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MASTER OF SCIENCE

2015

STUDIES ON THE POLYSACCHARIDE-PRODUCING BACTERIA, *SHEWANELLA PUTREFACIENS* ISOLATED FROM MARINE SPONGE, *THEONELLA* SP.

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Thesis Submitted in Fulfillment of the Requirement for the Degree of Master of Science in the School of Marine and Environmental Sciences
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DEDICATED TO MY FAMILY
AND MY BELOVED ONE

Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu in fulfillment of the requirement for the degree of Master of Science

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School : Marine and Environmental Sciences

Marine sponge, *Theonella* sp. is found in great quantity from Malaysian's ocean. *Theonella* sp. are one of marine sponges that produces a significant bioactive compounds. They are stated to be potential drug lead producers having exceptional structures that are unavailable from terrestrial region. Marine bacteria associated with sponges are significance as new promising source of large amount of biologically active compounds. The aims of this study were to identify polysaccharide-producing bacteria isolated from *Theonella* sp., to screen selected bacterial polysaccharides for antibacterial and toxicity and to determine composition of selected bacterial polysaccharide, *Shewanella putrefaciens*. Subsequent to this, bacterial sampling of *Theonella* sp. from Bidong Island in Terengganu was conducted. A total of seven types of bacteria were identified as *Shewanella putrefaciens*, *Brevundimonas diminuta*, *Alcaligenes faecalis*, *Burkholderia cepacia*, *Fusobacterium varium*, *Capnocytophaga* sp. and *Vibrio damsela. S. putrefaciens, Capnocytophaga* sp*., B. diminuta* and *B. cepacia* were determined as polysaccharide-producing bacteria. Disc diffusion test and brine shrimp lethality test have shown that only *S. putrefaciens* crude polysaccharide gave antibacterial activity and also toxic towards brine shrimp, *Artemia salina*. Composition analysis determined *S. putrefaciens* crude and acidic polysaccharides were hetero polysaccharide consisted of glucose, trehalose and mannose, respectively. Only crude polysaccharide contained trace elements of sulphur and uronic acid with molecular weight of 250.5 kDA. The presence of suphur and uronic acid in *S. putrefaciens* crude polysaccharide have been significantly ascertained to be sulfated polysaccharide. The presence of trace elements associated with polysaccharide gave positive result and potential value towards medicinal and pharmaceutical purposes.

Abstrak tesis yang dikemukakan kepada Senat Universiti Malaysia Terengganu sebagai memenuhi keperluan untuk Ijazah Sarjana Sains

KAJIAN TENTANG BAKTERIA PENGHASIL POLISAKARIDA, *SHEWANELLA PUTREFACIENS* YANG DIPENCILKAN DARIPADA SPAN MARIN, *THEONELLA* SP.

LUKMAN HAKIM BIN MOHD DIN
MAC 2015

Penyelia Utama : Profesor Madya Dr. Ahmad Shamsuddin Bin Ahmad
Penyelia Bersama : Profesor Dr. Najiah Binti Musa
Pusat Pengajian : Sains Marin dan Sekitaran

Span marin, *Theonella* sp. boleh dijumpai dalam kuantiti yang besar dari lautan Malaysia. *Theonella* sp. merupakan salah satu span marin yang menghasilkan sebatian bioaktif yang penting. Span marin ternyata berpotensi sebagai penghasil bahan bioaktif utama yang mempunyai struktur yang luar biasa yang tidak dijumpai dari kawasan daratan. Bakteria marin yang terdapat dalam span marin adalah penting sebagai sumber baru yang menjanjikan sejumlah besar sebatian bioaktif. Tujuan kajian ini adalah untuk mengenal pasti bakteria yang menghasilkan polisakarida yang diisolat daripada *Theonella* sp., untuk menyaring polisakarida bakteria yang dipilih untuk ujian antibakteria dan ketoksikan dan untuk menentukan komposisi polisakarida bakteria terpilih, *Shewanella putrefaciens*. Dengan demikian, penyampelan bakteria *Theonella* sp. dari Pulau Bidong di Terengganu telah dijalankan. Sejumlah tujuh jenis bakteria telah dikenal pasti sebagai *Shewanella putrefaciens*, *Brevundimonas diminuta*, *Alcaligenes faecalis*, *Burkholderia cepacia*, *Fusobacterium varium*, *Capnocytophaga* sp. dan *Vibrio damsela. S. putrefaciens, Capnocytophaga* sp*., B. diminuta* and *B. cepacia* telah ditentukan sebagai bakteria penghasil polisakarida. Ujian cakera resapan dan ujian kematian anak udang telah menunjukkan bahawa hanya polisakarida kasar *Shewanella putrefaciens* memberikan aktiviti antibakteria dan juga toksik terhadap anak udang, *Artemia salina*. Analisa komposisi telah menentukan bahawa polisakarida kasar dan polisakarida berasid *S. putrefaciens* merupakan polisakarida jenis hetero terdiri daripada glukosa, trehalosa dan mannosa. Hanya polisakarida kasar mengandungi unsur-unsur surih sulfur dan asid uronik dengan berat molekul 250.5 kDA. Kehadiran sulfur dan asid uronik dalam polisakarida kasar *S. putrefaciens* terbukti sebagai polisakarida tersulfat. Kehadiran unsur-unsur surih yang berkaitan dengan polisakarida memberikan hasil yang positif dan nilai yang berpotensi ke arah tujuan perubatan dan farmaseutikal.