Clostridium clifficileの毒素産生機構の解析

1995 Fiscal Year Final Research Report Summary

Study on the mechanism of toxin production by Clostridium difficile

Research Project

Project/Area Number

06670286

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Grant-in-Aid for General Scientific Research (C)

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Bacteriology (including Mycology)

Research Institution

Kanazawa University

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C.difficile / defined medium / amino acid / vitamin / toxin A / toxin B / toxin / biotin

Research Abstract

The mechanism of toxin production by Clostridium difficile was investigated from the stand poit of nutritional requirements. By the single-amino acid omission and addition methods with a basal defined medium consisting of 18 amino acids, it was found that valine, cysteine, tryptophan, proline, methionine, isoleucine, leucine, glycine and threonine were essential for good toxin production.

Further, by qualitative analysis, a defined medium (6xMADM) consisting (g/L) of tryptophan 0.6, methionine 1.2, valine 1.8, isoleucine 1.8, proline 1.8, leucine 2.4, glycine 0.2, threonine 0.4 and cysteine 0.5 was found to be fairly effective for stimulating toxin production. In a comparison of 6xMADM and m-BHI,which is excellent comple medium for toxin production, 13 of 20 strains tested produced the same amounts of toxin in both media, suggesting that the 9 amino acids mentioned above were particularly important for toxin production. By single-vitamin omission method with 6xMADM,it was found that pyridoxine, pantothenate and biotin were essential for good growth and toxin production and that biotin deficiency might stimulate toxin production. The effect of biotin was analyzed in detail with a strain KZ 1647. When toxin production was examined in relation to biotin concentration, it was found that with decreasing concentration of biotin bacterial growth decreased, but toxin production was remarkably increased, particularly with 0.05 nM biotin.
The time course of toxin production in biotin-limited conditions was similar to that in biotin-enriched conditions. The biotin effect on toxin production was also observed in 18 out of 19 strains tested, suggesting that the effect is a general phenomenon amongst toxigenic C.difficile strains.
These findings suggest that biotin play an important role in the development of C.difficile colitis.

Research Products (9 results)

All Other

All Publications (9 results)

[Publications] K.Yamakawa: "Toxin production by Clostridium difficile in a defined medium with limited amino acids" Journal of Medical Microbiology. 41. 319-323 (1994)

[Publications] T.Karasawa: "A defined growth medium for Clostridium difficile" Journal of General Microbiology. 141. 371-375 (1995)

[Publications] K.Yamakawa: "Enhancement of Clostridium difficile toxin production in biotin-limited conditions" Journal of Medical Microbiology. 44. 111-114 (1996)

[Publications] 山川 清孝: "ビオチンによるClostriclium difficile毒素産生の増強効果" 日本細菌学雑誌. 50. 278 (1995)

[Publications] 唐澤 忠宏: "Clostridium difficileの増殖に必要なアミノ酸とビタミン" 日本細菌学雑誌. 50. 167 (1995)

[Publications] 中村 信一: "消化管エコロジー" 小橋恭一編集, 108 (1994)

[Publications] K.Yamakawa: "Toxin production by Clostridium difficile in a defined medium with limited amino acids" Journal of Medical Microbiology. 41. 319-323 (1994)

[Publications] T.Karasawa: "A defined medium for Clostridium difficile" Journal of General Microbiology. 141. 371-375 (1995)

[Publications] K.Yamakawa: "Enhancement of Clostridium difficile toxin production in biotin-limited conditions" Journal of Medical Microbiology. 44. 111-114 (1996)

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