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The First Approach of Its Kind for Epidermal Anti-Aging
"Environmental Control Surrounding Epidermal Stem Cells" Shows a Way to Control Epidermal Aging

KOSÉ Corporation (HQ: Chuo-ku, Tokyo, President: Kazutoshi Kobayashi) advanced the research of stem cells*1 and aging mechanisms, and discovered for the first time in the industry that using antioxidant to control the environment surrounding epidermal stem cells would suppress skin's aging process.
This finding is scheduled to be presented at the 21st IFSCC (International Federation of Societies of Cosmetic Chemists) Conference in Bangkok (December 12th – 14th, 2011, in Bangkok, Thailand), which is an international workshop for the cosmetics science industry.

People develop diverse aging symptoms along with physiological aging. These changes are called "aging phenotype" and known to be caused by a gradual decline in the ability to maintain tissue homeostasis. It is considered important to prevent and improve "aging phenotype" in the study of skin in the cosmetics industry, and many researches are conducted to determine the cause of it. However, the past approaches to aging have targeted dermis, and "aging phenotype" in epidermis has remained untouched.
It has been known that aging epidermis slows down in turnover*2, resulting in thinning of the epidermal layer as a whole. A decline in the function of basal keratinocytes in the basal layer is considered the cause of these phenomena. With that, we have focused attention on the quality of epidermal stem cells, which play an important role in maintaining epidermal homeostasis by providing new cells, and have advanced our research to maintain the capacities of epidermal stem cells since 2004.
We have also conducted joint researches with universities, in parallel with aforementioned studies, to shed light on the relationship between stem cells in hair follicle and aging using "gray hair", a typical "aging phenotype", as a model. The results have been published in American science journals "Cell" and "Cell Stem Cell" on June 12, 2009 and February 4, 2011 respectively.

In the current study we have advanced developmental applications in our own researches of reconstructive epidermal models (epidermal equivalents) and epidermal stem cells, and clarified the mechanism of "aging phenotype".
We have also paid particular attention to surrounding microenvironment*3, which is considered to be effective in maintaining the quality of stem cells. As a result, we discovered that keepinghypoxic condition in the incubation period helps epidermis cells maintain their undifferentiated state similar to stem cells. (Figure 1)

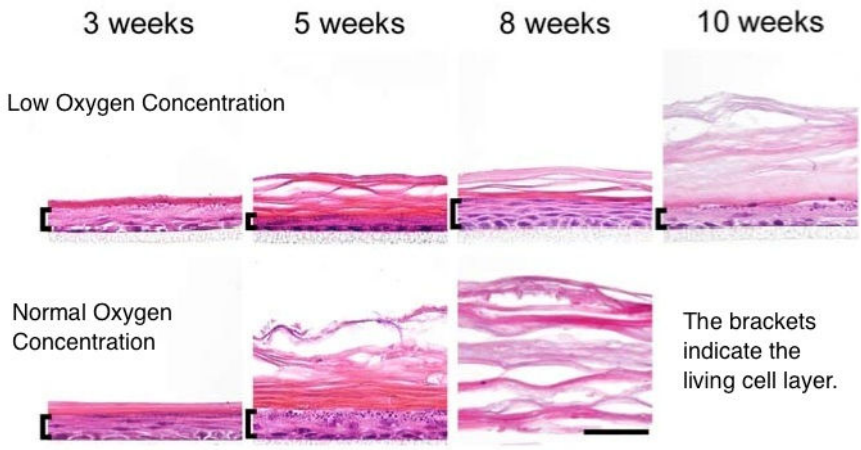


Figure 1: HE stained images of epidermal equivalents under different oxygen concentration environment

When the epidermal equivalent is regenerated under normal oxygen concentration, all cell layers undergo epithelization, i.e. keratinized and differentiated without the cell proliferation capacity. On the other hand, the lower hypoxic condition maintained the living cell layer seen in the above figure for an extended period.

Furthermore, as a result of exploring for materials to better control the environment, we have discovered that antioxidant agents such as vitamin C derivative, known to be good for skin, can be used to improve the microenvironment of stem cells. (Figure 2) It was the first time that the effects of antioxidant capabilities to stem cells were clarified, and we can say that a way to control epidermal aging was discovered.

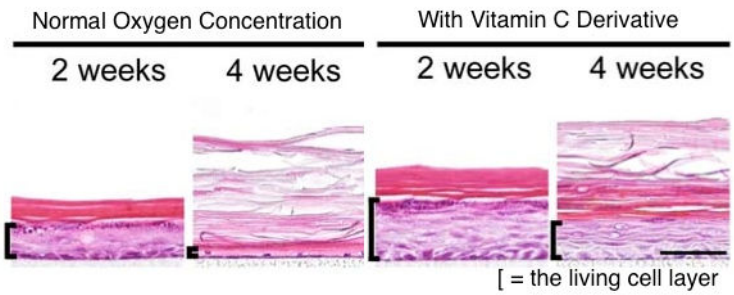


Figure 2: The effects of antioxidant in reconstructive epidermal equivalents

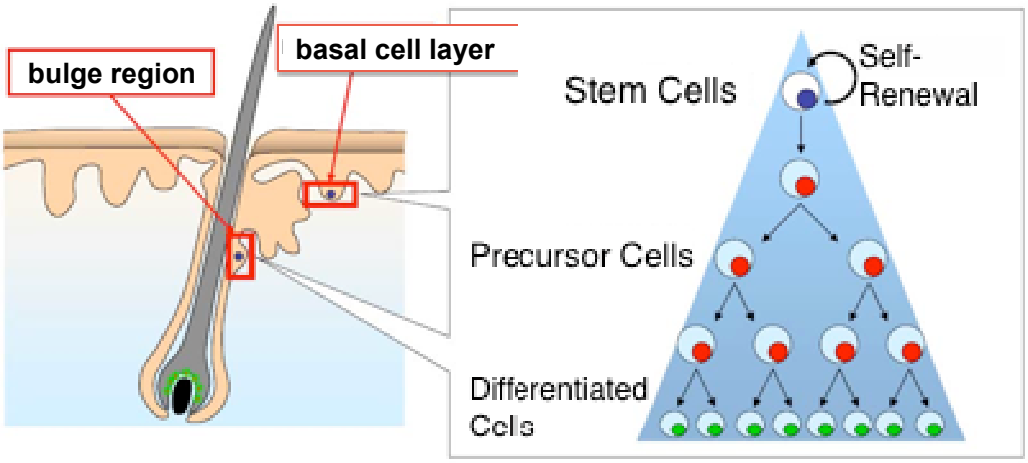
All living cell layers in the epidermal equivalent under normal oxygen concentration underwent epithelization after four weeks; however, the one treated with vitamin C derivative maintained the living cell layers after four weeks.

KOSÉ is planning on advancing detailed deliberation of the mechanism which maintains the capabilities of stem cells while applying these research results to future developments of aging care products.

[Glossary]

*1 Stem Cells

Stem cells are special cells from which all the other cells are generated, and possess abilities to proliferate (self-renewal) and differentiate to other cells (differentiation). Stem cells, through division, produce precursor cells with specific functions that turn into transient amplifying cells generating differentiated cells with specific functions. Stem cells exist in organs that have faster metabolism, and some known ones include hematopoietic stem cells that produce red and white blood cells, neural stem cells, and hepatic stem cells. In the skin, “hair follicle stem cells” in the bulge region, which are involved in epidermal metabolism and the growth of “epidermal stem cells” and hair in the basal cell layer are known



*2 Turnover

Epidermis consists of “stratum corneum”, “stratum granulosum”, “stratum spinosum”, and “stratum basale” from top to bottom. Epidermal stem cells in the basal layer at the very bottom of epidermis produce new epidermal cells, undergo cell division repeatedly, finally reaching the outermost layer to fall off as scurf. This cycle in which epidermis is regenerated is called “turnover.”

*3 Microenvironment

A special environment called “the niche”, in addition to autonomous control of cells, is thought to be essential in maintaining stable stem cells. There are many areas yet to be explored in “the niche”, however, a hypoxic environment seems to act as one factor, the niche, to protect stem cells from oxidative stress.