Preventive skin care against pathogens using microparticles of microalgae

Gerold Lukowski
Institute of Marine Biotechnology, Greifswald, Germany

Biomariner - Gdansk
06.09.2013
Motivation: Current problems in hospitals:

Worldwide increase of multiresistant bacteria:

- Methicillin-resistant *Staphylococcus aureus* (MRSA), Vancomycin-resistant enterococci (VRE), Extended–spectrum beta- lactamase (ESBL)

**Strategies?**
- Antibiotics
- Antiseptics
- Skin care

*Aim: Combination of different positive effects*

---

*European Antimicrobial Resistance Surveillance Network (EARS-Net), 2010
***A. Narezkina et al.: Prevalence of methicillin-resistant *Staphylococcus aureus* in different regions of Russia: results of multicenter study, 2006,481*
Preparation of algae ointment formulation

1. Selection of the special microalgae strain Bio33 (Island Rügen) out of more than 120 different marine microorganisms active substances: antibacterial skin protecting lipids* and lipopeptids

2. Large scale cultivation of algae biomass

3. Special microencapsulation of whole algae biomass into Maresome® (Microparticles of biomass)

Algae ointment formulation (Bio 33)

Properties of algae ointment formulation (Bio33 - Maresome®)

- Stabile system in aqueous dispersion with negative zeta potential – repulsive to bacteria *
- Increased surface by microparticles with better release kinetics and bioavailability of active substances
- No toxic effects **

Innovative biological effects:
- Prevention of pathogenic skin colonisation (e.g. MRSA)
- Skin care due to the lipid character of microparticles

Comparison of different algae species (Bio 33 (N=157), *Spirulina* and *Chlorella* (N = 14)) in the cow udder teat test

**Inhibition of contamination of MRSA**

Direct contamination with MRSA „North-German epidemic“ strain after treatment on the animal skin

---

Prevention of different pathogenic strains (N=54) after treatment with Bio33-Maresome® in the cow udder teat test

Inhibition of other pathogenic strains

*Vancomycin resistant MRSA Mu50
Direct contamination with different strains (N=16) of the normal skin flora without ointment treatment in the cow udder teat test

Skin flora without treatment

<table>
<thead>
<tr>
<th></th>
<th>Colony forming units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staph. caprae</td>
<td>200</td>
</tr>
<tr>
<td>Micrococcus lylae</td>
<td>400</td>
</tr>
<tr>
<td>Staph. chromogenes</td>
<td>250</td>
</tr>
<tr>
<td>Staph. xylosus</td>
<td>200</td>
</tr>
</tbody>
</table>
Direct contamination with different strains (N=16) of the normal skin flora after treatment with Bio33-Maresome® in the cow udder teat test

Skin flora after treatment

- Staph. caprae
- Micrococcus lylae
- Staph. chromogenes
- Staph. xylosus

colony forming units
Skin to skin transmission of MRSA strain (N=28) after treatment with Bio33-Maresome® in the cow udder teat test

**Inhibition of MRSA skin to skin transmission**
Summary:

Maresome®
1. Protects against bacterial (re)infections
2. Prevents (re)colonization with pathogens (MRSA)
3. Preserves physiological skin flora
4. Prevention of nosocomial infections and in cosmetic procedures
5. Ideal care especially to prevent flares of *S. aureus* in patients with atopic dermatitis, numular eczema, superficial folliculitis, diabetic and phlebologic problems
**Future perspectives**

**Needs and challenge:** research support by the government/ private money, development near real product, realization with a small company, sell to a big company for market realisation

**Advantage of the Maresome® technology:**

- Improvement the bioavailability and kinetics of poorly soluble active compounds of marine resource
- Drug loading of the Maresome (carrier) with other active compounds and vitamins
- Direct production of the biomass of different marine organism into micro- and nanoparticles for application
- Application in medical products, cosmetics, nutrition, health care and pharmacy

**Collaboration with other partners for common development of new products**
Thank you for your attention

Collaboration partner
-Institute of Dermatology, University of Greifswald
-Institute of Pharmacy (Pharmaceutical Biology), University of Greifswald

Email: lukowski@uni-greifswald.de