

# Insulin sensitivity, insulin release and glucagon-like peptide-1 levels in persons with impaired fasting glucose and/or impaired glucose tolerance in the EUGENE2 study

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## Abstract

**Aims/hypothesis** We examined the phenotype of individuals with impaired fasting glucose (IFG) and/or impaired glucose tolerance (IGT) with regard to insulin release and insulin resistance.

**Methods** Non-diabetic offspring ( $n=874$ ; mean age  $40\pm 10.4$  years; BMI  $26.6\pm 4.9$  kg/m<sup>2</sup>) of type 2 diabetic patients from five different European Centres (Denmark, Finland, Germany, Italy and Sweden) were examined with regard to insulin sensitivity (euglycaemic clamps), insulin release (IVGTT) and glucose tolerance (OGTT). The levels of glucagon-like peptide-1 (GLP-1) and gastric inhibitory polypeptide (GIP) were measured during the OGTT in 278 individuals.

**Results** Normal glucose tolerance was found in 634 participants, while 110 had isolated IFG, 86 had isolated IGT and

44 had both IFG and IGT, i.e. about 28% had a form of reduced glucose tolerance. Participants with isolated IFG had lower glucose-corrected first-phase (0–10 min) and higher second-phase insulin release (10–60 min) during the IVGTT, while insulin sensitivity was reduced in all groups with abnormal glucose tolerance. Similarly, GLP-1 but not GIP levels were reduced in individuals with abnormal glucose tolerance.

**Conclusions/interpretation** The primary mechanism leading to hyperglycaemia in participants with isolated IFG is likely to be impaired basal and first-phase insulin secretion, whereas in isolated IGT the primary mechanism leading to postglucose load hyperglycaemia is insulin resistance. Reduced GLP-1 levels were seen in all groups with abnormal glucose tolerance and were unrelated to the insulin release pattern during an IVGTT.

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