

Natural Nanoskin Advanced Cell Therapy (ACT) and Nanoskin ACT Soft towards the Definitive Solution for Acute and Chronic Wounds

Saqer Al Mualla¹, Noura Salim Salman¹, Nasreen Abdelatif¹, Salma Al Ketbi¹, Pierre Basmaji², Mohamed Kanjou³, Mirvan Ahmad³

¹Qassimi Hospital, Sharjah, United Arab Emirates

²Innovatec's-Biotechnology Research and Development, São Carlos, Brazil

³GEM International, Sharjah, United Arab Emirate

Email: nanoskin.healing@gmail.com

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Abstract

Natural Nanoskin Advance cell therapy (ACT) and Nanoskin ACT Soft have been established to be remarkably versatile biomaterials and can be used in a wide variety of applied scientific endeavors, especially for medical devices. In fact, the structure of Nanoskin materials can be adapted over length scales ranging from nano to macro by controlling the bio-fabrication process. The present paper describes Natural Nanoskin Advanced cell therapy (ACT) and Nanoskin ACT Soft production for wound care applications. ACT is produced from the bio-nanotechnology process. ACT is a highly hydrated pellicle with shaped fibers less than 2 nm wide. Nanoskin ACT Soft, like a paste, is designed to fill irregularities or recesses in the wound bed, and to absorb excess exudate from lesions by prolonging the used dressing's residence time and reducing the frequency of change.

Keywords

Wound Care, Diabetic Ulcer, Natural Fibers

1. Introduction

Nanoskin is a new biotechnology indicated for the treatment of lesions, diabetic foot ulcers, and complex chronic lesions.

Nanoskin is a nano-sized fiber platform with physical and mechanical properties that dramatically accelerate wound healing.

Nanoskin is an artificial scaffold that mimics the functions of the ECM (Extracellular Matrix) to facilitate tissue organization. In addition, nanomedicine will

have targeted drug delivery mechanisms as one of its main standard bearers. This allows for the precise administration of drugs at the cellular scale, thereby increasing their bioavailability in the body [1]-[5]. Nanoskin is well-known and is designed to address appearance and health synergistically, using only natural ingredients. Nanoskin is the combination of science and nature to create a product that is effective enough to treat and nourish skin. Nanoskin contains an abundance of plant extracts and vitamins that aid in skin tissue regeneration.

2. What Is Nanoskin?

Nanoskin extracellular matrix is made of vegetal stem cells called meristems. Meristem (from the Greek meristem = divide). Because of this “infinite” capacity of division and the fact that it is continually adding new cells to the plant body, meristems are the tissues responsible for plant growth. During many years of research, we obtained Nanoskin with fibers of the order up to 50 nm. In order to improve the size of the fibers, the manufacturing process was improved until we obtained fibers of the order of 2 nm. These 2 nm results are innovative and practically the only product on the market with these characteristics.

Nanoskin is 100% natural fiber scaffold nanometric size **Figure 1(a)** and **Figure 1(b)**.

Nanoskin is based on nanobiotechnology biomimetic scaffolds process Nanoskin is a highly hydrated pellicle made up of a random assembly of ribbon shaped fibers less than 2 nm wide. Nanoskin is a natural fiber based on polysaccharides composed of hemicelluloses protein. They increase the activity of the cells NK (Natural Killer Cell), cells T (cells T are a kind of lymphocytes—white cells of the blood) and the cells (cell B is a kind of lymphocytes constituted the immune system). These polyunsaturated fatty acids and fatty-acid derivatives exist in Nanoskin and activate peroxisome-proliferator-activated receptors (PPARs); these receptors are increased in keratinocytes after skin injury and have been considered important regulators of re-epithelialization. A variety of factors due to Nanoskin Biomimetic scaffolds can activate the intracellular signaling pathways that regulate the various steps of wound re-epithelialization and granulation.

3. What Makes Nanoskin Different?

The optimal skin substitute will provide immediate replacement of both the lost dermis and epidermis and ensure permanent wound coverage. There is no ideal substitute in the market at present that provides an effective and scar-free wound healing.

Currently, no skin substitute in the market provides effective and scar-free wound healing. Nanoskin natural extracellular matrix—free from animal collagen—is the answer to this unmet need. It is the ideal skin substitute with the following features: Able to resist infection Able to prevent water loss Able to withstand the shear forces cost effective widely available Long shelf life and easy

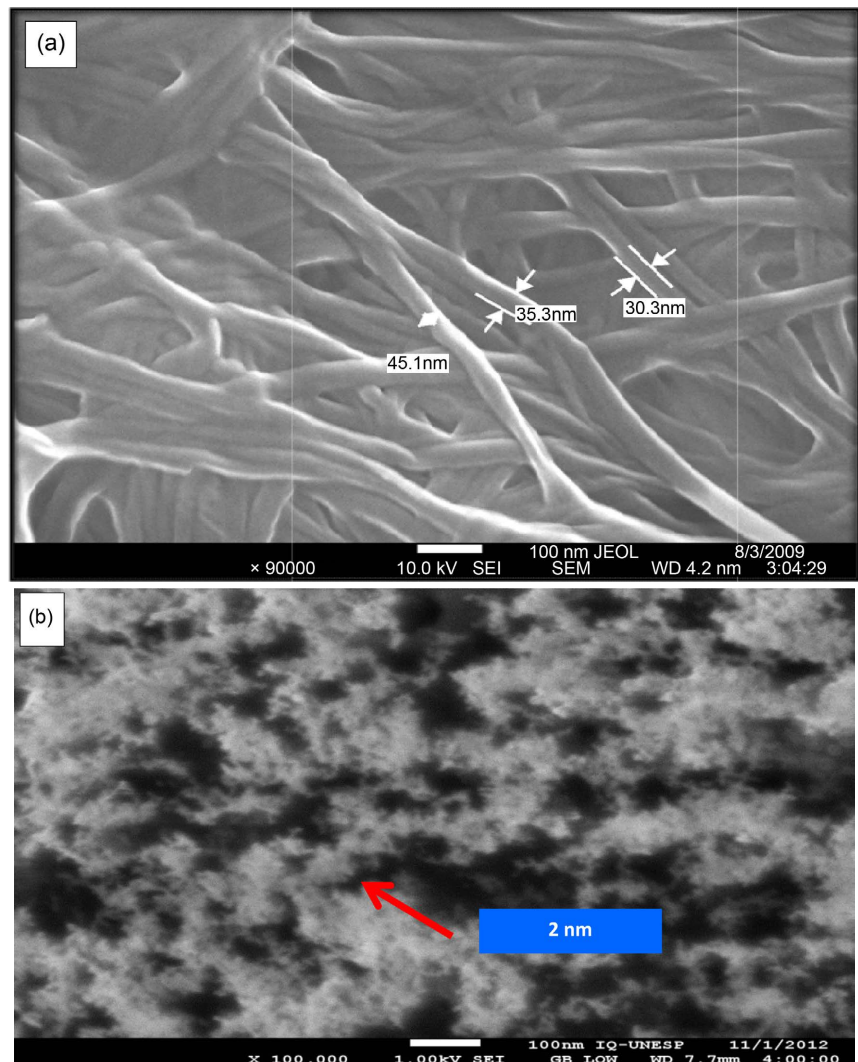


Figure 1. (a) Shows the nanofiber size of Nanoskin of up to 50 nm. (b) Shows the nanofiber size of Nanoskin of 2 nm. Note in (b) shows fibers size of 2 nm according to the amplification scale shown in figure.

to store Lack of antigenicity Flexible in thickness Durable with long-term wound stability Can be conformed to irregular wound surfaces and Easy to be secured and applied.

4. Nanoskin Product Types

There are several product types of Nanoskin to meet the different needs in optimal wound healing.

4.1. Nanoskin ACT Natural Extracellular Matrix

- 1) Promotes the release of oxygen and acts as a powerful antimicrobial, anti-inflammatory and anti-ulcer agent with the immunomodulatory proficiency of phenolic compounds from green tea.
- 2) Promotes the release of growth factors and cytokines which attract inflam-

matory cells Neutrophils and macrophages to the injured area (neutrophils will release a number of lysosomal enzymes which proteolytically will remove the damaged components of extracellular matrix), Neutrophils and macrophages digest bacteria, releasing growth factors, cytokines, and proteases.

3) Helps to reduce the bacterial load in infected wounds.

4.2. Nanoskin ACT Soft

1) Natural fibers based on polysaccharides composed of hemicelluloses protein in soft paste form.

2) Indicated to fill irregularities of the wound bed or cavities and facilitate the use of wound dressings.

3) Suitable for wounds where a conventional dressing does not make an effective coverage of the wound bed and for wounds with difficult access areas.

5. Nanoskin Mode of Action

- Provides a “true” alternative to traumatic surgical debridement by eliminating necrotic tissue.
- Promotes epithelialization by preserving viable tissue that can heal spontaneously.
- -Decreases the risk of infection and regulates the moisture balance of the wound.
- Lowers the formation of hypertrophic scarring and contractures due to rapid re-epithelialization.
- Helps to increase patients’ life of quality through pain reduction and faster recovery.
- Lowers treatment costs due to reduced need for surgery, fewer complications and faster recovery.

6. Nanoskin to Treat Complex Chronic Wounds

Nanoskin has been demonstrated to be an excellent option to treat complex wounds. Several clinical cases have shown that the use of Nanoskin in complex diabetic foot ulcers with necrotic tissue has prevented amputation by removing the non-viable tissue and promoting the re-epithelialization of the wound bed. Principally, all chronic wounds can be treated with Nanoskin with the ultimate goal to close the wound.

Several clinical cases and studies have demonstrated the efficacy and safety of Nanoskin [6]-[11].

Case 1

Chronic Diabetic Foot Wound

Treatment with Nanoskin ACT & Nanoskin ACT Soft & Nanoskin in Qassimi Hospital under the supervision of Dr. Saqer Al Mualla, Dr. Noura Salim Salman & Ns. Nasreen Abdelatif; as we can observe in **Figure 2**, **Figure 3**, and **Figure 4**.

Name: A.A.A.A.

File: 6699534
Age: 54 yrs. Gender: Male.
Date of Admission: 08/04/2022
History:
Amputated right 5th small toe
Diabetic Foot Ulcer.
Known case of DM.



Figure 2. Wound size (L 12 cm, W 8 cm, D 0.4 cm). Has two cavities (1.3 cm & other 2.7 cm) Applying Nanoskin ACT Soft & Nanoskin ACT with Biogel. Treatment began on 08-04-2022.



Figure 3. Dressing change on 18-04-2022. Note healthy granulation tissue, cavity filled granulation tissue, and growth of new skin on sides.



Figure 4. Wound healed completely.

Case 2

Chronic Diabetic Foot Ulcer Case Post Amputation

Treatment with Nanoskin ACT & Nanoskin in Qassimi Hospital under the supervision of Dr. Saqer Al Mualla, Dr. Noura Salim Salman & Ns. Nasreen Abdelatif:

Start applying Nanoskin ACT DD 03/10/2022. As we can observe in **Figure 5** and **Figure 6**.

Name: S.M.R.

File: 6901129.

Age: 51 yrs. Gender: Male.

Date of Admission: 01/09/2022

History:

Left Diabetic Foot Ulcer. Post op wound, Amputated left 5th toe.

Known case of peripheral vascular disease and DM.



Figure 5. Patient recently discovered he is diabetic after sustaining wound in leg and underwent amputation of distal small toe.



Figure 6. (a) Dressing change on 13-10-2022. Note healthy granulation tissue and growth of new skin on sides (size L 6 × W 4 cm). (b) The wound is getting small and shrinks with healthy granulation dressing change on 24-10-2022. (c) After wound completely healed 05-12-2022. (d) After wound completely healed following up 15-12-2022.

Case 3

Deep Burn II Case, Right Arm (Upper & Lower)

Treatment with Nanoskin ACT & Nanoskin in Qassimi Hospital under the supervision of Dr. Saqer Al Mualla, Dr. Noura Salim Salman & Ns. Nasreen Abdelatif; as we can observe in **Figure 7**.

Note: The Patient fell from a high place onto a hot surface and injured the skull, resulting in weakness on the left side and a Deep Burn II wound from hot surface, over upper and lower right arm. Admitted to Hospital DD 21/08/2022 with ischemic stroke, known case of diabetes and hypertension.

Use different type of dressing but with poor progress and start applying Nanoskin ACT DD 03/10/2022

Name: A.C.S

File: 6915319.

Age: 43 yrs. Gender: Male.

Date of Admission: 21/08/2022

History:

Deep Burn II over right upper and lower arm.

Admitted with ischemic stroke out of window.

Known case of diabetes and hypertension.

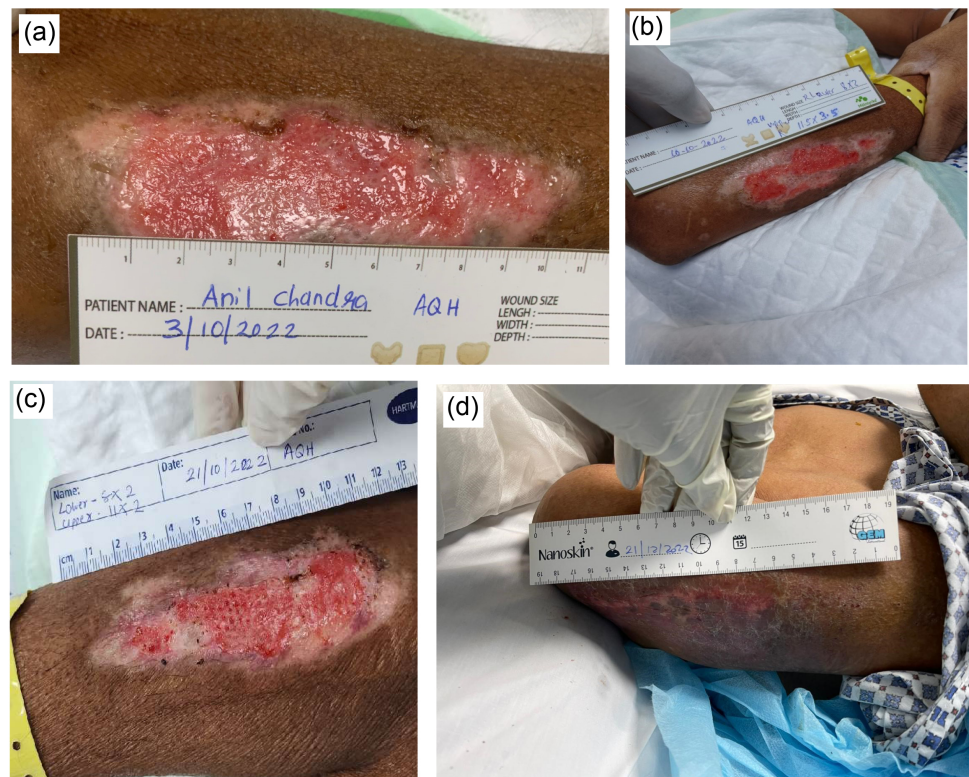


Figure 7. (a) Chronic burn II on right upper & lower arm (bedridden patient). Treatment began on 03-10-2022. (b) Burn deep II size R upper 11.5 × 3.5 cm right lower arm 8 × 2 cm. Dressing change on 10-10-2022. (c) Lower 8 × 2 cm & upper 11 × 2 cm. Dressing change on 21-10-2022. (d) After completely healed on 21-12-2022.

Case 4

Post-Surgical Wound (PNS) Re Open Wound

Treatment with Nanoskin ACT & Nanoskin ACT Soft & Nanoskin in Qassimi Hospital under the supervision of Dr. Saqer Al Mualla, Dr. Noura Salim Salman & Ns. Nasreen Abdelatif; as we can observe in **Figure 8**.

Name: S.A.M.S.A.

File: 214992.

Age: 23 yrs. Gender: Male.

Date of Admission: 13/10/2022

History:

Post pilonidal sinus.

Chronic apical pilonidal sinus.

After surgery before healing re-open.

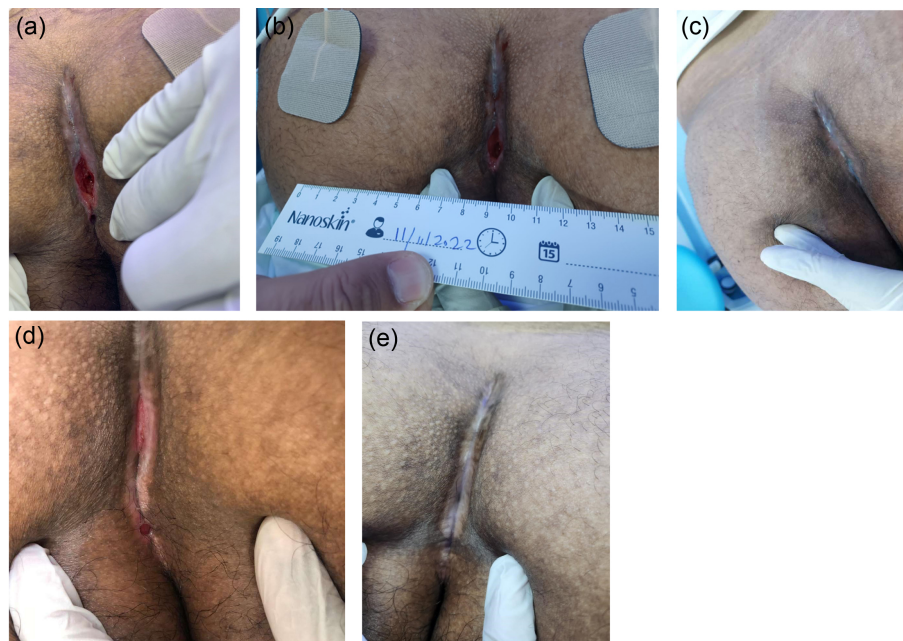


Figure 8. (a) and (b) Treatment Began on 11-11-2022. Male has PNS surgery but before healing the wound is re-open again. Having two deep cavities. (c) Completely healed 05/12/2022. (d) Patient is student and seating for long time so re-open again 18/01/2023 so re-apply Nanoskin membrane 19/01/2023. (e) Completely healed 27/01/2023.

Case 5

Baby after Delivery Had Irregular Mass in the Shown Side Had Dissected and Left with Open Side with Failed Sutures.

Treated with Nanoskin ACT Soft, Nanoskin Act & Nanoskin in Qassimi Children Hospital under the supervision of Dr. Saqer Al Mualla & Dr. Salma Alketbi. As we can observe in **Figure 9**.

Name: M.A.J.

Age: 3 Month. Gender: Female.

History:

Baby after delivery had irregular mass in the shown side had dissected and left with open side with failed sutures.



Figure 9. (a) and (b) Treatment began on 26-05-2022. Baby after delivery irregular mass in the right lower back has dissected and left with open side with failed sutures, treatment began 26/05/2022. (c) Dressing changed with healing process 02/06/2022. (d) Completely healed 29/06/2022.

7. Summary

Nanoskin ACT and Nanoskin Act Soft shows several applications of natural material in wound application. Clinical cases with chronic wounds have been described in details and the treatments were successful. In conclusion, Nanoskin ACT membranes and Nanoskin Soft are applied to different wound healing treatments, such as chronic diabetic foot and several rare wounds. In addition, the advantages of using natural Nanoskin are as follows:

- Easy application and adaptation to the lesion layer;
- Protection and acceleration of the healing process;
- Absence of adverse reactions;
- Reduction of pain;
- Comfort for the patient;
- Easy drainage of secretions;
- Visualization and evolutionary control of the lesion;
- Maintenance of physiological moisture between the layer of the lesion and the membrane;
- Occurrence of gas exchange;
- Lower cost of treatment.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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