BARIERY MOLEKULARNE W WYMIANIE GENOW POMIĘDZY BAKTERIAMI

Marian Sęktas

1. Wprowadzenie. 2. Przekazywanie informacji genetycznej pomiędzy komórkami bakterii. 2.1. Pionowy (wertykalny) transfer genów. 2.2. Horyzontalny transfer genów. 3. Metody wykrywania obszarów obcego DNA w obrębie DNA chromosomowego. 4. Cechy obcego DNA jako substratu procesów rekombinacji. 5. Koncepcja gatunku genomowego bakterii. 6. Podsumowanie

Molecular barriers to interspecies gene exchange among bacteria

Abstract: Recently, the study of bacterial evolution has been based on the comparative analysis of nucleotide sequences within and between species. Analyses of microbial genomes has shown that genomes contain genes that are closely related to phylogenetically, very distantly related procaryotes. Usually, evolutionary biologists have thought mutations within individual genes, followed by clonal transfer of genetic information, is the major source of phenotypic variation, leading to adaptation through natural selection and generating diversity among species. Contrary to eukaryotes, which evolve principally through the modification of existing genetic information, bacteria obtain a significant proportion of their genetic diversity through the acquisition of DNA fragments from distantly related organisms. Horizontal gene transfer is the term used to describe the processes that permit the exchange of DNA among organisms of different species. Such a transfer produces highly dynamic genomes in which substantial amounts of DNA are introduced into and deleted from the chromosome. Changes in the genome, occurring through gene acquisition and deletion, are the major events underlying the emergence and evolution of a new bacterial strains including pathogens. However, beside ecological isolation and the fitness of new recombinants, there are several molecular barriers to chromosomal gene transfer between bacterial species, which correlate with genomic sequence divergence/homology. First, specific uptake sequences (US) in DNA may be required for an efficient transformation process. The real barrier to successful DNA aquisition being recipient celi are restriction-modification systems and the lack of Chi-like sequences in the structure of alien DNA, both of which provide a means to species specific endo- and exonucleolytic degradations, respectively. The strong barrier for homologous recombination is the methyl-directed mismatch (MMR) system. MMR-deficient mutators repair exhibit a hyperrecombinetic phenotype and act to reduce sequence homology limitations in such processes like transformation, transduction, and conjugation. Repeated changes in the MMR phenotype (loss and acquisition) are involved in rapid genetic diversity and the quick adaptation of bacterial populations.

1. Introduction. 2. Transfer of genetic information between bacteria. 2.1. Vertical gene transfer. 2.2. Horizontal gene transfer. 3. Methods of detection of alien DNA regions within bacterial chromosomes. 4. Properties of DNA as a recombination substrate. 5. Genom species concept. 6. Conclusions

Katedra Mikrobiologii Uniwersytetu Gdańskiego ul. Kładki 24, 80-822 Gdańsk tel./fax. 058 320-2031, e-mail: <u>sektas@biotech</u> .univ.gda.pl

Wpłynęło w lipcu 2003 r.