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Symposium
From the deepest oceans
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Oceanic environments cover 70% of our planet and make up 95% of our biosphere. The marine environment is home to a multitude of life forms existing under very different conditions (pressure, low temperature, saline conditions) and it is believed that the secondary metabolites produced by marine organisms hold great potential as novel compounds for the biotech industry. We isolated approx. 500 antibacterial bacteria on a global research cruise with the purpose of purifying and identifying novel small molecules with antibacterial activity. The bacteria belonged to the Roseobacter clade, the Vibrionaceae family or the Pseudoalteromonas genus. We isolated several antibiotics such as pentabromopseudilins, andrimide and tropodithietic acid that have been found in marine bacteria before. We also isolated several antibiotics such as holomycin and indolmycin that are known antibiotics hithero only isolated from terrestrial Streptomycetes. The fact that we predominantly found already known antibiotics could be because we used the same growth conditions as many previous studies. Genome sequencing of one Pseudoalteromonas strain from which 2 antibiotics were isolated revealed that at least seven PKS/NRPS genes were found. Hence manipulating culture conditions, or expression in other hosts, may induce expression of hithero silent genes coding for bioactive metabolites. Certainly culturing one of the antibiotic producing Vibrionaceae on a substrate mimicking its natural conditions by containing exclusively chitin as C- and N-source, led to a dramatic alteration in secondary metabolite profile. Under these natural growth conditions, the antibiotic became almost the only metabolite produced. Some strains of the Vibrionaceae also produced compounds, so-called solonamides, that were not antibacterial per se but that specifically inhibited the quorum sensing system in Staphylococcus aureus likely via binding to the Agr. Also the quorum sensing system in Pseudomonas aeruginosa was inhibited by a yet un-identified compound produced by Roseobacter clade strains. Whilst it is known that both Roseobacter clade bacteria and Pseudoalteromonas species produce bioactive compounds, the Vibrionaceae have predominantly been researched due to their role as pathogenic or symbiotic bacteria. Our work demonstrates that this bacterial group likely also harbours organisms of biotechnological interest.