Bio-Medicine, Health Care and Food Production

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Bio-Medicine

Biomedicine is known as *theoretical medicine*, is a term that comprises the knowledge and research which is more or less in common to the fields of human medicine, veterinary medicine, odontology and fundamental biosciences

Main research topics in Bio-Medicine

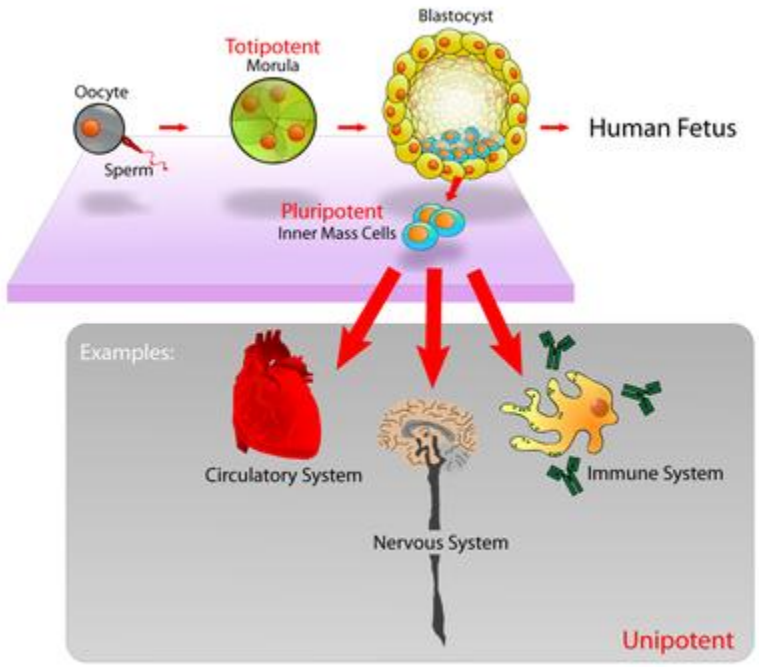
- Stem cells as a source of pluripotent genetic material for regenerative medicine
- Gene therapy - recombinant DNA technology to human therapeutics *(genetic cancer therapy)*
- Molecular diagnostics
- Drug production and testing, (pharmacogenomics)
  - drugs based on DNA/RNA
  - recombinants proteins
- Metabolomics

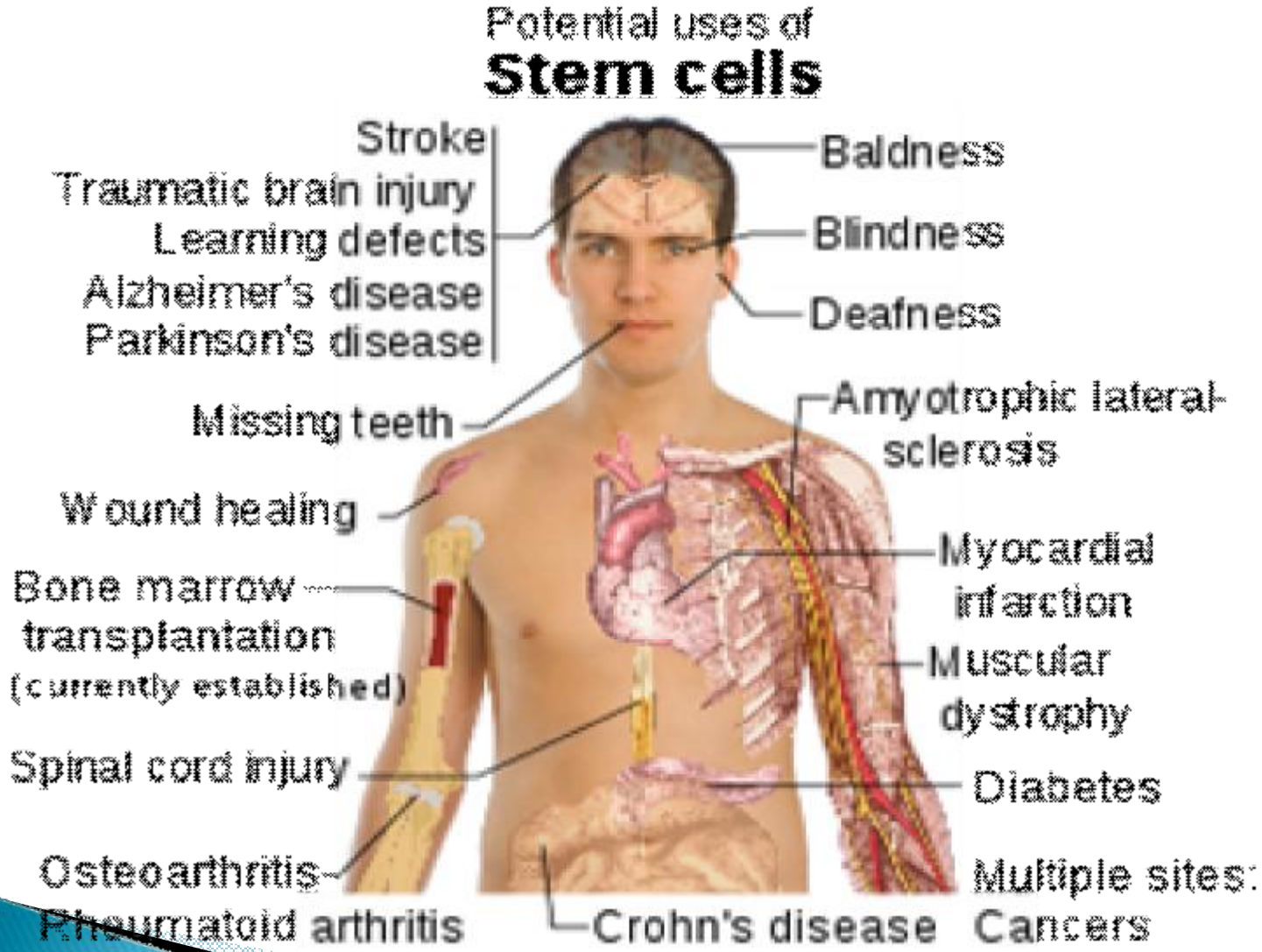
Stem Cells

Stem cells are cells are found in all multi-cellular organisms. They are characterized by the ability to renew themselves through mitotic cell division and differentiating into a diverse range of specialized cell types. The two broad types of mammalian stem cells are: embryonic stem cells that are isolated from the inner cell mass of blastocysts, and adult ells that are found in adult tissues. In a developing embryo, stem cells can differentiate into all of the specialized embryonic tissues. In adult organisms, stem cells and progenitor cells act as a repair system for the body, replenishing specialized cells, but also maintain the normal turnover of regenerative organs, such as blood, skin, or intestinal tissues.

Stem cells can be grown and transformed into specialized cells used in medical therapies.

Stem Cells


Blastocyst
Totipotent
Morula
Oocyte
Sperm
Human Fetus
Pluripotent
Inner Mass Cells
Examples:
Circulatory System
Immune System
Nervous System
Unipotent

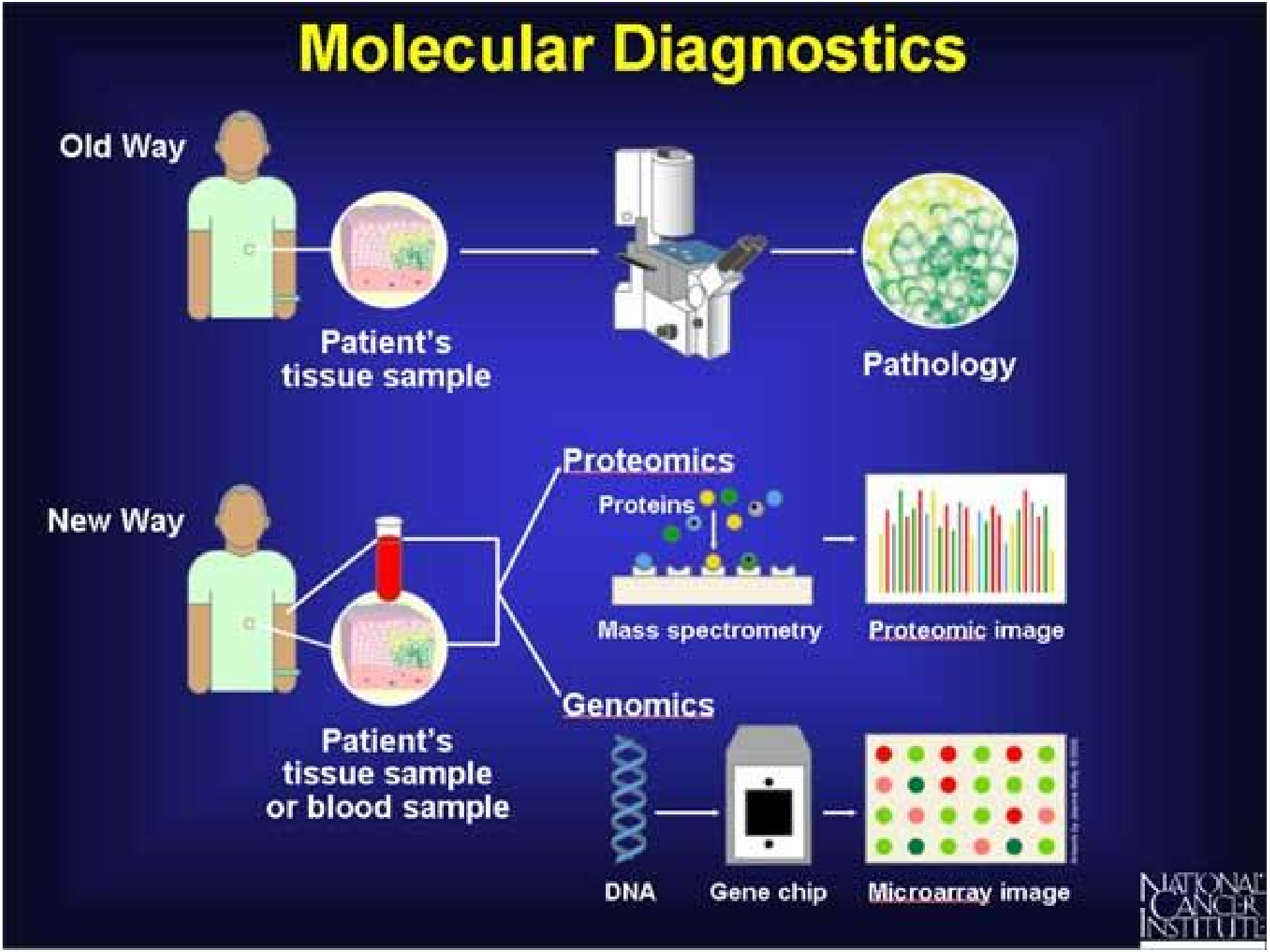

Potential uses of
Stem cells
Stroke
Traumatic brain injury
Learning defects
Alzheimer's disease
Parkinson's disease
Missing teeth
Wound healing
Bone marrow transplantation (currently established)
Spinal cord injury
Osteoarthritis
Rheumatoid arthritis
Baldness
Blindness
Deafness
Amyotrophic lateral sclerosis
Myocardial infarction
Muscular dystrophy
Diabetes
Multiple sites: Cancers
Crohn's disease

Gene therapy

- Gene therapy is the treatment that involves introducing genetic material into a person's cells to fight or prevent disease

- Researchers are studying gene therapy for cancer through a number of different approaches
- A gene can be delivered to a cell using a carrier known as a “vector.” The most common types of vectors used in gene therapy are viruses

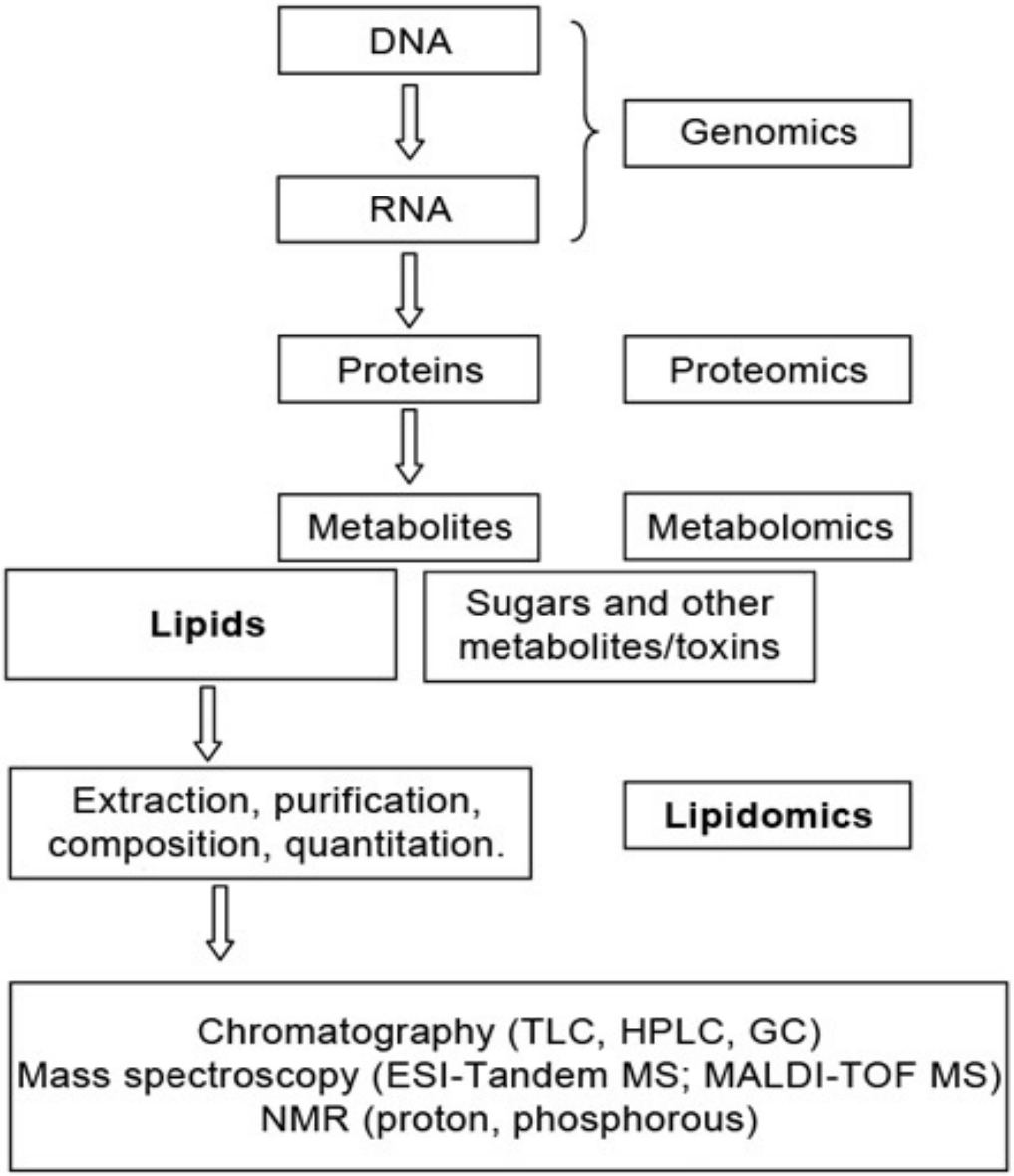
Molecular Diagnostics



Metabolomics in Medicine

- Metabolomics is concerned with the measurement of global sets of low-molecular weight metabolites. It is the study of metabolites and their roles in various disease states and is a novel methodology.

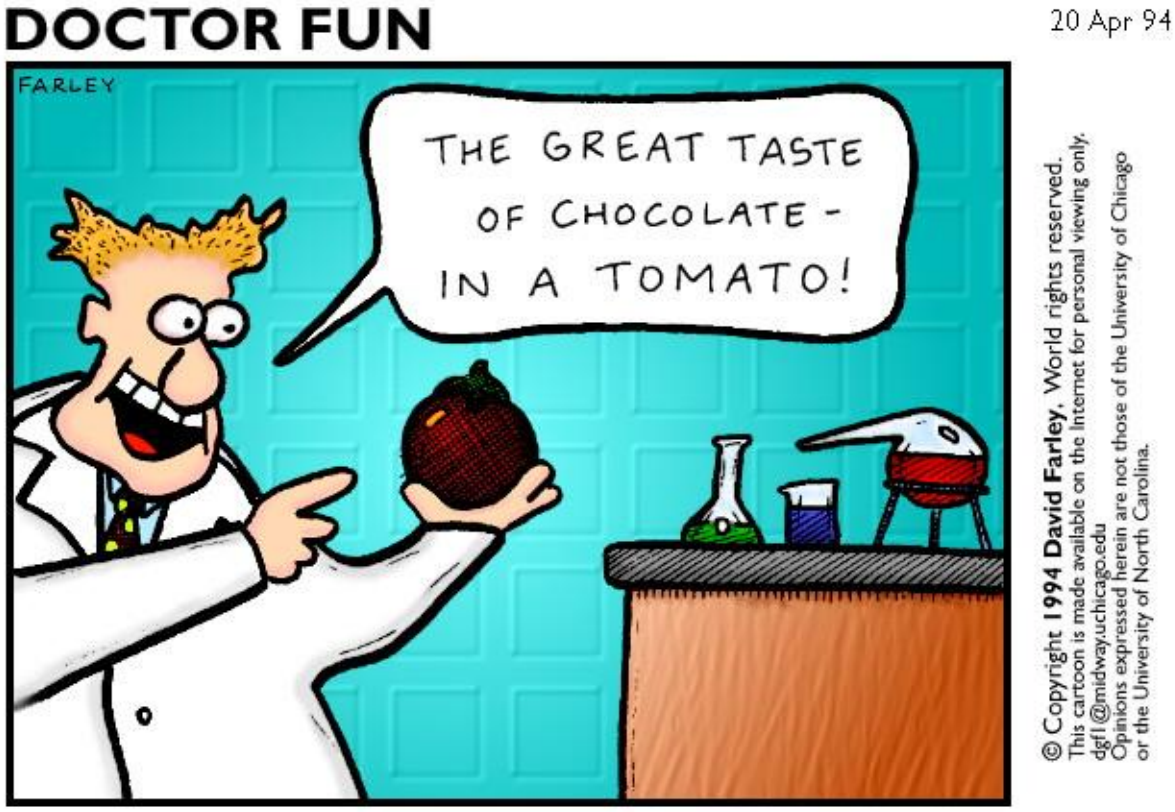
- The major application of metabolomics is in toxicology, clinical trial testing, pharmacology and drugphenotyping, nutrient industry and food /beverage tests, cancer research, clinical pathology tests.
- Metabolomics developed mostly in plants, which are easier to study compared to mammals.
- Metabolomics in medicine is considered to have the potential to revolutionize medical practice in prevention, predicting and personalizing health care.


DNA
RNA
Genomics
Proteins
Proteomics
Metabolites
Metabolomics
Lipids
Sugars and other metabolites/toxins
Extraction, purification, composition, quantitation.
Lipidomics
Chromatography (TLC, HPLC, GC)
Mass spectroscopy (ESI-Tandem MS; MALDI-TOF MS)
NMR (proton, phosphorous)

Food and Human Health

- Production of special food contents (e.g. insulin in transgenic plants etc.)
- Influencing vulnerability of crops by genetic engeneering
- Reduced use of fertilizers and pesticides in agriculture
- Genetics and nutrition *(The understanding of the role of nutrients on DNA stability, repair and on the different gene expression processes recently became more prominent in nutritional science. Nutrients can induce gene expression thereby altering individual phenotype.)*

Production of special food contents



What we have to look forward to from genetic engineering.

Genetics and Nutrition

- Metabolomics
- Gene – environment – interaction in health maintainance and diseases development

Ecological Food

Development of Medical Biotechnology in Poland

1. Biopharmacology
   - recombinants proteins
   - production of drugs based on nucleic acids
   - gene theraphy
2. Molecular diagnostics
3. Implementation of law regulations for genetics research.


International – Baltic
Biomedical Research Center in
Olsztyn
BioBaltMed
Olsztyn is a place where Nicolaus Copernicus was used to live and work.
The city is the recognised as a scientific, academic, business and cultural centre of
the North-Eastern Poland.

Olsztyn


SWEDEN
DENMARK
North Sea
Baltic Sea
LATVIA
RUSSIA
LITHUANIA
BELARUS
POLAND
GERMANY
CZECH
NETH.
Olsztyn
Gdańsk
Elbląg
Kętrzyn
Ełk
Morąg
Grudziądz
Bydgoszcz
Szczecin
Koszalin
Słupsk
Bytów
Szczecinek
Chojnice
Świecie
Piła
Gorzów Wielkopolski
Poznań
Września
Płock
Płońsk
Ciechanów
Warsaw
Białystok
Ostrołęka
Pisz
Łódź
Kalisz
Sieradz
Radom
Pionki
Lublin
Biała Podlaska
Wrocław
Legnica
Lubin
Opole
Brzeg
Częstochowa
Katowice
Gliwice
Kielce
Końskie
Zamość
Rzeszów
Kraków
Stalowa Wola
Kaliningrad
Sovetsk
Klaipėda
Liepāja
Šiauliai
Panevėžys
Kaunas
Vilnius
Alytus
Hrodna
Lida
Minsk
Brest
Pinsk
Slonim
Baranavičy
Bobruysk
Vitsyebsk
Orsha
Mahilyow
Barysaw
Daugavpils
Rēzekne
Lutsk
Rivne
Kovel'
Lvov
Ternopil'
Zhitomir
Berdichev
Hamburg
Bremen
Hannover
Berlin
Potsdam
Magdeburg
Wolfsburg
Lübeck
Kiel
Rostock
Wismar
Dortmund
Kassel
Halle
Leipzig
Dresden
Erfurt
Chemnitz
Zwickau
Bonn
Koblenz
Frankfurt
Mainz
Würzburg
Nüremberg
Prague
Plzeň
Liberec
Hradec Králové
Cottbus
Copenhagen
Helsingborg
Århus
Laholm
Kalmar
Ystad
Flensburg
Schleswig
Groningen
Enschede

Aims of BioBaltMed Center:

- Research integration in the area of bio-medical and bio-veterinary sciences
- Integration of local science activities with European Research Area (ERA)
- Translating research into the practise

Partners and contributors:

1.Local contributors: - University of Warmia and Mazury
- Institute of Animal Reproduction & Food Research of PAS
- Warmia and Mazury Special Economic Zone (*Industry*)

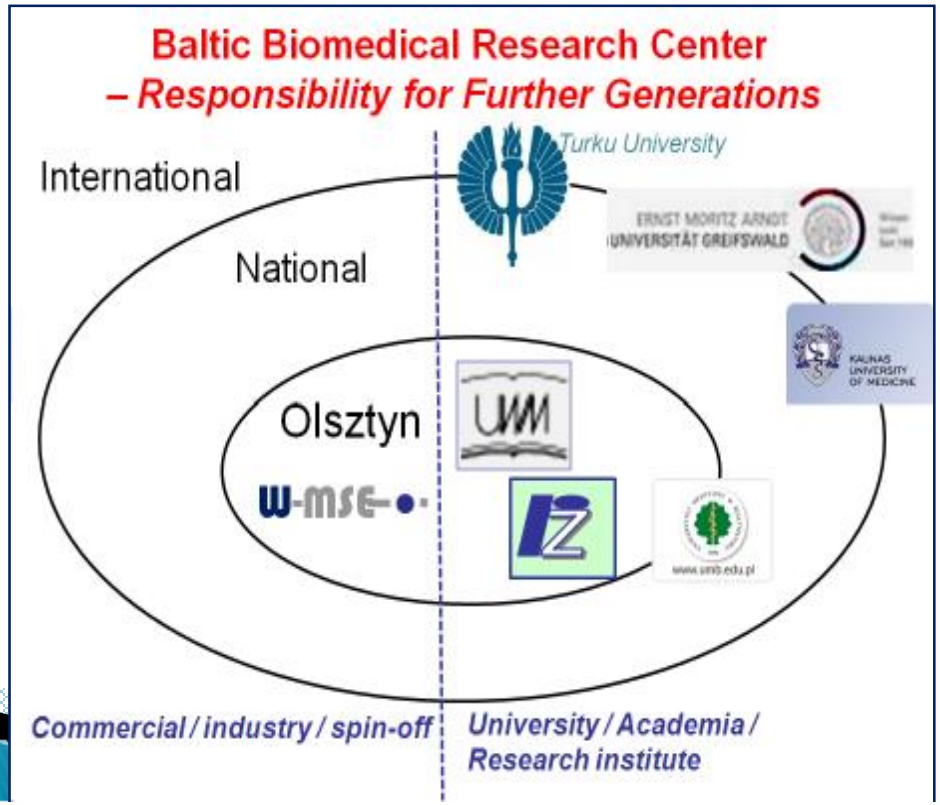
2. Country (National) Partner(s):
- Medical University in Bialystok

3. Baltic Sea Country Partners:

- Turku University (Finland)

-Greifswald University (Germany)

Kaunas University of
- Medicine (Lithuania),



- Baton Rouge Biomedical Research Center (Louisiana),
- MD Anderson Cancer Center, Houston (Texas)
- Miller School of Medicine, University of Miami (Florida).

Structure and specific subjects of BioBaltMed Center

(first level of organization)

1. **Reproductive Biology and Medicine** *(the study focused on inferitilty problmes and biotechnics and biotechnology of reproduction)*
2. **Food and Health** *(the study focused on food quality , advanced food processing, personalized nutrition and metabolic diseases)*
3. **Neuro and Regenerative Biology and Medicine** *(the study focused on stem cells, neuroanatomy and neurodegeneration/regeneration, neuropharmacology and carcinogenesis)*