Microbiology and Biotechnology

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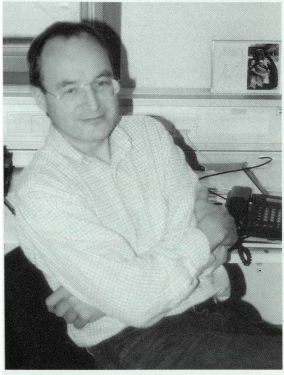

Research

Research in our section focusses on bacteriophages with an emphasis on molecular mechanisms of gene expression, and on bacterial lysis mediated by phage gene products. Results of these studies led to a new system for the development of vaccines.

U Bläsi
Molecular mechanism of holin proteins and translation of leaderless mRNA's

Holins represent a class of phage encoded lysis proteins which form non-specific lesions in the cytoplasmic membrane of bacteria by oligomerization. As a consequence, the phage "endolysin" is released to its murein substrate resulting in cell lysis. Employing the lambda S holin as a model system, translational and post-translational regulatory events are studied to determine the lysis time in the developmental program of the phage. The lambda S system is being used as a model system to study intra- and intermolecular interactions in an integral membrane protein.

A second area of research concerns molecular interactive events resulting in translation initiation of leaderless mRNA's. They have in common the lack of a Shine and Dalgarno sequence (rbs) and initiate directly with the A of the AUG start codon. Our research interests concern the identification of downstream elements that may either undergo base-pairing with 16S rRNA sequences or which may serve as recognition sites for ribosomal proteins.

A Witte
Phage PhiCh1 in the archaeal Natronobacterium magadii

Natronobacteria are living in high salt and pH environments and therefore can be used for non-sterile fermentation processes. To extend the metabolic capacity of such organisms recombinant technology would be helpful. We set out to search for phages and to develop phage vectors. Presently we are studying the phage PhiCh1, a temperate DNA phage isolated from the archaeal *Natronobacterium magadii* after spontaneous lysis. Molecular characterization of its structure, genome and coding capacity is in progress.

A Witte, W Lubitz
Investigations on PhiX174 lysis protein E and development of new vaccines

The protein of the phage encoded PhiX gene E is necessary and sufficient for lysis of bacterial cells. Among phage lysis systems the gene E mediated one is unique as it introduces a transmembrane tunnel structure through the cell wall complex of Gram-negative bacteria. The resulting bacterial ghosts' have intact envelope structures devoid of

cytoplasmic contents. Presently we study the topology of the gene E protein in the envelope complex by use of biochemical and electron microscopic techniques.

Recombinant bacterial 'ghosts' represent multivaccine vehicles with high immunogenicity. They carry parts of foreign proteins (e.g. of human pathogens) inserted into the inner membrane via specific anchor sequences, e.g.fused to the gene E protein. These can be directly used for the immunization of experimental animals. These immunogens have several advantages as compared to traditional vaccines.

H-J Busse
Bacterial systematics

We are interested in the systematics of different groups of prokaryotes including arachaea and bacteria. We use DNA-DNA hybridization and 16S rRNA sequencing and, in addition, polyamine pattern which we found previously to provide useful criteria for the classification of bacteria. Within the EUROCARE project BIODECAY we are investigating members of the microbial community colonizing medieval wall paintings. These studies include the molecular systematic and chemotaxonomic characterization of isolates from wall paintings as well as the detection of non-cultivable members from the community using a molecular approach.

Teaching

Members of this section teach molecular microbiology of bacteria and phages and biotechnology from introductory to advanced courses.

International Cooperations

Institute of Contageous Virus Diseases, Tübingen; Texas A and M University, College Station.

Selected References

Henrich B, Binishofer B, Bläsi U (1995) Primary structure and functional analysis of the lysis genes of *Lactobacillus gasseri* phage Øadh. J Bacteriol 177: 723-732

Hensel A, Stockhofe-Zurwieden N, Petzoldt K, Lubitz W (1995) Oral immunization of pigs with viable of inactivated Actinobacillus pleuropneumoniae serotype 9 induces pulmonary and systemic antibodies and protects against homologous aerosol challenge. Infect Immun 63: 3048-3053

Kuen B, Sleytr UB, Lubitz W (1994) Sequence analysis of the sbsA gene encoding the 130-kDa surface-layer protein of *Bacillus stearothermophilus* PV72. Gene 145: 115-120

Schön P, Schrot G, Wanner G, Lubitz W, Witte A (1995) Two-stage model for integration of the lysis protein E of PhiX174 into the cell. envelope of *Escherichia coli*. FEMS Microbiol Rev 17: 207-212

Tedin K, Resch A, Steiner M, Bläsi U (1995) Dual translational start motif evolutionarily conserved in the holin gene of the lytic *Bacillus subtilis* phage Ø29. Virology 206: 479-484

Tedin K, Witte A, Reisinger G, Lubitz W, Bläsi U (1995) Evaluation of the *E. coli* ribosomal rmB P1 promoter and phage-derived lysis genes for the use in a biological containment system: A concept study. J Biotechnol 39: 137-148