

Self-Growth Colony

A plasma-derived solution for skin rejuvenation and anti-ageing

- Our blood plasma is abundant in platelets, growth factors, and proteins. It can treat deficiencies, ailments, and injuries in other parts of our body.
- Professor Karl Wah-Keung Tsim at the Hong Kong University of Science and Technology is expanding its applications to the field of skincare.
- He and his team have optimised methods to extract plasma that is richer in growth factors and called it Self-Growth Colony (SGC).
- Treating cell cultures with SGC boosts their wound-healing ability and improves skin properties, including hydration levels, firmness, and elasticity.
- Pending larger studies, SGC may play a key role in future medical treatments and the cosmetic industry.

Plasma is the liquid that bathes the solid components of our blood, such as white blood cells, red blood cells, and platelets. In the laboratory, a centrifuge separates these components by forcing heavier blood cells to the bottom of the tube, leaving plasma at the top. This platelet-rich plasma (PRP) is a cocktail of growth factors and proteins which have important wound-healing and clotting functions. Certain proteins within it even control inflammation, promote blood vessel and neuron growth, and aid tissue regeneration.

Five decades ago, platelet-rich plasma was used medically for the first time to increase platelets in patients with low counts. Now, it is also used during oral and orthopaedic surgery and to treat sports injuries, burns, and soft tissue diseases. Moreover, PRP's potential application in the field of dermatology and skin cosmetics is becoming increasingly recognised. But there is one drawback: laboratory methods used to generate PRP aren't standardised, resulting in different quantities of growth factors and a lack of quality control. To unlock the true potential of PRP, efficient extraction techniques are required.

Professor Karl Wah-Keung Tsim at the Hong Kong University of Science and Technology and his colleagues are addressing this issue. They have

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optimised extraction methods to produce a purer form of PRP, a solution that is richer in growth factors and called this Self-Growth Colony (SGC). Their landmark study published in the journal *Skin Pharmacology and Physiology* provides the first evidence that SGC enhances wound healing in laboratory (in vitro) experiments and improves skin rejuvenation properties in participants.

Collect, optimise, test, repeat

'All life is an experiment. The more experiments you make, the better', said Ralph Waldo Emerson, an American poet and philosopher. To prepare SGC, the scientists collected blood, extracted PRP, and sterilised it. But within this overall process was a series of experiments designed to test the effects of different parameters on the quality and quantity of growth factors in SGC. Using a freeze-thaw cycle, they froze the solution to stimulate cytokine and growth factor release and used sonication to agitate and break down platelets – also in a bid to release growth factors. Therefore, through trial and error, the researchers could optimise the laboratory techniques and parameters to obtain a high-quality solution abundant in cytokines (signalling proteins essential for normal cell and immune system functioning) and growth factors.

Equipped with an optimised extract, the team now wanted to compare SGC's wound-healing and skin rejuvenation properties with that of PRP. They started by culturing human skin cells on plates in the laboratory and then scratching these to mimic a wound before applying either SGC or PRP as treatments. The team found that SGC outperformed PRP in terms of actively promoting wound healing, both in repairing the structure of the cells and increasing certain proteins involved in wound healing. But how is it achieved?

The process is kickstarted by a family of molecules called platelet-derived growth factors, which are more abundant in SGC compared to PRP. Certain platelet-derived growth factors such as PF4 and β -TG activate platelets, causing them to release other growth factors in a process essential for wound healing. The researchers believe that it is SGC's increased growth factors that boost its wound-healing properties.

From the laboratory to human skin

The in vitro results hold promise, but what happens when we apply the SGC solution to our skin? In a first-in-human study, 20 individuals



Self-Growth Colony in clinical application. Wound size reduction has been shown in diabetic foot ulcers before (top) and after (bottom) SGC treatment.

received monthly treatments of either SGC or PRP over a 6-month period. Compared to the control group (received no treatment) and PRP group, those treated with SGC had improved skin properties such as hydration, firmness, elasticity, and glossiness. With such improvements, the researchers believe Self-Growth Colony could one day be used as an anti-ageing treatment. Although only of visual concern, SGC-treated skin also reduced the number of skin pores after six months. Despite outperforming PRP in most aspects, SGC-treated skin had lower sebum content (an oily substance that protects the skin and prevents water loss) than PRP.

In addition to the medical benefits of SGC, the team say there are also practical advantages with increased stability and a longer storage time without the addition of additives to preserve it. Importantly, SGC is less invasive because it can be applied to the skin and does not need to be injected like PRP.

This research describes the innovative methods for generating Self-Growth Colony solution and illustrates the potential of SGC for skin rejuvenation, but it is early days, and the sample size is small. Larger studies are now needed to fully explore uses for SGC in skin cosmetics and for medical use. Studies using patients' own Self-Growth Colony for treatment of their diabetic foot ulcers are currently ongoing and should offer insights into the possibility of this application. Whether Self-Growth Colony is proven better than PRP for other medical applications remains to be determined in future research – watch this space.

The researchers believe Self-Growth Colony could one day be used as an anti-ageing treatment.

Personal response

What inspired you to conduct this study?

Platelet-rich plasma has long been used to treat sports injuries. Due to its excellent efficacy, PRP treatment is now also getting attention from the cosmetics industry. We have identified that the lack of quality control and standardisation is detrimental to the development of products derived from PRP. Thus, we have optimised the extraction method, and subsequently standardised the final product (SGC) for its active ingredients. We were able to show that SGC has promising effects on skin regeneration.

In simple terms, could you explain how SGC is chemically standardised and what this means?

In the past, different protocols have been used to prepare PRP. The inconsistency and ambiguity made it hard to evaluate the efficacy in a scientific manner. When it comes to the preparation of SGC, we were dedicated to the calibration of each parameter (eg, centrifugal force, freeze-thaw cycle, times of sonication, etc). We performed vigorous testing and analysis to figure out the optimal condition and establish a quality control measure for the best yield of growth factors in SGC. The standardisation ensures SGC products can be reliably reproduced and used in clinical applications with consistent chemical properties and known quality assurance.

Can you tell us about any other ongoing studies investigating potential medical or skin cosmetic applications for SGC?

The skin regenerative function of SGC in cell and animal models has been validated and well defined. We are currently focusing on the implementation of SGC in the treatment of chronic wounds in clinical use. We are collaborating with Shenzhen Hospital for this project, in which we are evaluating the effectiveness and safety of SGC in the treatment of

diabetic foot ulcers. Ideally, through this project, we hope to further strengthen the efficacy of SGC in the clinical setting and meet the standard for drug registration set by China's National Medical Products Administration.

Are there any things that have surprised you during this project?

SGC demonstrated enhanced preservation and stability when stored at 4 °C over 6 months. This observation was unexpected and not initially hypothesised. However, we consider this to be a significant advantage, as this is a convenient storage condition that is highly accessible. Other than this, when we compared the yield of growth factors of SGC to that of PRP, the amount of bioactive components was remarkably increased. The outcome was a big surprise to us and gave us a great confidence in continuing in the study on SGC.

Can you explain SGC's potential anti-ageing properties in a bit more detail?

Ageing is characterised by reduced water retention ability, firmness, and elasticity of the skin. We recruited 20 healthy subjects and tested the efficacy of SGC in addressing these ageing indicators with probes designed by C+K System. SGC demonstrated a significant efficacy in reversing the signs of ageing. We believe one key factor contributing to the remarkable regenerative properties of SGC is its high concentration of factors, including growth factors and cytokines. These bioactive substances play a crucial role in tissue regeneration. Our cellular-level studies supported this idea, as we observed an upregulation of genes associated with skin tissue regeneration following treatment with SGC. This provides further evidence for the extraordinary effects of SGC in promoting tissue rejuvenation.

Professor Karl WK Tsim (centre) collaborated with Ms Vicky Tsoi (left) and Ms Venice Tsoi (right) to develop a regenerative topical procedure for the treatment of diabetic foot ulcers.



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Collaborators

Vencie Tsoi and Vicki Tsoi from SGC Cosmotech and VK Meditech in performing the treatments of diabetic foot ulcers in Shenzhen hospitals.

Bio

Dr Karl Tsim is a Chair Professor and Director of the Center for Chinese Medicine and Director of Shenzhen Key Laboratory of Edible & Medicinal Bioresources at Hong Kong University of Science and Technology. He is the Founding Chairman of Hong Kong Association of Biotechnology in Chinese Medicine. He serves as adviser/consultant/member to various organisations, both nationally and internationally.

Further reading

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