CHEMICAL HERITAGE FOUNDATION

FENYONG LIU

The Pew Scholars Program in the Biomedical Sciences

Transcript of an Interview Conducted by

Robin Mejia

at

University of California, Berkeley Berkeley, California

on

1, 2, and 3 November 2005

From the Original Collection of the University of California, Los Angeles

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FENYONG LIU

Born in Guangzhou, China

Education

1986 1989 1992	B.S., Biology, University of Science and Technology of China M.S., Biochemistry and Molecular Biology, University of Chicago Ph.D., Biochemistry and Molecular Biology, University of Chicago,	
Professional Experience		
1992	Bristol-Myers Squibb Pharmaceutical Research Institute Visiting Scientist for Postdoctoral Internship, Department of Virology	
1992-1995	Yale University Postdoctoral Fellow with Dr. Sidney Altman, Department of Biology	
1996-2001 2001-2005 2005-present 2006-present	University of California at Berkeley Assistant Professor, School of Public Health Associate Professor (with tenure), School of Public Health Professor, School of Public Health Professor and Chair, Program in Comparative Biochemistry	
	Honors	
1986	University Fellowship, Chicago Medical School	
1987	University of Chicago Fellowship, University of Chicago	
1993	Parke-Davis Postdoctoral Fellowship of Life Sciences Research Foundation	
1997	Basil O'Conner Starter Scholar Award, March of Dimes National Birth Defects Foundation	
1997	Liu Tianhong Foundation Memorial Visiting Professorship, College of Life Sciences, Hsing Hua University, Beijing, P. R. China	
1997	Regent's Junior Faculty Fellowship (University of California)	
1998	Hellman Family Faculty Award, University of California at Berkeley	
1998-2002	Pew Scholar of Biomedical Sciences	
2001	Established Investigator Award, American Heart Association	

Selected Publications

- Liu, F., and Roizman, B. (1991). The promoter, transcriptional unit, and coding sequence of herpes simplex virus 1 family 35 proteins are contained within and in frame with the UL26 open reading frame. *J. Virol.* 65: 206-212.
- Liu, F., and Roizman, B. (1991). The herpes simplex virus 1 gene encoding a protease also contains within its coding domain the gene encoding the more abundant substrate. *J. Virol.* 65: 5149-5156.
- Liu, F., and Roizman, B. (1992). Differentiation of multiple domains in the herpes simplex virus 1 protease encoded by the UL26 gene. *Proc. Natl. Acad. Sci. LISA*. 89: 2076-2080.
- Dilanni, C. L., Drier, D. A., Deckman, I. C., McCann III, P. J., Liu, F., Roizman, B., Colonno, R. J. and Cordingley, M. G. (1993). Identification of the herpes simplex virus 1 protease cleavage sites by direct sequence analysis of autoproteolytic cleavage products. *J. Biol. Chem.* 268: 2048-2051.
- Liu, F., and Roizman, B. (1993). Characterization of the protease and of other products of the amino terminus proximal cleavage of the herpes simplex virus 1 UL26 protein. *J. Virol.* 67, 1300-1309.
- Liu, F., and Altman, S. (1994). Differential evolution of substrates for an RNA enzyme in the presence and absence of its protein cofactor. *Cell*, 77, 1093-1100.
- Liu, F., and Altman, S. (1995). Inhibition of viral gene expression by the catalytic RNA subunit of RNase P for *Escherichia coli*. *Genes & Development*, 9, 471-480.
- Liu, F., and Altman, S. (1996). Requirements for cleavage by a modified RNase P of a small model substrate. *Nucleic Acids Res.* 24, 2690-2696.
- Kim, J., Kilani, A., Zhan, X., Altman, S., and Liu, F. (1997). The protein cofactor allows the sequence of an RNase P ribozyme to diversify by maintaining the catalytically active structure of the enzyme. *RNA*, 3, 613-623.
- Yuan, Y., and Liu, F. (1998). Targeted cleavage of RNA using eukaryotic RNase P and external guide sequences. In Therapeutic applications of ribozymes. Edited by K. J. Scanlon, *Methods in Molecular Medicine*. Humana Press, New Jersey. p397-414.
- Kawa, D., Wang, J., Yuan, Y., and Liu, F. (1998). Inhibition of viral gene expression by human ribonuclease P. *RNA*. 4: 1397-1406.
- Chen, D., Jiang, H., Lee, M., Liu, F., and Zhou, H. (1999). Three-dimensional visualization of tegument/capsid interactions in intact human cytomegalovirus. *Virology*, 260, 10-16.
- Kilani, A. F. and Liu, F. (1999). UV-crosslink mapping of the substrate-binding site of RNase P ribozyme to a target mRNA sequence. *RNA*, 5, 1235-1247.
- Trang, P., Hsu, A., and Liu, F. (1999). Nuclease footprint analyses of the interactions between RNase P ribozyme and a model mRNA substrate. *Nucleic Acids Res.* 27, 4590-4597.
- Zhan, X., Abenes, G., Lee, M., VonReis, I., Kittikarookoon, C., Ross-Macdonald, P., Snyder, M., and Liu, F. (2000). Mutagenesis of murine cytomegalovirus using a Tn3-based transposon. *Virology*, 266, 264- 274.
- Kilani, A. F., Trang, P., Jo, S. Hsu, A., Kim, J., Nepomuceno, E., and Liu, F. (2000). RNase P ribozymes selected in vitro to cleave a viral mRNA effectively inhibit its expression in cell

culture. J. Biol. Chem., 275, 10611-10622.

- Wang, J., Jiang, H., and Liu, F. (2000). In vitro selection of novel RNA ligands that bind human cytomegalovirus and block viral infection. *RNA*, 6, 571-583.
- Trang, P., Lee, M., Nepomuceno, E., Kim, J., Zhu, H., and Liu, F. (2000). Effective inhibition of human cytomegalovirus gene expression and replication by a RNase P ribozyme. *Proc. Natl. Acad. Sci. LISA*, 97, 5812-5817.
- Liu, F., Wang, J., and Trang, P. (2000). In vitro selection of substrates by RNase P ribozymes. *Methods in Enzymology*, Vol 318, 238-250.
- Zhan, X., Lee, M., Xiao, J., and Liu, F. (2000). Construction and characterization of murine cytomegalovirus mutants that contain a transposon insertion at open reading frames m09 and M83. *J. Virol.* 74, 7411-7421.
- Hsu, A. W., Kilani, A. F., Liou, K., Lee, J., and Liu, F. (2000). Differential effects of the protein cofactor on the interactions between an RNase ribozyme and its target mRNA substrate. *Nucleic Acids Res.* 28, 3105-3116.
- Trang, P., Kilani, A. F., Lee, J., Kim, J., and Liu, F. (2000). A ribozyme derived from the catalytic subunit of RNase P from *Escherichia coli* is highly effective in inhibiting replication of herpes simplex virus 1. *J. Mol. Biol.*, 301, 817-826.
- Xiao, J., Tong, T., Zhan, X., Haghjoo, E., and Liu, F. (2000) In vitro and in vivo characterization of a murine cytomegalovirus with a transposon insertional mutation at open reading frame M43. *J. Virol.*, 74, 9488-9497.
- Lee, M., Xiao, J., Haghjoo, E., Tong, T., Abenes, G., Zhan, X., Dunn, W., and Liu, F. (2000) Murine cytomegalovirus containing a mutation at open reading frame M37 is severely attenuated in growth and virulence in vivo. *J. Virol.* 74, 11099-11107.
- Abenes, G., Haghjoo, E., Lee, M., Tong, T., Zhan, X., and Liu, F. (2001) Murine cytomegalovirus open reading frame M27 plays an important role in viral growth and virulence in mice. *J. Virol.* 65, 1697-1707.
- Trang, P., Lee, J., Kilani, A. F., Kim, J., and Liu, F. (2001) Effective inhibition of herpes simplex virus 1 gene expression and growth by engineered RNase P ribozyme. *Nucleic Acids Res*, 29, 5071-5078.
- Dunn, W., Trang. P., Kahn, U., Nassi, A., and Liu, F. (2001). RNase P-mediated inhibition of cytomegalovirus protease expression and viral DNA encapsidation by oligonucleotide external guide sequences. *Proc. Natl. Acad. Sci. LISA*, 98, 14831-14836.
- Trang, P., Hsu, A., Zhou, T., Lee, J., Kilani, A. F., Nepomuceno, E., and Liu, F. (2002). Engineered RNase P ribozymes inhibit gene expression and growth of cytomegalovirus by increasing rate of cleavage and substrate binding. *J. Mol. Biol.* 315, 573-586.
- Zhou, T., Kim, J., Kim, K., Kilani, A. F., Dunn, W., Jo, S., Nepomuceno, E., and Liu, F. (2002). In vitro selection of external guide sequences for RNase P-mediated inhibition of viral gene expression. *J. Biol. Chem.* 277, 30112-30120.
- Trang, P., Kilani, A., Lee, J., Hsu, A., Liou, K., Khan, U., Nassi, A., and Liu, F. (2002). (Review) RNase P ribozymes for the studies and treatment of human herpesvirus infections. *Journal of Clinical Virology*, 25, 63-74.
- Lee, M., Abenes, G., Zhan, X., Xiao, J., Dunn, W., Haghjoo, E., Tong, T., Kim, J., Tam, A., and Liu, F. (2002) (Review). Genetic analyses of gene function and pathogenesis of murine cytomegalovirus by transposon-mediated mutagenesis. *Journal of Clinical Virology*, 25, 111-122.

- Zhu, J., Chen, J., Hai, R., Tong, T., Xiao, J., Zhan, X., Lu, S., and Liu, F. (2003). In vitro and in vivo characterization of a murine cytomegalovirus with mutation at open reading frame m166. *J. Virol.* 77, 2882-2891.
- Trang, P., KimK., Zhu, J., and Liu, F. (2003). Expression of a RNase P ribozyme against the mRNA encoding human cytomegalovirus protease inhibits viral capsid protein processing and growth. *J. Mol. Biol.* 328, 1123-1135..
- Tam, A., Zhu, J., Hai, R., Haghjoo, E., Zhou, T., Zhan, X., and Liu, F. (2003). Murine cytomegalovirus with a transposon insertional mutation at open reading frame M35 is defective in growth in vivo. *J. Virol.* 77, 7745-7755.
- Singh, R., Haghjoo, E., and Liu, F. (2003). Cytomegalovirus M43 gene modulates T helper cell response. Immunol Lett. 88, 31-5.
- Zou, H., Lee, J., Umamoto, S., Kilani, A. F., KimJ., Trang, P., and Liu, F. (2003). Engineered RNase P ribozymes are efficient in cleaving a human cytomegalovirus mRNA in vitro and are effective in inhibiting viral gene expression and growth in human cells. *J. Biol. Chem.*, 278, 37265-37274.
- Raj, M. L. S., and Liu, F. (2003) (review). Engineering of RNase P for gene-targeting applications. *Gene.* 313, 59-69.
- Dunn, W., Chou, C., Li, H., Hai, R., Patterson, D., Stolc, V., Zhu, H., and Liu, F. (2003). Functional profiling of human cytomegalovirus genome*Proc. Natl. Acad. Sci. LISA.* 100, 14223-14228.
- Zou, H., Chan, K., Trang, P., and Liu, F. (2004). (Book chapter). General design and construction of RNase P ribozymes for gene-targeting applications. In Catalytic Nucleic Acids. Edited by M. Sioud and J. Walker, *Methods in Molecular Medicine*. Vol. 252, p385-398. Humana Press, New Jersey.
- Kim, K., and Liu, F. (2004). (Book chapter). In vitro selection of RNase P ribozymes that efficiently cleave a target mRNA. In Catalytic Nucleic Acids. Edited by M. Sioud and J. Walker, *Methods in Molecular Medicine* Vol. 252, p399-412. Humana Press, New Jersey.
- Raj, M. L., and Liu, F. (2004). (Book chapter). *In vitro* selection of external guide sequences for directing human RNase P to cleave a target mRNA. In Catalytic Nucleic Acids. Edited by M. Sioud and J. Walker, *Methods in Molecular Medicine*. Vol 252, p413-424. Humana Press, New Jersey.
- Dunn, W., and Liu, F. (2004). (Book chapter). RNase P-mediated inhibition of viral growth by exogenous administration of short oligonucleotide external guide sequence. In Catalytic Nucleic Acids. Edited by M. Sioud and J. Walker, *Methods in Molecular Medicine*. Vol 252, p425-436. Humana Press, New Jersey.
- Trang, P. and Liu, F. (2004). (Book chapter). RNAse P ribozyme as an antiviral agent against human cytomegalovirus. In Catalytic Nucleic Acids. Edited by M. Sioud and J. Walker, *Methods in Molecular Medicine*. Vol. 252, p437-450. Humana Press, New Jersey.
- KimK., Umamoto, S., Trang, P., Hai, R., and Liu, F. (2004). Intracellular expression of engineered RNase P ribozymes effectively blocks gene expression and replication of human cytomegalovirus. *RNA*, 10, 438-447.
- McGregor, A., Liu, F., and Schleiss, M. R. (2004). Identification of essential and non-essential genes of the guinea pig cytomegalovirus (GPCMV) genome via transposome mutagenesis of an infectious BAC clone. Virus Res. 101, 101-8.
- Trang, P., Kim, K., and Liu, F. (2004) (Invited review). Developing RNase P ribozymes for

gene-targeting and antiviral therapy. Cellular Microbiology, 6, 499-508.

- Abenes, G., Chan, K., Haghjoo, K., Zhu, J., Lee, M., Zhou, T., Tong, T., and Liu, F. (2004). A murine cytomegalovirus with a transposon insertional mutation at open reading frame m155 is attenuated in growth and virulence in immunodeficient hosts. *J. Virol.* 78, 6891-6899.
- Zhu, J., Trang P., Kim, K., Zhou, T., Deng, H., and Liu, F. (2004). RNase P cleavage of Rta mRNA of Kaposi's sarcoma-associated herpesvirus effectively inhibits viral global gene expression and growth. *Proc. Natl. Acad. Sci. LISA*. 101, 9073-9078.
- KimK., Trang, P., Umamoto, S. Hai, R., and Liu, F. (2004). RNase P ribozyme inhibits cytomegalovirus replication by blocking the expression of viral capsid proteins. *Nucleic Acids Res.*, 32, 3427-34.
- Lee, M., and Liu, F. (2004). (Book chapter). Genetic analysis of cytomegalovirus using shuttle mutagenesis. In DNAViruses: Methods and Protocols. Edited by Lieberman, P., *Methods in Molecular Biology*. Humana Press, New Jersey. 292, 371-386.
- Zou, H., Lee, J., Kilani, A. K., Kim, K., Trang, P., Kim, J., Liu, F. (2004). Engineered RNase P ribozymes increase their cleavage activities and efficacies in inhibiting viral gene expression in cells by enhancing the rate of cleavage and binding of the target mRNA. *J. Bio. Chem.* 279, 32063 - 32070.
- McGregor, A., Liu, F., and Schleiss, M. R. (2004). Molecular, biological, and in vivo characterization of the guinea pig cytomegalovirus homologs of the HCMV matrix proteins pp71 (UL82) and pp65 (UL83). *J. Virol.* 78, 9872-9889.
- Lodoen, M., Abenes, G., Umamoto, U., Houchins, J. P., Liu, F., and Lanier, L. L. (2004). The Cytomegalovirus m155 Gene Product Subverts NK cell Antiviral Protection by Disruption of H60-NKG2D Interactions. J. Exp. Med. 200, 1075-1081.
- Yu, X., Shah, S., Atanasov, I., Lo, P., Liu, F., Britt, W., and Zhou, Z. H. (2005). Threedimensional localization of smallest capsid protein in human cytomegalovirus capsid. *J. Virol.* 79, 1327-1332.
- Netterwald, J., Yang, S., Wang, W., Ghanny, S., Cody, M., Soteropoulos, P., Bin, T., Dunn, W., Liu, F., and Zhu, H. (2005). Two VRS elements in the human cytomegalovirus major immediate-early promoter/enhancer are important for viral replication. *J. Virol.* 79, 5035-46.
- Yu, X., Trang, P., Shah, S., Atanasov, I., Bai, Y., Zhou, Z. H. and Liu, F. (2005). Dissecting human cytomegalovirus gene function and capsid maturation by ribozyme targeting and electron cryomicroscopy. *Proc. Natl. Acad. Sci. LISA*, 102, 7103-7108.
- Dunn, W., Trang, P., Zhong, Q., Yang, W., van Belle, C., Bai, Y., and Liu, F. (2005). Human cytomegalovirus expresses novel microRNAs during productive viral infections. *Cell Micro.*, 7, 1684-1695.
- Liu, F., and Zhou, Z. H. (2006). (Book chapter). Comparative virion structures of human herpesviruses. In Human herpesviruses: pathogenesis, therapeutics, and immunophalactics. Edited by Arvin, A., Mocarski, E., Moore, P., Roizman, B., Whitley, R., Yamaguchi, P. Cambridge University Press, New York. In press.
- Li, H., Trang, P., Kim K., Zhou, T., Umamoto, S., and Liu, F. (2005). Effective inhibition of human cytomegalovirus gene expression and growth by intracellular expression of external guide sequence RNA. *RNA*. in press.
- Trang, P. and Liu, F. (2006). (Book chapter). Mapping the regions of RNase P catalytic RNA that are potentially in close contact with its protein cofactor. In RNA Protein Interaction Protocols. The 2nd edition. Edited by Lin, R., *Methods in Molecular Biology*. Humana Press,

New Jersey. In press.

- RoizmanB. and Liu, F. (1995). Methods and compositions for the preparation and use of a herpes protease. U.SPatent No. 5,478,727. (December 26, 1995), U.S. Patent and Trademark Office.
- YuanY. Guerrier-Takada, C. Altman, S. and Liu, F. (1997). Targeted cleavage of RNA using eukaryotic ribonuclease P and external guide sequence. U.S. Patent No. 5,624,824 (April 29, 1997). U.SPatent and Trademark Office.
- Yuan, Y. Guerrier-Takada, C. Altman, S. and Liu, F. (1998). Targeted cleavage of RNAusing eukaryotic ribonuclease P and external guide sequence. U.S. Patent No. 5,728,521 (March 17, 1998). U.SPatent and Trademark Office.
- Yuan, Y. Guerrier-Takada, C. Altman, S. and Liu, F. (1999). Targeted cleavage of RNAusing ribonuclease P and external guide sequence. U.S. Patent No. 5,869,248 (February 9, 1999). U.SPatent and Trademark Office.
- Liu, F., Wang, J., and Jiang, H. (2005). A method to generate nucleic acid ligands that bind herpesviruses and inhibit their infection. U.S. Patent No. 6,849,610 (February 1, 2005). U.S Patent and Trademark Office.
- Liu, F., Dunn, W., and Chou, C. (2003). Cytomegalovirus gene function and methods for developing antivirals, anti-CMV vaccines, and CMV-based vectors. Submitted to the U.S Patent and Trademark Office (7/25/2003).

ABSTRACT

Fenyong Liu was born and raised in Guangzhou, China during the Cultural Revolution. Early on in life he knew that he wanted to pursue science as his career, learning English during junior high school and having influential teachers while attending high school in Guangzhou. After passing the university entrance examinations, Liu matriculated at the prestigious University of Science and Technology of China. Initially he decided to pursue physics, but then transferred to the biology program after two years of study.

Encouraged by his professors, Liu decided to attend graduate school in the United States at the University of Chicago, briefly spending time in the Medical School before transferring into the Biochemistry and Molecular Biology program, where he worked with Richard Roller and Bernard Roizman. While his initial research focused on the biochemistry of viral DNA replication, Liu focused in the last years of his doctoral study on the genetics of the herpes virus capsid protein; his research resulted in a patent and created intense interest from the pharmaceutical industry.

He followed up his graduate research with postdoctoral positions at Bristol-Myers Squibb Pharmaceutical Research Institute and Yale University, where he worked with Sidney Altman on the inhibition of antiviral gene expression. Liu discusses his wife (also a scientist) and family as well as balancing family commitments and career, especially during the period when he became a principal investigator at University of California, Berkeley. His current research in molecular biology and virology has focused on cytomegalovirus infection; during the interview he describes his typical workday and both his laboratory management style as well as the multiple roles he plays as a principal investigator. The interview concludes with Liu's reflections on his various scientific mentors and on his wife's career trajectory and the difficulties of being a woman in science. Liu concludes his interview by reflecting on his various scientific mentors.

UCLA INTERVIEW HISTORY

INTERVIEWER:

Robin Mejia, Interviewer, UCLA Oral History Program; B.A., Biology, University of California, Santa Cruz, 1997.

TIME AND SETTING OF INTERVIEW:

Place: Liu's office at the University of California, Berkeley.

Date: November 1, 2 and 3, 2005.

Total number of recorded hours: 6.

Persons present during interview: Liu and Mejia.

CONDUCT OF INTERVIEW:

This interview is one in a series with Pew Scholars in the Biomedical Sciences conducted by the UCLA Oral History Program in conjunction with the Pew Charitable Trusts' Pew Scholars in the Biomedical Sciences Oral History and Archives Project. The project has been designed to document the backgrounds, education, and research of biomedical scientists awarded four-year Pew scholarships since 1988.

To provide an overall framework for project interviews, the director of the UCLA Oral History Program and three UCLA faculty project consultants developed a topic outline. In preparing for this interview, Mejia contacted Liu by telephone and email to obtain Liu's curriculum vitae and agree on an interviewing schedule. Mejia also reviewed Liu's web site and published papers and reviewed the documentation from Liu's file at the Pew Scholars Program office in San Francisco, including his proposal application and letters of recommendation.

ORIGINAL EDITING

Carol Squires edited the interview. She checked the verbatim transcript of the interview against the original tape recordings, edited for punctuation, paragraphing, and spelling, and verified proper names. Words and phrases inserted by the editor have been bracketed.

Liu reviewed the transcript. He verified proper names and made a number of corrections and additions.

Carol Squires prepared the table of contents. Technitype Transcribing compiled the guide to proper names.

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