

Nonhuman Primates and Other Animal Models in Diabetes Research

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Abstract

Animal models are important for determining the pathogenesis of and potential treatments for obesity and diabetes. Nonhuman primates (NHPs) are particularly useful for studying these disorders. As in humans, type 2 diabetes mellitus is the most common form of diabetes in NHPs and occurs more often in older obese animals, with a metabolic progression from insulin resistance (IR) and impaired glucose tolerance to overt diabetes. Histopathologic changes in pancreatic islets are also similar to those seen in humans with diabetes. Initially, there is islet hyperplasia with abundant insulin production to compensate for IR, followed by insufficient insulin production with replacement of islets with islet-associated amyloid. Diabetic NHPs also have adverse changes in plasma lipid and lipoprotein concentrations, biomarkers of obesity, inflammation, and oxidative stress, and protein glycation that contribute to the numerous complications of the disease. Furthermore, sex hormones, pregnancy, and environmental factors (e.g., diet and stress) affect IR and can also contribute to diabetes progression in NHPs. Additionally, due to their similar clinical and pathologic characteristics, NHPs have been used in many pharmacological studies to assess new therapeutic agents. For these reasons, NHPs are particularly valuable animal models of obesity and diabetes for studying disease pathogenesis, risk factors, comorbidities, and therapeutic interventions.

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Abbreviations: (CB₁) cannabinoid 1, (CVD) cardiovascular disease, (GDM) gestational diabetes mellitus, (GLP-1) glucagon-like peptide-1, (HbA1c) hemoglobin A1c, (HDL) high-density lipoprotein, (IGT) impaired glucose tolerance, (IR) insulin resistance, (LDL) low-density lipoprotein, (NHP) nonhuman primate, (PPAR) peroxisome proliferator-activated receptor, (STZ) streptozotocin, (T1DM) type 1 diabetes mellitus, (T2DM) type 2 diabetes mellitus, (VLDL) very-low-density lipoprotein.

Keywords: cardiovascular disease, diabetes, metabolic syndrome, nonhuman primates, obesity, therapeutic intervention

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