Proteomics

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Proteomics defines the study of proteins in the cells

Proteomics = Proteins + omics  
omics = study  
Identification and analysis of entire protein content

Central Dogma
One gene is not equal to one protein

**Genome**
all genes in an organism

**Transcriptome**
all transcripts in an organism

**Proteome**
all proteins in an organism

- alternate splicing
- mRNA editing
- alternate promoters

- proteolysis
- post-translational modifications
Proteomics can tell a lot of things

• protein identification
• protein function
• protein expression levels
• post-translational modifications
• protein localization and compartmentalization
• protein-protein interactions
Old proteomics using 2D Gel Electrophoresis

1. Protein Sample
2. pH 9.0
3. Isoelectric Focusing (IEF)
4. pH 4.0
5. SDS electrophoresis
6. pH 4.0
7. pH 9.0
8. 220 kDa
9. 10 kDa
New generation proteomics uses mass spectrometry

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Applications of Proteomics

• Characterize protein - molecular weight and structural information
• Protein fingerprinting, Peptide mass fingerprinting - gives a set of peptides
• Identification of disease related biomarkers - diagnostic tool
Identification of disease biomarkers
Identifying interactions of a favorite protein

1. Plasmid encoding protein of interest with affinity tag
2. Transfect tagged protein of interest
3. Express protein of interest
4. Cell lysis
5. Add beads to capture tag
6. Elution of bound proteins
7. Identify proteins with LC-MS measurement
8. Bait
9. beads with Ab
10. interacting proteins
11. irrelevant proteins
12. Empty plasmid with affinity tag as control
13. human cell
Identification of protein-protein interaction
Questions