

Mandom has clarified the inhibitory effect of *Paeonia lactiflora* Pallas extract on skin injury from ultraviolet rays and has analyzed the activation mechanism of its DNA damage repair function

Mandom Corporation (headquarters: Osaka City, President & CEO: Motonobu Nishimura; hereinafter referred to as “Mandom”) has used skin models to elucidate the inhibitory effect of *Paeonia lactiflora* Pallas extract on skin injury caused by ultraviolet rays.

Furthermore, using “DNA Microarray Analysis,” one of the latest biotechnology methods, Mandom has analyzed the effect of *Paeonia lactiflora* Pallas extract at the genetic level.

Paeonia lactiflora Pallas extract is obtained from the root of *Paeonia lactiflora* Pallas, a plant belonging to Paeoniaceae. Its scientific name is derived from the physician Paeon from Greek mythology. Since ancient times, the *Paeonia* plant has been recognized as a medicinal herb, and its usefulness has been identified in both Western medicine and traditional Chinese medicine. Mandom has discovered that the *Paeonia lactiflora* Pallas extract can suppress damage to the epidermal cells in the skin caused by ultraviolet rays. In addition, a scientific analysis of its mechanism of action has been performed.

We have filed a patent application for this research which will be applied to the future development of Mandom's ultraviolet ray-compatible skin care cosmetics.

1. *Paeonia* extract suppresses the formation of sunburn cells caused by ultraviolet rays

Skin injury caused by ultraviolet rays leads to cosmetic skin conditions such as erythema, pigmentation, rough skin due to disrupted turnover and texture, and decreased moisture content in the skin. Studies on the formation of sunburn cells as an indicator for the evaluation of such skin conditions has been performed.

When exposed to ultraviolet rays, the epidermal cells (keratinocytes) that are damaged by sunburn are called sunburn cells (Figure 1, black arrows). In sunburn cells, the nucleus, which is the most important organelle within the cell, is atrophied. We believe the main cause of this occurrence is the fatal damage suffered by DNA present in the nucleus. Once a sunburn cell is formed, keratinocytes cannot function as normal cells and the favorable state of healthy and beautiful skin is lost.

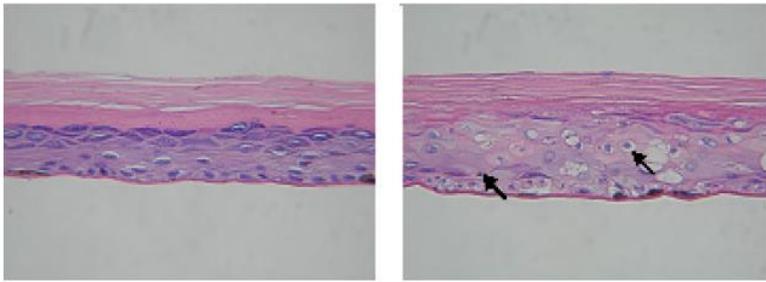
We used three-dimensional skin model* as a model of human skin and tested over one hundred plant-related substances. We confirmed that *Paeonia* extract strongly suppressed the formation of sunburn cells (Figure 2). Therefore, *Paeonia* extract suppressed the damage caused by ultraviolet rays to epidermal cells and assisted in their normal functioning.

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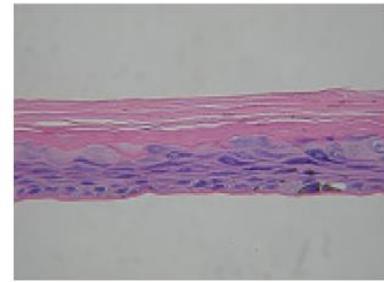




Normal (no UV irradiation)

UV irradiation

Figure 1. Formation of sunburn cells in three-dimensional skin model by ultraviolet rays



Paeonia extract + UV irradiation

Figure 2. Suppression of sunburn cell formation in three-dimensional skin model by Paeonia extract

*Three-dimensional skin model

This skin model was artificially derived from human epidermal cells by applying knowledge of regenerative medicine. It has the same structure as human skin (stratum basale/stratum spinosum/stratum granulosum/stratum corneum) and is one of the cutting-edge human skin substitute materials used to verify the effect of cosmetics and raw materials on the skin.

2. Paeonia extract promotes the expression of genes involved in DNA damage repair caused by ultraviolet rays

DNA is the blueprint of life, and the most important feature of cells. Although we have indicated in the previous section that sunburn cells arise from DNA damaged within keratinocytes by ultraviolet rays, cells have a self-repair function for damage repair.

To analyze the mechanism of action of Paeonia extract, we irradiated keratinocytes with ultraviolet rays, added Paeonia extract to the irradiated sample, and analyzed, using “DNA Microarray**”, the extract’s effect on keratinocytes at the genetic level. We confirmed that Paeonia extract promotes the expression of genes related to the production of “XPC” (Figure 3), a protein that recognizes sites of DNA damage (approximately 30% increase, relative value). XPC plays an important role in the damage repair function of DNA by recognizing damaged sites and guiding the excision factor at injured sites.

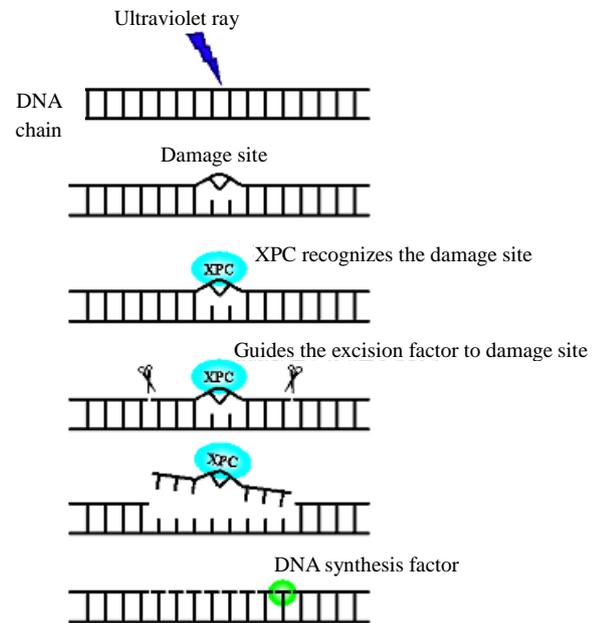


Figure 3. Role of XPC in the DNA damage-repair mechanism

Although the relationship between inhibition of sunburn cell formation by Paeonia extract (introduced in the previous section) and activation of the DNA damage-repair mechanism requires further clarification, the results presented suggest that Paeonia extract is useful in the suppression of skin damage, at the cellular level, caused by ultraviolet rays. We believe that suppressing skin injury due to ultraviolet rays leads to the maintenance of skin health and may prevent photoaging.

Mandom will continue to study the effect of Paeonia extract for application in skincare products that protect against ultraviolet rays.

**DNA Microarray

A comprehensive method to detect differences in DNA expression following the application of various drugs or stimuli to cells or tissues. This method allows us to analyze tens of thousands of changes in DNA expression in a relatively short period of time.