Supplementary material

Marine bacteria as source of antimicrobial compouds

**Supplementary Figure S1**

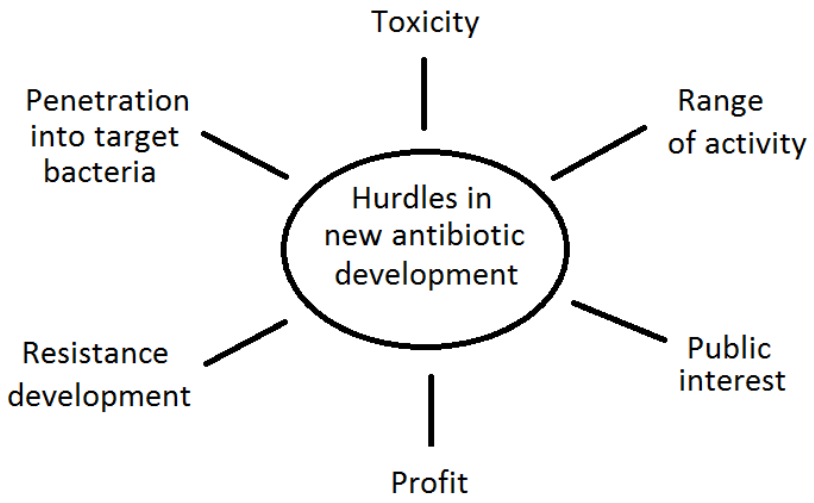


**Figure S1**. Major difficulties in developing new antimicrobial drugs. (1) *Penetration into target bacteria*, particularly in Gram-negative species where double system of membrane block different molecules; (2) *Toxicity*, frequently associated with difficulty of penetration, effective concentrations of some antibiotics are in the micromolar range, as compared to nanomolar range required for therapeutics action against targets in mammalian cells; (3) *Range of antimicrobial activity*, most antibiotics are demanded to act against different pathogens; (4) *Resistance development*, a single drug target develop faster resistance because of high number of microorganism evolved in an infection, multiple targets, retarding development of resistance. There are also additional barriers unrelated to scientific aspects that are hard to surpass: (5) *Profit*, almost always related with the number of patients; and (6) *Public interest*, for example in diseases that cause prolonged malaise for patients and their families. This suffering results in high public awareness.

**Supplementary Figure S2**

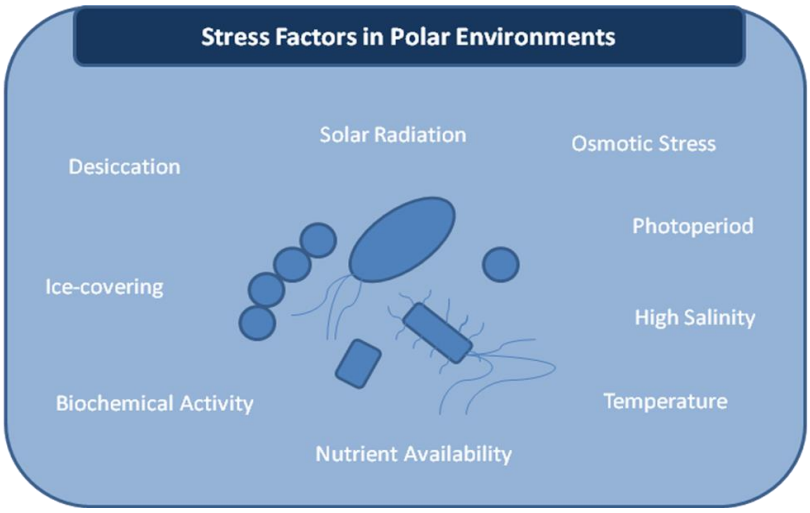


**Figure S2**. Microorganisms, living in costal and deep-sea polar areas, are constantly subjected at a large range of environmental and extreme abiotic factors that can also co-work together and make polar areas unique. These factors include: extreme temperatures depending of the high latitude, desiccation and osmotic stress, low nutrient concentrations, high levels of UVB radiation (under the Antarctic continent is placed the ozone hole) and a highly variable photoperiod (from no light at all during the winter to continuous light during a 24-h period in summer).

**Supplementary Table S1**

**Table S1**. Examples of antimicrobial compounds produced by marine bacteria.

| Compounds | Bacteria | Activity Spectrum | Development Phase |
|---|---|---|---|
| **Fijimycins A-C** | Actinomycetes (*Streptomyces*) | Methicillin-resistant *Staphylococcus aureus* (MRSA) | Discovery/pre-clinical |
| **Etamycin A** | Actinomycetes | *MRSA* | Discovery/pre-clinical |
| **Kahakamide A** | Actinomycetes | *Bacillus subtilis* | Discovery/pre-clinical |
| **Heronamycin** | Actinomycetes (*Streptomyces*) | *B. subtilis* | Discovery/pre-clinical |
| **Lynamicins A-E** | Actinomycetes (*Marinispora*) | *MRSA*, vancomicyn-resistent *Enterococcus faecium* (VREF) | Discovery/pre-clinical |
| **7-methylcoumarin** | Actinomycetes (*Streptomyces*) | *S. aureus*, *B. subtilis*, *Micrococcus luteus* | Discovery/pre-clinical |
| **Rhamnazin** | Actinomycetes (*Streptomyces*) | *Aspergillus niger*, *Botrytis fabae* | Discovery/pre-clinical |
| **Cirsimaritin** | Actinomycetes (*Streptomyces*) | *Candida albicans*, *Piscia angusta*, *Cryptococcus neoformans* | Discovery/pre-clinical |
| **Essramycin** | Actinomycetes (*Streptomyces*) | *S. aureus*, *M. luteus*, *B. subtilis*, *E. coli*, *Pseudomonas aeruginosa* | Discovery/pre-clinical |
| **Thiomarinol** | Proteobacteria (*Pseudoalteromonas*) | MRSA, *Enterococcus faecalis*, *Klebsiella pneumoniae*, *Enterobacter cloacae*, *Serratia marcescens*, *Proteus vulgaris*, *Morganella morganii*, *P. aeruginosa* | Discovery/pre-clinical |
| **3,4-dibromopyrrole-2,5-dione** | Proteobacteria (*Pseudoalteromonas*) | *E. coli* | Discovery/pre-clinical |
| **Aqabamycins A-G** | Proteobacteria (*Vibrio*) | *B. sutbilis*, *M. luteus*, *E. coli*, *P. vulgaris* | Discovery/pre-clinical |
| **1-acetyl-β-carboline** | Proteobacteria | MRSA | Discovery/pre-clinical |
| **6-chloro-2,4-dibromophenol** | Proteobacteria (*Pseudoalteromonas*) | MRSA, *Burkholderia cepacia* | Discovery/pre-clinical |
| **Korormicin** | Proteobacteria (*Pseudoalteromonas*) | *Marine pathogens* | Discovery/pre-clinical |
| **Violacein** | Proteobacteria (*Pseudoalteromonas*) | *B. subtilis*, *S. aureus* | Discovery/pre-clinical |
| **Holomycin** | Proteobacteria (*Photobacteria*) | *S. aureus*, *Saprolegnia parasitica*, *Staphylococcus epidermis* , *E. faecalis*, *E. coli* | Discovery/pre-clinical |
| **Miuraenamides A and B** | Proteobacteria (*Myxobacteria*) | *Phytophthora capsici*, *Rhizopus oryzae*, *Candida rugosa* | Discovery/pre-clinical |
| **Haliangicin** | Proteobacteria (*Myxobacteria*) | *Phthium ultimium*, *Saprolegnia parasitica* | Discovery/pre-clinical |
| **Macrolactin A** | Firmicutes (*Bacillus*) | *B. subtilis*, *S. aureus*, *E. coli*, *P. aeruginosa* | Discovery/pre-clinical |
| **Macrolactin W** | Firmicutes (*Bacillus*) | | Discovery/pre-clinical |
| **Macrolactin S** | Firmicutes (*Bacillus*) | *B. subtilis*, *S. aureus*, *E. coli* | Discovery/pre-clinical |
| **Macrolactin V** | Firmicutes (*Bacillus*) | | Discovery/pre-clinical |
| **Ambiguine-K** | Cyanobacteria | *Mycobacterium tuberculosis* | Discovery/pre-clinical |
| **Ambiguine K-O** | Cyanobacteria | | Discovery/pre-clinical |
| **Ambiguine M** | Cyanobacteria | | Discovery/pre-clinical |
| **Lyngbyoic acid** | Cyanobacteria | *P. aeruginosa* | Discovery/pre-clinical |

**Supplementary Figure S3**

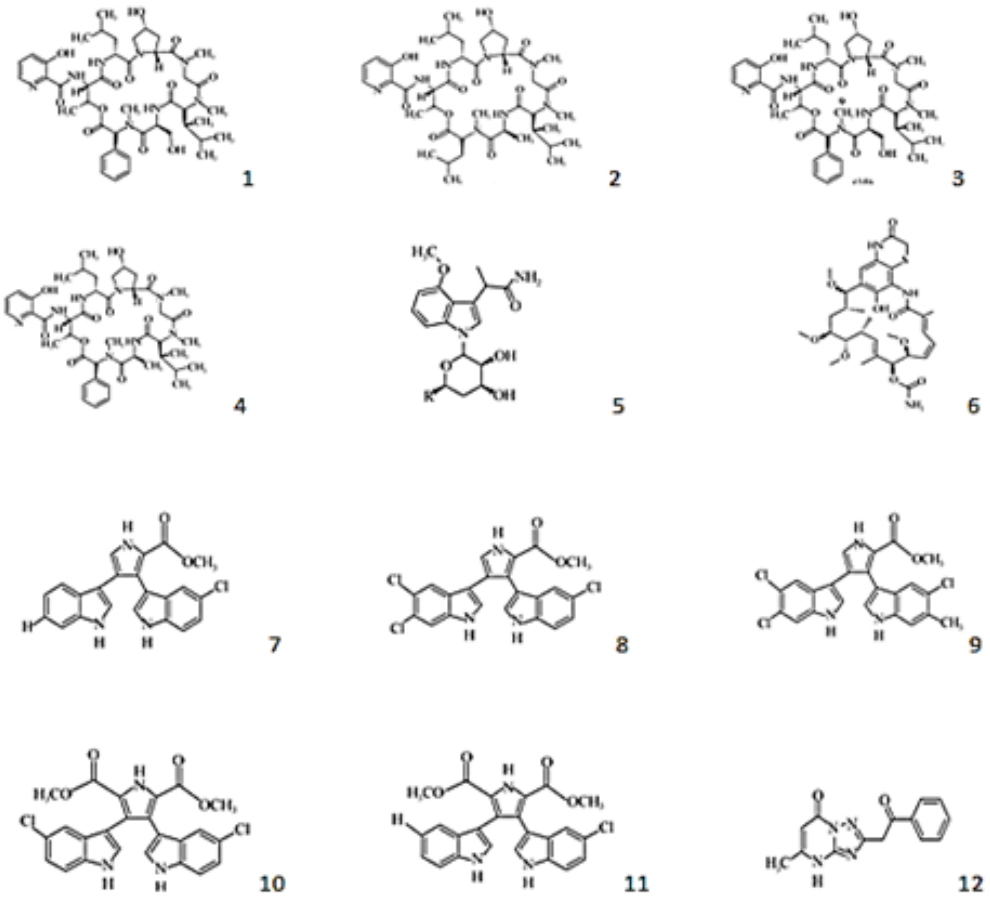


**Figure S3**. Antimicrobial compounds produced by marine Actinobacteria. (**1**-**3**) Fijimycins A-C; (**4**) etamycin A; (**5**) kahakamides A; (**6**) heronamycin A; (**7**-**11**) lynamicins A-E; (**12**) essramycin n.12.

**Supplementary Figure S4**

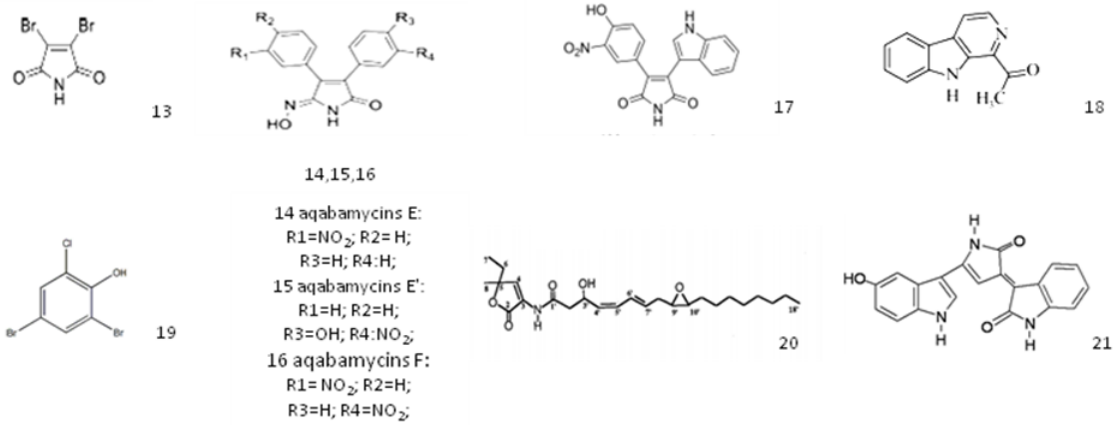


**Figure S4**. Antimicrobial compounds produced by marine Proteobacteria. (**13**) 3,4-Dibromopyrrole-2,5-dione; (**14-16**) aqabamycins E, E′, F; (**17**) aqabamycins G; (**18**) 1-acetyl-beta-carboline; (**19**) 6-chloro-2,4-dibromophenol; (**20**) korormicin; (**21**) violacein.

**Supplementary Figure S5**

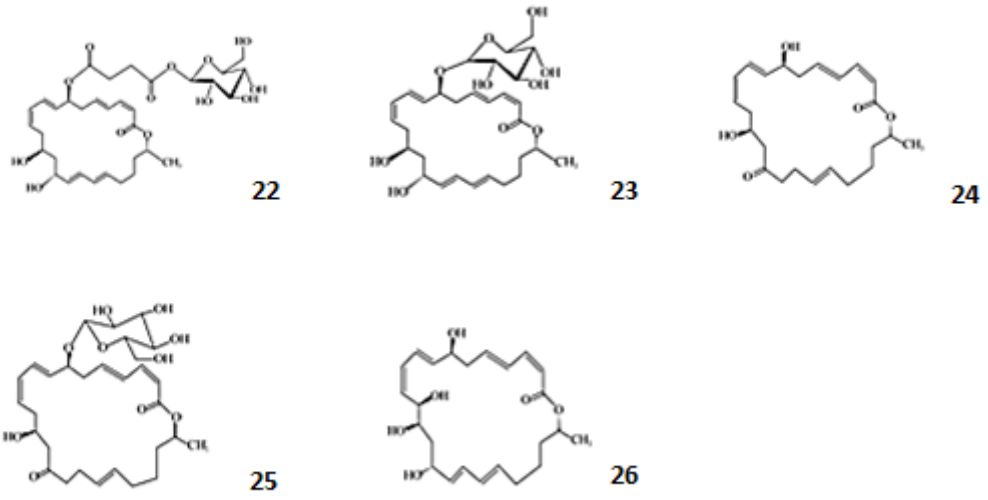


**Figure S5**. Antimicrobial compounds produced by marine Firmicutes. (**22)** Macrolactin W; (**23**) macrolactins A; (**24**) macrolactins F; (**25**) macrolactins O; (**26**) macrolactins S.