Age-related NADH oxidase (arNOX) activity of epidermal punch biopsies correlate with subject age and arNOX activities of serum and saliva

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BACKGROUND

The ECTO-NOX (external NADH oxidase) or ENOX (PMOR) system. Aging leads to the accumulation of mitochondrion DNA lesions and a shift towards an energy production via glycolysis, resulting in a hyperactive PMOR system. ENOX1 (CNOX) and ENOX2 (tNOX) carry out 4 electron transfers to molecular oxygen to form water. However, ENOX3 (arNOX) is involved in the plasma membrane oxidoreductase proteins are cell-surface located, terminal oxidases capable of damaging adjacent cells, circulating lipoproteins (3) and components of the skin’s extracellular matrix (ECM).

METHODS & MATERIALS

This was a single center study designed to obtain human skin, serum, and saliva samples from a variety of age groups for arNOX level determination and further laboratory study. From both sun-exposed and non sun-exposed sites, tissue mm full-thickness skin punch biopsies were taken from sixteen healthy female subjects age 50-73 years of Fitzpatrick skin type I & II. The epidermis and dermis of each biopsy were carefully separated and frozen in PBS. Serum and saliva samples were also collected from each of the 16 subjects. All epidermal, dermal, serum and saliva samples were sent to Purdue University for arNOX activity measurement. arNOX activity was measured as the production of superoxide based on the standard method where reduction of ferricytochrome c by superoxide was monitored from the increase in absorbance at 550 nm with reference at 540 nm (4). The oscillatory pattern of arNOX activity with a 26 min period and inhibition by superoxide dismutase (Fig. 2) served as the basis for the activity assay. Rates were determined using a SLM Aminco DW-2000 spectrophotometer in the dual wavelength mode with continuous measurements (over 1 min every 1.5 min). After 45 min, 60 µl (containing 60 units) SOD were added and the assay was continued for an additional 45 min as a further check for the specificity of the arNOX activity.

RESULTS

For all six tissue samples arNOX activity and subject age were positively correlated, with arNOX activity exceeding background (blank) rates beginning at about age 50 (extrapolation) and reaching a maximum between ages 55 and 65 (Fig. 3-8). For sun-exposed epidermis and both sun-exposed dermis and sun-protected dermis, arNOX activity values reached a plateau or declined between ages 55 and 72. However, for serum and saliva, activity increased with increasing age beginning at about age 30.

CONCLUSION

We have demonstrated that arNOX (ENOX3) is found in both the epidermis and dermis at both sun-exposed and non-sun-exposed sites. arNOX levels correlate with chronological age. Because of decreasing arNOX levels in the oldest subjects, the data suggest that arNOX inhibitors may be of cutaneous value in persons between ages 45 and 65.

REFERENCES