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

Dale Kern¹, Zoe Draelos², Dorothy M. Morré³ and D. James Morré³

¹NuSkin Enterprises, Provo, Utah, ²Dermatology Consulting Services, High Point, NC and ³Purdue University, West Lafayette, IN

The ECTO-NOX (external NADH oxidase) or ENOX (PMOR) system. Aging leads to the accumulation of mitochondrial DNA lesions and a shift towards en-active PMOR system. ENOX1 (CNOX) and ENOX2 (tNOX) carry out 4 electron transfers to molecular oxygen to form water. However, ENOX3 (arNOX) is unique in that it generates superoxide at the cell surface (Fig. 1) and its activity is elevated in individuals of 50-70 years of age compared to those of 20-40 years of age (1,2). Generated superoxide can then form H₂O₂ and other reactive oxygen species (ROS) capable of damaging adjacent cells, circulating lipoproteins (3) and components of the skin's extracellular matrix (ECM).

METHODS & MATERIALS

OBJECTIVE

To demonstrate the presence of arNOX (ENOX3) in human epidermis and dermis and examine possible correlations with age and sun exposure.

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 30 (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

1. Morré DM, Guo F, Morré DJ. An aging-related cell surface NADH oxidase (arNOX) generates superoxide and is inhibited by coenzymes & Nicot. Biochem. 2000;24:210-220

FIG. 1


FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIG. 6

FIG. 7

FIG. 8