



## Antibacterial agent production from marine bacteria, *Silicibacter*

**The Challenge:** Antibiotic resistance has become a serious problem around the world. In some cases, antibiotic resistance has become so prevalent that standard low-cost antibiotics are virtually useless for treatment of frequently seen infections. Thus, it would be of great benefit to develop alternative classes of antibiotics with the hope of fighting infections that are resistant to standard antibiotic treatment.

**UMBI Solution:** UMBI scientists have recently discovered that *Silicibacter* sp. TM1040 produces a water-soluble sulfur-containing antibiotic, tropodithietic acid (TDA), which may account for as much as 15% of its metabolites. TDA has been known for many years, but the inability to produce large quantities synthetically has hampered its utility. *Silicibacter* sp. TM1040 is a member of the *Roseobacter* clade, originally isolated from a culture of the algae *Pfiesteria* from the Chesapeake Bay. A *Silicibacter* sp. strain can be easily used for genetic transformation of marine algae and production of antibiotic agents. These antibiotic agents are effective against pathogenic bacteria such as *Mycobacterium marinum*, *Vibrio anguillarum*, *V. coralliilyticus*, and *V. shiloi* bacteria. Furthermore, TDA kills even extremely resistant bacterial strains, such as community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA). Therefore, TM1040 represents an exciting new approach to economically developing a variety of pharmaceutical and probiotic applications, capitalizing on its antimicrobial functions and TDA compositions.

### Commercial Applications:

- Anti-microbial agent: New antimicrobials effective against bacteria, fungus, mycobacterium, vibrio, other eukaryotic and parasitic agents. May also be used topically to treat bacterial infections of the skin such as human cutaneous mycobacterial infections.
- Finfish or Shellfish Aquaculture: Used as a probiotic prophylactic, preventative treatment or curative treatment of bacterial diseases or to improve growth and weight gain. May be added to or cultured with greenwater in aquaculture feeds or mixed with algal feed prior to feeding.
- Biofouling/biofilm inhibitor: Surface applications, particularly in maritime environments.
- Environmental clean-up: May be used in the environment to treat fish diseases or help prevent the bleaching of coral reefs.
- Agriculture: Used as an antibiotic additive to the animal feed.

### Advantages:

- Grown using a large-scale fermentation system, which is a much more cost effective production method than chemical synthesis.
- Alternative to antibiotics for treatment and control of disease. Acts to inhibit both prokaryotic (bacteria) and eukaryotic (protozoa, fungi, parasites) microorganisms.

- Natural product eliminates environmental release issues.
- Prevents the attachment of other bacteria to surfaces.

**Patent Status:** Pending PCT application

**Licensing Potential:** UMBI is seeking non-exclusive and exclusive licensees to all or part of this technology. The UMBI inventors would welcome the opportunity to work with any licensee to further refine or extend the capabilities this invention.

**Inventors & UMBI References:** Belas and Bruhn, 05-031

**Relevant Publications:**

1. Geng, H., J.B. Bruhn, K.F. Nielsen, L. Gram, and R. Belas. 2008. Genetic dissection of tropodithietic acid biosynthesis by marine roseobacters. *Appl. Environ. Microbiol.* 74:1535-1545.
2. Moran, M.A., R. Belas, et al. 2007. Ecological genomics of marine roseobacters. *Appl. Environ. Microbiol.* 73:4559-4569.
3. Bruhn, J.B., L. Gram, and R. Belas. 2007. Production of antibacterial compounds and biofilm formation in Roseobacter species are influenced by culture conditions. *Appl. Environ. Microbiol.* 72:442-450.
4. Miller, T.R. and R. Belas. 2006. Bacterial motility is important in the interaction of *Silicibacter* sp. TM1040 with *Pfiesteria* dinoflagellates. *Environ. Microbiol.* 8:1648-1659.

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