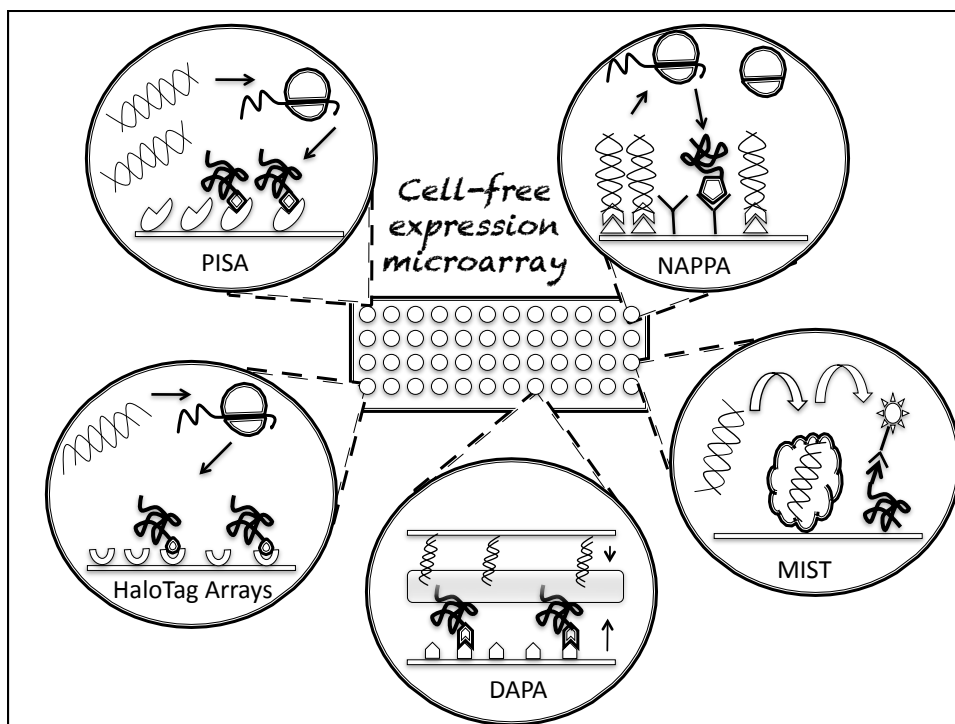


Proteomics Course

LECTURE-34 Applications of cell free protein microarrays



Dr. Sanjeeva Srivastava
IIT Bombay



Lecture outline

- An overview of protein microarray experiment
- Applications
 - Biomarker screening
 - Immunological studies
 - Protein-protein interactions
- Challenges of data analysis: discussion

An overview of protein microarray experiment

Applications

I. Biomarker identification

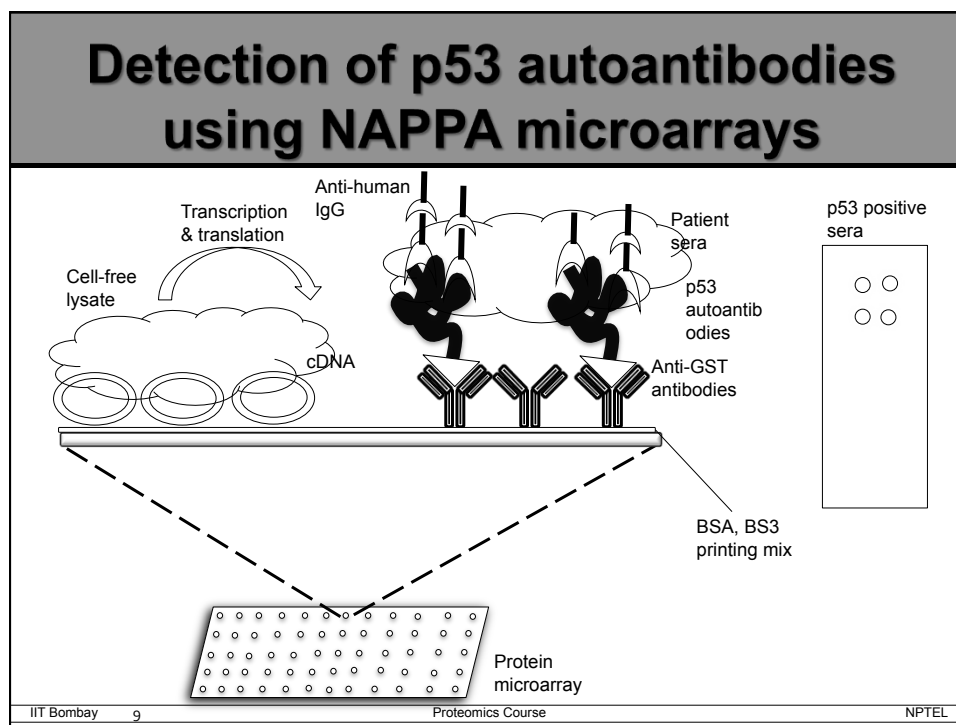
Biomarker discovery using protein microarrays

- Protein microarrays have greatly accelerated biomarker discovery by simultaneous and rapid investigation of thousands of proteins
- Biomarkers have potential for –
 - early identification of disease state
 - monitoring treatment
 - following disease prognosis

Case study-1

Detection of p53 autoantibodies using NAPPA microarrays

Anderson, K. A., Ramachandran, N., Wong, J., Raphael, J. V. et al., Application of protein microarrays for multiplexed detection of antibodies to tumor antigens in breast cancer. J. Proteome Res. 2008, 7, 1490–1499

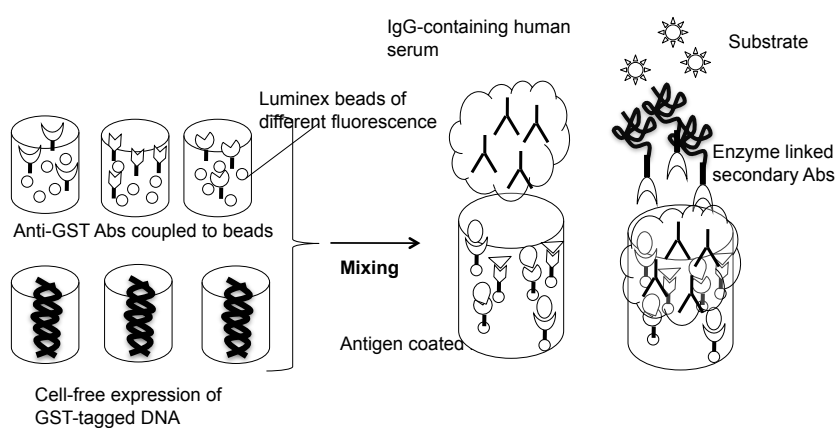


Case study-2

Bead-based assay for multiplexed detection of antibodies to EBNA-1 and p53

Wong, J., Sibani, S., Lokko, N. N., LaBaer, J., Anderson, K. S., Rapid detection of antibodies in sera using multiplexed self-assembling bead arrays. J. Immunol. Methods 2009, 350, 171–182.

multiplexed detection of antibodies to EBNA-1 and p53



II. Immunological studies

Case study-3

Detection of potential immunogenic proteins of *Plasmodium falciparum*

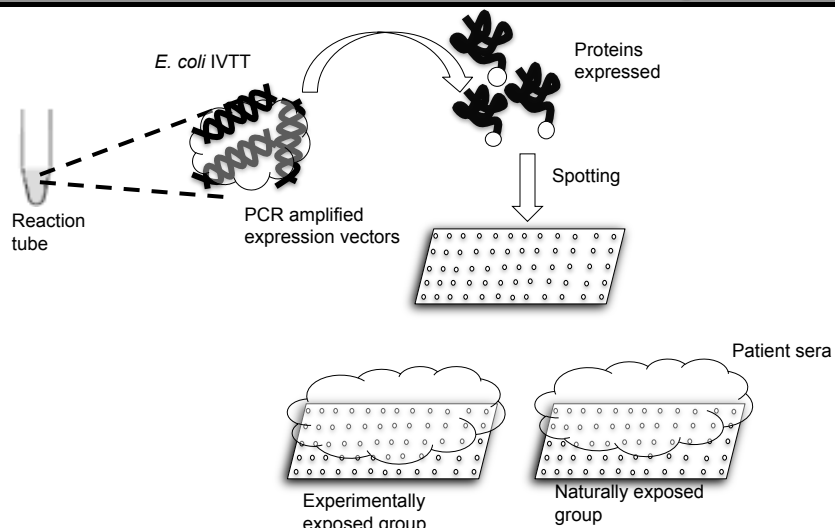
Doolan, D. L., Mu, Y., Unal, B., Sundaresh, S. et al., Profiling humoral immune responses to *P. falciparum* infection with protein microarrays. *Proteomics* 2008, 8, 4680–4694.

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Detection of potential immunogenic proteins of *Plasmodium falciparum*



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Case study-4

Identification of immunogens of Q-fever-causing *Coxiella burnetii*

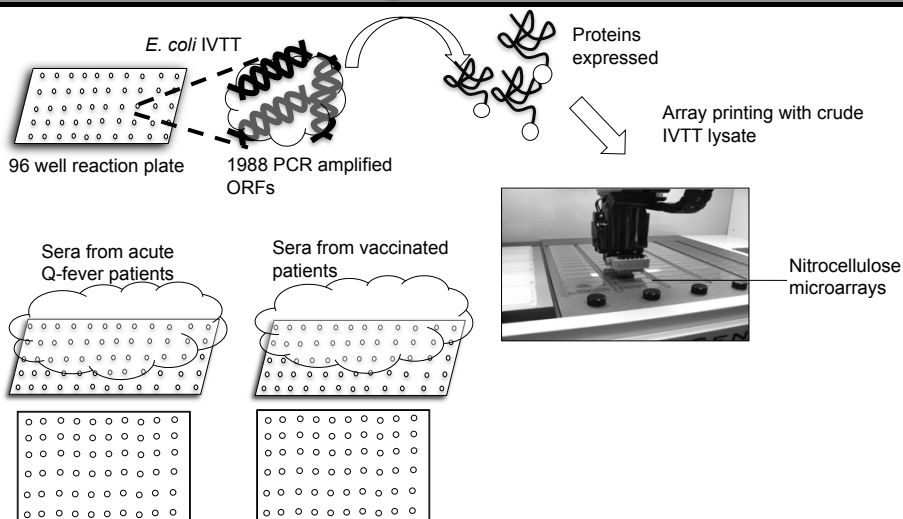
Beare, P. A., Chen, C., Bouman, T., Pablo, J. et al., Candidate antigens for Q fever serodiagnosis revealed by immunoscreening of a *Coxiella burnetii* protein microarray. *Clin. Vaccine Immunol.* 2008, 15, 1771–1779.

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Identification of immunogens of Q-fever-causing *Coxiella burnetii*



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III. Protein Interaction

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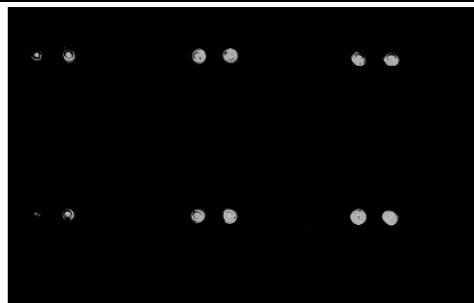
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Protein-protein interactions (Jun-Fos)

CDK2	CDK2	CDK4	CDK4	CDK2	CDK2	CDK4	CDK4	CDK2	CDK2	CDK4	CDK4
JUN	JUN	p53	p53	JUN	JUN	p53	p53	JUN	JUN	p53	p53
p21	p21	pCITE	pCITE	p21	p21	pCITE	pCITE	p21	p21	pCITE	pCITE
water	water	MM	MM	water	water	MM	MM	water	water	MM	MM

CDK2	CDK2	CDK4	CDK4	CDK2	CDK2	CDK4	CDK4	CDK2	CDK2	CDK4	CDK4
JUN	JUN	p53	p53	JUN	JUN	p53	p53	JUN	JUN	p53	p53
p21	p21	pCITE	pCITE	p21	p21	pCITE	pCITE	p21	p21	pCITE	pCITE
water	water	MM	MM	water	water	MM	MM	water	water	MM	MM

Fos query protein
(binding with Jun)



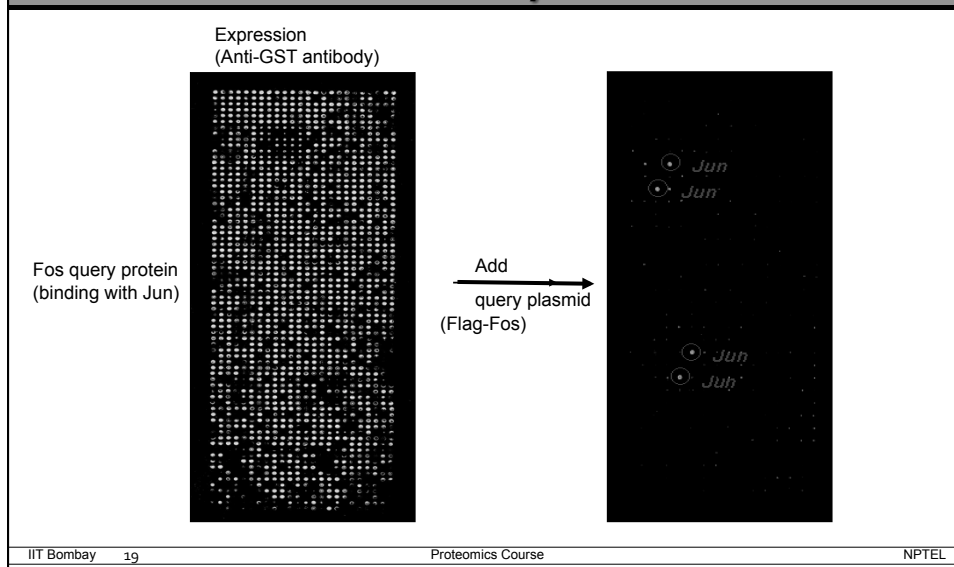
Fos query

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Protein-protein interactions (Jun-Fos)

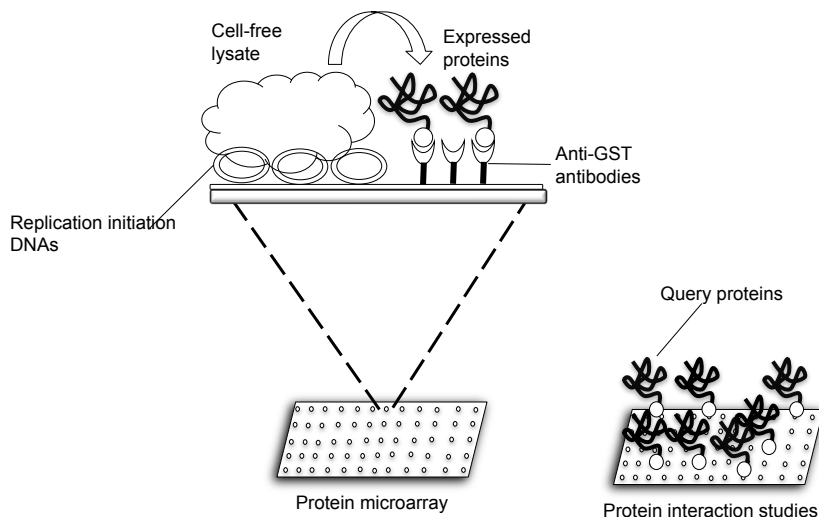


Case study-5

Identification of novel protein-protein interactions using NAPPA microarray

Ramachandran, N., Hainsworth, E., Bhullar, B., Eisenstein, S. et al., Self-assembling protein microarrays. Science 2004, 305, 86-90.

Protein interaction studies



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Case study-6

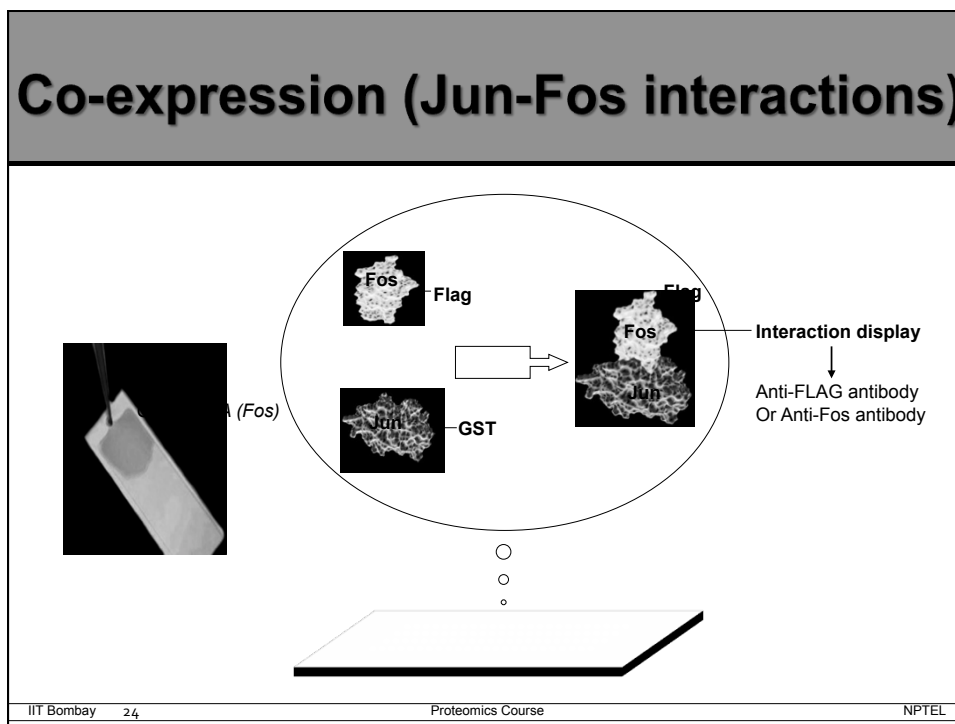
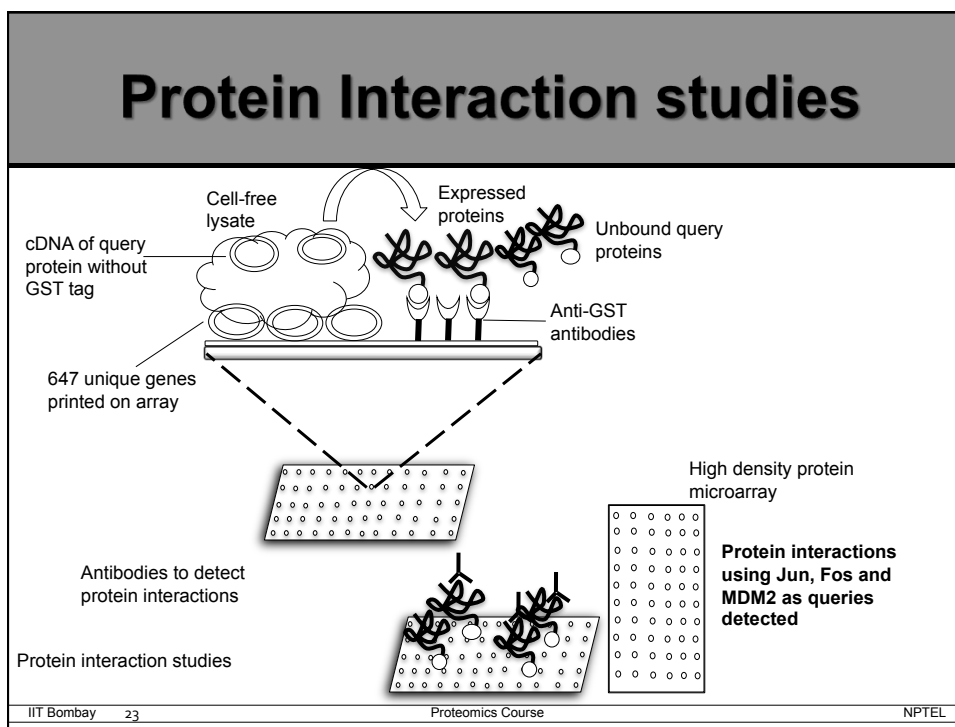
High density NAPPA array approach for studying well characterized gene pairs

Ramachandran, N., Raphael, J. V., Hainsworth, E., Demirkan, G. et al., Next-generation high-density self-assembling functional protein arrays. *Nat. Methods* 2008, 5, 535–538.

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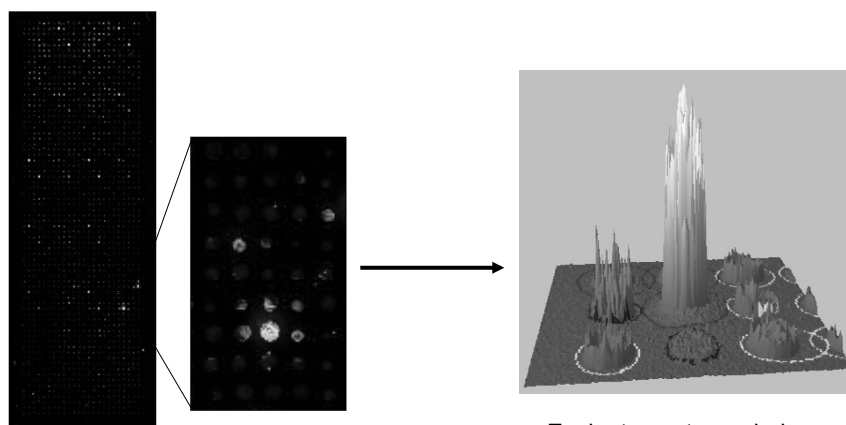
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NPTEL

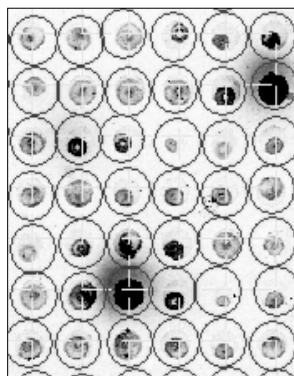
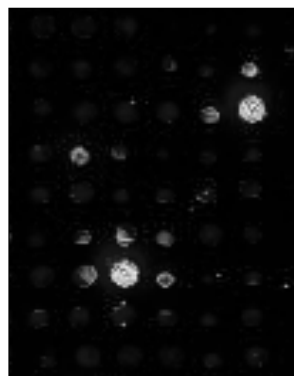


Microarray data analysis challenges

Image analysis



Issues in microarray data analysis



Microarray data analysis challenges: discussion

Summary

- An overview of protein microarray experiment
- Applications
 - Biomarker screening
 - Immunological studies
 - Protein-protein interactions
- Challenges of data analysis: discussion

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