

# EFFECTS OF QUANTUM POLARIZATION ON ATP PRODUCTION OF ALGINIC ACID, VITAMIN C AND VITAMIN A

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## BACKGROUND :

Quantum polarization has already been proven to increase the efficacy of biological ingredients ([cannabidiol](#); [peptides derived from scorpions](#)). The aim of the study was to compare the efficacy of polarized and non-polarized Vitamin C, Vitamin A and Alginic Acid. Increasing efficacy of key ingredients delivers greater end-benefits to consumers through higher-quality products.

Adenosine triphosphate (ATP) is an organic compound produced by oxidation that provides energy to drive many processes in living cells, including cellular mitochondria and immune response.<sup>1</sup>

ATP production level in primary human fibroblast cells was measured to validate the effectiveness of polarization in cellular functions for cosmetic use.

## METHODS:

ATP lite assay kit and SpectramaxID3 machine were utilized to measure differences between polarized and non-polarized Vitamins and Alginic Acid.



**Figure 1.** ATP-monitoring luminescence assay for quantitative evaluation of proliferation and cytotoxicity of cultured mammalian cells.



**Figure 2.** The SpectraMax® iD3 Multi-Mode Microplate Readers measure absorbance, fluorescence, and luminescence.

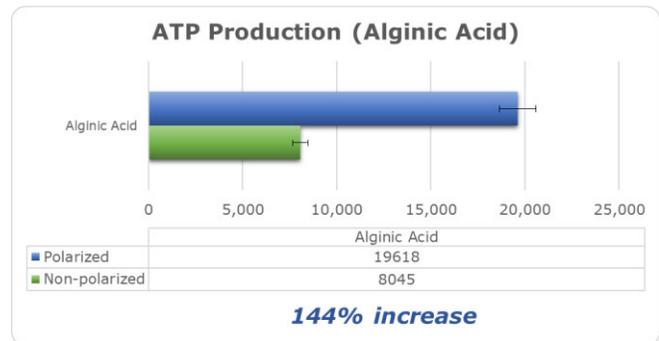
- Fibroblasts were plated in 96 well plates at 10000 cells per well
- Optimum concentration of Vitamin C, Vitamin A and Alginic Acid was 10mM, 10µM and 100mM respectively.
- Treating cells for 24 hours allowed us to determine the percent change between polarized and non-polarized versions of Vitamin C, Vitamin A and Alginic Acid.

<sup>1</sup> Pearce, Erika L, and Edward J Pearce. "Metabolic pathways in immune cell activation and quiescence." *Immunity* vol. 38,4 (2013): 633-43. doi:10.1016/j.immuni.2013.04.005

## RESULTS:

### Alginic Acid

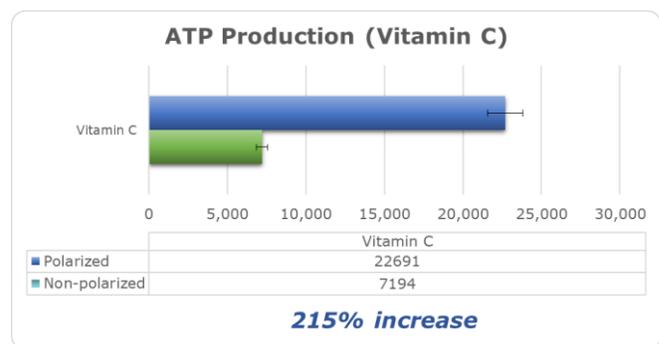
Fibroblast Growth Factor (FGF1 and FGF2) harvested from Algae presents a lower-cost, higher yield GF option that is stable at high temperature and resists contamination (unlike human- and animal-derived FGF). FGF plays a relevant role in anti-aging therapy because it is related to the induction of collagen and elastin synthesis responsible for skin elasticity and resistance, characteristics that are diminished with skin aging, both intrinsic and extrinsic.<sup>2 3</sup>



### Vitamin C

Topical Vitamin C, also known by Ascorbic Acid, is a vitamin and essential nutrient that is water-soluble and is commonly incorporated into formulations for makeup, skin care, hair care, and personal care products.

At higher concentrations Vitamin C may increase ATP production by increasing mitochondrial electron flux. In contrast, at lower concentrations Vitamin C displays antioxidant properties, meaning it protects skin cells from damaging free radicals caused by UV exposure. It also inhibits melanin production in the skin, which helps to lighten hyperpigmentation and brown spots, even out skin tone, and enhance skin radiance.<sup>4 5 6</sup>



Vitamin C promotes collagen production, which has the potential to thicken the dermis, diminish fine lines, and is essential for firm, youthful skin.

<sup>2</sup> de Araújo R, Lôbo M, Trindade K, Silva D, F, Pereira N: Fibroblast Growth Factors: A Controlling Mechanism of Skin Aging. *Skin Pharmacol Physiol* 2019;4:275-282. doi: 10.1159/000501145

<sup>3</sup> Żerańska, Justyna et al. "A study of the activity and effectiveness of recombinant fibroblast growth factor (Q40P/S47I/H93G rFGF-1) in anti-aging treatment." *Postepy dermatologii i alergologii* vol. 33,1 (2016): 28-36. doi:10.5114/pdia.2014.44024

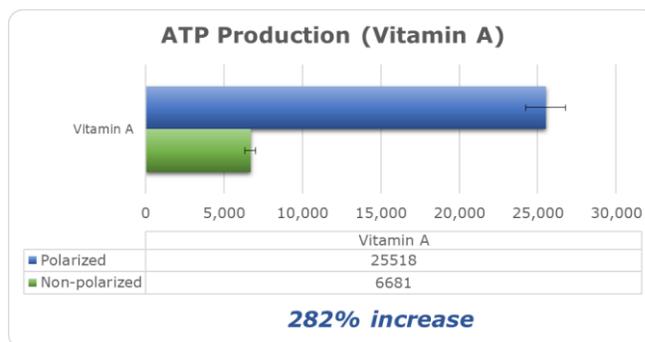
<sup>4</sup> Telang, Purnima Saakar. "Vitamin C in dermatology." *Indian dermatology online journal* vol. 4,2 (2013): 143-6. doi:10.4103/2229-5178.110593

<sup>5</sup> De Dormael, Romain et al. "Vitamin C Prevents Ultraviolet-induced Pigmentation in Healthy Volunteers: Bayesian Meta-analysis Results from 31 Randomized Controlled versus Vehicle Clinical Studies." *The Journal of clinical and aesthetic dermatology* vol. 12,2 (2019): E53-E59.

<sup>6</sup> González, Michael J et al. "Mitochondria, Energy and Cancer: The Relationship with Ascorbic Acid." *Journal of orthomolecular medicine: official journal of the Academy of Orthomolecular Medicine* vol. 25,1 (2010): 29-38.

## Retinol (Vitamin A)

Retinol also called vitamin A is an extremely effective cell-communicating ingredient, meaning the substance can literally attach itself to almost every skin cell and it 'tells' the cells that they should behave like healthy, younger skin cells.<sup>7</sup>



## CONCLUSIONS:

Polarization of Vitamin C, Vitamin A and Alginic Acid demonstrates sufficient polarizability, which is the ability of compounds to absorb photon emission through electromagnetic resonance. Fibroblasts are the mainstay of fibrous connective tissue in all metazoans— producing both the fibers and the matrix of this tissue. Like all eukaryotic cells, fibroblasts depend on mitochondria induced by ATP to furnish the requisite energy for their survival and function. The increase of ATP production induces the Fibroblast Growth Factor (FGF), leading to greater anti-aging effectiveness of skin manyfold.

Further optimization and experimentation can most likely increase the ATP production. For example, in the case of Alginic Acid, which is a linear copolymer with homopolymeric blocks of (1-4)-linked  $\beta$ -D-mannuronate (M) and its C-5 epimer  $\alpha$ -L-guluronate (G) residues, covalently linked together in different sequences or blocks, it is important to understand the beneficial role of each element of the molecule on human dermal fibroblast cells.

<sup>7</sup> Noa Noy. Vitamin A Transport and Cell Signaling by the Retinol-Binding Protein Receptor STRA6. 2016,,, 77-93. DOI: 10.1007/978-94-024-0945-1\_3.