劉世東 Shih-Tung Liu

教授 Professor

電話：03-2118800 ext 5133

傳真：03-2118292

信箱：cgliu@mail.cgu.edu.tw

學經歷

1989 - Present	Professor, Department of Microbiology and Immunology, Chang-Gung University, Kwei-Shan, Taiwan
2009 - 2011	Chairman, Pathogenic Bacterial Research Center, Chang-Gung University, Kwei-Shan, Taiwan
1989 - 2005	Chairman and Professor, Department of Microbiology and Immunology, Chang-Gung University, Kwei-Shan, Taiwan
1986 - 1989	Director, Division of Molecular Biology, Development Center for Biotechnology, Taipei, Taiwan
1981 - 1986	Senior Scientist, Biotechnology Group, Chevron Chemical Company, Richmond, California, USA
1978 - 1981	NIH Postdoctoral Fellow, Department of Plant Pathology, University of California, Davis, California, USA
1972 - 1977	Teaching and Research Assistant, Department of Molecular Biology, University of California, Berkeley, California, USA
1977	Ph.D. Molecular Biology, University of California, Berkeley
1971	B.S. Botany, National Chung-Hsing University, Taiwan

研究方向

Epstein-Barr Virus

Our laboratory conducted a yeast-two hybrid study, which found the proteins that participate in protein sumoylation interacted with Rta. This finding motivated the study of Rta sumoylation, which ultimately determined that sumoylation increases the transactivation activity of Rta and activates the EBV lytic cycle, revealing that the posttranslational modification of Rta is important to EBV lytic development. Another protein that interacted with Rta in the yeast-two hybrid screen is an Sp1-binding protein, MCAF1. Rta is known to autoregulate transcription of its own gene, BRLF1. However, the promoter of the Rta gene lacks an Rta-binding site, and Rta cannot bind to the promoter directly to activate transcription. This autoregulation phenomenon has puzzled researchers for numerous years. Our study found that formation of an Sp1-MCAF1-Rta at Sp1 sites is the basis of the mechanism of autoregulation. Additionally, Rta and Zta commonly cooperate with each other and activate the transcription of EBV lytic genes synergistically. Although many hypotheses regarding this

phenomenon have been proposed, no experimental data have elucidated the mechanism that is responsible for the synergy. Our investigation shows that MCAF1 interacts with not only Rta but also Zta. The Rta-MCAF1-Zta complex binds to the Zta-response elements to activate transcription synergistically.

To study the function of EBV late genes, a mutant library of EBV was created by our work using a bacterial transposon and PCR targeting. Screening of the library revealed that an EBV lytic gene, BBLF1, is critical to lytic development. Our study found that the BBLF1 protein is post-translationally modified by myristoylation and pamitoylation. This protein interacts with, and retrieves, gp350/200 of EBV, a ligand that is necessary for the interaction of B lymphocytes cells, from the cytoplasmic membrane to the early endosome. PACS1 then interacts with the BBLF1 to retrieve gp350/220 to the TGN, where the EBV capsid acquires the Golgi membrane that contains gp350/200, which is then released from the cell.

This laboratory also established that BORF1 and BDLF1 are the two minor capsid proteins of EBV. These two proteins formed a triplex that contain a BDLF1 dimer and a BORF1 monomer. These two proteins in the triplex interact with VCA, the major capsid protein of EBV, generating a building block of the EBV capsid. The investigation also found the interaction regions in these proteins, establishing a foundation for future studies of the mechanism that participates in EBV capsid assembly.

Bacillus subtilis

Bacillus subtilis F29-3 exhibits two types of swarming behavior on soft agar. The bacteria form a colony that has a beautiful branching (dendritic) or a combination of uniform and dendritic patterns. The bacteria also swarm with an amazing velocity of 1 cm per hour, which is faster than that of many swarming bacteria that had been reported. This study develops a modeling explaining how the dendritic swarming is developed, and the purpose of this study is to investigate how this organism achieves this peculiar swarming behavior. The aims of this study include (1) the investigation of the genes that are involved in swarming, (2) the study of the differentiation of the bacteria during swarming, and (3) identifying the substances produced by the bacteria that promote dendritic swarming. This investigation will reveal the mechanism that regulates *B. subtilis* F29-3 swarming. The information will be important to the understanding on how bacteria swarm, a phenomenon that is important to bacterial pathogenesis.

著作

1. P.-J. Chang, and **S.-T. Liu**. 2001. Function of the Intercistronic Region of the BRLF1-BZLF1 Bicistronic mRNA in Translating the Zta Protein of the Epstein-Barr Virus. J. Virol. **75**:1142-1151.
2. C.-Y. Wu, J.-F. Fu, and **S.-T. Liu**. 2001. The replicon of pSW800 from *Pantoea stewartii*. Microbiology **147**:2757-2767.
3. H.-Y. Shu, G.-H Lin, Y.-C. Wu, J. S.-M. Tschen, and **S.-T. Liu**. 2002. Amino Acids Activated by Fengycin Synthetase FenE. Biochem. Bioph. Res. Co. **292**:789-793.
4. L.-K. Chang, T.-T. Wei, Y.-F. Chiu, C.-P. Tung, J.-Y. Chung, S.-K. Hung, C. Li, and **S.-T. Liu**. 2003. Inhibition of Epstein-Barr virus lytic cycle by (-)-epigallocatechin gallate. Biochem. Bioph. Res. Co. **301**:1062-1068.
5. L.-K. Chang, Y.-H. Lee, T.-S. Cheng, Y.-R. Hong, P.-J. Lu, J.-J. Wang, W.-H. Wang, C.-W. Kuo, Steven S.-L. Li, and **S.-T. Liu**. 2004. Posttranslational modification of Rta of Epstein-Barr virus by SUMO-1. J. Biol. Chem. **279**:38803-38812.

6. T.-P. Lin, C.-L. Chen, H.-C. Fu, C.-Y. Wu, G.-H. Lin, S.-H. Huang, L.-K. Chang, and **S.-T. Liu**. 2005. Functional analysis of fengycin synthetase FenD. BBA-Gene. Struct. Expr. **1730**:159-164.
7. L.-K. Chang, J.-Y. Chung, Y.-R. Hong, Takaya Ichimura, Mitsuyoshi Nakao, and **S.-T. Liu**. 2005. Activation of Sp1-mediated transcription by Rta of Epstein-Barr virus via an interaction with MCAF1. Nucleic Acids Res. **33**:6528-6539.
8. C. Li, R.-S. Chen, S.-K. Hung, Y.-T. Lee, C.-Y. Yen, Y.-W. Lai, R.-H. Teng, J.-Y. Huang, Y.-C. Tang, C.-P. Tung, T.-T. Wei, Biehuoy Shieh, **S.-T. Liu**. 2006. Detection of Epstein-Barr virus infection and gene expression in human tumors by microarray analysis. J. Virol. Methods. **133**:158-166.
9. **S.-T. Liu**, W.-H. Wang, Y.-R. Hong, J.-Y. Chuang, P.-J. Lu, L.-K. Chang. 2006. Sumoylation of Rta of Epstein-Barr virus is preferentially enhanced by PIASxb. Virus. Res. **119**:163-170.
10. C.-Y. Wu, C.-L. Chen, Y.-H. Lee, Y.-C. Cheng, Y.-C. Wu, H.-Y. Shu, F. Götz, and **S.-T. Liu**. 2007. Nonribosomal Synthesis of Fengycin on an Enzyme Complex Formed by Fengycin Synthetases. J. Biol. Chem. **282**:5608-5616.
11. Y.-F. Chiu, C.-P. Tung, Y.-H. Lee, W.-H. Wang, C. Li, J.-Y. Hung, C.-Y. Wang, and **S.-T. Liu**. 2007. A Comprehensive Library of Mutations of Epstein-Barr Virus. J. Gen. Virol. **88**:2463-2472.
12. M.-H. Lin, and **S.-T. Liu**. 2008. Stabilization of pSW100 from *Pantoea stewartii* by F conjugation system. J. Bacteriol. **190**:3681-3689.
13. L.-K. Chang, **S.-T. Liu**, C.-W. Kuo, W.-H. Wang, J.-Y. Chuang, E. Bianchi, and Y.-R. Hong. 2008. Enhancement of Transactivation Activity of Rta of Epstein-Barr Virus by RanBPM. J. Mol. Biol. **379**:231-242.
14. Y.-H. Lee, Y.-F. Chiu, W.-H. Wang, L.-K. Chang, and **S.-T. Liu**. 2008. Activation of the ERK signal transduction pathway by Epstein-Barr virus immediate-early protein Rta. J. Gen. Virol. **89(10)**:2437-2446.
15. W.-J. Ke, B.-Y. Chang, T.-P. Lin, and **S.-T. Liu**. 2009. Activation of the Promoter of the Fengycin Synthetase Operon by the UP Element. J. Bacteriol. **191(14)**:4615-4623.
16. C.-Y. Yen, M.-C. Lu, C.-C. Tzeng, J.-Y. Huang, H.-W. Chang, R.-S. Chen, S.-Y. Liu, **S.-T. Liu**, B. Shieh, and C. Li. 2009. Detection of EBV Infection and Gene Expression in Oral Cancer from Patients in Taiwan by Microarray Analysis. J. Biomed Biotechnol. Volume 2009, Article ID 904589, 15 pages, doi:10.1155/2009/904589.
17. L.-K. Chang, J.-Y. Chuang, Mitsuyoshi Nakao, and **S.-T. Liu**. 2010. MCAF1 and synergistic activation of the transcription of Epstein-Barr virus lytic genes by Rta and Zta. Nucleic Acids Res. **38(14)**:4687-4700. doi:10.1093/nar/gkq243.
18. Y.-C. Wu, and **S.-T. Liu**. 2010. A Sequence That Affects the Copy Number and Stability of pSW200 and ColE1. J. Bacteriol. **192(14)**:3654-3660.
19. W.-H. Wang, L.-K. Chang, and **S.-T. Liu**. 2011. Molecular interactions of Epstein-Barr virus capsid proteins. J. Virol. **85(4)**:1615-1624.
20. M.-H. Lin, F.-R. Chang, M.-Y. Hua, Y.-C. Wu, and **S.-T. Liu**. 2011. Inhibitory effects of 1,2,3,4,6-penta-*O*-galloyl-β-D-glucopyranose on biofilm formation by *Staphylococcus aureus*. Antimicrob. Agents Ch. **55(3)**:1021-1027.
21. C.-W. Kuo, W.-H. Wang, and **S.-T. Liu**. 2011. Mapping Signals that Are Important for Nuclear and Nucleolar Localiztion in MCRS2. Mol. Cells **31(6)**:547-552.
22. C.-P. Tung, F.-R. Chang, Y.-C. Wu, D.-W. Chuang, A. Hunyadi, and **S.-T. Liu**. 2011. Inhibition of the Epstein-Barr virus lytic cycle by protoapigenone. J. Gen. Virol. **(In press)**