3rd Global Microbiologists Annual Meeting

August 15-17, 2016 ,Portland, Oregon, USA

Quorum Sensing and Biofilm Formation

Samer M. Al-Hulu

Al-Qasim Green University / Iraq
alhulusamer@ymail.com

Abstract

Quorum sensing (QS) is a process which included communication between bacterial cells. There are three types of QS system, LuxI/LuxR–type Quorum sensing in gram negative bacteria,oligopeptide–two component-type quorum sensing in gram positive bacteria and LuxS encoded autoinducer 2 (AI-2) quorum sensing in both gram positive and negative. Formation of biofilm is controlled by QS system such as, formation of biofilm in *P.aeruginosa* is coordinated by QS pathway.

Background

Quorum sensing (QS) is a process which included communication between bacterial cells, also involved production , deletion and response for extracellular signaling molecules which called autoinducer (AI). AIs autoinducer due to accumulation of bacterial and the density increased and changing in their cell number and altering in gene expression. QS control genes having more benefit when groups of bacteria acting in synchrony. biofilm formation is controlled by QS.

Methods

Quorum sensing system (QS)
generally divided into three class:

(1) **LuxI/LuxR –type Quorum sensing** in gram negative bacteria,which use acyl-homoserine lactones (AHL) as a signal molecules.

(2) **oligopeptide –two component-type** quorum sensing in gram positive bacteria, which use small peptide as signal molecules .

(3**) LuxS encoded autoinducer 2 (AI-2**) quorum sensing in both gram positive and gram negative bacteria. each type of signal molecules is detected and responded by a precise sensing apparatus and regulatory network.

A biofilm: is sessile microbial community composed of cells irreversibly attached to substratum , to an interface or between them , embedded in a matrix of extracellular polymeric substances produced by themselves and which present a modified phenotype, concerning the growth rate and gene transcription.

QS Systems and biofilm formation :

1-***Streptococcus mutans*** is a bacterium that adapting in biofilm life style

These bacteria having a well conserved quorum sensing system that consists of at least three gene products encoded respectively by **Com CDE system**.

2-The **Lux-dependent** biofilm formation and its molecular mechanism demonstrated in clinical isolates of ***S.pneumonia***.

3-The role of **AI2** in oral cavity biofilm for ***Streptococcus gordonii*** as well as the etiology of dental caries, ***Streptococcus mutans*.**

4- AI-2 stimulate biofilm formation and changes its architecture by stimulating flagellar Motility via quorum sensing regulater MqsR, which act through the two component motility regulatory system **QseBC**. The recent finding that AI-2 regulate biofilm formation in ***Actinomycetemcomitans*** though **QseB** system .

5- The formation of biofilm in ***P.aeruginosa*** is coordinated by QS pathway which involves the transcriptional regulator **LasR** and **RhIR system** and the signal QS molecules :C12HSL(N-C3-oxododecanoyl-HSL lactone)=OdDHL) and C4-HSL [N-butanoyl-L-HSL].

Results

1- Quorum sensing (QS) is a process which included communication between bacterial cells.

2-There are three types of Quorum sensing **LuxI/LuxR , oligopeptide –two component-type**, and **LuxS encoded autoinducer 2 (AI-2**) .

3- Many examples ensures the formation of biofilm under control by **Quorum sensing (QS**) system.

Conclusions

Formation of biofilm is controlled by **QS**

References

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