

2,4-DNP as an agent for losing weight and prolonging lifespan

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Introduction

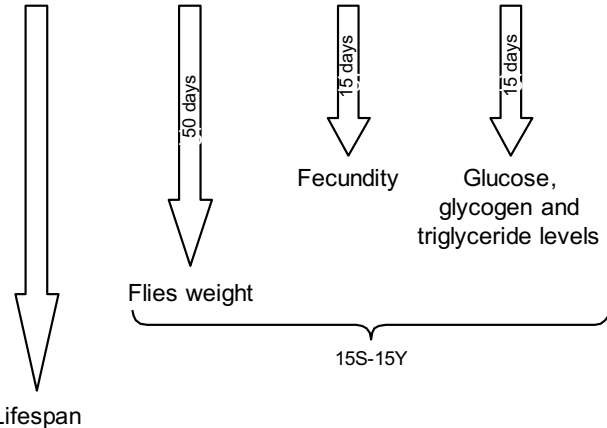
Despite the ban of 2,4-DNP consumption by humans in many countries since, a desire to boast by healthy and beautiful body suggest the use of very attractive “fat burners”. They include 2,4-DNP which are advertised as safe products, easily available in the market and advertised to quickly reduce body weight. That is why it is important to conduct the research in order to establish a safe dosage and physiological effects of 2,4-DNP.

Method and materials

Design of experiment

4-day old flies line *w¹¹¹⁸*

Experimental medium with different concentration of 2,4-DNP (50 mg/l; 100 mg/l; 200 mg/l)



We used *Drosophila melanogaster* to test the effects of high-caloric diet supplementation with 2,4-DNP in different concentrations (ranged from 50 to 200 mg/l). In these conditions, we evaluated the lifespan and fecundity, measured flies weight and also glucose, glycogen and triglyceride levels. Moreover, we used diets with different caloric values keeping the protein-to-carbohydrate ratio constant.

Results

Addition of 2,4-DNP significantly reduces the lifespan of flies of both sexes (1S-15). Diet supplementation with 2,4-DNP in concentrations of 50, 100 or 200 mg/l extended the lifespan of male flies fed 5S-5Y and 10S-10S diets and females fed 10S-10Y diet. Only higher tested concentrations have extended the fly lifespan when fed with high caloric density (15S-15Y) (Fig. 1).

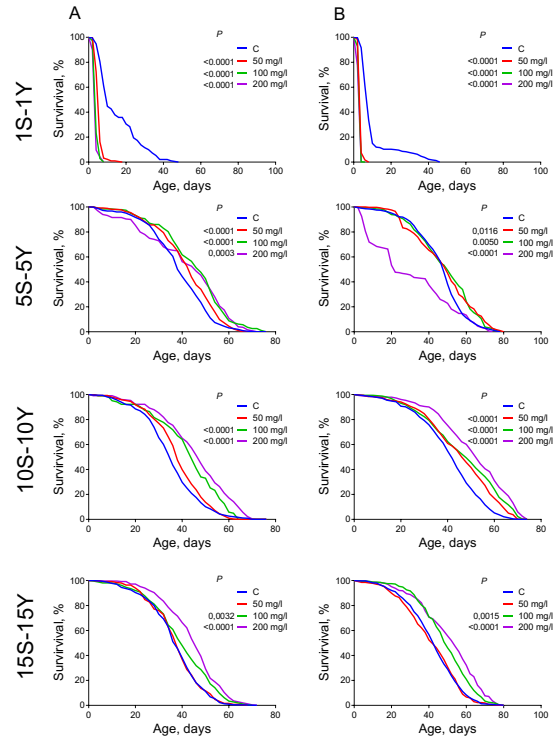


Figure 1. Lifespan of flies (A – female; B – male) with consumed 2,4-DNP (50 mg/l, 100 mg/l, 200 mg/l). Each curve represents the percentage of individuals alive as a function of age for about 100 flies, Log Rank test, $p < 0.001$.

The decrease weight was observed in flies fed 100 and 200 mg/l DNP starting from the day 20 (Fig. 2). The weight loss could be explained by uncoupling properties of DNP.

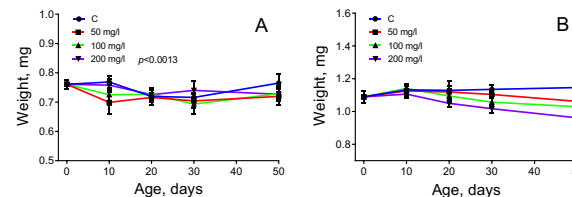
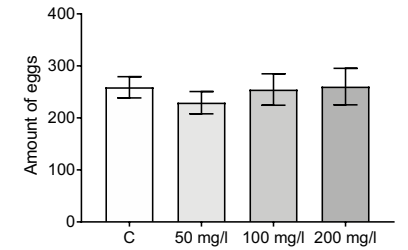


Figure 2. Weight of flies (A – female; B – male) which consumed medium without and with 2,4-DNP, Dunnett's test, $p < 0.05$

Figure 3. Fecundity of flies fed by 2,4-DNP supplementation versus flies fed by standard diet. Data are represented as mean \pm SEM, $n = 4$, Dunnett's test, $p < 0.05$



We found that DNP strongly affected the metabolism of flies. Glycogen and TAG levels were decreased by 40-50% in flies fed diet supplemented with DNP in concentration of 100 and 200 mg/l (Fig. 4).

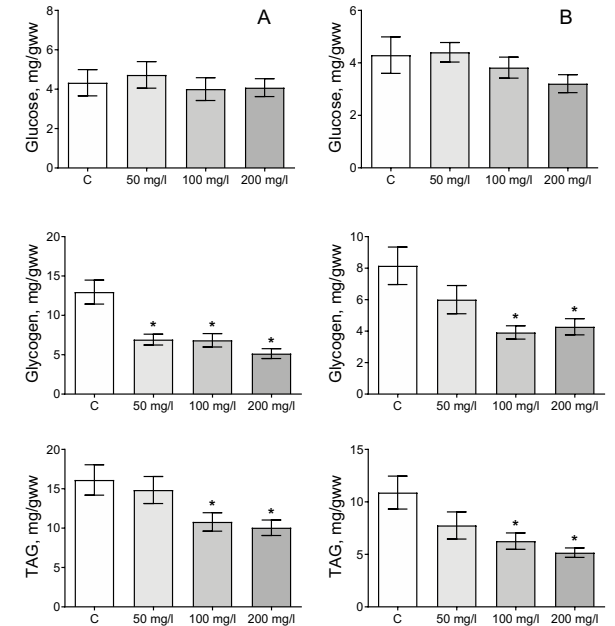


Figure 4. The graphs represent body glucose (mg/gww), glycogen (mg/gww) and TAG in body (mg/gww). For measuring were used flies (A – female; B – male) which consumed concentrations 2,4-DNP (50 mg/ml, 100 mg/ml, 200 mg/ml). Data are represented as mean \pm SEM. *Significantly different ($p < 0.05$) from control group as evaluated by Dunnett's test.

Conclusions

We can conclude that 2,4-DNP is toxic when flies fed diet of low caloricity but significantly extend the lifespan at diets of moderate or high caloricity. DNP also reduces weight, lipid and carbohydrates stores that makes possible to use it as geroprotector and weight-maintaining agent.