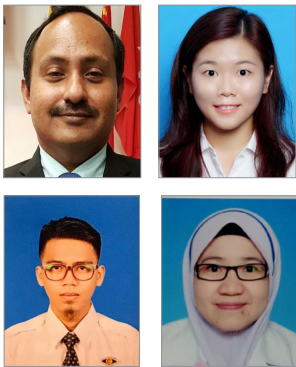


Self-administration of *Garcinia mangostana* standardise pericarp extract to aid wound healing in diabetic and non-diabetic patients



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In this era of civilisation, modern societies are beginning to reconsider holistic remedies used millennia ago in spite of various technologic and strategic advances. Several studies have shown that the standardised extract of DermaXan® (Mangosteen; *Garcinia mangostana*) pericarp has antibacterial effect, high antioxidant and anti-inflammatory effect. The aim of this on-going study is to assess the wound healing activity of DermaXan (Garcinia mangostana) pericarp extract, Spray 8®. We selected 11 patients by simple randomisation at the Wound Care Unit, Department of Internal Medicine, Hospital Kuala Lumpur. They had various wound aetiology and medical background. All the wounds were cleansed using distilled water and debridement was done when necessary. Spray 8 was sprayed on before the wound was covered with a foam dressing. The results show that Spray was effective at reducing wound size and improving healing in both diabetic and non-diabetic ulcers. There were no adverse reactions or allergies reported. However, the sample size in this pilot study was comparatively small, due to the limitation of subject availability. A much larger study is needed to show statistically significant results.

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Wounds are increasingly recognised as an emerging epidemic within healthcare as a lot of resources are required in managing wounds. Prolonged wound management times can delay chemoradiation treatments, extract a significant toll on patients' quality of life, compound psychological devastation on top of injury and illness, and may lead to cosmetically unacceptable results (Stoeckel et al, 2006).

Modern societies are beginning to reconsider holistic remedy used millennia ago in spite of technologic and strategic advances. The major use of herbal medicines is for health promotion and therapy for chronic, as opposed to life-threatening, conditions. Natural formulations have a long history of use in wound care. Natural product extracts can be a complex mixture of several components that have antioxidants, anti-inflammatory, angiogenic and cell synthesis-modulating properties.

These remedies are often more affordable than conventional treatments (Sivamani et al, 2012). However, there are limited number of rigorous studies to understand their efficacy and side effects.

Skin extract (the pericarp; wall of the ripened fruit) of *Garcinia mangostana*, more commonly known as mangosteen, is rich with xanthone derivatives such as alpha-, beta-, gamma-mangostin as well as considerable amounts of other bioactive compounds, such as terpenes, anthocyanins, tannins, flavonoids and polyphenols (Pedraza-Chaverri et al, 2008). Studies have shown that the standardised extract of *Garcinia mangostana* pericarp has antibacterial (Chomnawang et al, 2009), high antioxidant (Moe et al, 2018) and anti-inflammatory effects (Herrera-Aco et al, 2019).

Xanthenes are naturally-occurring compounds with a distinct chemical structure, known as tricyclic aromatic system, with known antibacterial properties (Iinuma et al, 1996). A

Table 1. Results summary

Patient	Diagnosis	Wound healing duration
1	Post-motor vehicle accident wound	13 weeks
2	Post-stasis eczema wound	8 weeks
3	Post-abscess wound	8 weeks
4	Non-healing wound	19 weeks
5	Post-stroke sacral pressure ulcer Category II	27 weeks
6	Post-motor vehicle accident wound	13 weeks
7	Left lower limb post-cellulitis wound	9 weeks
8	Diabetic leg ulcer	9 weeks
9	Ankle diabetic abscess	9 weeks
10	Foot cellulitis with dorsolateral abscess	11 weeks
11	Foot exhaust burn wound	16 weeks

study by Narasimhan et al 2017, showed semi-synthetic derivatives of α -mangostin have both antibacterial and antifungal activities. In another study, which compared the structure-activity relationship between prenylated xanthenes from *Garcinia mangostana* and their synthetic analogues showed high antibacterial activity for

both (Dharmaratne et al, 2013). A study by Chomnawang et al (2009), showed that *Garcinia mangostana* contained significant antioxidant activity and reduced reactive oxygen species production. *Garcinia mangostana* extracts could reduce the tumour necrosis factor (TNF)- α production as

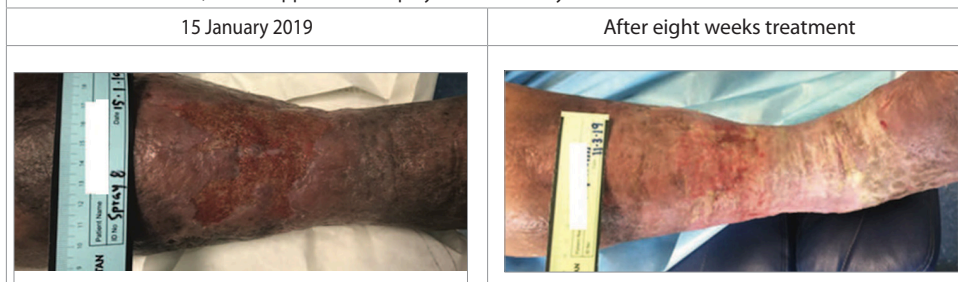
Case 1

- A 47-year-old male with no known medical illness
- Patient presented with post-motor vehicle accident wound of the right foot since October 2018
- Wound size: 16 x 6cm, started application of spray on 27 December 2018 and wound healed after 13 weeks.



Case 2

- A 80-year-old male with underlying diabetes mellitus and hypertension
- Presented with distal third of the right shin post-stasis eczema wound since January 2018
- Wound size: 8 x 8cm, started application of Spray 8 on 15 January 2019 and wound healed after 8 weeks.

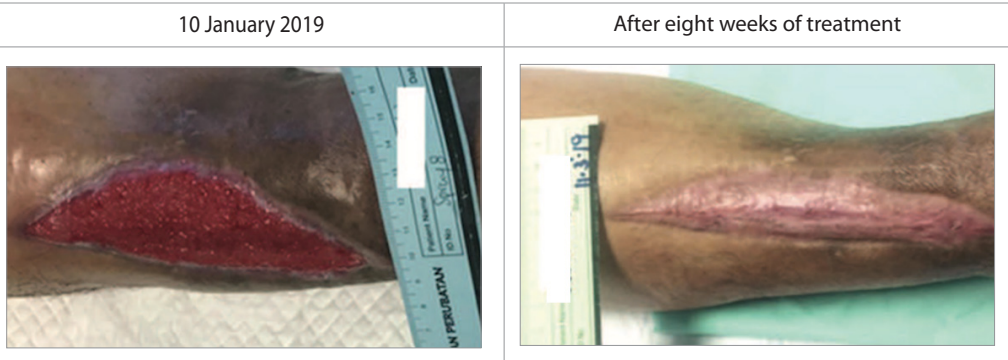


Key words:

- Bacteria
- *Garcinia mangostana*
- Wound healing
- Wound infection

Case 3

- A 51-year-old female with underlying diabetes mellitus and hypertension
- Presented with distal two-third of the right shin post-abscess wound present since November 2018
- Wound size: 9 x 4cm, started application of Spray 8 on 10 January 2019 and wound healed after 8 weeks.



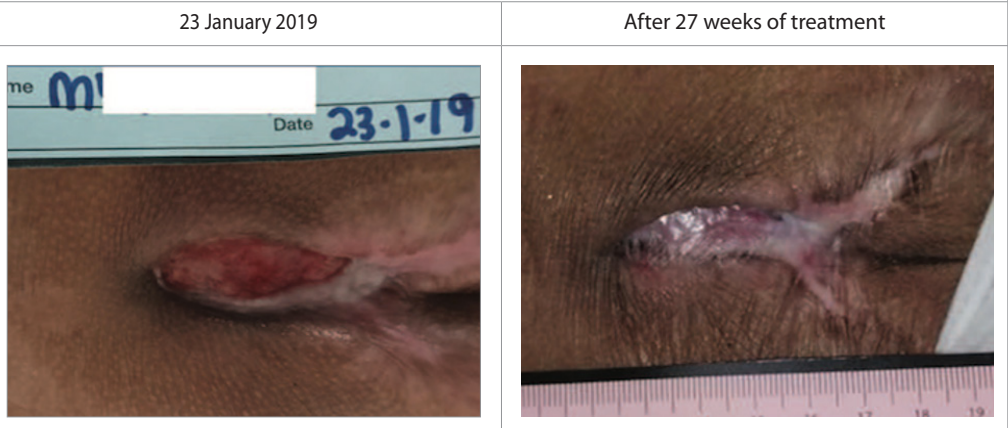
Case 4

- A 50-year-old female with underlying hypertension
- Presented with right lateral malleolus non-healing wound present since 2015
- Wound size: 7.5 x 3cm, started application of Spray 8 on 21 December 2018 and wound healed after 19 weeks.



Case 5

- A 68-year-old male with underlying diabetes mellitus and hypertension
- Presented with post-stroke sacral pressure ulcer category II present since 2016
- Wound size: 4 x 1.5cm, started application of Spray 8 on 23rd January 2019 and wound healed after 27 weeks.



determined by ELISA, was highly effective in scavenging free radicals and was able to suppress the production of pro-inflammatory cytokines (Chomnawang et al, 2009). In an

animal study by Tatiya-Aphiradee et al (2019), *Garcinia mangostana* extracts is a promising alternative Methicillin-resistant *Staphylococcus aureus* (MRSA) treatment because of its

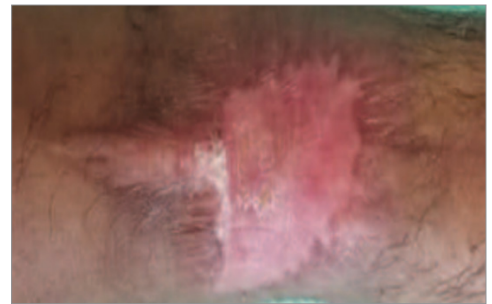
Case 6

- A 47-year-old male with no known medical illness
- Presented with distal third of the right shin post-motor vehicle accident wound present since October 2018
- Wound size: 16 x 6cm, started application of Spray 8 on 27 December 2018 and wound healed after 13 weeks.

27 December 2018



After 13 weeks of treatment



Case 7

- A 62-year-old Malay male with underlying diabetes mellitus, hypertension and ischaemic heart disease
- Presented with left lower limb post-cellulitis wound present since September 2019
- Wound size: 3.5 x 4cm, started application of Spray 8 on 26 February 2020 and wound healed after 9 weeks.

26 February 2020



After 9 weeks of treatment



antibacterial, anti-inflammatory, and wound healing effects.

Objective

To assess the wound healing activity of *Garcinia mangostana* pericarp extract (DermaXan in Spray 8®).

Methodology

All the wounds were cleansed using distilled water and debridement was done when necessary. Spray 8 was sprayed on after wound cleansing. Patients were also given the product to perform self-administration at home. The

wound was covered with a foam dressing. Crepe bandage was used for postoperative wounds and diabetic foot ulcers (DFU).

The study was performed in accordance with the principles of good clinical practice guidelines, in compliance with the declaration of Helsinki and with the approval by the hospital review board. Informed consent and permission to use clinical images and case details for publication/research purposes were obtained before the study began.

Results

We selected 11 patients by simple randomisation

at the Wound Care Unit. The wounds were of various aetiologies and the patients also had various medical histories.

There were a number of different dressings used including honey, hydrogel and polyurethane foam before the referral to the Wound Care Unit. The average time for wounds healing was 13 weeks. All wounds healed completely and the patients were discharged from the Wound Care Unit. Most wounds healed between 2 to 4 months. The pressure ulcer wound took 27 weeks to close completely. Patient was immobile and cachexic. Therefore, the wound healing time till full closure was longer than the others.

Discussion:

In this study, we aimed to assess the wound healing activity of the product containing DermaXan (*Garcinia mangostana*) pericarp extract, Spray 8. The main ingredients is DermaXan which has been approved as an indication for wound care by the Ministry of Health Malaysia (MOH). This registered extract is safe for consumption and the extraction process of *Garcinia mangostana* pericarp using water extraction is a proprietary trade secret.

The spray is a stain-free and natural wound care formulation that contains herbal extracts. The active ingredients are mangosteen skin

Patient 8

- A 60-year-old Malay female with underlying diabetes mellitus
- Presented with right diabetic leg ulcer present since September 2019
- Wound Size: 6 x 3cm, started application of Spray 8 on 25 February 2020 and wound healed after 9 weeks.



Patient 9

- A 23-year-old a Malay female with underlying diabetes mellitus and dyslipidemia and a right ankle diabetic abscess
- Presented non-healing ulcer after post-right ankle diabetic abscess wound present since 26 January 2020
- Wound size: 5.5 x 3cm, started application of Spray 8 on 26 February 2020 and wound healed after 9 weeks.



Patient 10

- A 53-years-old Chinese male with underlying diabetes mellitus and polycythemia
- Presented with left foot cellulitis with dorsolateral abscess in February 2020
- Wound size: 10 x 5cm, started application of Spray 8 on 26 February 2020 and wound healed after 11 weeks.

26 February 2020



After 11 weeks of treatment



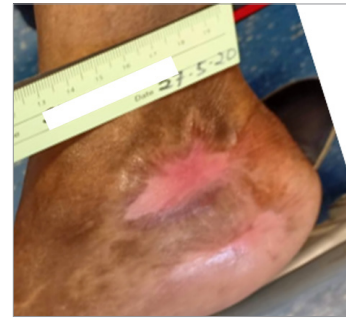
Patient 10

- 65 years old, Malay gentleman, with no known medical illness.
- Presented with ulcer at the right medial malleolus, after alleged exhaust burn wound on right foot in December 2019
- Wound size: 5 x 6cm, started application of Spray 8 on 6 February 2020 and wound healed after 16 weeks.

6th February 2020



After 16 weeks of treatment



extract and neem extract. Spray 8 is beneficial for all kinds of wounds, burns, bruises and is suitable for all skin types. Spray 8 wound care mist is a natural wound remedy for fast skin recovery which does not contain alcohol, iodine or steroids, it does contain 2,2-Diphenyl-2-picrylhydrazyl (DPPH), 2,2'-Azinobis (3-ethylbenzothiazoline-6-sulphonic acid) (ABTS) and Total Phenolic Content (TPC). When measured using spectrophotometer under optimal conditions, total phenolic content, DPPH value and ABTS value of SPRAY 8 were 21.222mg GAE/g, 86.51% and 86.77% (n=3), respectively. This indicates a high antioxidant activity.

In this prospective case series involving 11 patients of various aetiology, all the wounds completely closed. Standard care was carried out accordingly, such as offloading for diabetic patients along side the spray treatment.

Conclusion

The results show that Spray 8 was effective at reducing wound size and improving healing in both diabetic and non-diabetic ulcers. There were no adverse reactions or allergies reported. However, the sample size in this pilot study was comparatively small, due to the limitation of subject availability. A much larger study is needed to show statistically significant results.

Declaration of interest:

Furley Bioextracts Sdn Bhd sponsored the DermaXan (*Garcinia mangostana*) pericarp used for this study. The author has no conflicts of interest to declare.

References

- Chomnawang MT, Surassmo S, Woungsariya K, Bunyapraphatsara N (2009) Antibacterial activity of Thai medicinal plants against methicillin-resistant *Staphylococcus aureus*. *Fitoterapia* 80(2):102-4. <https://doi.org/10.1016/j.fitote.2008.10.007>
- Herrera-Aco DR, Medina-Campos ON, Pedraza-Chaverri J et al (2019) Alpha-mangostin: anti-inflammatory and antioxidant effects on established collagen-induced arthritis in DBA/1J mice. *Food Chem Toxicol* 124:300-15. <https://doi.org/10.1016/j.fct.2018.12.018>
- Linuma M, Tosa H, Tanaka T et al (1996) Antibacterial activity of xanthenes from guttiferaceous plants against methicillin-resistant *Staphylococcus aureus*. *J Pharm Pharmacol* 48(8):861-5. <https://doi.org/10.1111/j.2042-7158.1996.tb03988.x>
- Moe TS, Win HH, Hlaing TT, Lwin WW et al (2018) Evaluation of in vitro antioxidant, antiglycation and antimicrobial potential of indigenous Myanmar medicinal plants. *J Integr Med* 16(5):358-366. <https://doi.org/10.1016/j.joim.2018.08.001>
- Narasimhan S, Maheshwaran S, Abu-Yousef IA (2017) Anti-bacterial and anti-fungal activity of xanthenes obtained via semi-synthetic modification of α -Mangostin from *Garcinia mangostana*. *Molecules* 22(2):275. <https://doi.org/10.3390/molecules22020275>
- Pedraza-Chaverri J, Cárdenas-Rodríguez N, Orozco-Ibarra M, Pérez-Rojas JM (2008) Medicinal properties of mangosteen (*Garcinia mangostana*). *Food Chem Toxicol* 46(10):3227-39. <https://doi.org/10.1016/j.fct.2008.07.024>
- Sivamani RK, Ma BR, Wehrli LN, Maverakis E (2012) Phytochemicals and Naturally Derived Substances for Wound Healing. *Adv Wound Care (New Rochelle)* 1(5):213-217. <https://doi.org/10.1089/wound.2011.0330>
- Stoeckel W, David L, Levine E et al (2006) Vacuum-assisted closure for the treatment of complex breast wounds. *The Breast*. 2006;15:610-3. <https://doi.org/10.1016/j.breast.2005.11.006>
- Tatiya-Aphiradee N, Chatuphonprasert W, Jarukamjorn K. (2019) Anti-inflammatory effect of *Garcinia mangostana* Linn. pericarp extract in methicillin-resistant *Staphylococcus aureus*-induced superficial skin infection in mice. *Biomedicine & Pharmacotherapy* 111:705-13. <https://doi.org/10.1016/j.biopha.2018.12.142>

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