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About OMICS Group Conferences

OMICS Group International is a pioneer and leading science event organizer, which publishes around 400 open access journals and conducts over 300 Medical, Clinical, Engineering, Life Sciences, Phrama scientific conferences all over the globe annually with the support of more than 1000 scientific associations and 30,000 editorial board members and 3.5 million followers to its credit.

OMICS Group has organized 500 conferences, workshops and national symposiums across the major cities including San Francisco, Las Vegas, San Antonio, Omaha, Orlando, Raleigh, Santa Clara, Chicago, Philadelphia, Baltimore, United Kingdom, Valencia, Dubai, Beijing, Hyderabad, Bengaluru and Mumbai.

PPPM

as a new model of and thus a unique tool in global restructuration of national and international healthcare services

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Over the course of its history, medicine has given special attention to the already diseased individual, focusing on a type of disorder (*nosology*) rather than on one's health or the so-called *pre-nosological* (or *pre-illness*) conditions, the latter being left in the shade.

Those speculations along with latest advances in science and technology combined with worldwide practice and personal experience have led us to conclude that the key link in the modern healthcare strategy, namely, a link of *predictive, preventive and personalized medicine* (or *PPPM*) is missing.

The link, I would stress, that might exert reliable control over morbidity, mortality and disabling rates and significantly reduce the cost of treatment for those who had fallen ill.

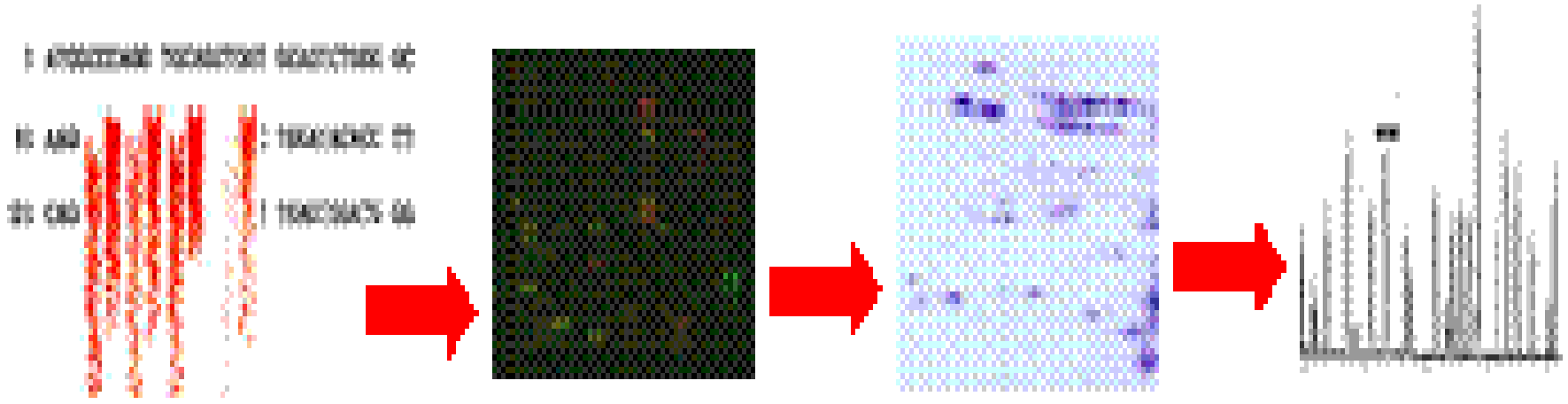
To achieve the practical implementation of *PPPM concept,* it is necessary to create a fundamentally new strategy based upon the *pre-early (subclinical)* recognition of *biomarkers* of hidden imbalances and defects long before the illness clinically manifests itself.

This strategy would give a real opportunity to secure *preventive* measures whose *personalization* could have a significantly positive influence on demographics! *(next Fig)*

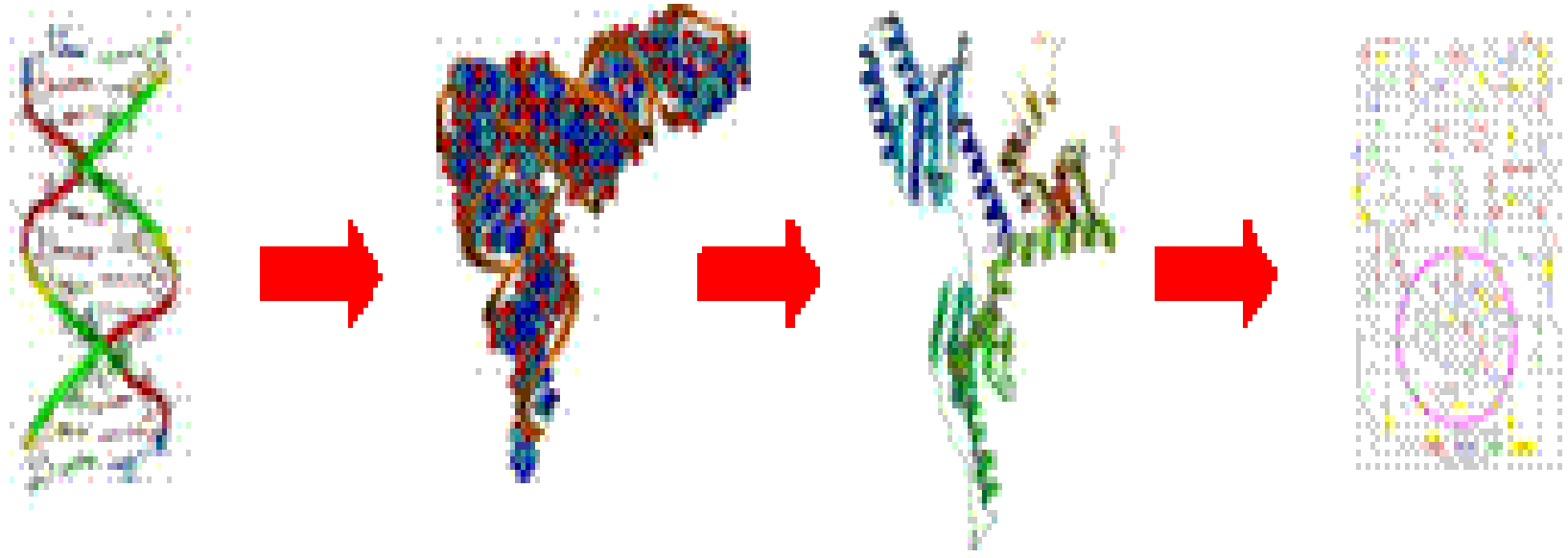
Impacts to be assumed for the practical implementation of *predictive* biomarkers into *PPPM*

- to predict the likelihood of developing disease
- to estimate the length of the asymptomatic period
- to provide predictive information about disease course, severity, and complications
- to serve as a warning to avoid potential disease-triggering factors
- identify high-risk individuals who might be suitable candidates for preventive intervention trials

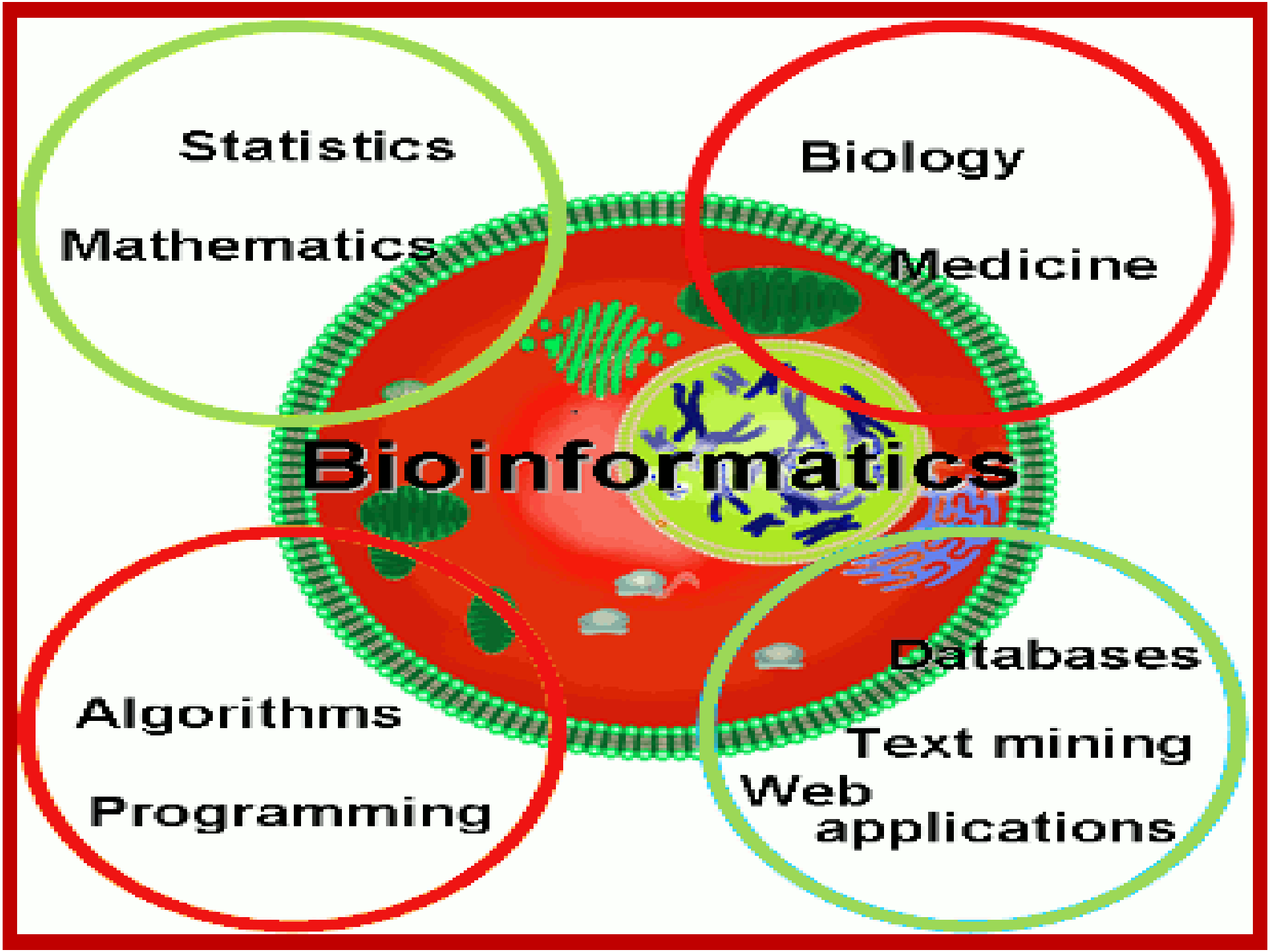
PPPM **as the big change to forecast, to *predict* and to *prevent* is rooted in a big and new science to be rooted from the achievements of genomics, proteomics, metabolomics and *bioinformatics* which *are* being implemented into the daily practice to secure visualizing of lesion foci that was previously unknown to clinicians *(next two Figs)***



Genomics Transcriptomics Proteomics Metabolomics



DNA RNA Protein Metabolites


Statistics
Mathematics
Biology
Medicine
Bioinformatics
Algorithms
Programming
Databases
Text mining
Web
applications

In reality,

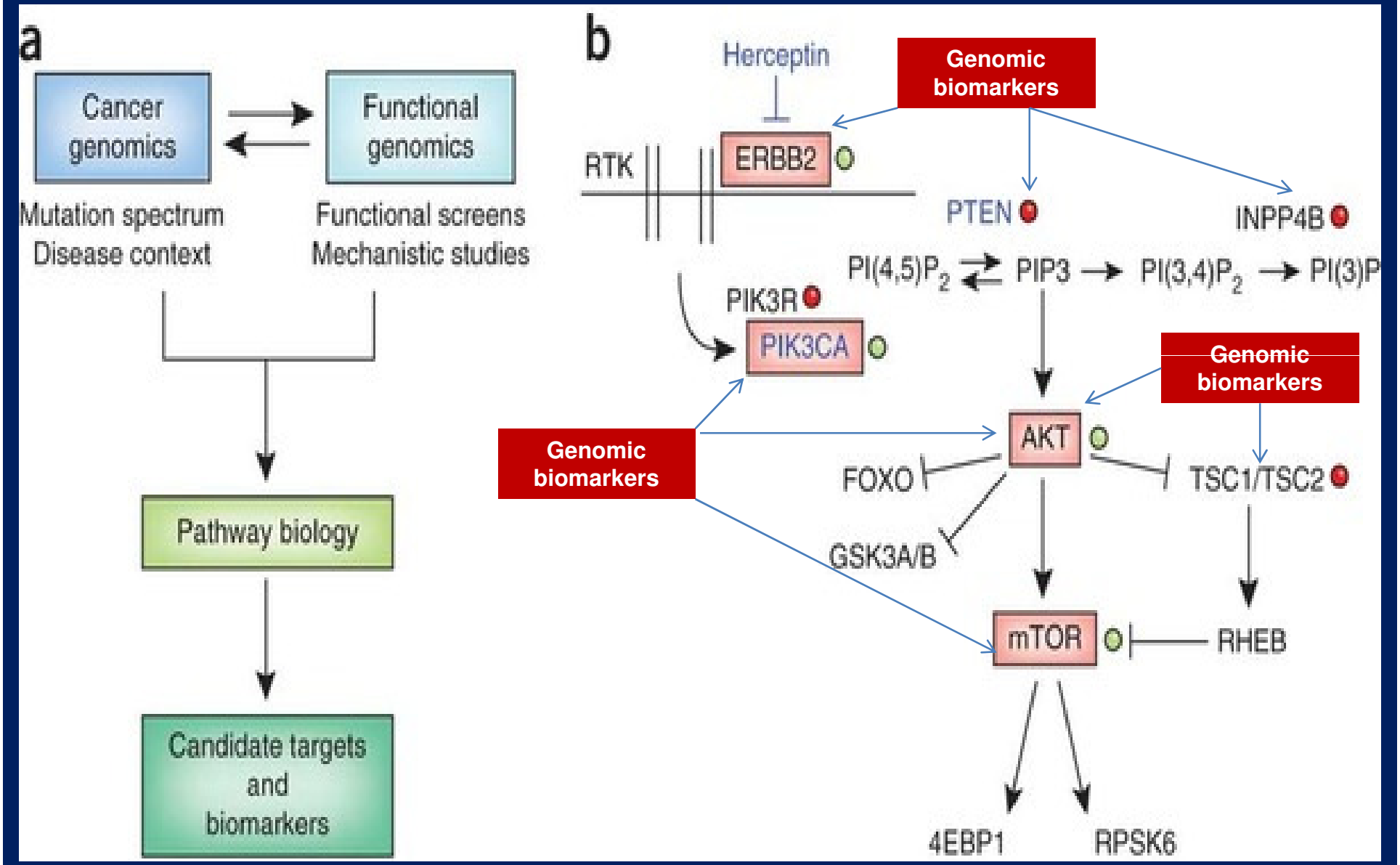
Genomics

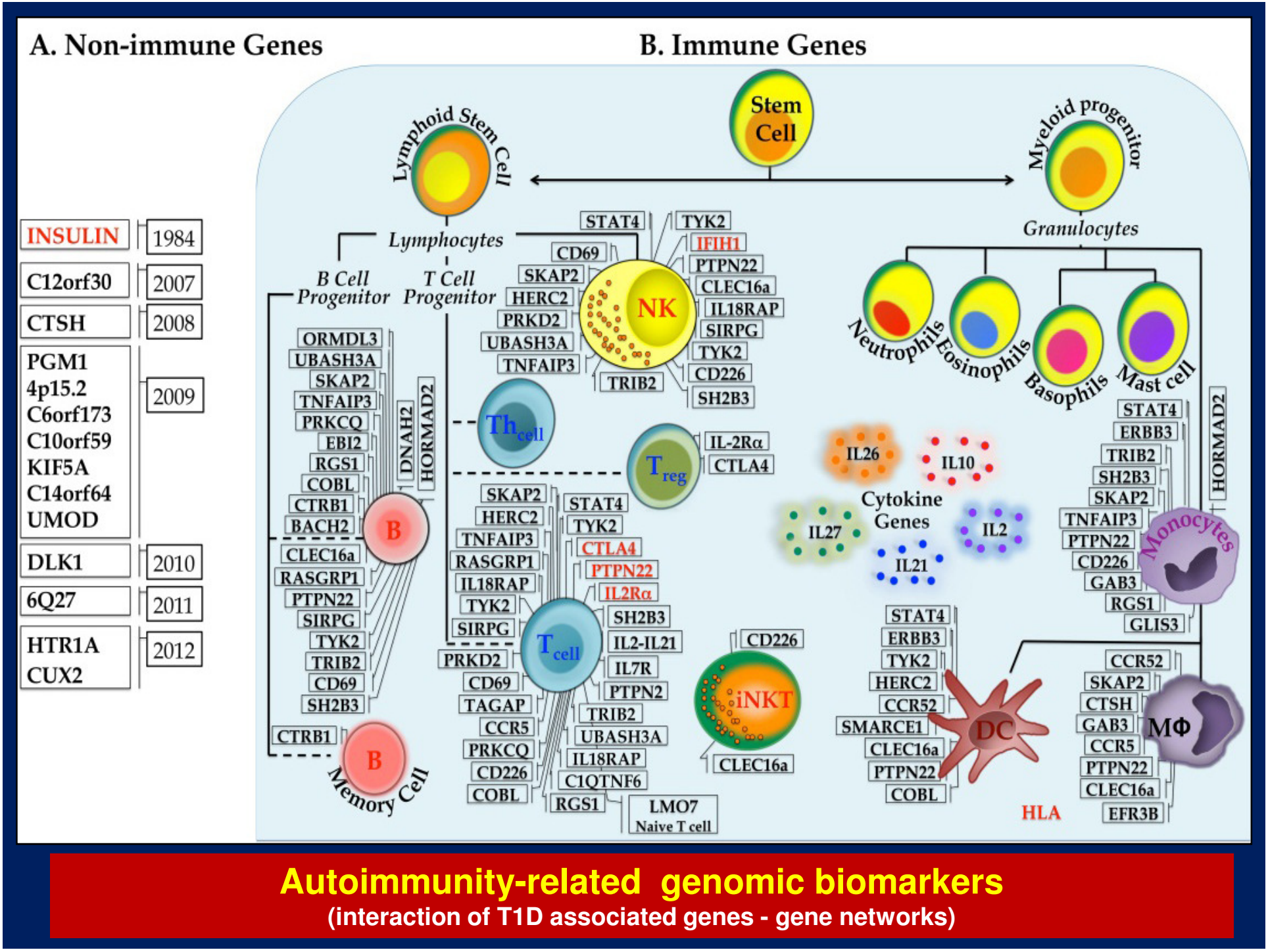
as a set of molecular tools
to probe genome and to thus identify and
to select *genomic biomarkers*

has allowed for identifying newer *genes* and
newer *genetic variations* that affect health
to form *subclinical* and *predictive* risks
to be screened and unveiled, and then
the *subclinical* pathology to be diagnosed,
monitored and terminated
to *prevent* illness *(next two Figs)*

Genomic biomarkers and their impact into pathway-targeted cancer therapies

(a) Routine sequencing of cancer genomes will identify many new genes that are involved in cancer;
(b) Detailed mechanistic studies will be required to determine how these genes contribute to tumorigenesis and how they influence therapeutic efficacy




A. Non-immune Genes
B. Immune Genes
INSULIN 1984
C12orf30 2007
CTSH 2008
PGM1
4p15.2
C6orf173
C10orf59
KIF5A
C14orf64
UMOD 2009
DLK1 2010
6Q27 2011
HTR1A
CUX2 2012
Stem Cell
Lymphoid Stem Cell
Myeloid progenitor
Lymphocytes
Granulocytes
B Cell Progenitor
T Cell Progenitor
Neutrophils
Eosinophils
Basophils
Mast cell
NK
Th cell
Treg
B
Memory Cell
T cell
iNKT
DC
MΦ
Monocytes
Cytokine Genes
IL26
IL10
IL27
IL2
IL21
HLA
LMO7
Naive T cell
Autoimmunity-related genomic biomarkers
(interaction of T1D associated genes - gene networks)

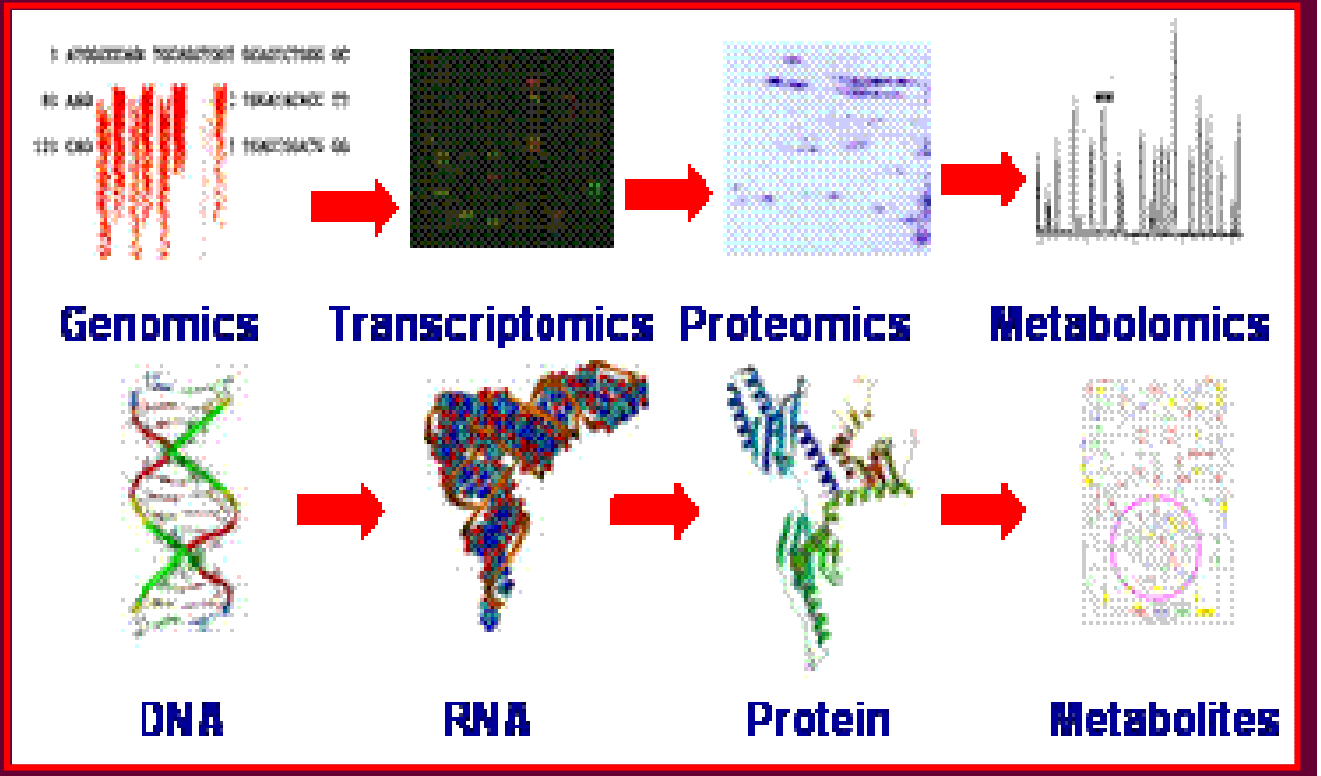
As an allied portion of *genomics* and thus an area of study to examine the impact of *genetic variations* on the response to medications is *pharmacogenomics.*

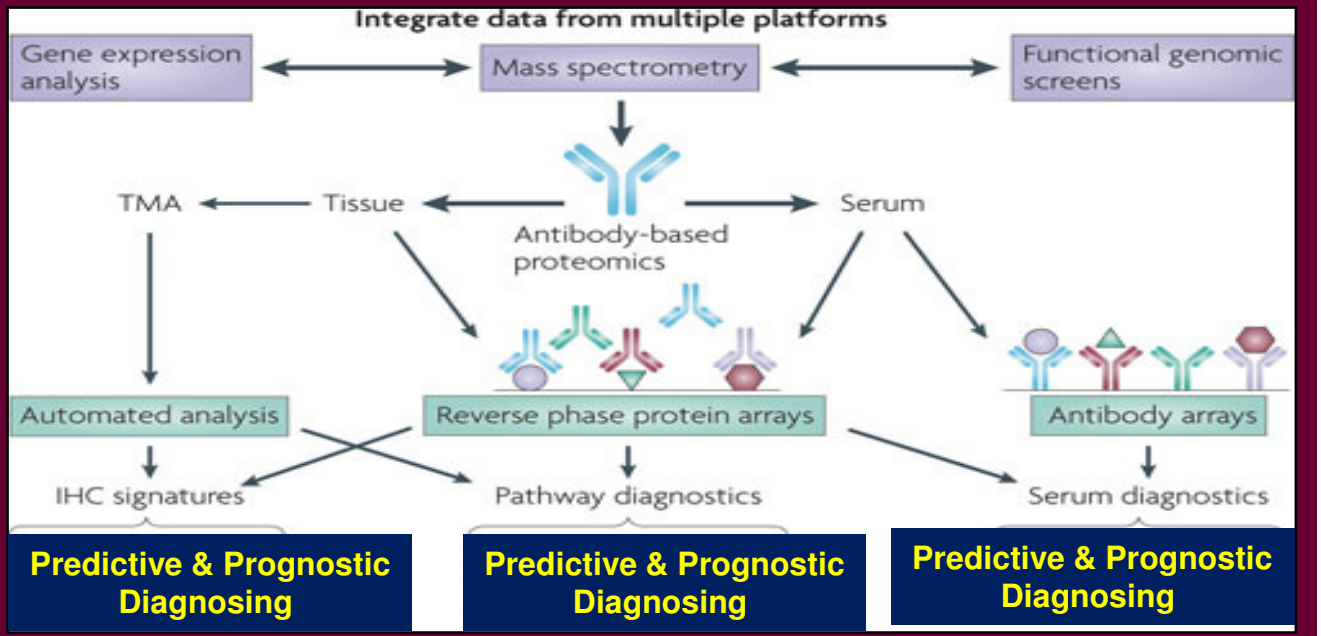
The latter is aimed at tailoring drug therapy at a dosage that is most appropriate for an individual patient, with the potential benefits of increasing the clinical efficacy and safety.

***Pharmacogenomics* will thus guide therapeutic decisions and monitor the response to therapy on one hand and speed the development of novel therapeutics, on the other one.**

Well, genes can say a lot about an individual's ***predisposition*** to a disease, but cannot reveal what is happening in cells at the protein level.

The latter would attribute to ***proteomics*** to identify individual proteins and their epitopes to be valuable for ***predictive*** diagnosing and thus may eventually have a great impact on ***PPPM***





Proteomics, **in turn, is the study of the *proteins* and *protein pathways* involved in a disease for identifying *subclinical* defects and imbalances suitable for *preventive* intervention using the appropriate proteins as *biomarkers.***

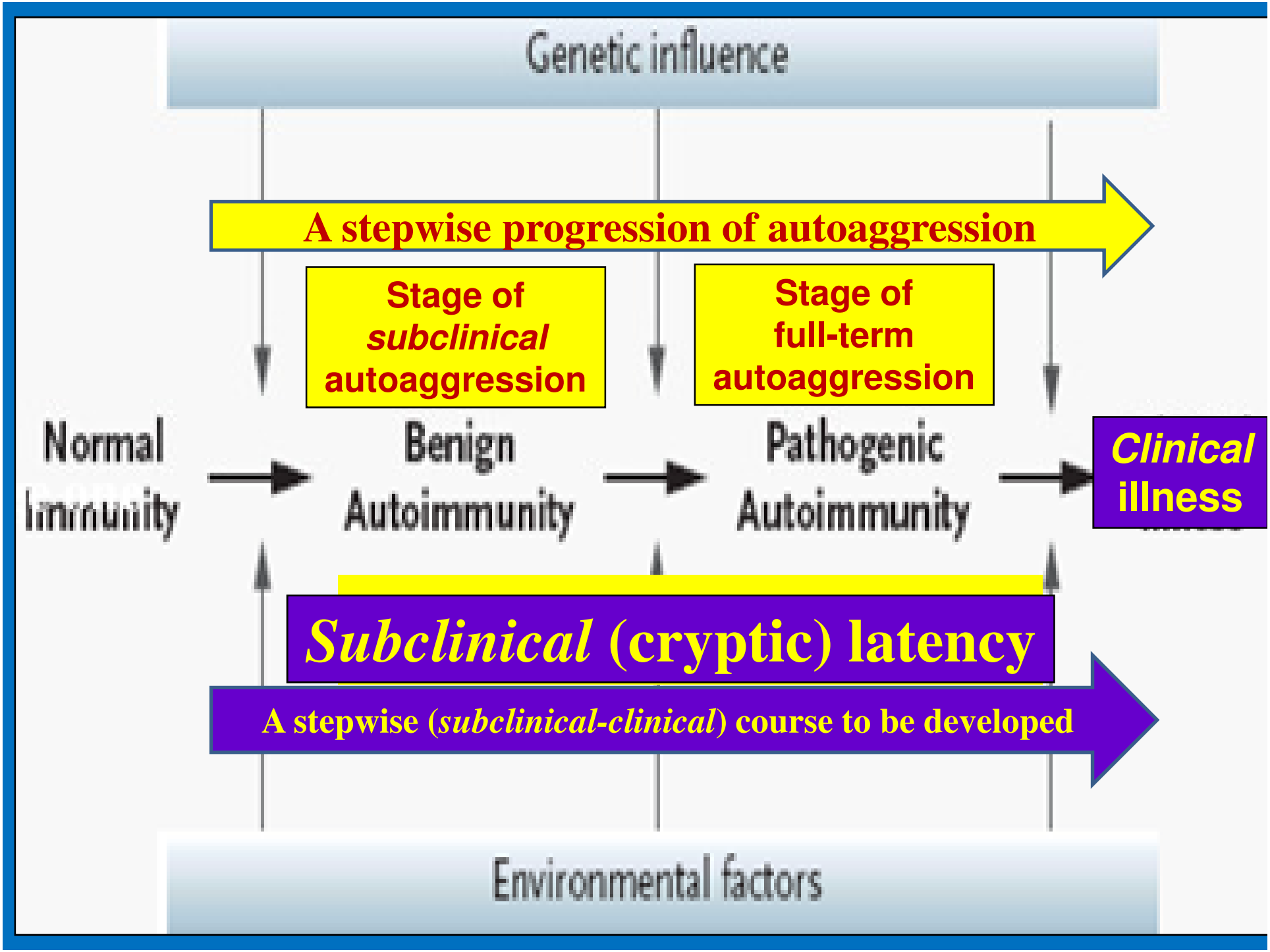
Among the latter are *cancer-* and *autoimmunity-related biomarkers.*

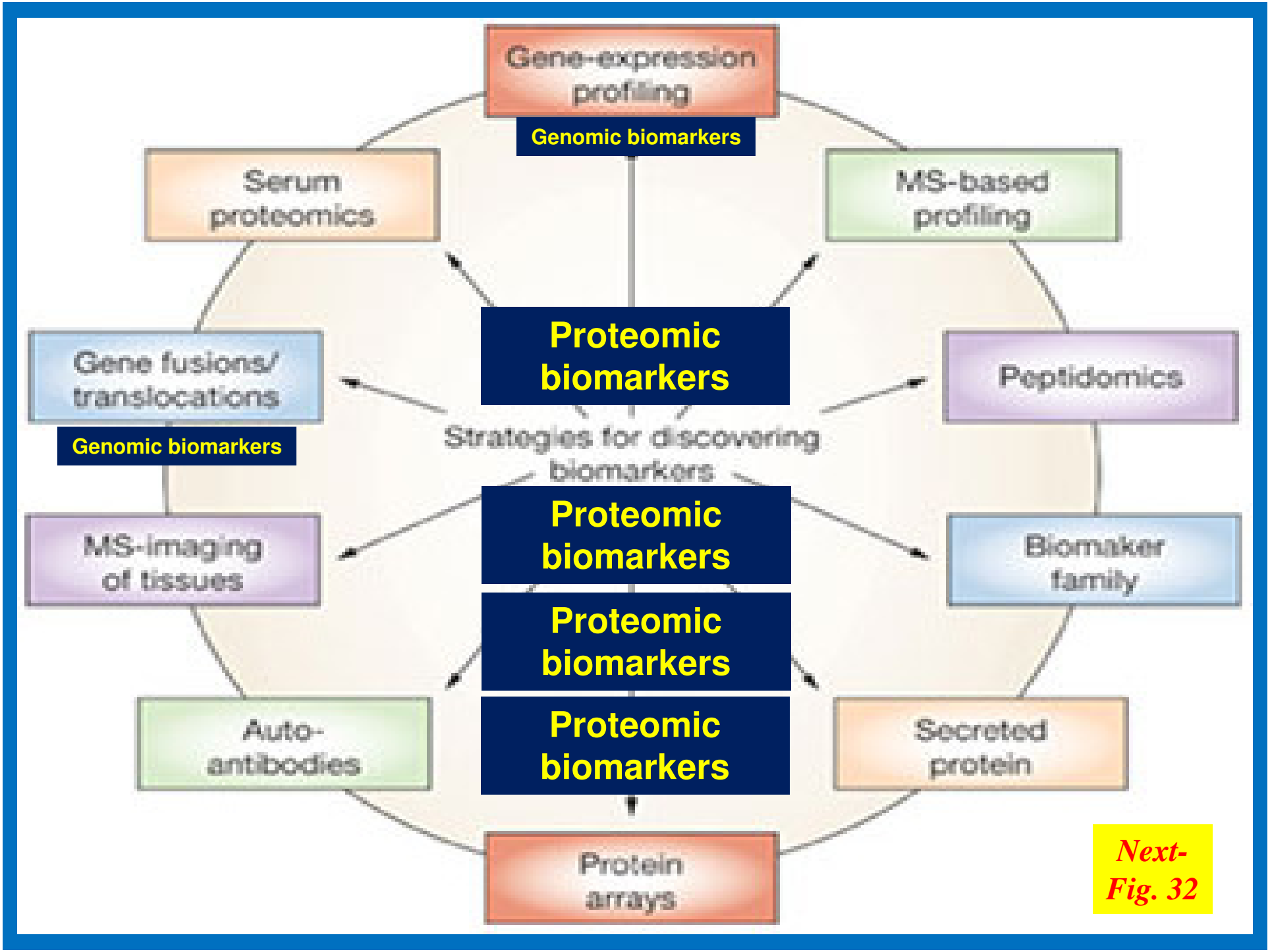
Biomarker	Cancer type	Specificity	Example of non-cancer pathology	Primary clinical use
α-fetoprotein	Hepatocellular, non-seminomatous testicular	Moderate	Prostatitis	Staging
Human chrionic gonadotropin-β	Testicular, ovarian	Low	Pregnancy	Staging
CA15-3	Breast	Poor	Cirrhosis, benign diseases of ovaries and breast	Disease monitoring
CA19-9	Gastro, pancreatic, stomach	Poor	Gastritis	Disease monitoring
CA125	Ovarian, cervical, uterine, fallopian tube	Moderate	Pancreatitis, kidney or liver disease	Disease monitoring
CA27-29	Breast			Disease monitoring
CEA	Colorectal, pancreas, lung, breast, medullary thyroid	Low	Non-malignant disorders	Disease monitoring
Epidermal growth factor receptor	Colon, non-small cell lung cancer	Low	Non malignant disorders, such as benign prostatic hyperplasia	Selection of therapy
Her2/Neu	Breast, ovarian	Moderate	Benign breast disease	Disease monitoring; selection of therapy
PSA	Prostate	High	Benign prostatic hyperplasia	Screening; disease monitoring
Thyroglobulin	Thyroid	Poor	Grave's disease thyroiditis	Disease monitoring

Autoimmune disorder	Autoantigen
Multiple sclerosis (MS)	Myelin basic protein (MBP), myelin oligodendrocyte glycoprotein (MOG) and others
Autoimmune myocarditis	Cardiac myosine
IDDM1	Insulin, GAD-65
Graves disease (diffuse toxic goiter)	TSH receptor (TSHR)
Hashimoto's thyroiditis (autoimmune thyroiditis)	Thyroid peroxidase (TPO), thyroglobulin (TG)
Systemic lupus erythematosus (SLE)	dsDNA
Rheumatoid arthritis (RA)	Citrullinated cyclic peptide, IgM

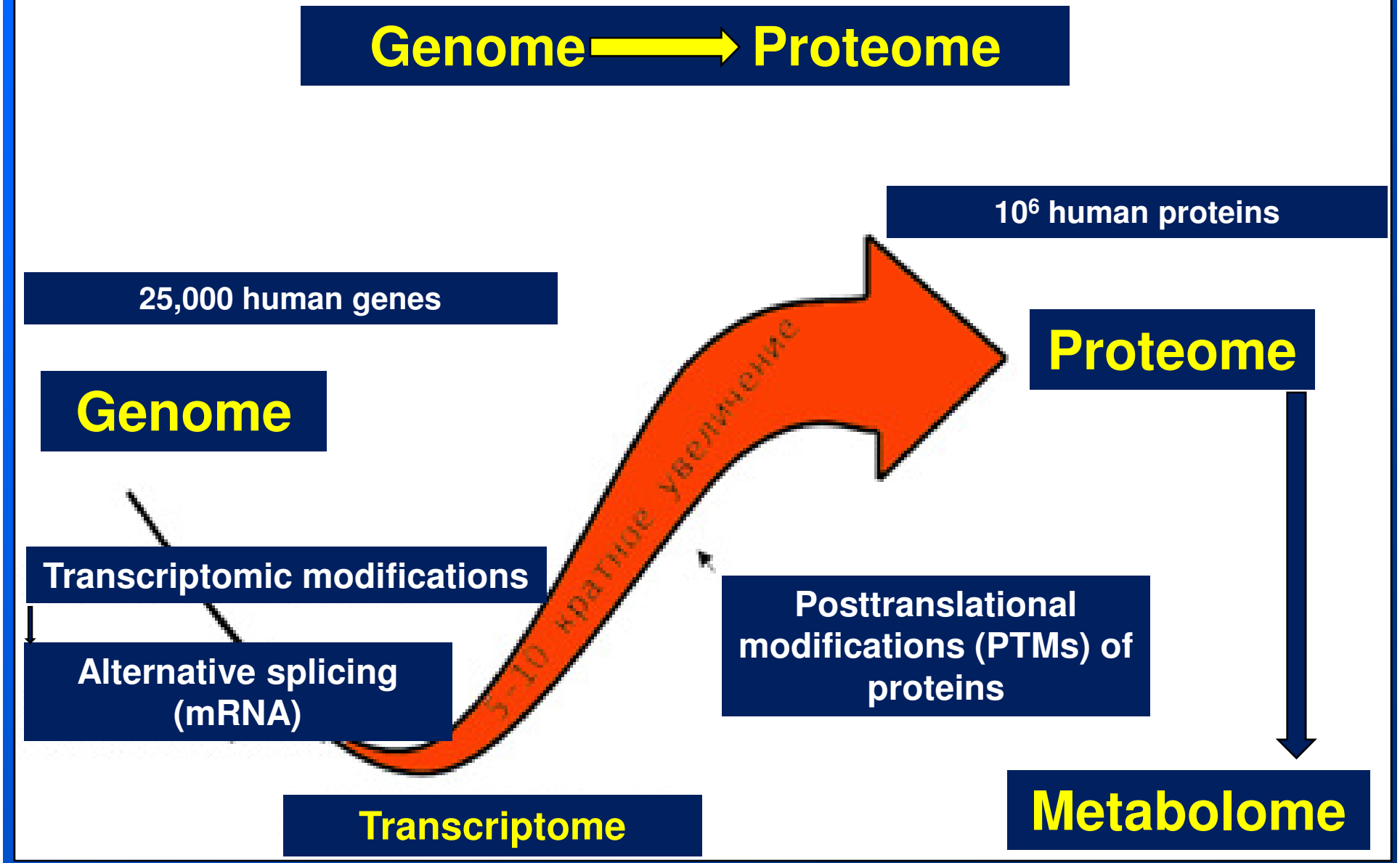
Meanwhile,
a combination of *genomic* and *proteomic biomarkers*
are becoming of great significance to *predict risks* of the *chronization* and thus of *disabling* since chronic diseases are preceded by a *long subclinical (symptom-free) phase* or a period of latency

(next Fig)

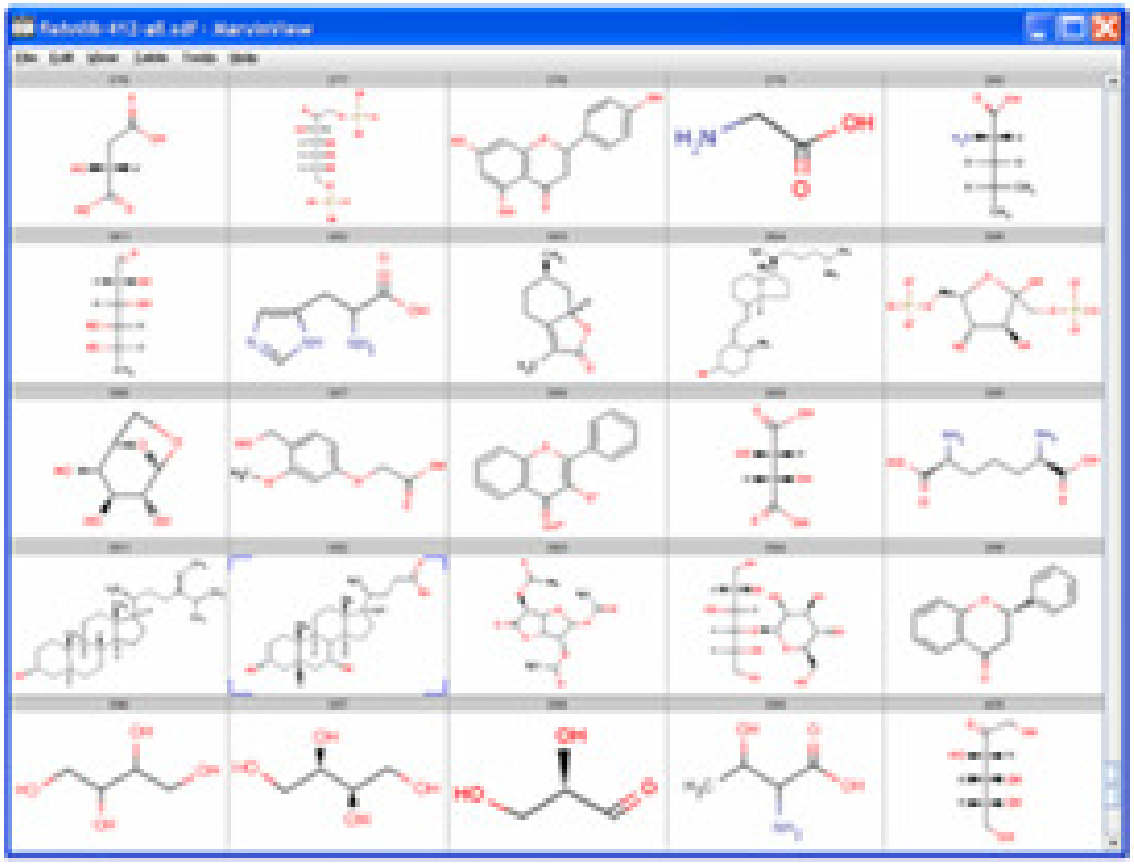

Genetic influence
A stepwise progression of autoaggression
Stage of subclinical autoaggression
Stage of full-term autoaggression
Normal Immunity
Benign Autoimmunity
Pathogenic Autoimmunity
Clinical illness
Subclinical (cryptic) latency
A stepwise (subclinical-clinical) course to be developed
Environmental factors


Gene-expression profiling
Genomic biomarkers
Serum proteomics
MS-based profiling
Gene fusions/ translocations
Genomic biomarkers
Proteomic biomarkers
Peptidomics
Strategies for discovering biomarkers
Proteomic biomarkers
MS-imaging of tissues
Biomaker family
Proteomic biomarkers
Proteomic biomarkers
Auto-antibodies
Secreted protein
Protein arrays
Next-
Fig. 32

In reality,
proteomics per se **is the continuation of** ***functional genomics*** **and, at the same time, a prologue to** ***metabolomics***

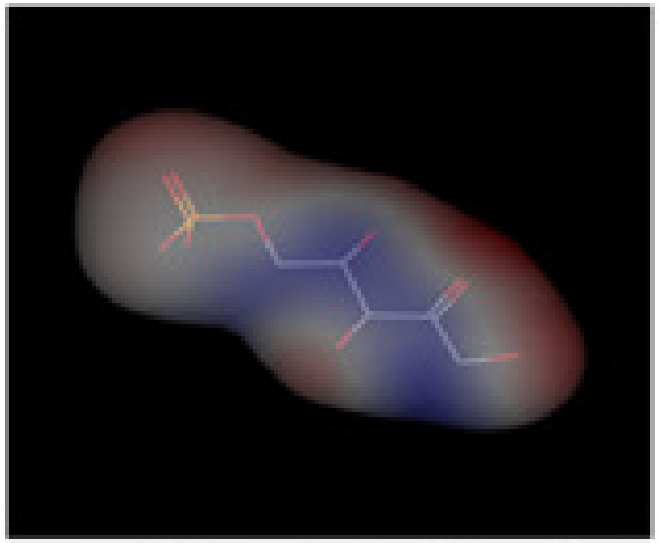


Metabolomics - The science of the small molecules



Compound Classes:

- sugars
- amino acids
- steroids
- fatty acids
- lipids
- phospholipids
- organic acids



3D model of a molecule with surface plot

The latter ***(metabolomics)*** illustrates the functional state of the cell at the level of ***metabolism*** on a real time basis, requiring the use of the term ***'metabolome',*** demonstrating a set of ***metabolic pathways*** in the cell at a given time point

Tissue-derived information we would accumulate might be combined with the:

- **individual's medical records;**
- **family history;**
- **data from imaging;**
- **instrumental and laboratory tests**

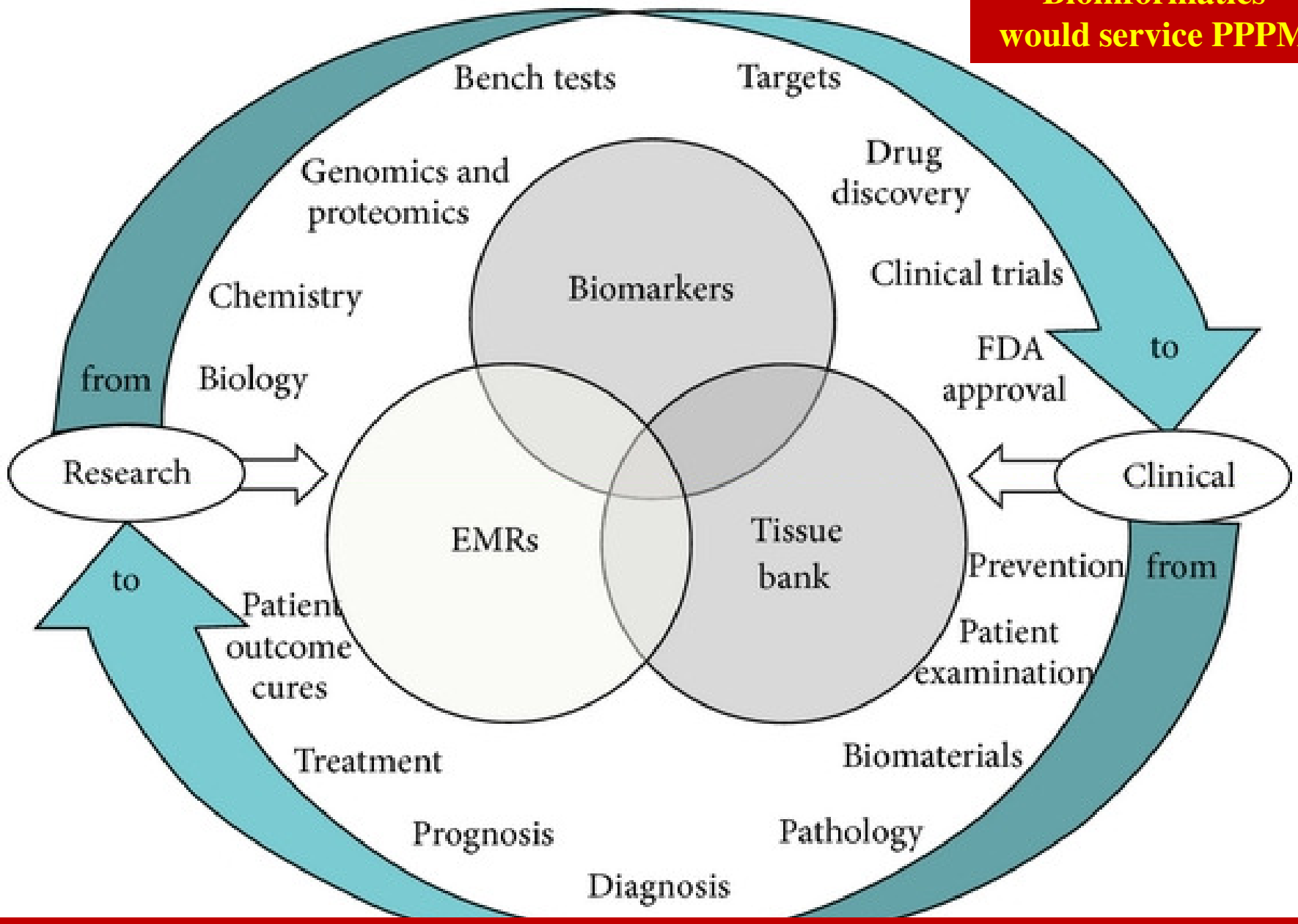
to develop *personalized* and *preventive* treatments.

But, in this sense, how is the whole databank provided by omics-technologies could be comprehended?

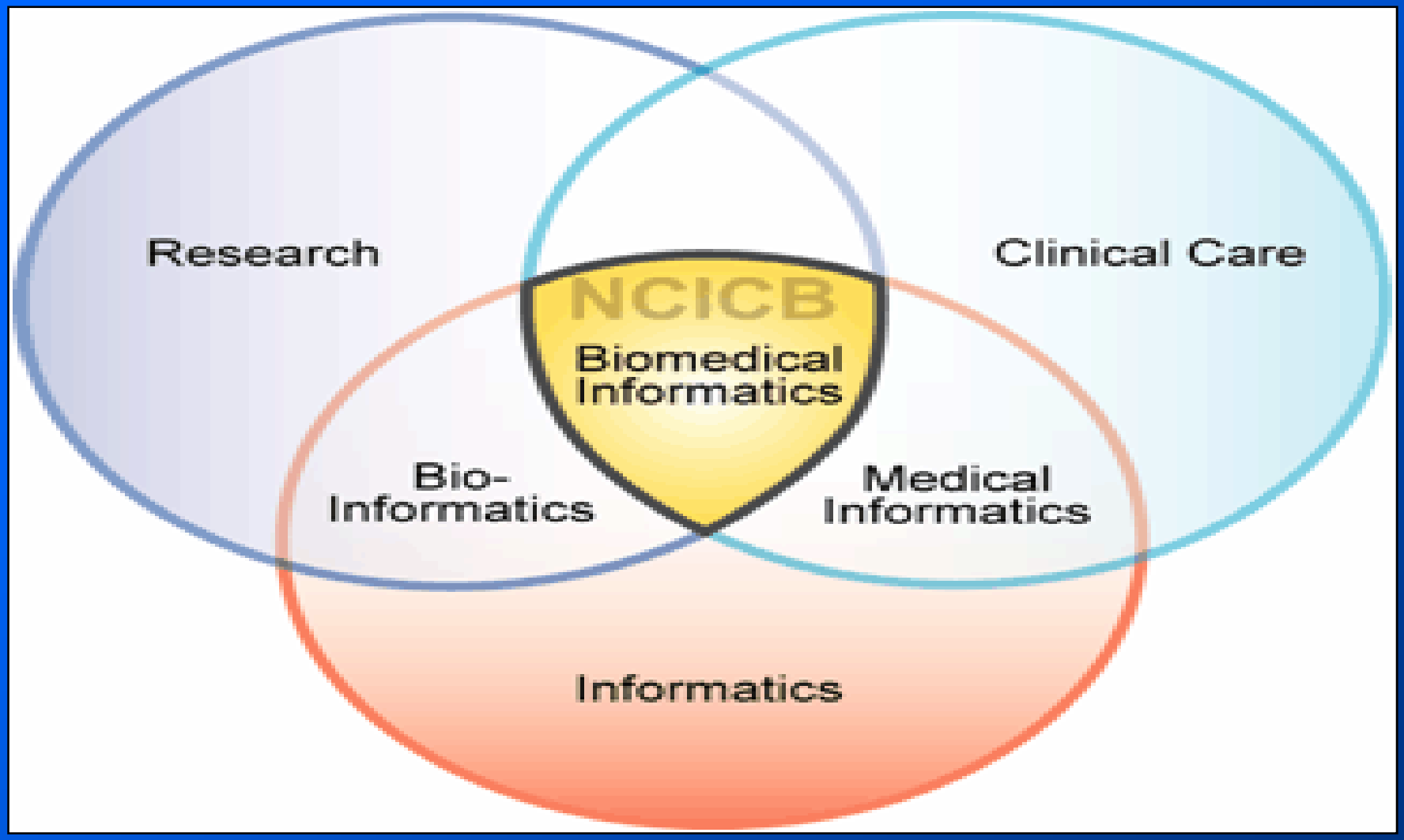
It is *bioinformatics*
to suit the goal by applying mathematical modeling techniques to thus secure constructing and maintaining unified *biobanks* and *databanks* necessary for *personal health monitoring* based on principles of *genotyping* and *phenotyping.*

As a result, the *patient* becomes a *data carrier,* whilst learning about possible risks of a disease, and the *physician* can reasonably select a kind of *preventive* and *personalized* protocol rooting from the *predictive* assays made *(next two Figs)*

Bioinformatics would service PPPM



The diagram shows the integrated "knowledge environment" that enables clinicians to query critical information from across disparate data sources to find relationships between an individual patient's EMR information of persons-at-risk family records

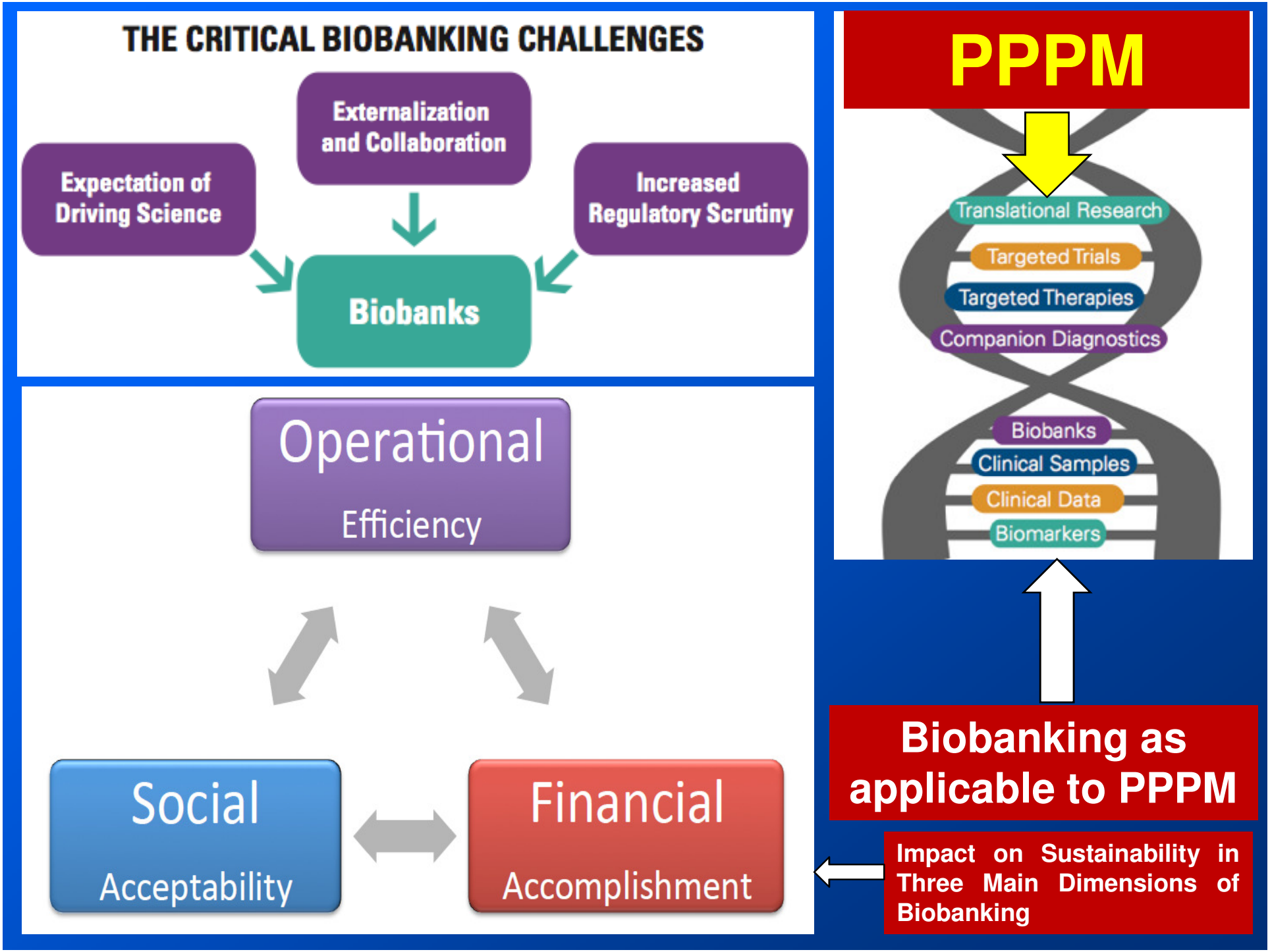


By integrating *bioinformatics* and *clinical informatics*, both offers unique infrastructure, tools, techniques and applications to bridge those areas.

This facilitates the sharing of data and information across diverse disciplines and professional sectors

Biobanks **would provide the proper information about patient's proteomic, genetic and metabolic profiles to be used to tailor medical care due to the individual's needs and *personalized* scenarios.**

An understanding of the factors underlying the burden of a disorder and later on of the clinical illness would provide policymakers, healthcare providers and medical educators with an opportunity to guide *preventive* initiatives at both *individual* and *community* levels *(next Fig)*


THE CRITICAL BIOBANKING CHALLENGES
Externalization and Collaboration
Expectation of Driving Science
Increased Regulatory Scrutiny
Biobanks
Operational
Efficiency
Social
Acceptability
Financial
Accomplishment
PPPM
Translational Research
Targeted Trials
Targeted Therapies
Companion Diagnostics
Biobanks
Clinical Samples
Clinical Data
Biomarkers
Biobanking as applicable to PPPM
Impact on Sustainability in Three Main Dimensions of Biobanking

Well, two key objectives of *PPPM* are:

***(i)* screening for *subclinical imbalances* and *defects* with *a pre-selection* of suitable *targets* for the next step of PPPM protocol, i.e., *drug-based prevention*;**

***(ii)* repair of the *imbalances* and *defects* mentioned to restore the function and to thus *prevent* the clinical illness**

***PPPM* is thus a model of healthcare services being tailored to the individual and dictates a construction of *PPPM-based algorithms* to *diagnose, to predict,* and *to prevent* in time!**

• ***Predictive branch*** **of PPPM is mainly designed to meet the interests of healthy individuals, its purpose being to determine whether susceptibility to a particular disease is increased or not.**

•• ***Preventive branch*** **is aimed at taking measures to avoid development of clinical manifestations rather than cure or treat it on manifestation.**

••• ***Personalized medicine*** **proposes the customization of healthcare, being tailored to the *individual patient* and/or to the *person-at-risk* by the mutual integration of: family history, medical records and other information including genomic, proteomic and metabolomic *biomarkers-based* profiles to be integrated *via bioinformatics***

PPPM **thus uses** ***diagnostic*** **and** ***predictive*** **tests of newer generations based on** ***biomarkers,*** **to individually determine the health conditions a person is predisposed to and to reveal biomarkers of the probable or the already existing pathological processes, and thus to select the** ***targets.***

PPPM-oriented survey **should be based on** ***biomarkers*** **and** ***algorithms*** **to differ essentially from those employed in traditional clinical strategies, namely,**

(i) algorithms for ***predictive*** **and** ***subclinical*** **diagnostics on one hand, and**

(ii) **algorithms for** ***preventive*** **therapy, on the other one**

Individuals, selected in *the first* stage, undergo *the second* stage, which uses a panel of *phenotypic* biomarkers, while monitoring every:

- ***potential patients,***
- ***persons-at-risks*** **predisposed to the disease,**

and/or

- ***persons at subclinical stages*** **of the disease.**

By illustration and irrespective of the underlying mechanism, the proven *predictive ability* to accompany *the diagnostic* and *predictive* tests has been documented for:

(i) ***HLA-related biomarkers*** **in** ***combination*** **with** ***autoAbs*** **and other** ***biomarkers*** **(e.g., cytokines, autoreactive CTLs, etc) to monitor chronic autoimmune inflammation (T1D, MS, SLE);**

(ii) genomic biomarkers **in combination with** ***cancer-associated antigens*** **and other** ***biomarkers*** **(e.g., components of the signaling pathways defined) to monitor cancerogenesis**

A strategy of *preventive treatment* should contain, at least, two critical steps.

For chronic autoimmune and/or infectious diseases:

***(i) quenching of autoagression* or *blocking the infectious process*; and,**

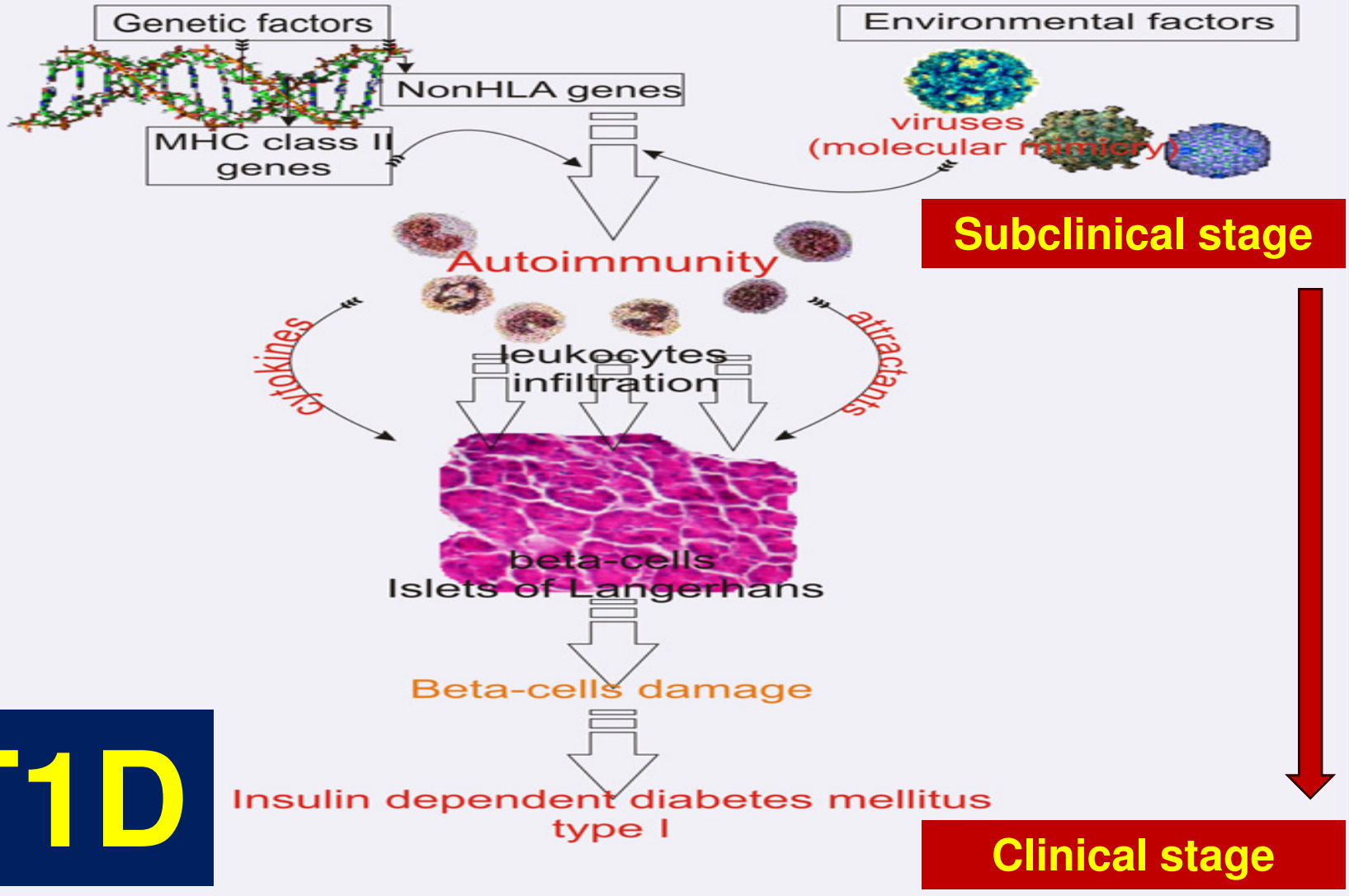
***(ii) restoration of the tissue* affected.**

For cancerogenesis:

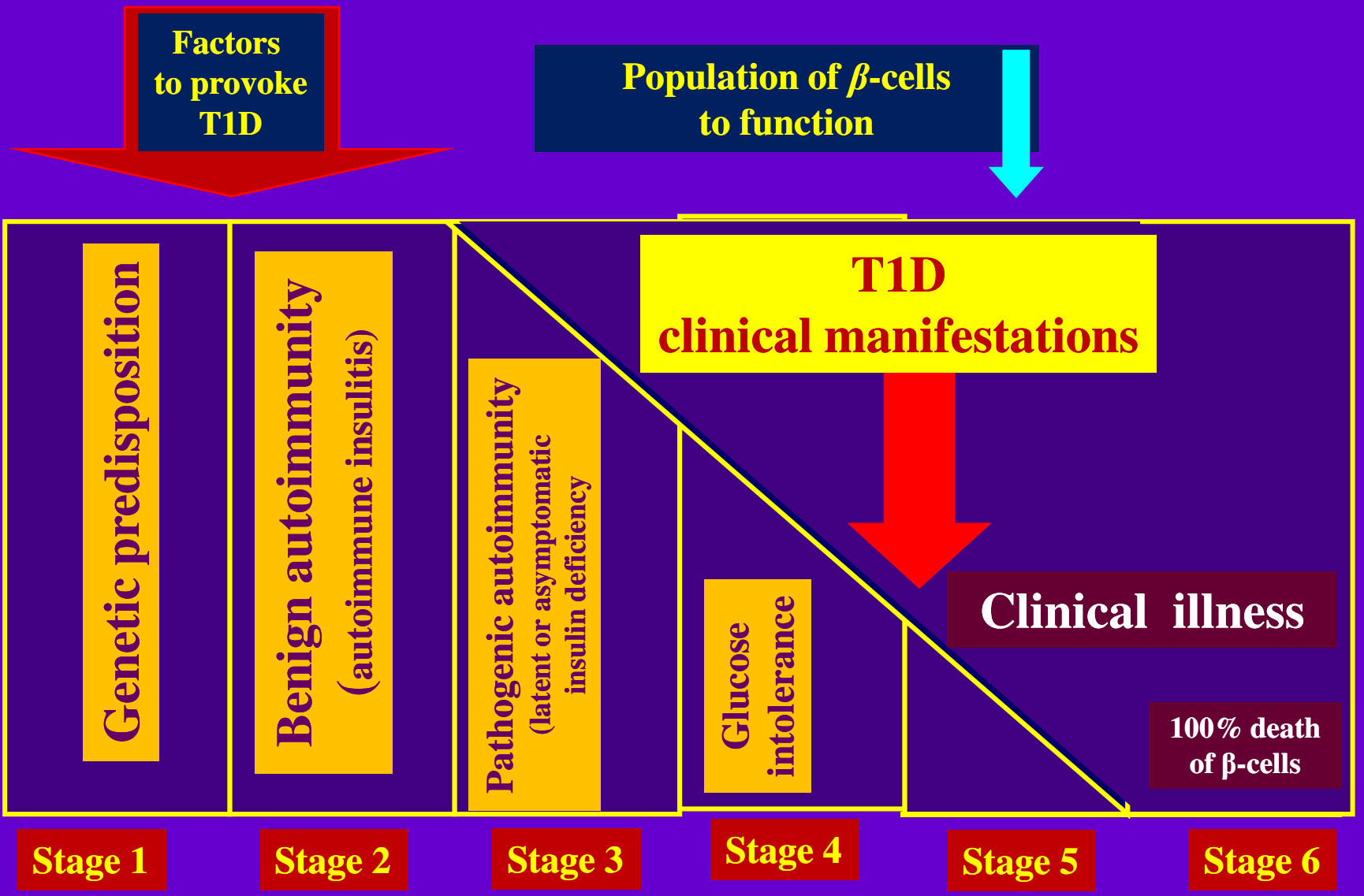
(i) killing the malignancy* and *prevention of metastatic formation;

***(ii) restoration of the primary tissue* affected.**

T1D is a chronic autoimmune inflammation comprising stages of *subclinical pathology* and *clinical manifestations* and resulting in a destruction of pancreatic *beta*-cells capable of producing insulin

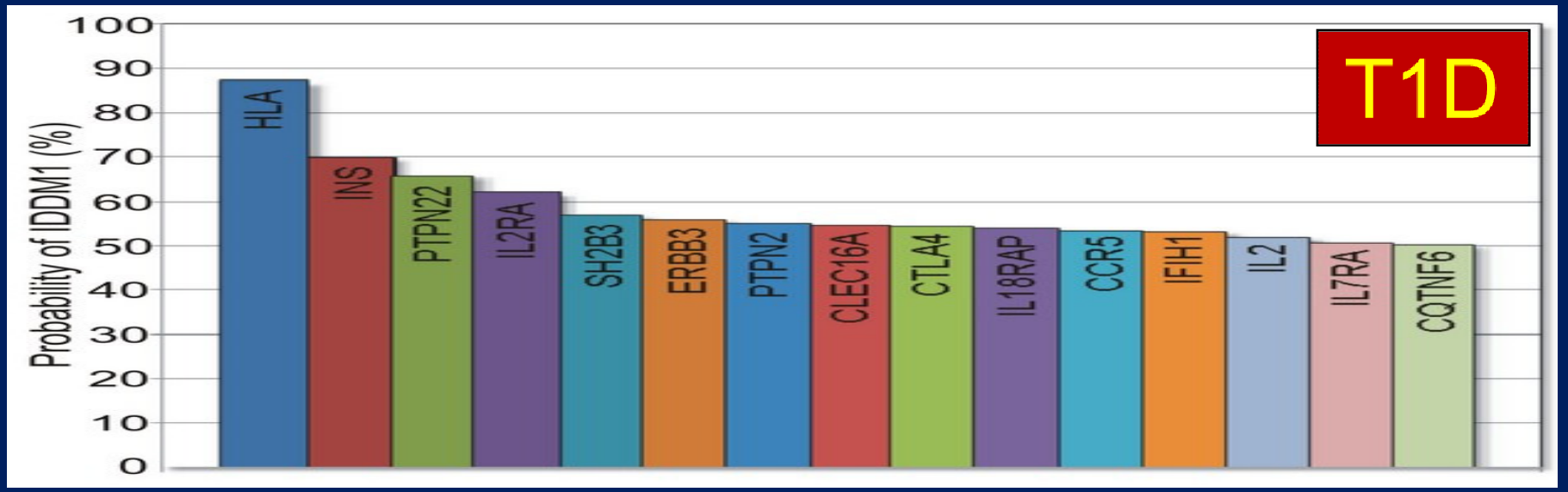


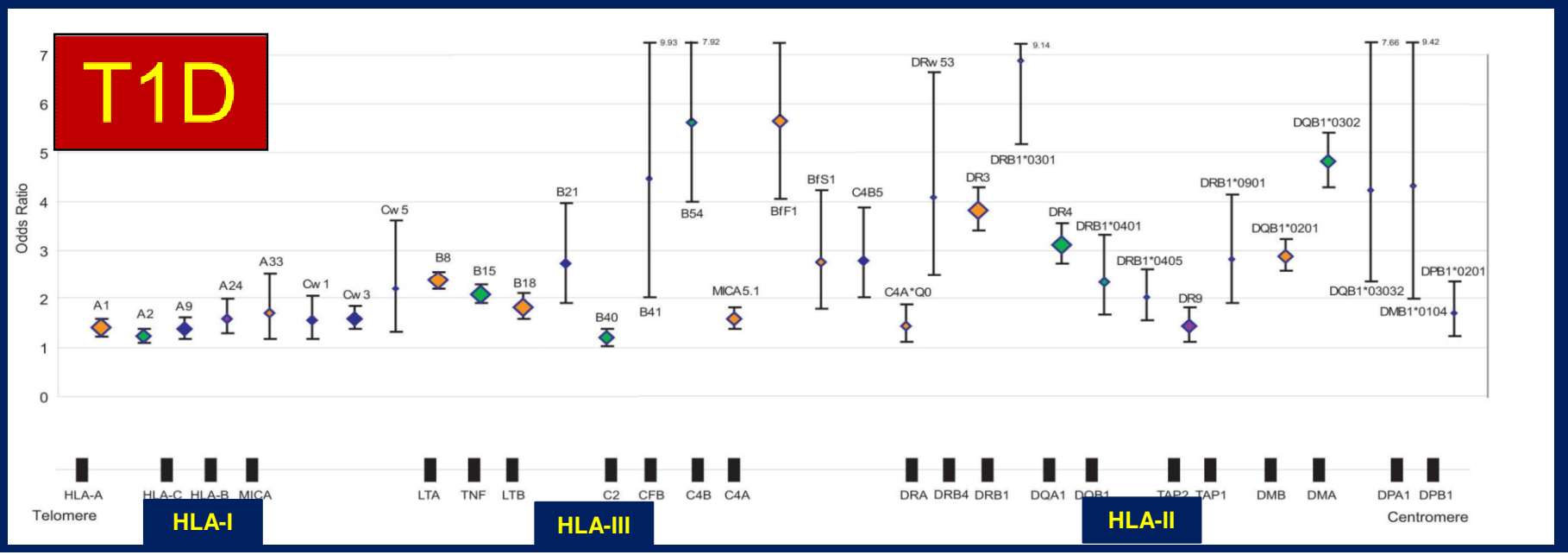
A stepwise development of T1D

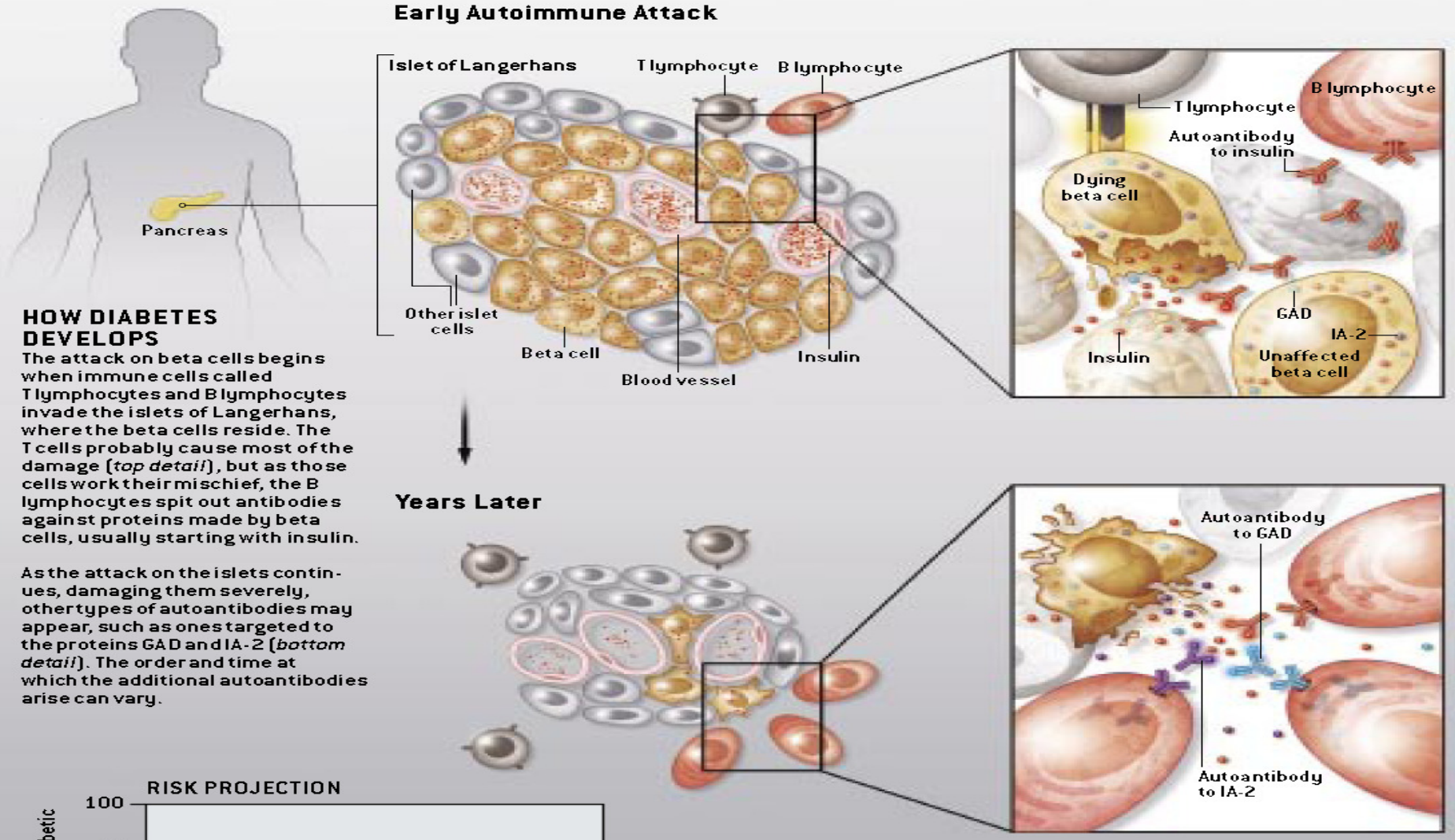


A *subclinical stage* is characterized by depletion of β-cells and fall in insulin secretion levels to have a biased burst.
Clinical manifestations link to β-cell death to illustrate ceasing in insulin secretion.

For this model, about half of the total risk is *genetically predisposed*, and about half of the risk is in the *HLA* and *other regions* to be useful for *gene-based predictive testing!*



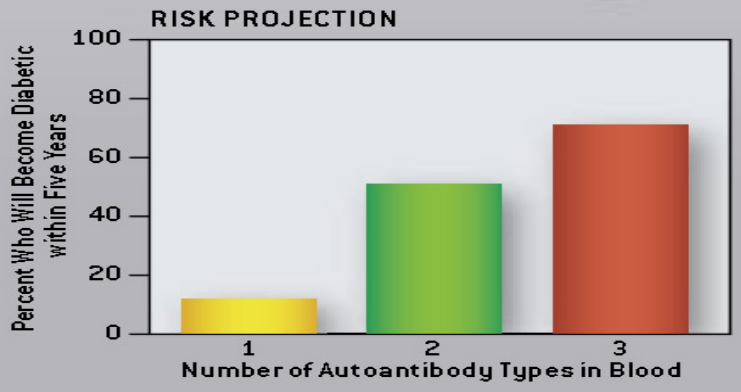




HOW DIABETES DEVELOPS

The attack on beta cells begins when immune cells called T lymphocytes and B lymphocytes invade the islets of Langerhans, where the beta cells reside. The T cells probably cause most of the damage (*top detail*), but as those cells work their mischief, the B lymphocytes spit out antibodies against proteins made by beta cells, usually starting with insulin.

As the attack on the islets continues, damaging them severely, other types of autoantibodies may appear, such as ones targeted to the proteins GAD and IA-2 (*bottom detail*). The order and time at which the additional autoantibodies arise can vary.

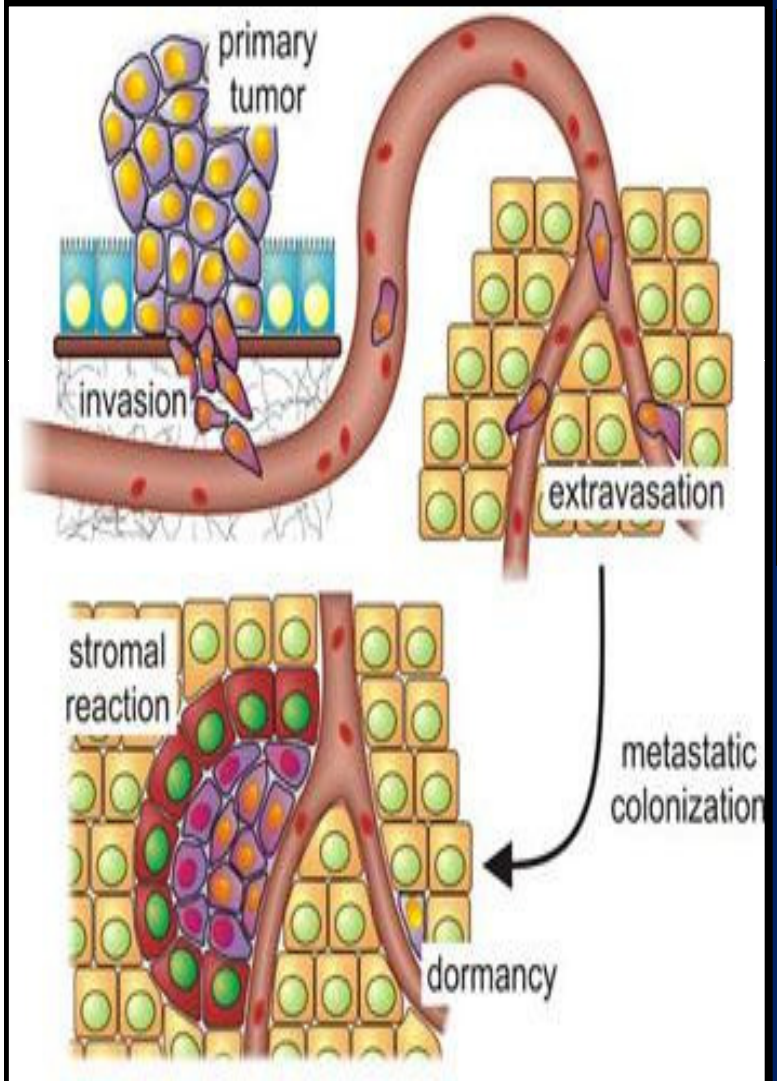


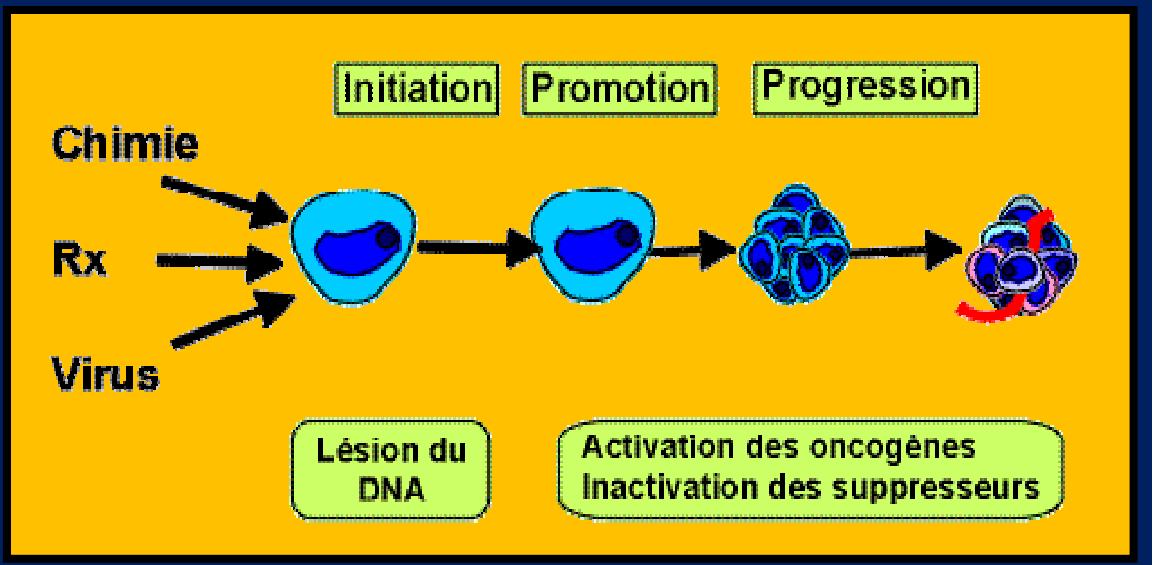
Subclinical stages **are also determined by identification of** ***proteomic biomarkers,*** **i.e.,** ***antiislet autoAbs*** **as early as 5-10 years before the** ***clinical onset*** **of disease** ***(Fig. 54)***

AUTOANTIBODIES AND DIABETES RISK

Whether autoantibodies to insulin, GAD and IA-2 contribute to the beta cell killing is not known, but studies have shown that the molecules can signal greatly enhanced risk for diabetes. Risk increases with the number of diabetes-related autoantibody types in the blood.

Tumor initiation **is provided by** ***oncogenic mutations*** **and** ***inactivation of tumor-suppressor genes*** **and depends on the stepwise acquisition of specific functions by** ***cancer stem cells (CSC)*** **and** ***circulating tumor cells (CTCs)*** **to be identified by** ***genomic tailoring*** **approach on one hand and** ***proteomic-immunonomic*** **approaches, on the other hand** ***(Fig. 56)***



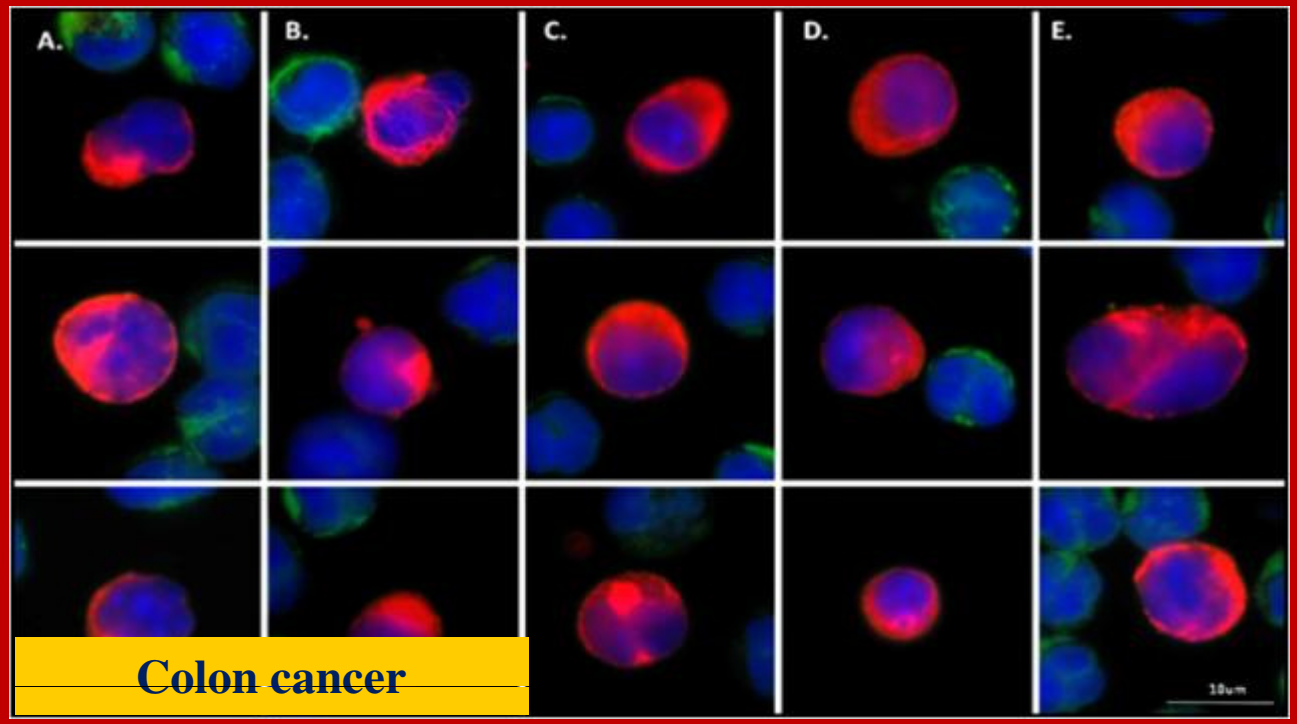


Three different steps are described during cancerogenesis:

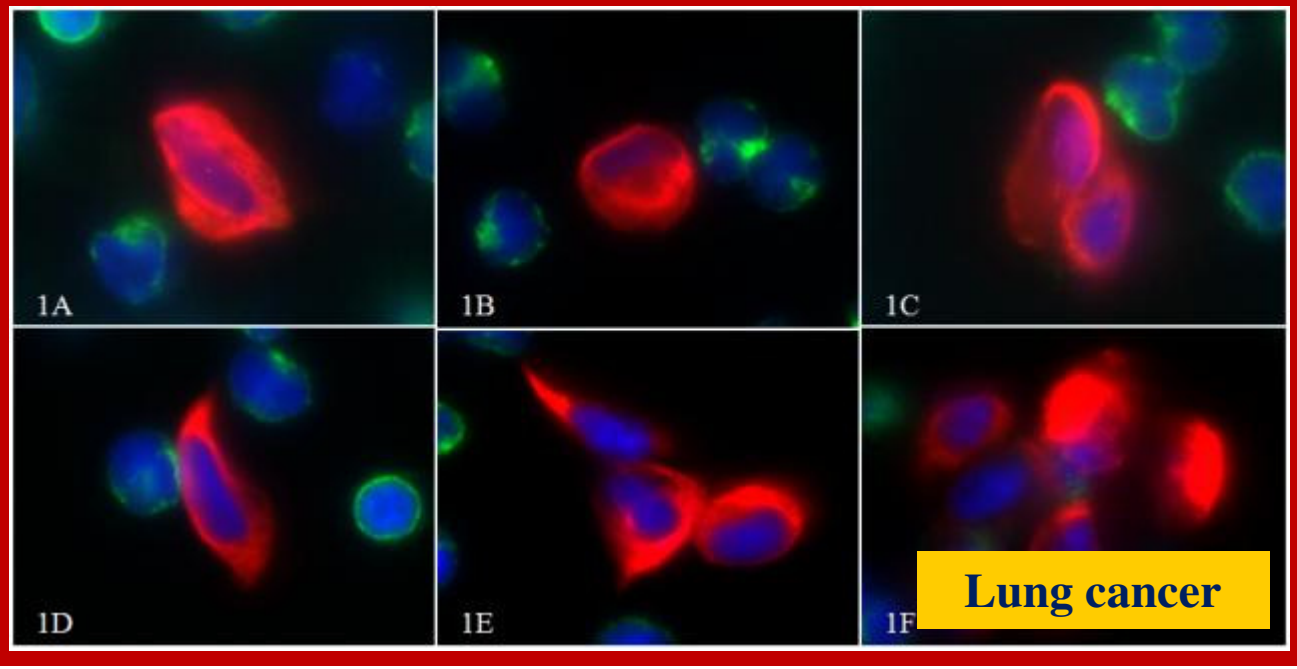
Initiation **is a rapid and irreversible DNA lesion which occurs after exposure to a carcinogen (physical carcinogen, chemical carcinogen, viral carcinogen)**

Promotion **is due to prolonged, repetitive or continuous exposure to substances which maintain and stabilize the initiated lesion**

Progression **is the acquisition of non-controlled multiplication properties, independence acquisition, loss of differentiation, local invasion and metastasis**


A.
B.
C.
D.
E.
Colon cancer


Breast cancer


1A
1B
1C
1D
1E
1F
Lung cancer

PPPM **is a new healthcare model that notifies people of the health conditions they're disposed to and it reveals the *biomarkers* and thus the *agents* to improve and to thus secure the health and individual biosafety.**

Meanwhile, implementation of PPPM would require the adjusted technology for proper interpretation of *diagnostic* and *predictive* data before the current model *"physician-patient"* could be gradually displaced by a *"medical advisor-healthy persons-at-risk"* model.

This approach should be based on postulates which will change the incarnate culture and social mentality.

First of all, **it is the impact of human responsibility for the own health and for the health of their children, and active involvement into the *preventive* measures for strengthening of the public health and country's biosafety.**

Secondly, **a creation of legal basis to satisfy all society needs for the *protection* of individual health – regulations of the state insurance in the PPPM.**

And, *thirdly,* for sure, it's necessary to radically change the system of *medical training,* and designing novel approaches to build the *academic schools* of new generations

Due to our viewpoint, all healthcare professionals of the future should be educated to deliver *patient-centric care* as members of *interdisciplinary teams*, emphasizing *evidence-based practice*, *quality improvement approaches* and *bioinformatics.*

That concerns the need for novel training programs since the society is in bad need of large-scale dissemination of *novel systemic thinking* and *minding*.

And upon construction of *the new educational platforms* in the rational proportions, there would be not a *primitive physician* created but *a medical artist* to be able to enrich flow-through medical standards with creative elements to gift for a *patient a genuine hope to survive* but, in turn, *for a person-at-risk – a trust for being no diseased.*

So, the existing medical education would strongly need to be restructured to involve along with traditional graduate and post-graduate training, *pre-graduate* preliminaries to disclose for schoolchildren the mysteries of the evidence-based medicine and *PPPM* as the entity

Based on current trends and own experience, we have tried a non-canonical approach towards reshuffling the traditional educational tandem

"School-University"

to create a team of talented and gifted teenagers to be engaged into PPPM-related areas.

The Team has been given a roof under the aegis of

European Association of Predictive, Preventive and Personalized Medicine (EPMA), Brussels, EU,

and started up to move ahead now

The First Anglo-Russian Students' Workshop on PPPM and Translational Medicine

Lancaster University

4th September 2012

Location: **TR1/TR2 Gordon Manley building**

Chairs:

Professors Frank Martin, PhD (UK)

Director, Environmental and Biophotonics Center, and Chairman, Dept for Biochemistry, Lancaster University, UK

Professor Sergey Suchkov, MD, PhD (Russia)

Dept of Pathology, School of Pharmacy, I.M.Sechenov First Moscow State Medical University, and Dept of Clinical Immunology, Moscow State Medical & Dentistry University, First Vice-President and Dean, School of PPPM, University of World Politics and Law, Moscow, Russia

EPMA
European Association for Predictive Preventive & Personalised Medicine

EPMA-World Congress 2011

September 15th19th, Bonn, Germany

International Research Team of Youngers

EPMA World Congress 2013

Europarliament, Brussels, EU, Sep 2013

Section For Young Professionals (Session)

Our global challenge is that
the new guidelines should create
the robust *juristic* and *economic*
platforms for
advanced medical services utilizing
the cost-effective models of risk
assessments followed by
tailored *preventive* treatments
focused on the precursor stages of
chronic diseases

Some comments:

Individuals to be under ***regular monitoring*** that helps to detect pathological shifts at ***subclinical*** stages have a higher life expectancy and are able-bodied up to 8–15 years more than those under traditional treatment.

This means that the society would save more than ***US$20,000–40,000 per person annually.***

At the community level, the annual savings from each individual may vary from ***several thousands*** to ***several tens*** of ***thousands*** U.S. dollars.

In the area of oncology, for instance, the latter means that as little as a 10 percent reduction in cancer would translate into ***a savings of 4.4 trillion US dollars*** to society.

As you might feel, besides the *scientific* and *clinical* challenges, there are *economic* hurdles.

The opportunity arises for unusual and, even extraordinary, *strategic partnerships* between:

► governments, academic and business sectors.

The healthcare industry, public policy sector, and consumer industries will be required to develop *new and creative business models and products.*

And, no doubt, next generations will speak about the XXI century as a time, when medicine became *preventive* and *personalized*, and its outcomes – *predictive* and *guarantied.*

Let Us Meet Again

We welcome you all to our future conferences of OMICS Group International

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