Bioinformatics in Cancer Research

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What is Cancer?

- Youtube Animated Video
Bioinformatics

As a tool for Cancer researchers
Proteonomics

- Large scale study of proteins, focusing mainly in their structure and function
DNA Microarrays

- Collection of microscopic DNA spots attached to a solid surface.
- Used mainly to measure gene expression.
- It contains pieces of a gene or a DNA sequence.
- Can accomplished many tasks in parallel.
Application of DNA Microarrays

• Identifying genetic individuality in tissues or organisms or genotyping.

• Investigating cellular state and processes.

• Diagnosis of genetic disease.

• Diagnosis of infectious disease.

• Specialized diagnosis of disease.
Application of DNA Microarrays

- Genetic warning signs.
- Drug selection.
- Target selection for drug design.
- Pathogen resistance.
- Measuring temporal variations in protein expression.
Mass Spectrometry

- Measures the mass-to-charge ratio of molecules.
- Useful for rapid identification of the components of proteins.
- Partial sequencing of proteins and nucleic acids.
Bioinformatics

In Cancer diagnosis and treatment design
Diagnosis of Disease

- DNA sequence can detect the absence of a gene or mutation. Disease risks.

- Identification of gene sequences associated with disease will permit fast and reliable diagnosis of conditions (Huntington Disease).

- Relationship between genotype and disease risk is difficult to established.

- Analysis of protein expression, in the case of asthma, can help.
Genetics of Responses to Therapy

• Customized treatment.

• Pharmacogenomics.

• Avoid experimenting with different therapies.
Identification of Drug Targets

• Ideally, a drug will fight a disease and its effects by interacting with a specific protein to alter its function.

• Protein is the target of drug discovery process.

• Identification of the protein involved in the disease, leads to a better drug design.
Gene Therapy

- For missing or defective genes: Supply its product.
- For overactive genes: Turn them off.
Future Trends

And conclusions.
Where are we heading to?

• Precision medicine.
• Data generation and analysis.
• Targeted drugs.
• Better drug design.
• Early diagnosis.
• Personalized treatment.
• Simulation of Tumor growth.
• Van Andel Research Institute.
References


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• Karmen Stankov, Bioinformatic tools for cancer geneticists.

• Sylvia Nagl, Cancer Bioinformatics: From Therapy Design to Treatment.


In loving memory to mom

Who lose her (and our) battle against colon cancer.