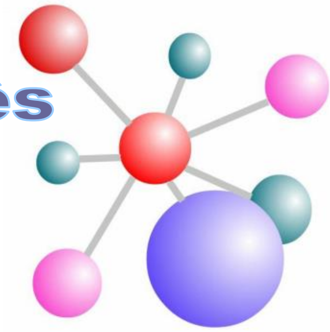
UNIVERSIDADE FEDERAL DO RIO GRANDE DO NORTE

Exame de Proficiência 2015.2

Inglês



Ciências Biológicas

Instruções

1	Confira se os dados contidos na parte inferior desta capa estão corretos e, em seguida, assine no espaço reservado para isso. Se, em qualquer outro local deste Caderno, você assinar, rubricar, escrever mensagem, etc., será excluído do Exame.
2	Este Caderno contém 5 questões discursivas referentes à Prova da Língua Estrangeira escolhida pelo candidato. Não destaque nenhuma folha.
3	Se o Caderno estiver incompleto ou contiver imperfeição gráfica que impeça a leitura, solicite imediatamente ao Fiscal que o substitua.
4	Será avaliado apenas o que estiver escrito no espaço reservado para cada resposta, razão por que os rascunhos não serão considerados.
5	Escreva de modo legível, pois dúvida gerada por grafia, sinal ou rasura implicará redução de pontos.
6	Só será permitido o uso de dicionário INGLÊS/INGLÊS.
7	Use exclusivamente caneta esferográfica, confeccionada em material transparente, de tinta preta ou azul. Em nenhuma hipótese se avaliará resposta escrita com grafite.
8	Utilize para rascunhos, o verso de cada página deste Caderno.
9	Você dispõe de, no máximo, três horas, para responder as 5 questões que constituem a Prova.
10	Antes de retirar-se definitivamente da sala, devolva ao Fiscal este Caderno.

Assinatura do Candidato: ____

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As questões de 01 a 05, cujas respostas deverão ser redigidas EM PORTUGUÊS, referem-se ao texto abaixo.

GTP-binding protein Era: a novel gene target for biofuel production

Background

Biodiesel produced by photosynthetic microorganisms, such as eukaryotic algae and cyanobacteria, provides a promising alternative to reduce our reliance on fossil fuels. Biodiesel can be produced either directly by these organisms or from their biomass. This fuel is carbon neutral, renewable and its use requires minimal changes in the current structure of fuel delivery and consumption. However, the relatively low productivity and the high cost of harvesting the biomass present mayor limitations for commercialization of cyanobacteria-derived biodiesels.

These limitations have been mainly addressed by using a rational approach. The rational approach involves designing strains with enhanced biodiesel precursor production (e.g. fatty acids, hydrocarbons) by modifying and/or introducing known metabolic pathways. The most common modifications include the introduction of a heterologous thioesterase and removal of the endogenous acyl-ACP synthetase. The introduced thioesterase is capable of hydrolysing the acyl-ACP molecule and thus releases the fatty acid, the major precursor of biodiesel. The acyl-ACP synthetase can reactivate free fatty acids by attaching them to the ACP-molecule. By introducing a thioesterase in combination with disrupting the endogenous acyl-ACP synthetase, one can significantly enhance fatty acid production and secretion in cyanobacteria.

However, despite some success, the reported fatty acid yields are still not sufficient for large-scale production. This is partly due to the fact that the bulk of the fatty acids remain within the cell. Changing the cell structure in such a way that the cells can auto-flocculate or elongate might help to harvest the remaining biomass more efficiently. Since the rational approach is guided by existing knowledge about the cellular processes involved in fatty acid biosynthesis and/or transport, it can limit strain improvement due to missing information on key intermediates, regulators, competing pathways etc. Therefore, combining the rational approach with random approaches (e.g. transposon mutagenesis) may result in the identification of novel genes involved in efficient biodiesel precursor production.

Random mutagenesis has been successfully used in cyanobacteria to isolate filamentous and grazing resistant mutants as well as to identify environmentally responsive genes and genes involved in polyhydroxybutyrate synthesis. Furthermore, this approach was previously applied to isolate genes involved in fatty acid production in *Escherichia coli*. However, genes identified by Hoover and colleagues (2012) in *E. coli* lack obvious orthologous genes in cyanobacteria. Moreover, to our knowledge, random mutagenesis has never been applied to isolate lipid-overproducing mutants in cyanobacteria.

In this study we used *Synechococcus elongatus* PCC 7942 which is amenable to genetic modification and has a fully sequenced genome. This strain produces the major biodiesel precursors and lacks the ability to synthesize PHB (a competing pathway for biofuel production). These properties make *S. elongatus* PCC 7942 a good model strain to isolate mutants with an enhanced fatty acid production. The construction and analysis of a transposon generated mutant library, resulted in the identification of a gene that directly or indirectly affects fatty acid and hydrocarbon production. Moreover, this gene, named *era*, is also involved in determining the cellular morphology of PCC 7942. To our knowledge this gene has never been analyzed in cyanobacteria.

Fonte: *Voshol et al. BMC Biotechnology (2015)*

Questão 1

Quais as vantagens e desvantagens do biodiesel produzido por micro-organismos fotossintéticos?

Espaço para Resposta

Questão 2

Em que consiste o “rational approach”?

Espaço para Resposta

Questão 3

De acordo com o texto, a produção de ácidos graxos não é suficiente para a produção de biodiesel em larga escala. Qual a causa e o que é dito com vistas a melhorar essa condição?

Espaço para Resposta

Questão 4

Em quais aplicações a mutagênese aleatória tem sido usada?

Espaço para Resposta

Questão 5

- Traduza o fragmento textual abaixo no espaço reservado para isso.
- Seu texto deverá apresentar clareza e estar bem articulado tanto em termos estruturais quanto de sentido.

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