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# United States Patent [19]

**Klaenhammer et al.**

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[54] **BACTERIOPHAGE-TRIGGERED CELL SUICIDE SYSTEMS AND FERMENTATION METHODS EMPLOYING THE SAME**

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### Related U.S. Application Data

[63] **Continuation-in-part of Ser. No. 709,520**, Sep. 6, 1996, abandoned.

[51] **Int. Cl.<sup>6</sup>** ..... **C12N 1/21; C12N 15/11; C12N 21/00; C12N 1/00**

[52] **U.S. Cl.** ..... **435/69.1; 435/71.1; 435/172.3; 435/252.3; 435/252.33; 435/320.1; 536/23.1; 536/23.2; 536/24.1**

[58] **Field of Search** ..... **435/252.3, 252.33, 435/172.3, 520.1, 69.1, 71.2; 536/23.1, 23.2, 24.1**

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[57] **ABSTRACT**

Described herein is a bacterial cell containing a recombinant bacteriophage defense mechanism. The defense mechanism comprises a bacteriophage promoter (e.g., a phage  $\phi$ 31 promoter; a T7 promoter) operatively associated with a heterologous DNA encoding a product lethal to the bacterial cell. The bacterial cell is susceptible to infection by a bacteriophage, and the promoter is activated upon the infection of said bacterial cell by that bacteriophage. Bacteria useful in carrying out the invention include both gram negative and gram positive bacteria (e.g., *Lactococcus lactis*; *Escherichia coli*); the heterologous DNA may encode an enzyme that degrades nucleic acid (e.g., the products of the *LlaI* restriction cassette; barnase). Recombinant DNAs useful for making the foregoing cells, cultures prepared from such cells, and fermentation methods carried out with such cells are also disclosed.

**22 Claims, 7 Drawing Sheets**