

Scientific Research Behind NanoBio[®] Protect

Safety

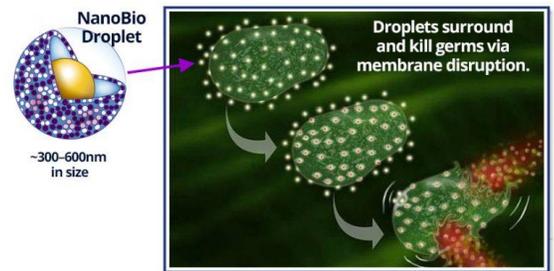
NanoBio[®] Protect and similar NanoBio[®] formulations have been tested extensively in animal and human studies involving topical application to skin. These studies demonstrate that topical NanoBio[®] products are non-irritating and are not absorbed systemically. The products are alcohol-free and are comprised of nanodroplets that have been optimized to provide significant advantages when used as topical antiseptic products, without being absorbed through the skin and into the bloodstream.

NanoBio[®] Protect's active ingredient is 0.13% benzalkonium chloride, which is regulated by the FDA as a skin antiseptic and has been used in humans for over 75 years. Unlike alcohol-based products, NanoBio[®] Protect does not irritate or dry out the skin, and instead provides a moisturizing and comforting experience. The product should be applied with any cotton swab to the skin around the nose and up to one-half inch inside of each nostril where germs frequently enter the body.

The Science

The unique effectiveness of NanoBio[®] Protect is derived from BlueWillow's patented nanotechnology. NanoBio[®] Protect places the BZK antiseptic on the surface of nano-droplets, which results in at least four key advantages:

1. The nano-droplets are attracted to germs by electro-kinetic charge and present the BZK in such a way to enable killing of germs on contact.
2. The droplets persist on skin for 4 or more hours, enabling long-lasting effectiveness.
3. The droplets significantly hydrate skin to avoid dryness and cracking that can allow germs in.
4. When bound to nano-droplets, BZK is non-irritating to the skin.



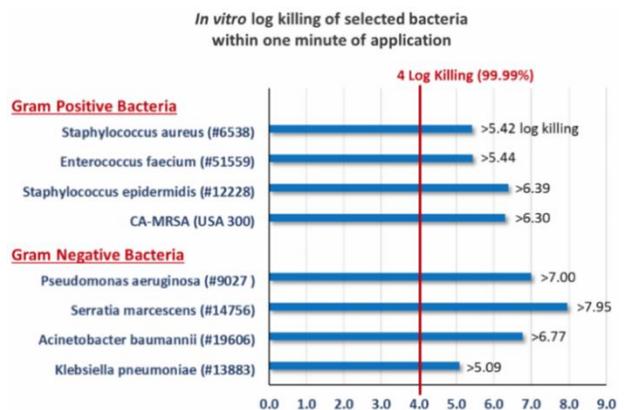
NanoBio[®] Protect kills germs via membrane disruption. NanoBio[®] Protect is comprised of positively charged droplets that are 300–600nm in size. The droplets are attracted to negatively charged germs in the skin. As shown to the right, the nano-droplets physically disrupt the outer membrane of germs, killing on contact.

Clinical Tests

BlueWillow's nasal antiseptic has not been clinically tested to confirm protection against COVID-19 infection in humans. It has demonstrated both anti-bacterial and anti-viral activity in laboratory tests making it a potentially important additive measure to reduce the risk of infection.

Standard in vitro lab experiments demonstrate that NanoBio[®] Protect kills more than 99.99% of germs within 60 seconds of exposure, as shown in the graph to the right.

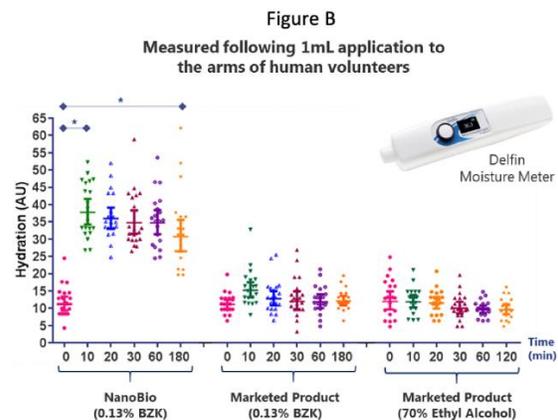
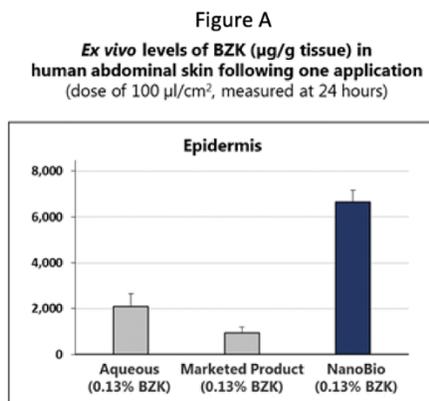
Recent studies conducted by Public Health England also demonstrate NanoBio[®] Protect's ability to kill COVID-19 virus in laboratory tests. However, studies to test for protection in humans have not yet been performed.



Because COVID-19 can cause serious and potentially lethal disease, tests with this virus were conducted in Biosafety Level 3 (BSL-3) facilities at Public Health England laboratories. NanoBio[®] Protect was tested against COVID-19 by mixing the virus with the product. Samples were taken at five, 20, and 30 minutes and plated for viral counts. After five to seven days, the plates were fixed and stained, and the plaques were counted. The results were conclusive – NanoBio[®] Protect killed the COVID-19 virus at every time point. Any remaining virus was below the level of detection in all samples, representing more than 99.99% killing and demonstrating how effective NanoBio[®] Protect is at inactivating COVID-19.

In addition, ex vivo tests in human skin (Figure A) demonstrate that NanoBio[®] Protect persists on skin up to 7x better than commercial products and aqueous solutions containing the same BZK antiseptic agent.

In vivo studies conducted in human volunteers (Figure B) demonstrate that a single application of NanoBio[®] Protect significantly increases skin hydration for at least 3 hours, as compared to common hand sanitizer products.



Peer-Reviewed Scientific Publications

Other scientific publications describe the extensive research conducted with topical NanoBio formulations, as listed below:

- “A Nanoemulsion as an Effective Treatment Against Human Pathogenic Fungi”. *Therapeutics and Prevention*. 2019, Nov/Dec 4:6
- “Screening of Nanoemulsion Formulations and Identification of NB-201 as an Effective Topical Antimicrobial for Staphylococcus Aureus in a Mouse Model of Infected Wounds”. *Military Medicine*. 2016, May: 181, 5S:259-264
- “Nanoemulsion Therapy for Burn Wounds is Effective as a Topical Antimicrobial Against Gram-Negative and Gram-Positive Bacteria”. *Burn Care Res*. 2016, March /April: 37(2); 104-114
- “Treatment With a Novel Topical Nanoemulsion (NB-001) Speeds Time to Healing of Recurrent Cold Sores”. *Drugs Dermatol*. 2012 Aug; 11(8):970-7
- “In Vitro Antibacterial Activity of NB-003 Against Propionibacterium Acnes”. *Antimicrobial Agents And Chemotherapy*, Sept. 2011, Vol. 55, No. 9, p. 4211–4217
- “Topical Nanoemulsion Therapy Reduces Bacterial Wound Infection and Inflammation After Burn Injury”. *Surgery*. 2010
- “NB-002, A Novel Nanoemulsion With Broad Antifungal Activity Against Dermatophytes, Other Filamentous Fungi, and Candida Albicans”. *Antimicrobial Agents and Chemotherapy*, Aug. 2009, Vol. 53, No. 8, p. 3273–3279
- “In Vitro Activities of a Novel Nanoemulsion Against Burkholderia and Other Multidrug-Resistant Cystic Fibrosis-Associated Bacterial Species”. *Antimicrobial Agents and Chemotherapy*, Jan. 2009, Vol. 53, No. 1, p. 249–255
- “The Fungicidal Activity of Novel Nanoemulsion (X8W60PC) Against Clinically Important Yeast and Filamentous Fungi”. *Mycopathologia* 155: 195–201, 2001
- “A Novel Surfactant Nanoemulsion With a Unique Non-Irritant Topical Antimicrobial Activity Against Bacteria, Enveloped Viruses and Fungi”. *Microbiol. Res.* (2001) 156, 1-7
- “Inactivation of Ebola Virus With a Surfactant Nanoemulsion”. *Acta Tropica* 87 (2003) 315/320
- “Antimicrobial Mechanism of Action of Surfactant Lipid Preparations in Enteric Gram-Negative Bacilli”. *Journal of Applied Microbiology* 2000, 89, 397-403
- “Prevention of Murine Influenza A Virus Pneumonitis by Surfactant Nano-Emulsions”. *Antiviral Chemistry & Chemotherapy*, 2000, 11:41-49
- “A Novel Surfactant Nanoemulsion With Broad-Spectrum Sporocidal Activity Against Bacillus Species”. *The Journal of Infectious Diseases*, 1999, 180:1939–49