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Antidiabetic effect of galantamine: Novel effect for a known centrally acting drug

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The cholinergic anti-inflammatory pathway is one of the putative biochemical pathways that link diabetes with Alzheimer's disease. Hence, we aimed to verify the potential antidiabetic effect of galantamine, unveil the possible mechanisms and evaluate its interaction with vildagliptin. The n5 STZ rat model was adopted and the diabetic animals were treated with galantamine and/or vildagliptin for 4 weeks. Galantamine lowered the n5-STZ-induced elevation in body weight, food/water intake, serum levels of glucose, fructosamine, and ALT/ AST, as well as AChE in the tested organs. Moreover, it modulated successfully the lipid profile assessed in serum, liver, and muscle, and increased serum insulin level, as well as %β-cell function, in a pattern similar to that of vildagliptin. Additionally, galantamine confirmed its antioxidant (Nrf2, TAC, MDA), anti-inflammatory (NF-κB, TNF-α, visfatin, adiponectin) and anti-apoptotic (caspase-3, cytochrome c) capabilities by altering the n5-STZ effect on all the aforementioned parameters. On the molecular level, galantamine/vildagliptin have improved the insulin (p-insulin receptor, p-Akt, GLUT4/GLUT2) and Wnt/β-catenin (p-GSK-3β, β-catenin) signaling pathways. On almost all parameters, the galantamine effects surpassed that of vildagliptin, while the combination regimen showed the best effects. The present results clearly proved that galantamine modulated glucose/lipid profile possibly through its anti-oxidant, -apoptotic, -inflammatory and -cholinesterase properties. These effects could be attributed partly to the enhancement of insulin and Wnt/β-catenin signaling pathways. Galantamine can be strongly considered as a potential antidiabetic agent and as an add-on therapy with other oral antidiabetics.

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Nanoparticle toxicity assessment: A lesson learnt from fly

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In recent era, wide usage of nanoparticles (NPs) in domestic items, medicines, cosmetics, body implants, etc., has increased the threat to the live cell as well as the genetic material. To understand the mechanistic role of nanoparticle toxicity in development and behavior, *Drosophila* appeared to be a superior model organism. We tested the toxicity of three chemically synthesized nanoparticles: Titanium, hydroxyapatite and zirconia using *Drosophila*. Since all the chosen nanoparticles are administered orally, we have chosen oral route of administration for this study. The NPs, after oral route of exposure accumulates in the gut, crosses the barrier of periotrophic membrane by inducing apoptosis as confirmed via SEM, trypan blue, 2',7'-dichlorofluorescein and DAPI staining. The toxicity of theses NPs resulted developmental delay, with decrease in pupa count and fly hatching along with weight loss. The adult fly hatched from the treatment vial shows increasing phenotypic defect like loss of thorax bristle (macrochaetes), incomplete wing venation, affected eye (ommatidia). Besides phenotypic defect an altered behavioral phenotypes like larva crawling or adult climbing were also observed. Both phenotypic as well as behavioral assay clearly represented the affected development of neurons, which could be due to affected signaling pathway like Notch, Wnt, EGFR, etc. The current study proved that NPs can alter the development of sensory organs in *Drosophila*. The nanoparticles toxicity should be accounted before its wide use in food and medicine.

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