

Short research communication

科研简报

Bacteria of Extreme Longevity: Possible Applications in Biotechnology

极端长寿细菌： 在生物技术领域的可能应用

Anatoli Brouchkov, PhD

Anatoli Brouchkov, 博士

Lomonosov Moscow State University, Russian

Lomonosov 莫斯科国立大学, 俄国

New Approaches combating Cancer & Aging 2016; 3: 9-10

新法抗癌抗衰老 2016 年第 3 期第 9 至 10 页

*Corresponding Author:

Anatoli Brouchkov, PhD

Professor

Chairman of Geocryology Department

Moscow State University

Moscow, Russian Federation

E-mail: brouchkov@hotmail.com

*通讯作者:

Anatoli Brouchkov, 博士

教授

冻土层系, 系主任

莫斯科国立大学

莫斯科, 俄国

E-mail: brouchkov@hotmail.com

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Received: 2015.10-03; Accepted: 2015.12-13; Published: 2016-01-07

收稿: 2015-10-03; 接受: 2015-12-13; 发表: 2016-01-07

Abstract

A group of new bacteria with extreme longevity (living in frozen soils as single viable cells for over 3 million years) have been isolated from an ancient permafrost. Newly isolated bacteria have ability to actively grow under a wide range of temperatures, and to resist a number of damaging factors, including thermal degradation, radiation, free radicals, carcinogens and aging agents. More importantly, they are non-pathogenic with several unique features that may be used to benefit development of anti-cancer and anti-aging agents.

摘要

一组极端长寿的细菌(以单体活细胞的形式在冰冻土壤层中生活了三百多万年)已自一古老的永久冻土层中分离出来. 新分离出的细菌具有在不同温度条件下活跃生长的能力, 且可对抗高温降解、辐射、自由基、致癌、致衰剂等的损伤. 更为重要的是, 它们具有几个独特的生物学特性. 这些特性可望有助于抗肿瘤、抗老化剂的开发.

Short research communication

A number of cultured relic microorganisms from an ancient permafrost of Central Yakutia, aged more than 3 million years, isolated and examined. According to identification by 16S rDNA and sequencing of full genomes these strains are new species and belong to the Bacillus mostly. Detected bacteria are not numerous, they are contained in frozen soils as single viable cells, and belong to non-pathogenic microorganisms. They have increased antibiotic susceptibility, minor antagonist properties and high resistance to extreme environmental factors. They also have a specific set of biochemical features, such as the ability to active growth in a wide range of temperatures, acidity [1-5].

科研简报

一组年龄超过三百万年, 生活在 Yakutia 中部一古老永久冻土层的细菌已被分离和检测. 根据 16S rDNA 的鉴定和完整基因组的测序, 这些菌株是新的物种, 多属于芽孢杆菌家族. 被检测到的细菌并不多, 它们以单体活细胞的形式生活在冻土内, 属于非致病性微生物. 它们有上调的抗菌素敏感性; 对其他细菌有轻度拮抗性; 对恶劣环境有高度抵抗力. 同时, 它们有一组特定的生物化学特征, 例如能够在一个很宽的温度, 酸度范围内活跃的生长 [1-5].

However, the main unique feature of the relic microbial cells is their ability to preserve (or repair) their genome for many

然而, 这些古老细菌最主要的生物学特征是: 它们能在几万甚至几百万年的恶劣

thousands or even millions of years in spite of extreme conditions of permafrost. Obviously, they have specific DNA protection mechanisms against thermal degradation, radiation, free radicals and other damaging factors [1-5].

We have performed a research of influence of the relict bacteria on higher organisms and have found they can be useful for production of a wide range of biologically active substances. A high level of antimicrobial activity of relict strains with respect to some pathogenic species has been found. An activation of innate immunity of laboratory animals and immunomodulatory properties of the strain have been shown. The stimulating effects of strain on the activity of cellular and humoral immunity, phagocytic activity of macrophages, range of morphological parameters, muscle strength, motor activity and the activity of the central nervous system have been found. A steady gerontological effect was also observed [1-5].

生活环境中，保存(或者修复)自身的基因库稳定不变。显然，这些细菌有特殊的DNA保护机制以对抗高温降解、辐射、自由基、和其他损伤因素 [1-5]。

我们已进行了一系列实验，以评估这些古老细菌对高等生物的影响。我们的实验提示：这些细菌可用于生产一系列生物活性物质：这些古老细菌对某些致病微生物有很高水平的抑制活性。这些菌株的免疫调节性能和先天免疫的活化已被实验动物结果所证明。我们发现：这些细菌对细胞免疫和体液免疫，巨噬细胞的吞噬活性，形态学参数的范围，肌肉力量，运动活性和中枢神经系统的活动有显著的刺激作用。我们还观察到：这些细菌有稳定的抗衰老作用 [1-5]。

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