



(Staaf et al, *Pediatric Res*, 2016)

Obese children, islets and palmitate

- Human islets exposed to high palmitate
- Obese children with high palmitate



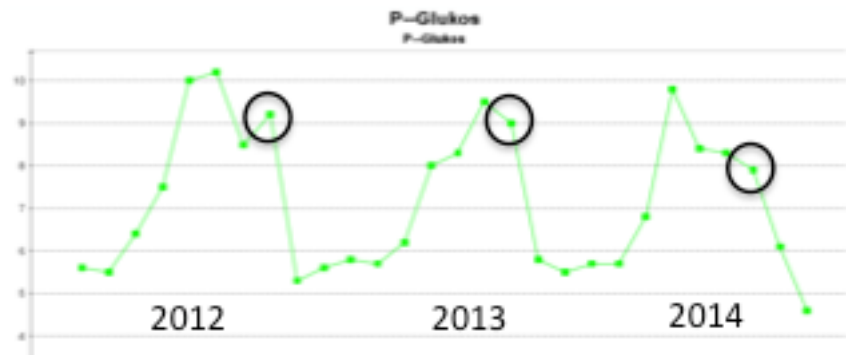
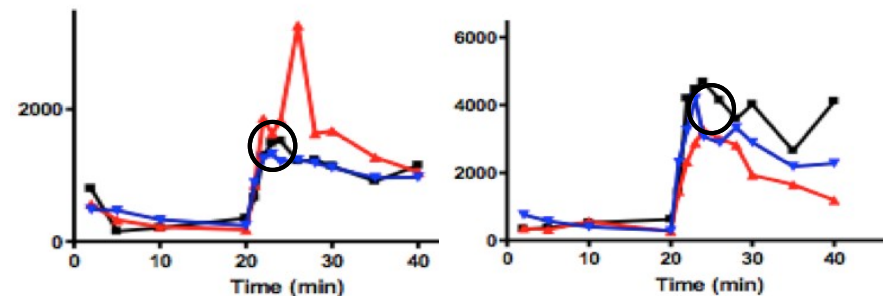
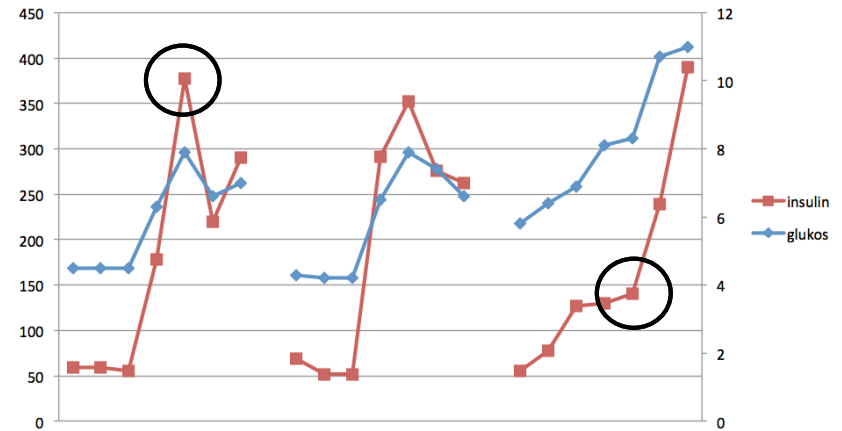
(Staaf et al, *Pediatric Res*, 2016)

Hypothesis

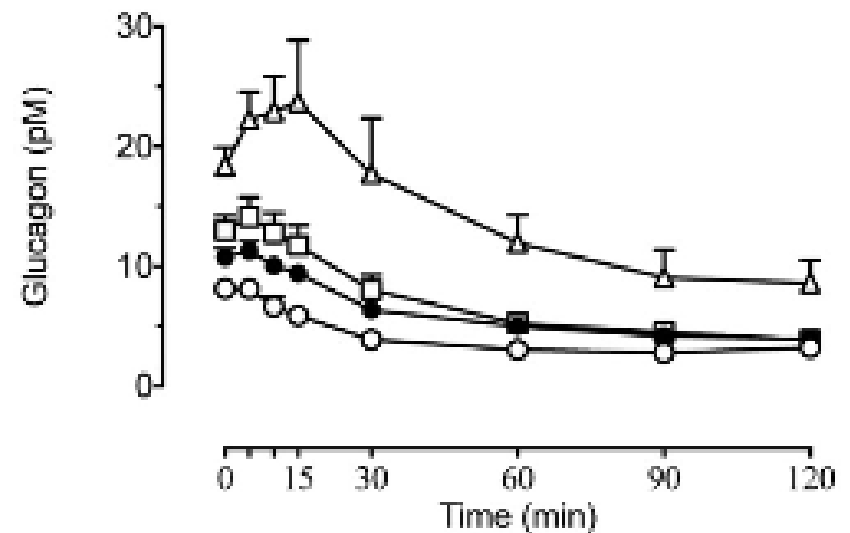
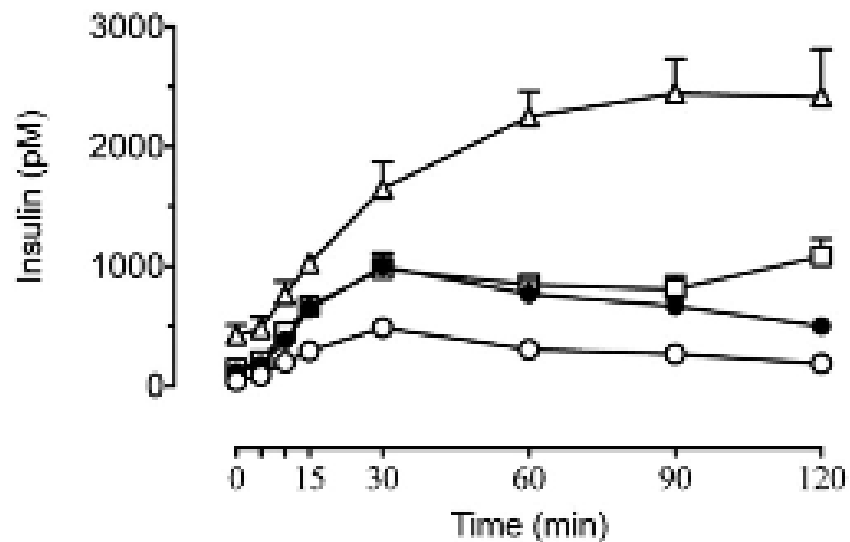
- Insulin hypersecretion:
 - early factor promoting and preceding lipid accumulation, insulin resistance and glucose intolerance (FP7 project “Beta-JUDO”)

Translational medicine

- 15-year old girl developing T2DM
- Human islets high FFAs fail (red), recover with GLP-1 (blue)
- 17-year old boy glucose intolerant, improving with metformin



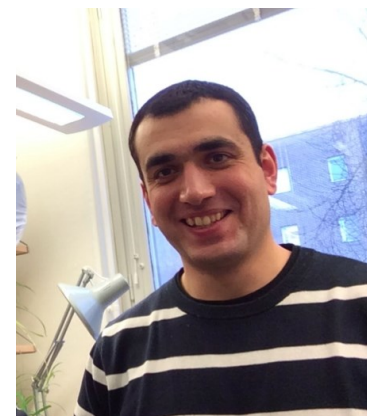
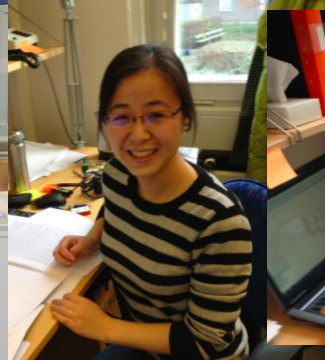
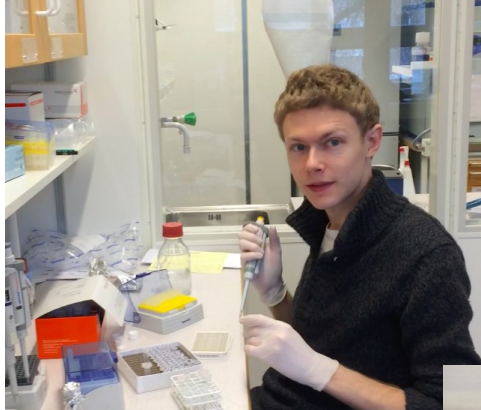
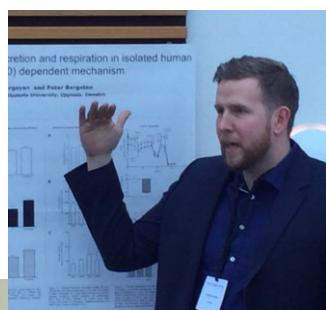
Glucagon and insulin in ULSCO



Acknowledgements

- European Commission, FP7 project “Beta-JUDO” (2012-2016)
- Uppsala Health Summit: “**E**nding **C**hildhood **O**besity” (ECHO) (October 2016)
- European Commission, H2020 project “ECHO-zones” (decision Dec 2017)
- Swedish Diabetes Association (2012-2017)
- Regional Clinical Research Council (2012-2017)
- Swedish MRC (2010-2014)

- Network: Finland, Norway, Iceland, Austria, Spain, South Africa, Qatar, New Zealand, Sri Lanka, USA, WHO



Tack!

