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Superoxide dismutase and life span of *Drosophila melanogaster*¹

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Summary. Comparison of superoxide dismutase activity in homogenates of wild and vestigial strains of *D. melanogaster* revealed a lower enzyme activity in the short-living vestigial strain.

The discovery of superoxide dismutase (SOD), the enzyme dealing with superoxide free radicals formed upon oxygen metabolism³ induced a wide interest in the possible effects of this enzyme upon free-radical related biological processes. Some theories of aging assume that this process is due to side reactions of active free radicals with biologically active macromolecules⁴. Taking it for granted, one can expect possible relations between superoxide dismutase and aging phenomena. Indeed, age-related alterations in physicochemical properties of SOD itself were proved in rat liver⁵ and we demonstrated a decrease in SOD activity on erythrocyte aging⁶. Some differences were found in SOD activity in brains and lungs of long- and short-lived mice of certain age⁷. This prompted us to resume studies on possible correlations between animal life span and SOD activity in animal tissues. In this communication, we report a lowered SOD activity in homogenates of a *Drosophila* strain of significantly reduced life-span.

Material and methods. Wild-type *D. melanogaster* and its vestigial mutant were obtained from the Department of Cytology, University of Łódź, and were grown as recommended by Lewis⁸, at a photoperiod of 12 h light/12 h dark and at a temperature of 25±1 °C. Killing and homogenization of the insects was performed according to Fernandez-Sousa and Michelson⁹. SOD activity was determined in the homogenates by the adrenalin method¹⁰ and converted into the most widely used McCord and Fridovich' units³ by calibration with a commercial Sigma preparation of known activity. The assay medium for mitochondrial SOD included 2 mM KCN. Protein was estimated according to the method of Lowry et al.¹¹ as modified by Lees and Paxman¹². All the results represent mean±SD from at least 3 parallel experiments.

Results and discussion. SOD activity was determined in

homogenates of *D. melanogaster* imagines 1–10 days after emergence (table). The rather high scatter of data is partly conditioned by the method of SOD estimation applied which is very reproducible but, due to the low value of the reference rate of absorbance change (0.025/min), yields discrete values of per cent inhibition of adrenalin autoxidation when absorbance is measured with an accuracy of 0.001 (VSU-2P spectrophotometer, GDR).

The total SOD activity seems to be constant in the imagines within the time period studied. The increase observed in 10-day-old imagines is devoid of statistical significance ($p > 0.05$ when estimated using the Student's t-test). On the other hand, total SOD activity was always lower in the vestigial strain, the difference being statistically significant at 10 days after emergence ($p < 0.05$). This difference seems to be conditioned by cytosolic SOD.

The vestigial strain of *D. melanogaster* is characterized by a considerably shortened life-span in comparison with the wild strain^{13,14}. It was reported impossible to find a correlation between the rate of accumulation of fluorescent pigment and the life span of different *Drosophila* strains¹³. On the other hand, the present results demonstrate that such a possibility may exist with respect to SOD activity and possibly to concentrations of other inhibitors of free-radical reactions.

SOD activity in homogenates of 2 strains of *Drosophila melanogaster* at different intervals after emergence (units/g protein)

Days after emergence	Wild		Vestigial	
	C+M	M	C+M	M
1	864±143	91±9	590±81	203±66
3	860±220	128±7	725±224	209±52
4	839±188	183±60	519±136	168±49
10	1039±11	174±7	775±114	135±25

C: cytosol SOD, M: mitochondrial SOD.

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