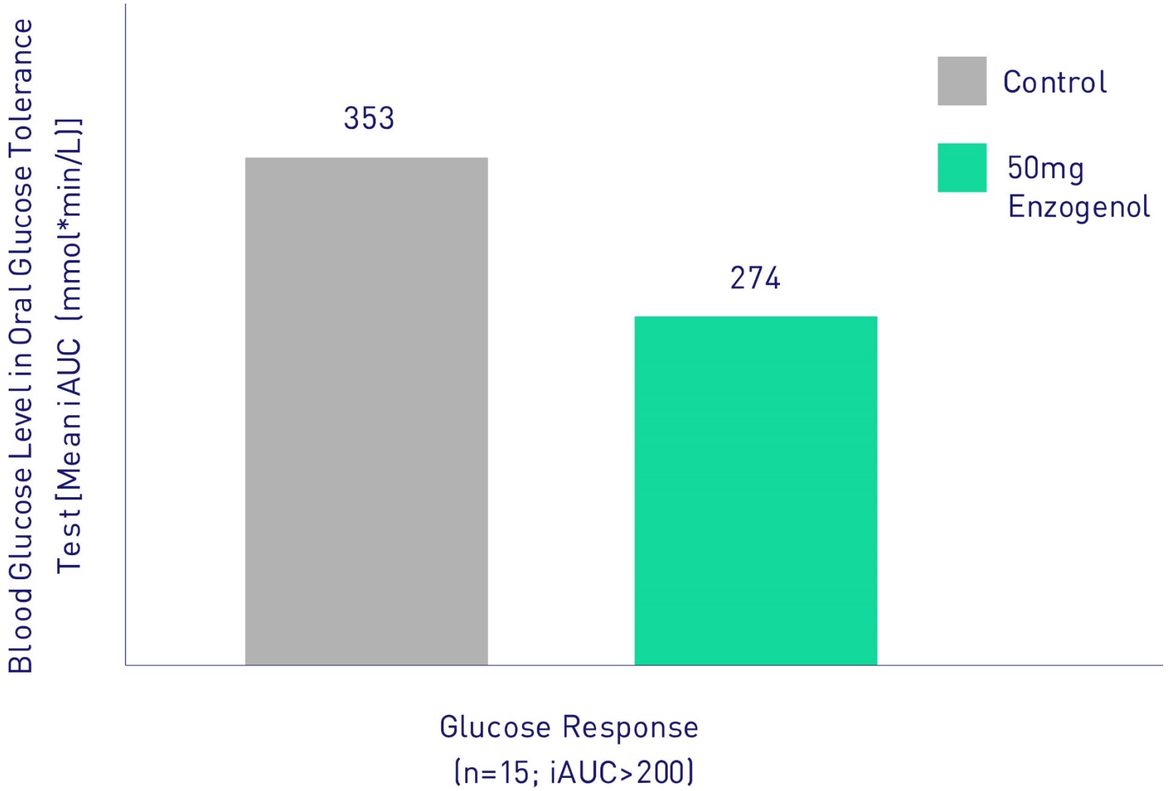
Blood Glucose Benefits – 1



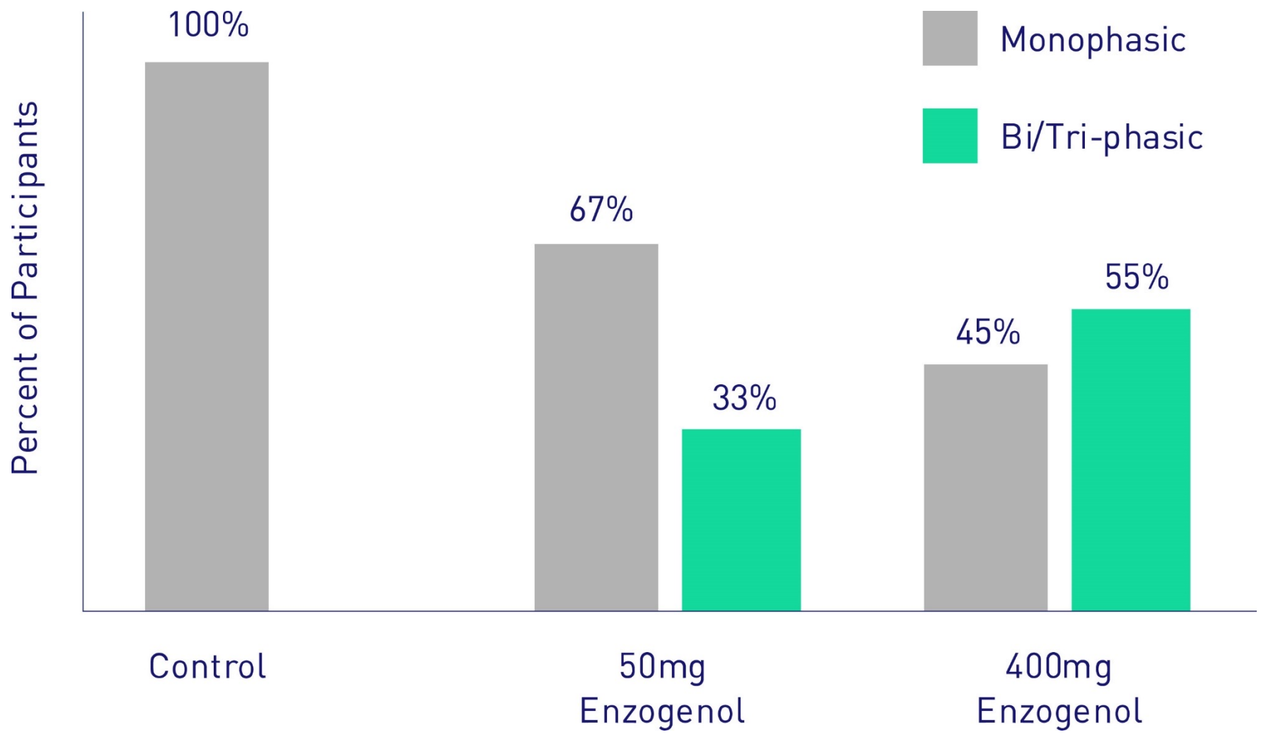
metabolic health

Improved glycaemic response in OGTT 20 min after consuming 50mg Enzogenol in non-diabetic people with sub-optimal glucose tolerance.

Enzogenol reduces blood sugar level after each meal.

Lim, et al., 2020. **An Acute, Placebo-Controlled, Single-Blind, Crossover, Dose-Response, Exploratory Study to Assess the Effects of New Zealand Pine Bark Extract (Enzogenol®) on Glycaemic Responses in Healthy Participants**. Nutrients 12, 497:2-14.

Blood Glucose Benefits – 2 metabolic health

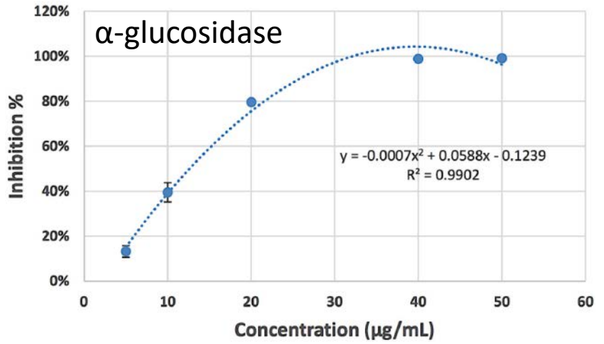


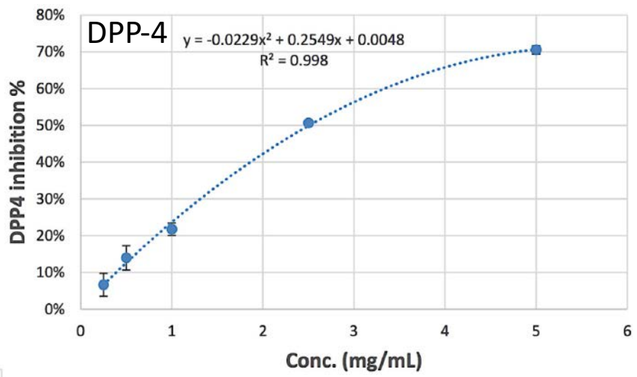
Shifting glucose response from mono-phasic to bi- and tri-phasic response

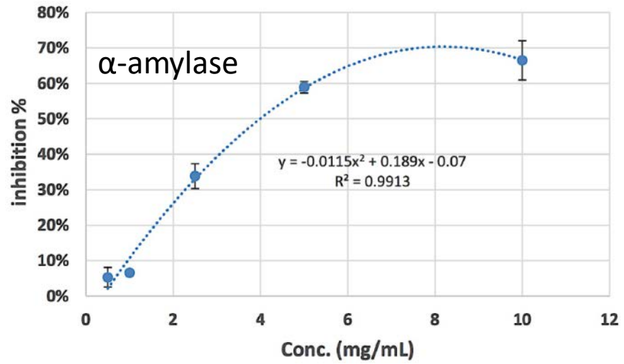
Enzogenol can shift glucose response curves indicating improved glucose metabolism.

Lim, et al., 2020. **An Acute, Placebo-Controlled, Single-Blind, Crossover, Dose-Response, Exploratory Study to Assess the Effects of New Zealand Pine Bark Extract (Enzogenol®) on Glycaemic Responses in Healthy Participants**. Nutrients 12, 497:2-14.

Blood Glucose Benefits – 3







ENZOGENOL IC50

- **α-glucosidase = 13 µg/ml**
- **DPP-4 = 2.5 mg/ml**
- **α-amylase = 4.0 mg/ml**

in-vitro research

Enzogenol inhibits enzymes involved in glucose metabolism:

α-glucosidase

DPP-4

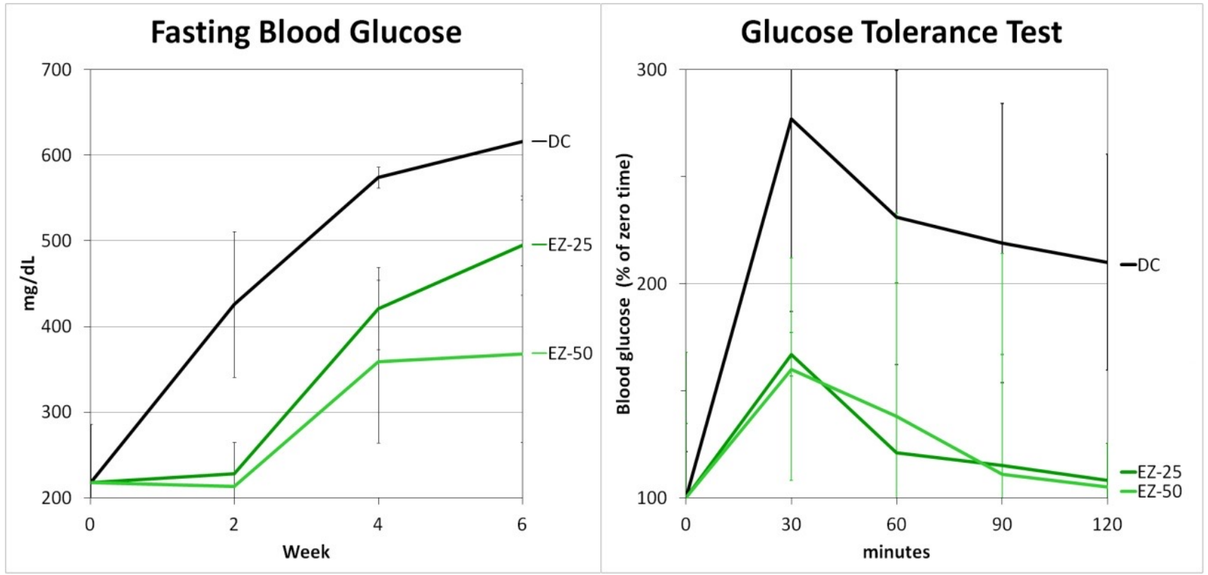
α-amylase

Revealing a possible mechanism of action for hypoglycaemic effects.

Lim, et al., 2020. **Mechanistic study on the inhibitory action of Pine Bark Extract (Enzogenol®) on digestive enzymes (α--amylase and α-glucosidase) and DPP--4 enzyme**. Unpublished Research Report by Massey University, New Zealand

ENZOGENOL®

Blood Glucose Benefits – 4 diabetic mouse trial



Enzogenol improves glucose metabolism in a diabetes mouse model.

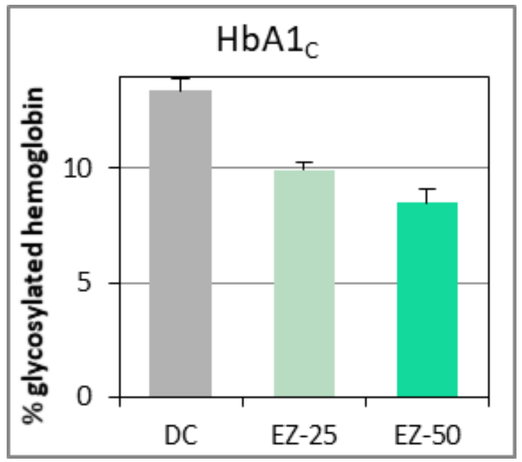
- **Significantly lower fasting blood glucose levels**
- **Improved blood glucose clearance**

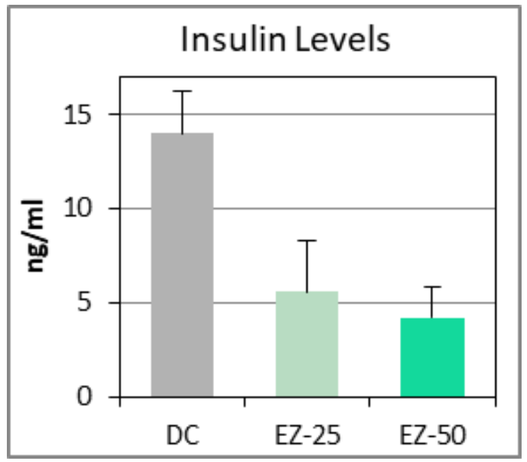
Bang and Choung, 2014. Enzogenol improves diabetes-related metabolic change in C57BL/KsJ-db/db mice, a model of type 2 diabetes mellitus. Journal of Pharmacy and Pharmacology 66(6): 875-885.

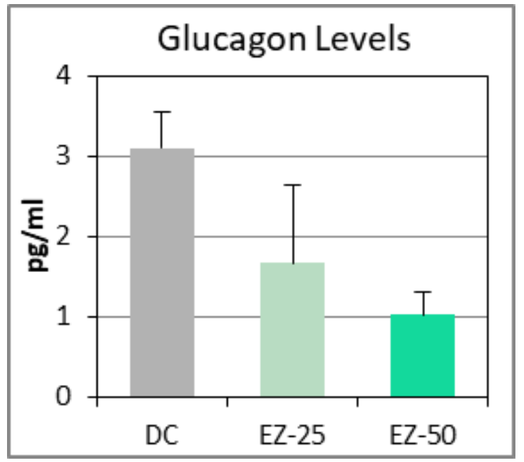
ENZOGENOL®

Blood Glucose Benefits – 5 diabetic mouse trial

Enzogenol significantly improves diabetes in a diabetes mouse model.







$HbA1_C$ levels ↘ by 58%

insulin levels ↘ by 70%

glucagon levels ↘ by 67%

Bang and Choung, 2014. Enzogenol improves diabetes-related metabolic change in C57BL/KsJ-db/db mice, a model of type 2 diabetes mellitus. Journal of Pharmacy and Pharmacology 66(6): 875-885.

ENZOGENOL®

Blood Glucose Benefits – 6 diabetic mouse trial

Enzogenol improves hepatic fat metabolism in a diabetes mouse model.

Enzyme / Lipids	Normal Function	Abnormal state in Diabetes	Effect of Enzogenol
AMPK = AMP activated Protein Kinase	Stimulates hepatic lipid oxidation, inhibits cholesterol and triglyceride synthesis, and lipogenesis.	Reduced activity in Diabetes => fat accumulation	Enzogenol increases activation of AMPK => reducing fat accumulation
Free fatty acids	Fatty acid metabolism	Increased	Normalised to non-diabetic values
Triglycerides			
Total Cholesterol			
HDL Cholesterol		Decreased	
HDL / Total Cholesterol			

Bang and Choung, 2014. Enzogenol improves diabetes-related metabolic change in C57BL/KsJ-db/db mice, a model of type 2 diabetes mellitus. Journal of Pharmacy and Pharmacology 66(6): 875-885.

Blood Glucose Benefits – 6

Conclusions

Clinical, animal and in-vitro studies show how Enzogenol

- Supports healthy glucose tolerance in non-diabetic people
- Helps to optimize glucose metabolism
- May serve as a nutritional adjunct for better management of diabetes