



FONDAZIONE IRCCS CA' GRANDA
OSPEDALE MAGGIORE POLICLINICO

Sistema Sanitario  Regione
Lombardia



INGM

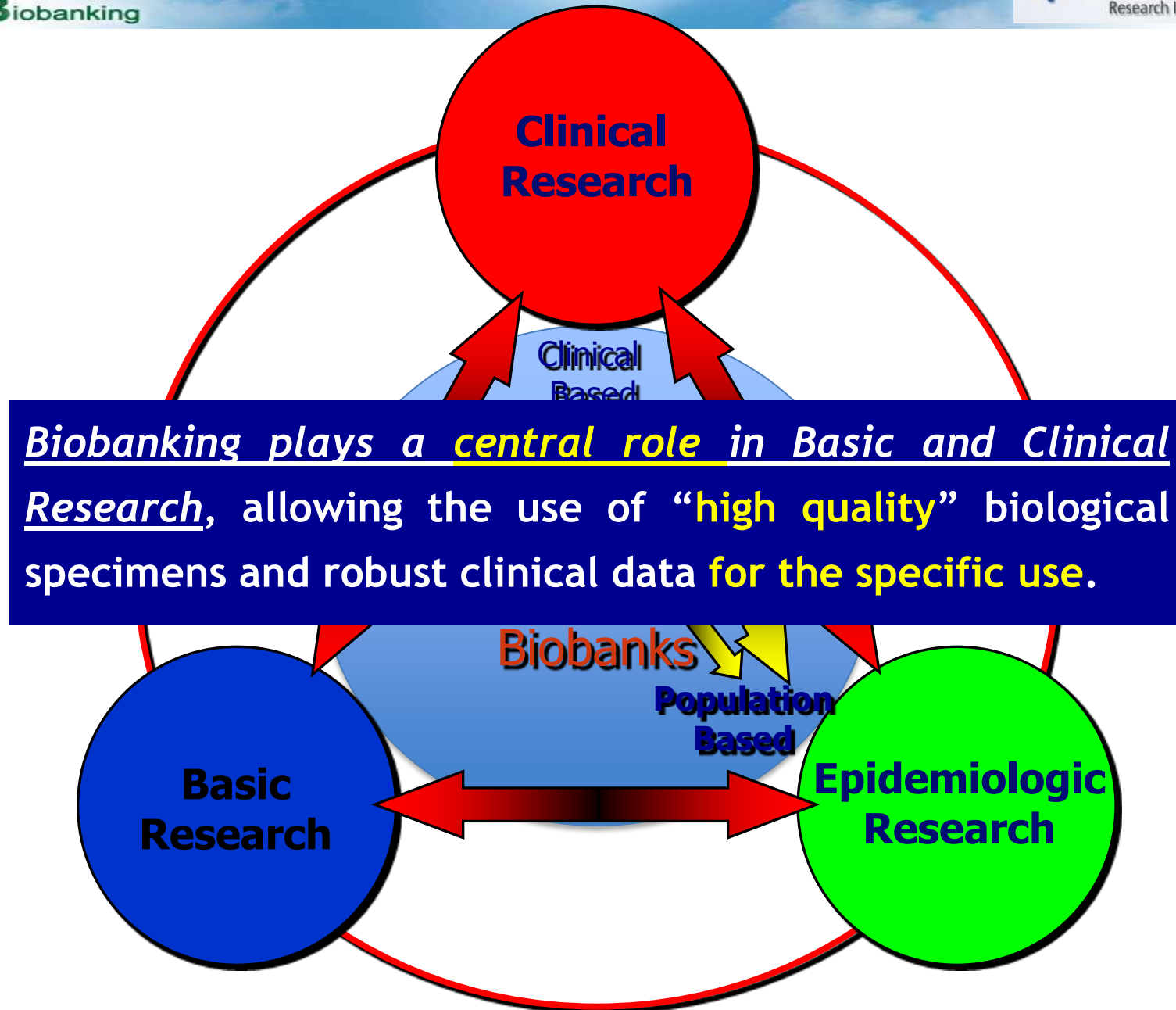
Fondazione Istituto Nazionale Genetica Molecolare

Ca' Granda Lectures and Seminars in Molecular Medicine

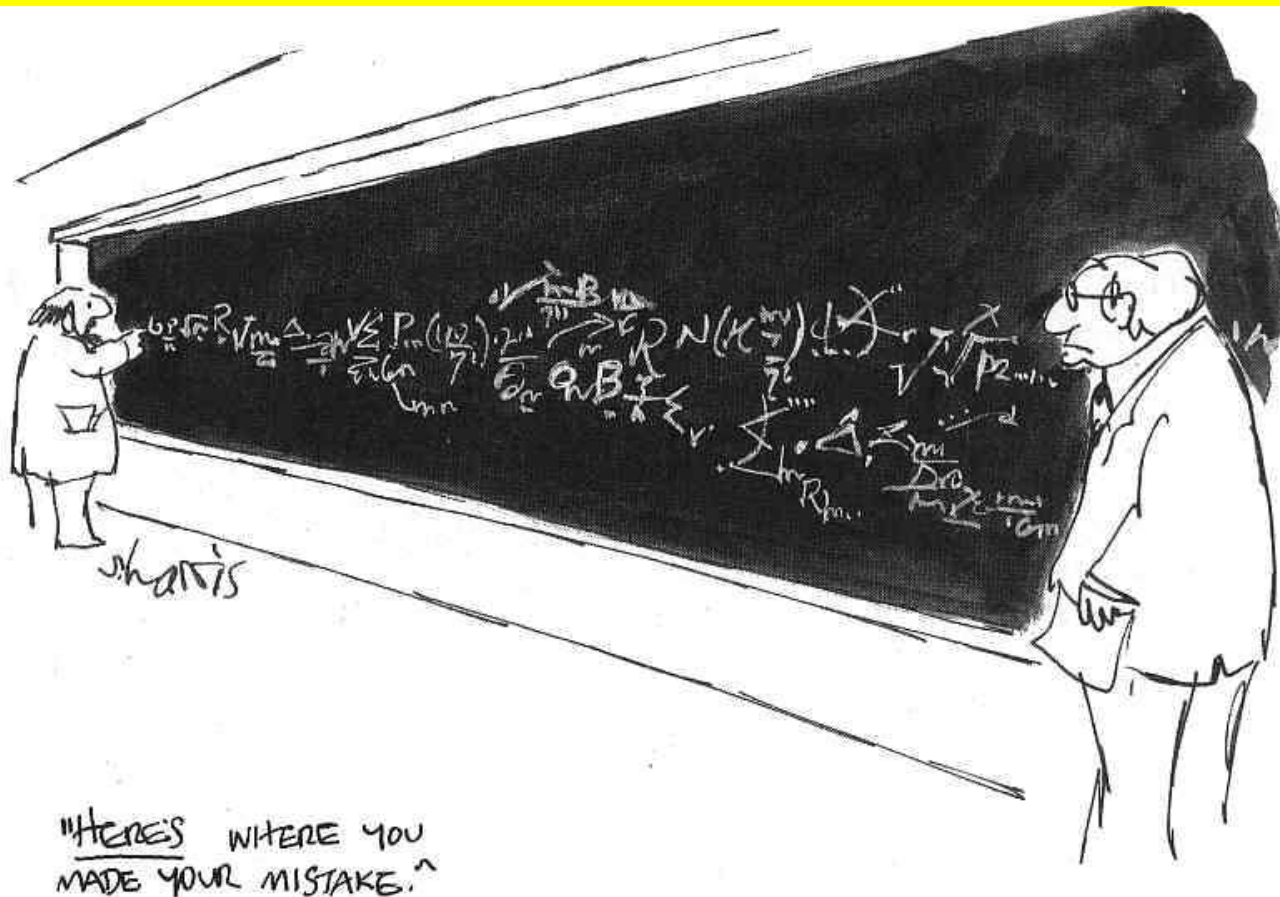
Biobanche: questioni giuridiche, casi pratici, opportunità



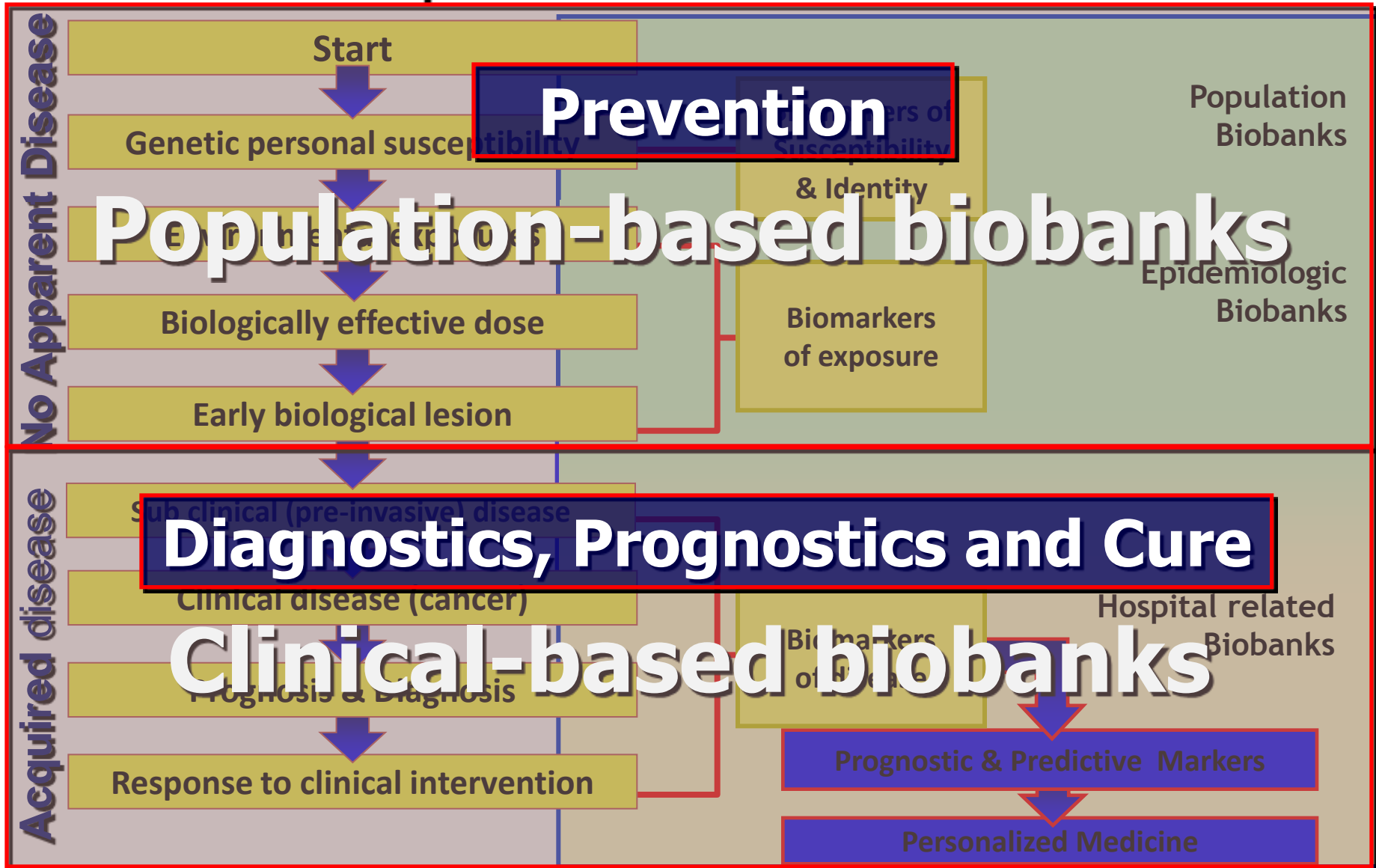
- ***Esperienze Italiane ed estere nelle Biobanche***
- ***Pasquale De Blasio***
ESBB Founding President
CEO of Integrating Systems Engineering srl – Milano - IT



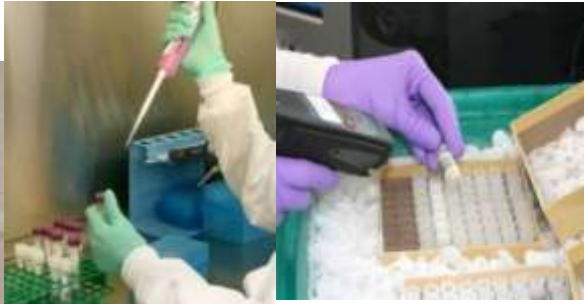
The “Quality of the biological materials” used in a research is fundamental for the “results that are published” and for its “confirmation in different labs”.



Disease development



Collect/Process/Inventory/Store



Search/Request



Evaluate Use

Biorepository Collection Life Cycle

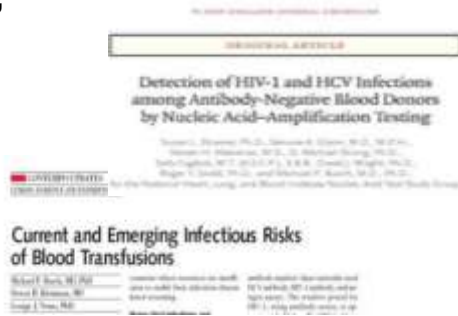
Biorepository obtains informed consent



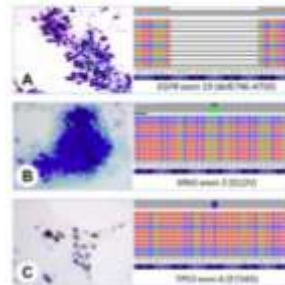
Develop New research protocols

New Clinical Application (diagnostic, prognostic, therapeutic)

Publish/ Submit to Regulatory body

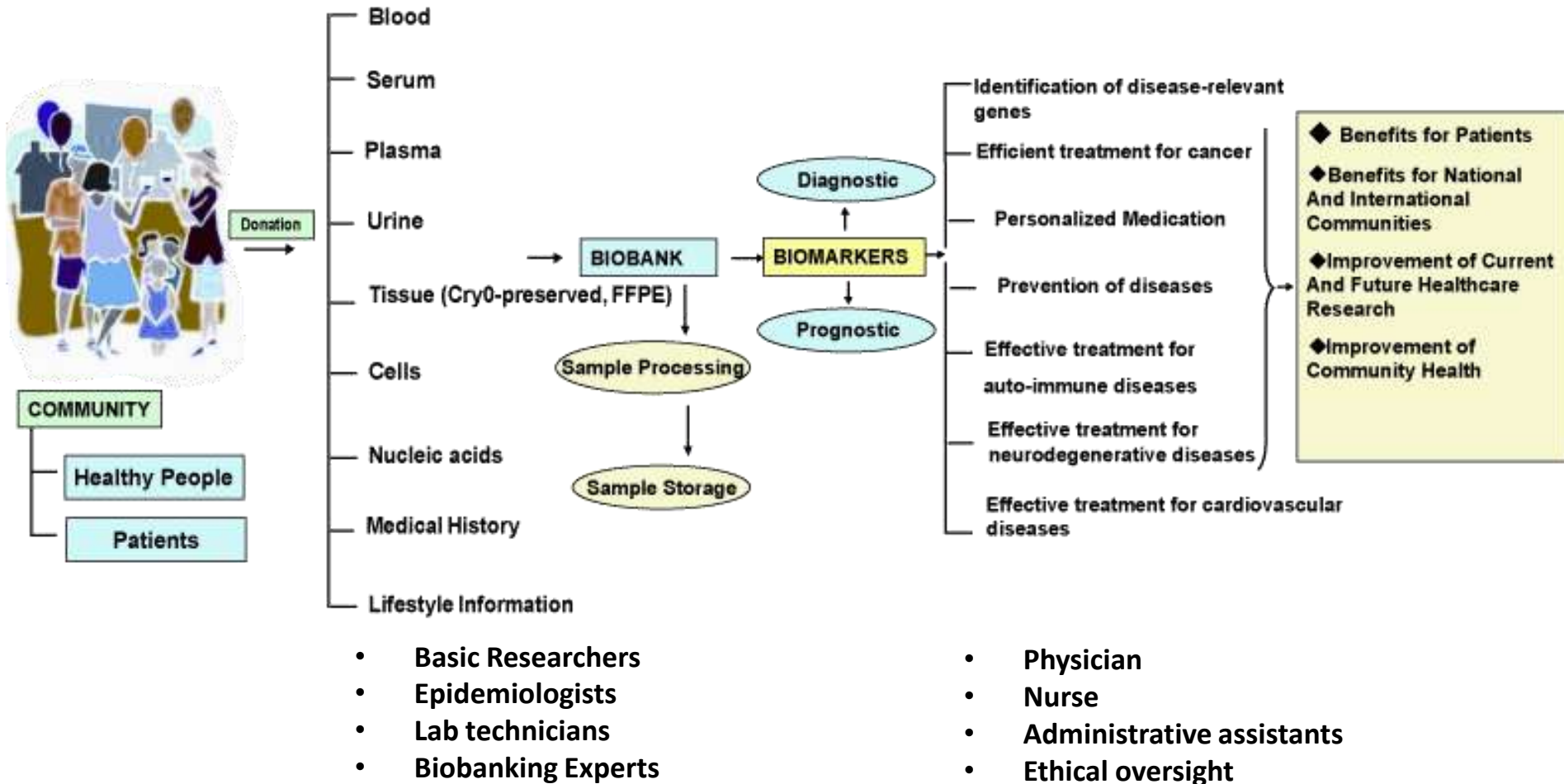


Analyze / Verify / Validate



Distribute





Fit for Purpose

- ▶ The research application and scientific question being addressed
- ▶ Specifics of the collection protocol
- ▶ Specific project needs (e.g. normal, diseased, tissue origin, specimen type, etc.)

Sample Quality and Specificity

- ▶ Quality and specificity price drivers:
 - ▶ Specimen rarity and size requirements
 - ▶ Extent of customized processing requested
 - ▶ Clinical parameters (e.g. treatments, etc.), and pathology parameters (e.g. tumor subtype, positive tissue markers) requested

Data Richness

- ▶ Outcomes data are in high demand
- ▶ Comprehensive data sets
- ▶ Customized data

Fit for Purpose

Quality and Specificity

Data Richness



frozen

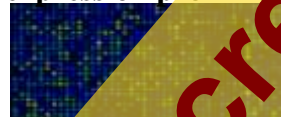
cryopreserved

paraffin

DNA: CGH analysis



RNA: expression profiling



Proteins: expression profiling



Primary Cell Lines
(in vivo model)
Xenograft

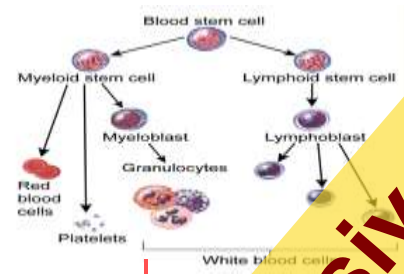


Selected genes-proteins

gene expression analysis using antibodies or DNA probes



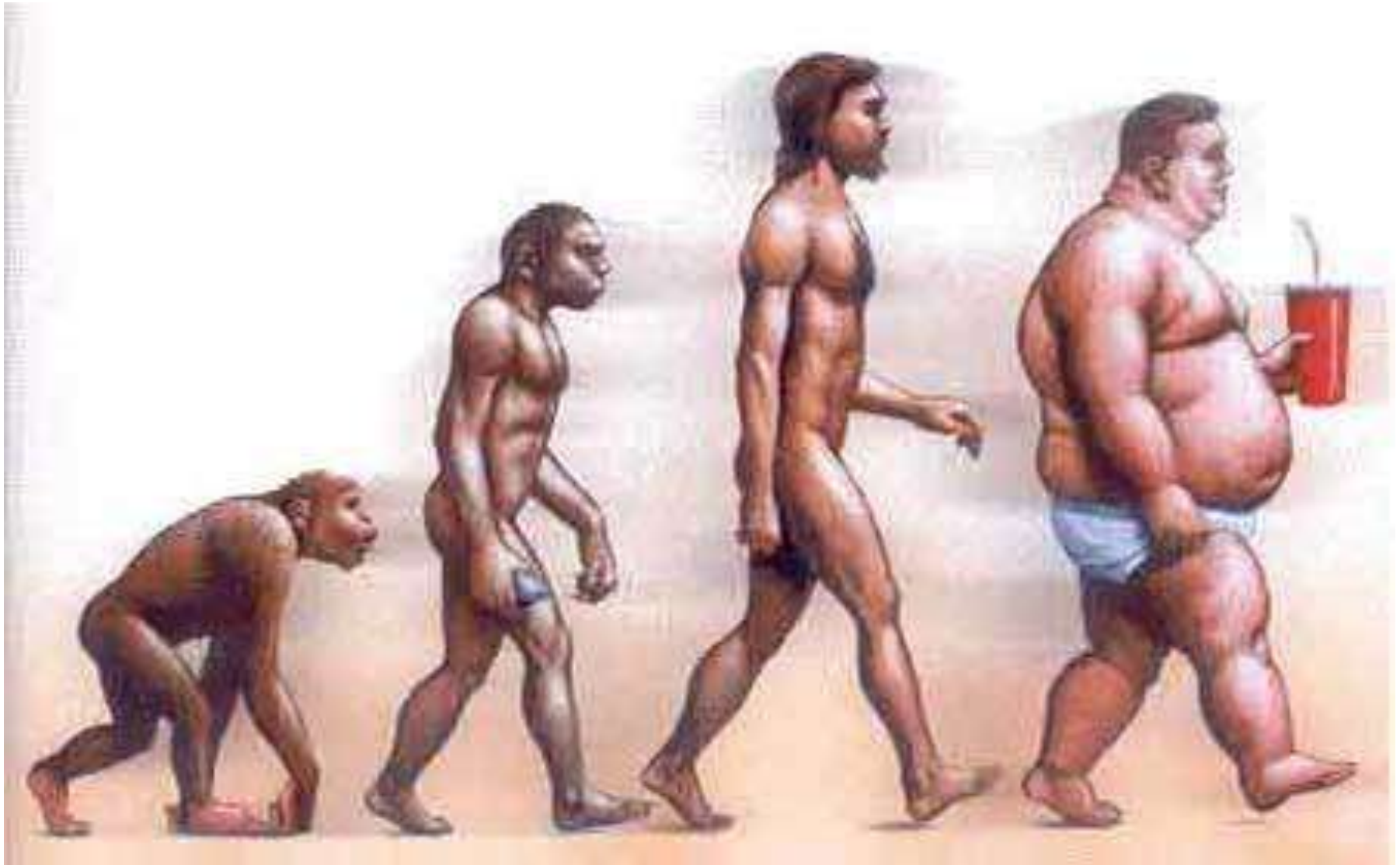
Selection of tumor types in which the expression of the given gene is altered



DNA (SNP analysis)

Proteins

Non-invasive diagnosis

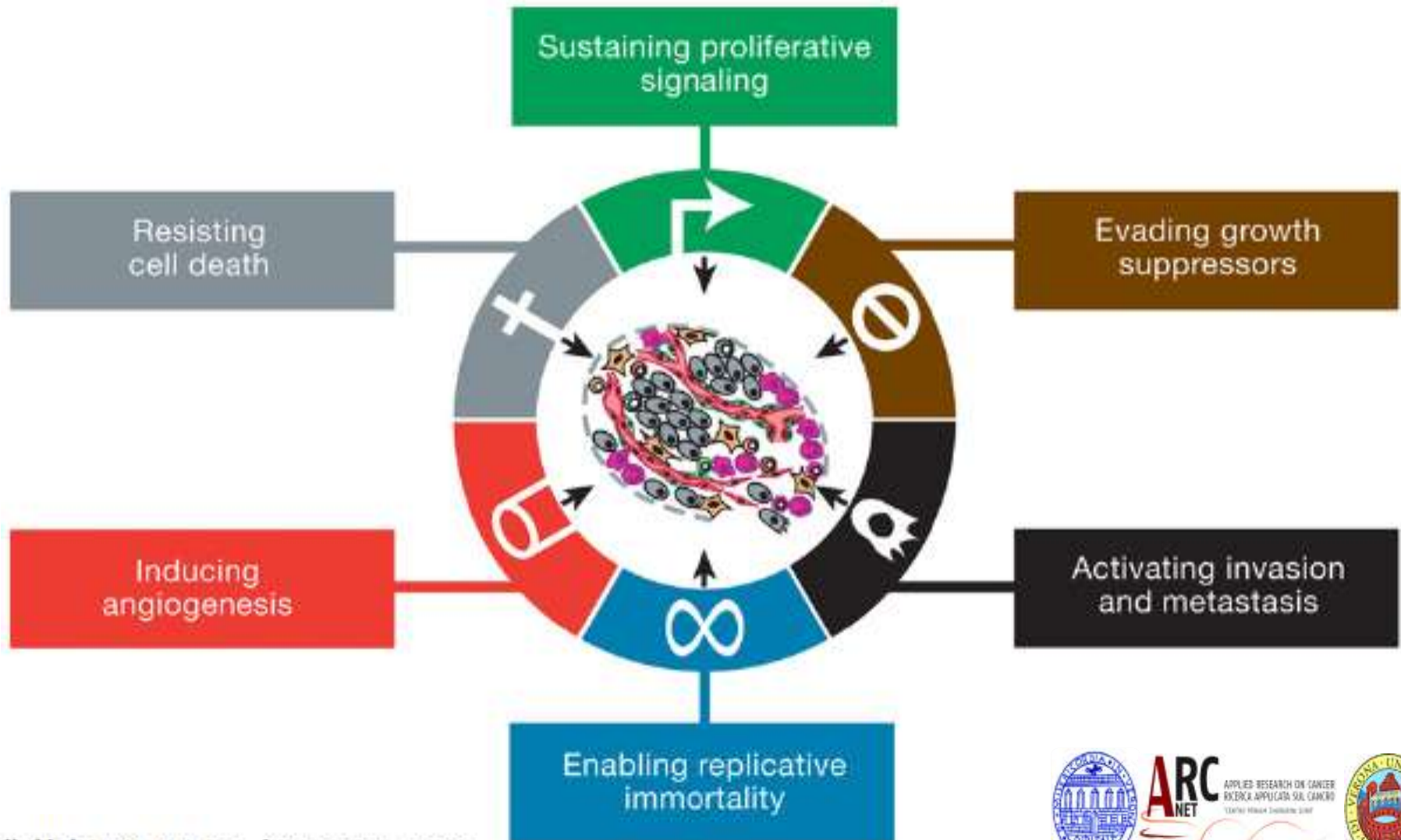


NEW Disease Classifications

(The most quoted paper in the last 10 yrs....)

The Hallmarks of Cancer

Douglas Hanahan* and Robert A. Weinberg†

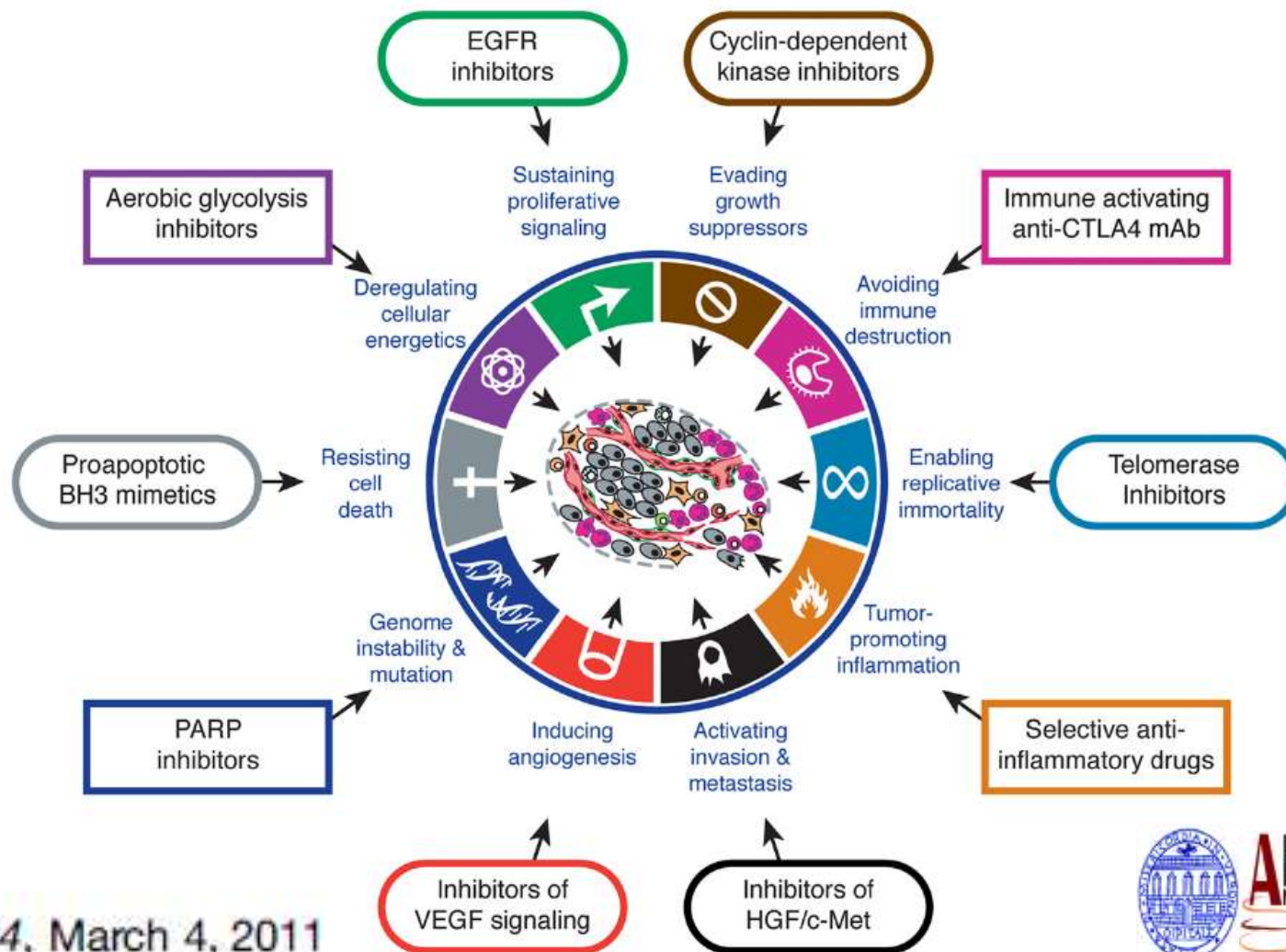


NEW Disease Classifications

(The most quoted paper in the forthcoming 10 yrs.....)

Hallmarks of Cancer: The Next Generation

Douglas Hanahan^{1,2*} and Robert A. Weinberg^{3,*}



NEW Disease Classifications (Standard Classification of Cancers)

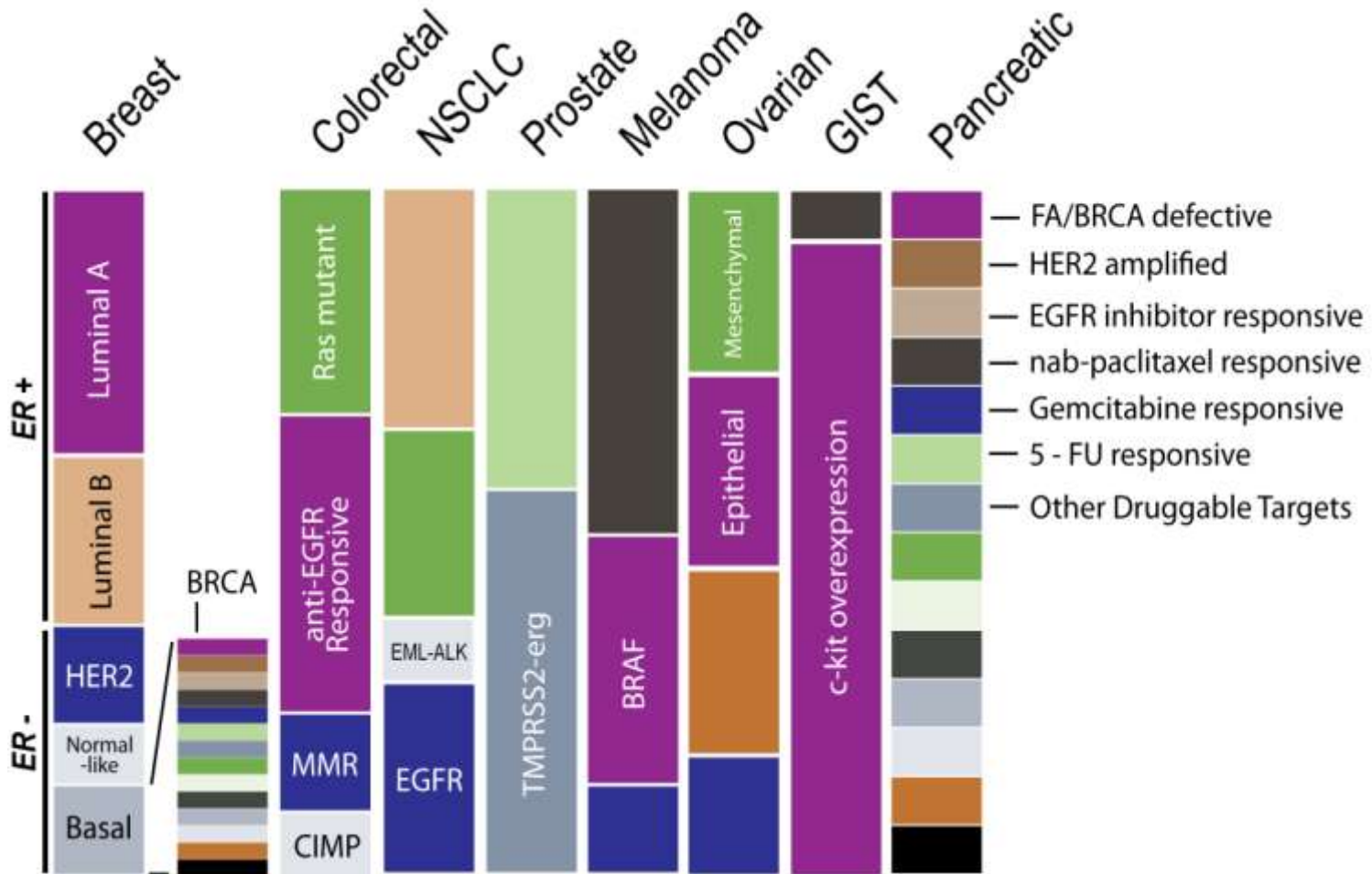
Breast
Colorectal
NSCLC
Prostate
Melanoma
Ovarian
GIST
Pancreatic





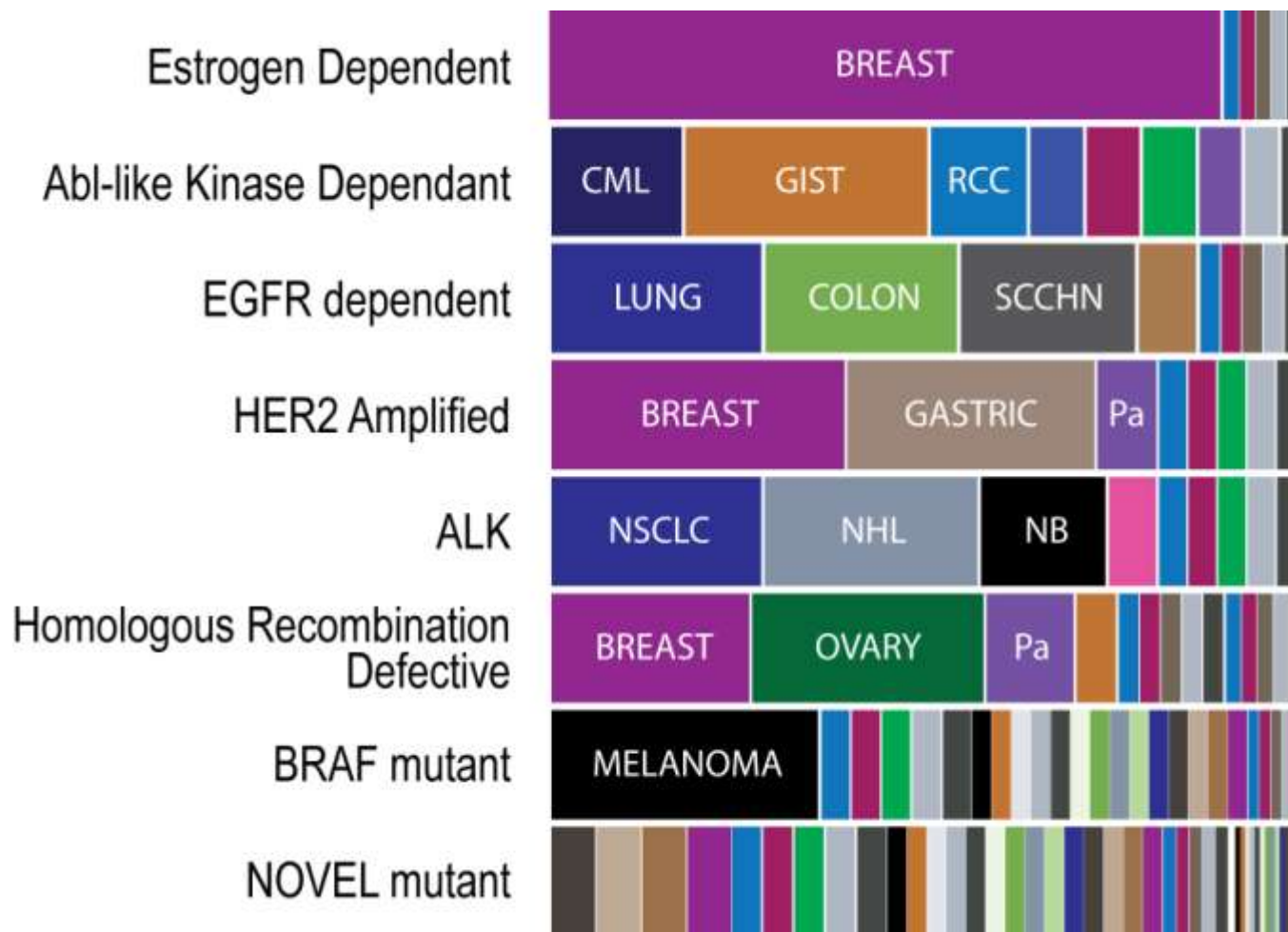
NEW Disease Classifications

(according to Molecular Heterogeneity)



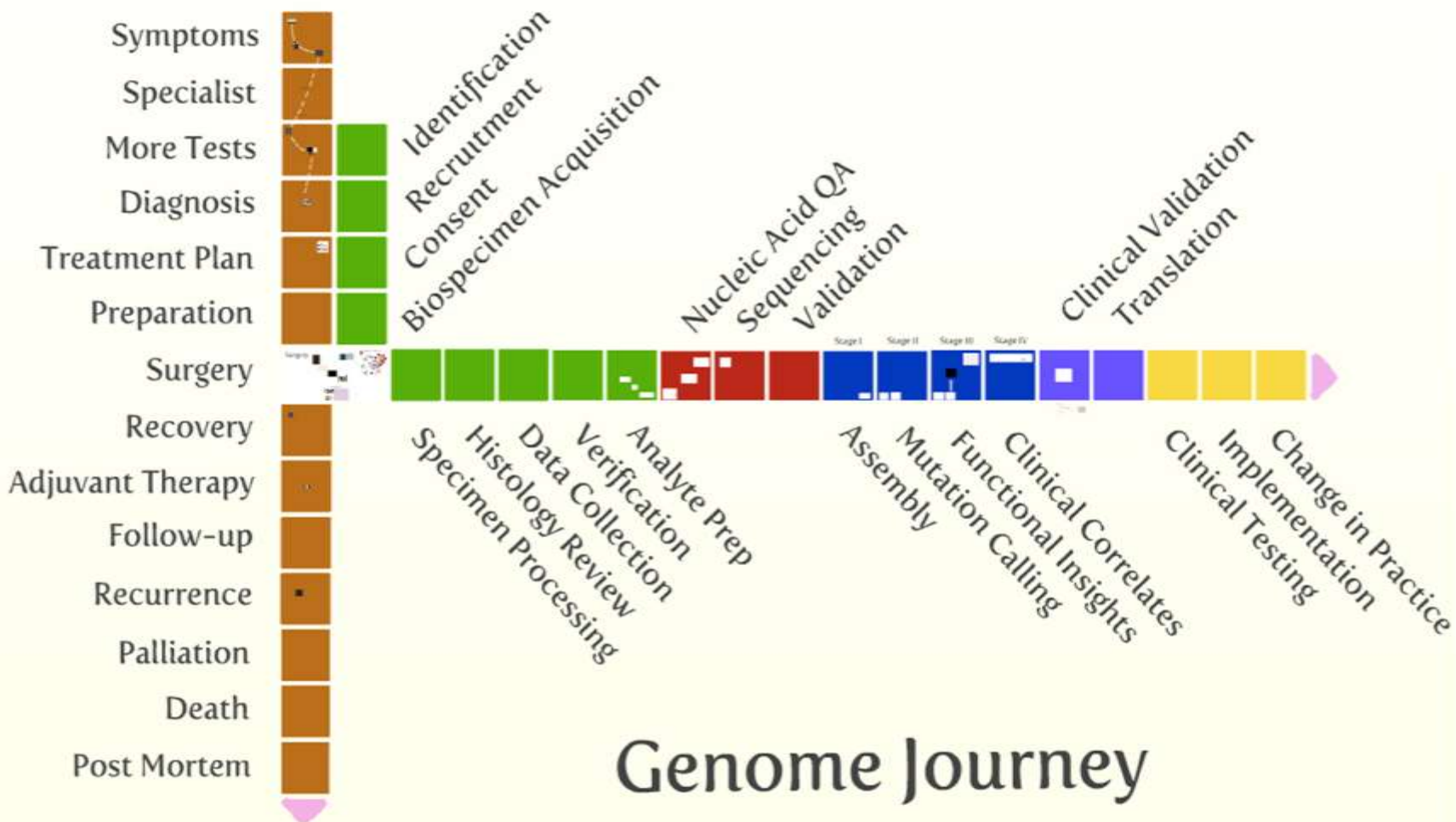
New Disease Classifications

(according to Heterogeneity & Biotypes)

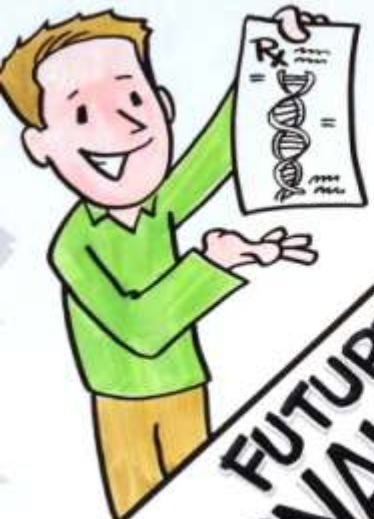


Cancer
“Biotypes”

Patient Journey



FUTURE OF PERSONALIZED MEDICINE



NEED MORE **AGILE** REGULATORY SYSTEM

GENETIC COUNSEL
+
DECISION SUPPORT
+
GENETIC LITERACY

BETTER EVIDENCE FOR DIAGNOSTICS AND THERAPIES

TRANSLATE RESEARCH...

...EMPOWER PATIENTS!

TAKE CARE OF YOUR OWN HEALTH!

GIVE ME MY DATA!

TEST BEFORE YOU **TREAT**

GET TO THE **RIGHT DRUG**

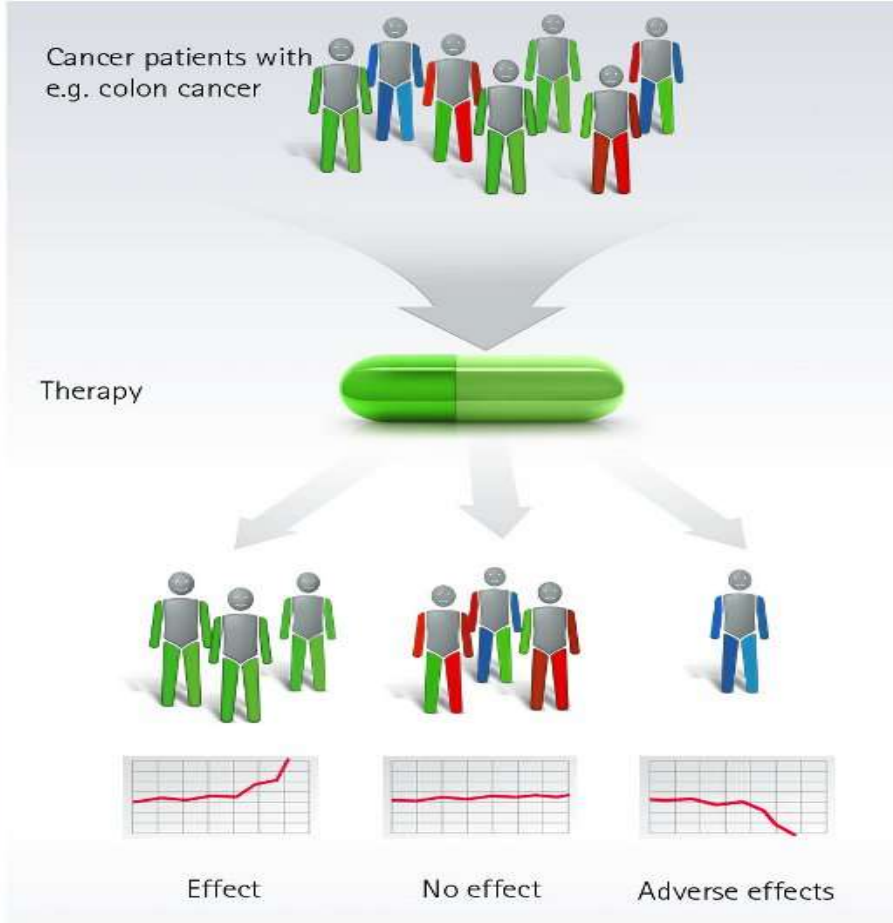
THE FIRST TIME!

ALL OF THE DATA FROM THE INTERNET CAN BE STORED IN DNA IN A SMALL TEST TUBE.

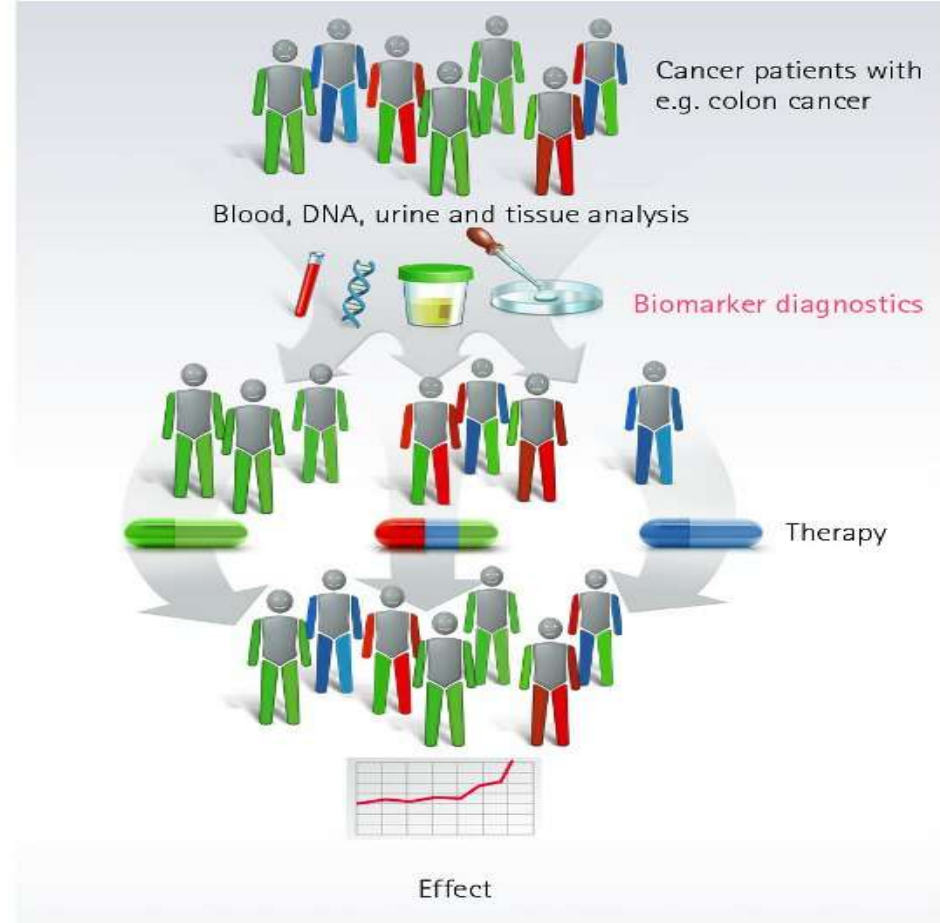
GIANT LEAPS IN **MEDICINE** ARE JUST AROUND THE CORNER!

Personalized medicine: tailored treatments

Medicine of the present: one treatment fits all



Medicine of the future: more personalized diagnostics



*Different people respond differently to the same therapy: while one treatment brings about the desired success in one group of patients with e.g. colon cancer, it does not change the condition of other groups at all, or even leads to adverse effects (left). The reason: the genetic makeup and metabolic profile of each individual patient influences the effect of a drug. Personalized medicine takes these individual patterns of cellular and metabolic products into account in the diagnostic phase: **biomarker diagnostics** separates patients into groups with similar characteristics, and provides information on the best individual treatment. This should enable all patients to benefit from their own, "personal" therapy.*



REVIEW

Biobanking shifts to “precision medicine”

This article was published in the following Dove Press journal:

Journal of Biorepository Science for Applied Medicine

24 July 2014

[Number of times this article has been viewed](#)

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Simona Baronchelli²
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Ida Biunno^{2,3}

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Abstract: The shape of the global health care system is changing rapidly to an approach that is much more patient-centered and focused on “precision medicine.” This is especially due to the development of large-scale “omics” biology results that rely on using and sharing sample collections and databases contained within bioresource facilities. “Personalized medicine” or “precision medicine” is the premise to help individuals to get the “right medicine for the right problem at the right time.” For several decades, tissues, body fluids, and cells obtained from patients with selected diseases have been cryopreserved in hospital-based biobanks, but samples were not accessible worldwide. Instead, the value of biobanks relies on the availability, at a necessary scale, of high-quality biospecimens and related data in order to respond to specific biological questions. However, the next generation of biobanks needs to face a major challenge – the costs related to the collection and processing of a large number of samples. Here, we describe the shift of biobanks from conventional repositories to functional infrastructures able to respond to specific medical demands.

Keywords: next-generation biobanking, personalized medicine, tumor biotypes

Need to make better use of Clinical Records





What is biospecimen science?

Biospecimen Science is the multidisciplinary field of study responsible for establishing tested and proven biospecimen resource-related procedures based on experimentation in the areas of specimen collection, processing, shipping, and storage

Why is it needed?

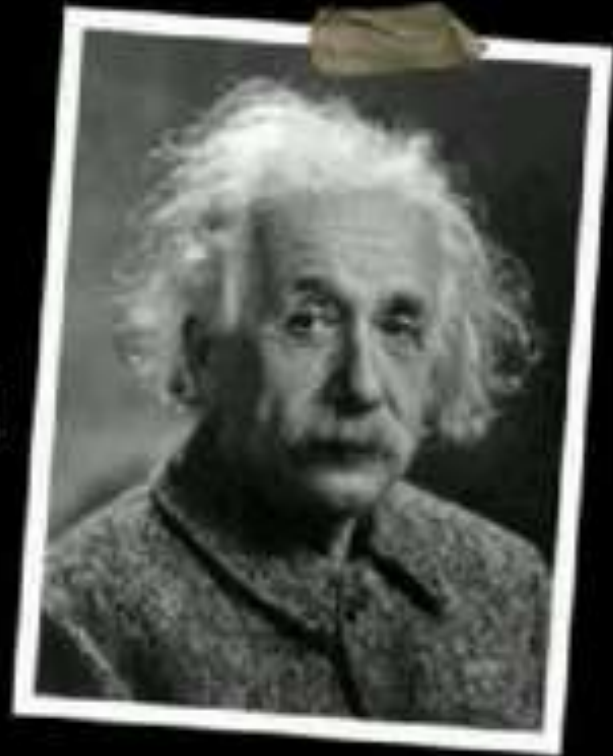
Biospecimens are composed of active and reactive living cells or cell products, making them highly complex.

The collection, handling, and storage process can profoundly alter the molecular profile and quality of biospecimens.

Such alterations, though artificial, can be misinterpreted as disease related or disease specific.

High degrees of sensitivity and specificity in new molecular techniques raise the bar for analyte (specimen) data and quality.

**"Education is not
the learning of
facts, but the
training of the mind
to think."
-Albert Einstein**



Biobanking experiences

Public Biobanks	Private Biobanks
• Population Based	• Population Based
• Hospital/Disease based	• Service Providers
• Cord Blood Banks	• Cord Blood Banks
• Stem Cell (MSC, ESC, iPS, etc.)	• Stem Cell (MCS, ESC, etc.)
	• iPSC
• Animal Biobanks	
• Enviro Bio Biobanks	
• Agriculture/seeds Biobanks	
• Museum Biobanks	



WELCOME TO BBMRI-ERIC

Essential for the understanding of the diversity of human diseases, biological samples and corresponding data are required for the development of any new drug or diagnostic assay and are therefore critical for the advancement in health research, ultimately leading to personalised medicine. Biobanks also will provide key information on the influence of environment and lifestyle on health, constituting a basis for disease prevention programmes and the improvement of public health.

Hence, a close collaboration between researchers, biobankers, patient advocacy groups, and the biotech and pharma industry is essential in addressing both common and rare diseases. Keeping in mind the need for better prevention, diagnostics, and therapy for all, we are aware that every single sample impacts our ability to comprehend disease and, thus, achieve our goal for a healthier life. Sixteen Member States and one International Organisation have thus joined forces in establishing BBMRI-ERIC, which is one of the largest health Research Infrastructure in Europe today. BBMRI-ERIC primarily aims at establishing, operating, and developing a pan-European distributed research infrastructure of *biobanks* and *biomolecular resources*. This will facilitate the access to biological resources as well as biomedical facilities and support high-quality biomolecular and medical research.

Imagine the countless possible applications for the billions of biological samples that are available from biobanks across Europe.

Welcome to BBMRI-ERIC - Welcome to the Gateway for Health!

Prof. Jan-Eric Litton
BBMRI-ERIC Director General

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RECENT NEWS

BiobankCloud Newsletter (2014-11)

The BiobankCloud project develops a software stack for the secure storage and analysis of...

[Read the full article](#)

BBMRI-ERIC to host HandsOn: Biobanks at EXPO Milan 2015

Following the "HandsOn: Biobanks 2014: From Biobanks to Medical Innovations" last month in...

[Read the full article](#)



WE KNOW GENETICS

deCODE genetics is a global leader in analyzing and understanding the human genome. Using its unique expertise and population resources, deCODE has discovered genetic risk factors for dozens of common diseases. The purpose of understanding the genetics of disease is to use that information to create new means of diagnosing, treating and preventing disease.

UNIQUE EXPERTISE



Using its unique expertise and population resources, deCODE has discovered key genetic risk factors for dozens of common diseases ranging from cardiovascular disease to cancer.

UNIQUE CAPABILITIES



We operate the most productive human gene discovery engine in the world, employing our discoveries to identify genetic variations associated with human disease.

OUR PUBLICATIONS



We regularly publish our discoveries in major, peer-reviewed journals, enabling others to further validate and expand upon our findings



UK Biobank imaging study launched

[Read more...](#)



Activity: 8 million hours and rising




World's largest dementias study group created




UK Biobank Imaging study launched

Participants

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[Look at the Data Showcase →](#)

Scientists

 [Web questionnaires: submit a proposal](#)

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 [UK Biobank Axiom Array](#)

 [UK Biobank Eye & Vision Consortium](#)

A healthier future starts with you



Welcome to Qatar Biobank

Qatar Biobank is a platform that will make vital health research possible through its collection of samples and information on health and lifestyle from large numbers of members of the Qatari population. Qatar Biobank, Qatar's long-term medical health initiative, was created to give Qatar's people better chances of avoiding serious illnesses, and to promote better health for our future generations.

Participating



You are being invited to take part in Qatar Biobank, Qatar's long-term medical health initiative for Qatar's population. To help you decide whether to contribute, here is some information on Qatar Biobank and what taking part involves.

Latest News



15/07/13 8:00 AM
Leading Geneticist Takes The Helm At Qatar Biobanking its 300th participant

[Read More](#)

Video



Qatar Biobank Educational Video

Email: takepart@qatarbiobank.org.qa

Tel: +974 4439 8899

Menu principale

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- News Moli-sani
- Orizzonte Ricerca
- Ricerca & Salute
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- In collaborazione con...
- Rassegna Stampa

Progetti

- Attività Lab. di Ricerca
- Calendario Laboratorio
- Progetto "Alla Salute"

Convegno su vino e salute



Certosa di Pontignano,
 Siena
 Scarica i lavori del
 convegno

News Moli-sani

- Al via la seconda fase del progetto Moli-sani: chiamati nuovamente a raccolta i 25mila cittadini
- Il progetto Moli-sani sbarca negli Stati Uniti

Orizzonte Ricerca

- Dopo un infarto o un ictus il comportamento di ciascuno farà la differenza
- Cancro al seno, la dieta mediterranea protegge dopo la menopausa



Attività

« **Novembre 2014**

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17	18	19	20	21	22	23
24	25	26	27	28	29	30



Destina il tuo
 5 per mille dell'IRPEF
 all'Associazione
 Cuore Sano ONLUS
92049530709



Un sonno irregolare come fattore di rischio per l'obesità



Secondo ricercatori statunitensi un sonno irregolare può influenzare l'aumento di peso, favorendo l'obesità e, indirettamente, tutti i problemi che questa comporta. Lo studio, recentemente pubblicato su *International Journal of Obesity*, si basa sull'ipotesi che non sarebbe solo quanto si dorme ad avere ricadute sul peso, ma

anche come si dorme.

► [Leggi tutto...](#)

Mangiare male induce ad essere pigri



È il risultato di una ricerca americana da dove emerge che l'aumento di peso dovuto a una dieta costituita da cibo spazzatura è causa di pigrizia, stanchezza e sedentarietà

La dieta mediterranea riduce l'infiammazione cronica silente: risultati dello studio Moli-sani



L'infiammazione cronica silente, alla base di numerose malattie croniche



Display Settings: Abstract

Send to: [dropdown]

Mol Oncol. 2008 Oct;2(3):213-22. doi: 10.1016/j.molonc.2008.07.004. Epub 2008 Jul 30.

Biobanking for better healthcare.

Riegman PH¹, Morente MM, Betsou F, de Blasio P, Geary P; Marble Arch International Working Group on Biobanking for Biomedical Research.

Collaborators (28)

Author information

Abstract

Translational cancer research is highly dependent of large series of cases including high quality samples and their associated data. Comprehensive Cancer Centers should be involved in networks to enable large-scale multi-center research projects between the centers [Ringborg, U., de Valeriola, D., van Harten, W., Lombart-Bosch, A., Lombardo, C., Nilsson, K., Philip, T., Pierotti, M.A., Riegman, P., Saghatchian, M., Storme, G., Tursz, T., Verellen, D, 2008. Improvement of European translational cancer research. Collaboration between comprehensive cancer centers. Tumori 94, 143-146.]. Combating cancer knows many frontiers. Research is needed for prevention as well as better care for those who have acquired the disease. This implies that human samples for cancer research need to be sourced from distinct forms of biobanking. An easier access to these samples for the scientific community is considered as the main bottleneck for research for health, and biobanks are the most adequate site to try to resolve this issue [Ozols, R.F., Herbst, R.S., Colson, Y.L., Gralow, J., Bonner, J., Curran Jr., W.J., Eisenberg, B.L., Ganz, P.A., Kramer, B.S., Kris, M.G., Markman, M., Mayer, R.J., Raghavan, D., Reaman, G.H., Sawaya, R., Schilsky, R.L., Schuchter, L.M., Sweetenham, J.W., Vahdat, L.T., Winn, R.J., and the American Society of Clinical Oncology, 2007. Clinical cancer advances 2006: major research advances in cancer treatment, prevention, and screening: a report from the American Society of Clinical Oncology. J. Clin. Oncol. 25, 146-162.]. However, biobanks should not be considered a static activity. On the contrary, biobanking is a young discipline [Morente, M.M., Fernandez, P.L., de Alava, E. Biobanking: old activity or young discipline? Semin. Diagn. Pathol., in press.], which need continuously evolve according to the permanent development of new techniques and new scientific goals. To accomplish current requirements of the scientific community biobanks need to face some essential challenges including an appropriate design, harmonized and more suitable procedures, and sustainability, all of them in the framework of their ethic, legal and social dimensions. This review therefore presents an overview on these issues, based on the works and discussions of the Marble Arch International Working Group on Biobanking for Biomedical Research, integrated by experts in biobanking from five continents.

PMID: 19383342 [PubMed - indexed for MEDLINE] Free full text



Publication Types, MeSH Terms, Substances

LinkOut - more resources

Full text links



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Related citations in PubMed

- The Organization of European Cancer Institute Pathol [Cancer Epidemiol Biomarkers Prev. 2010]
- Review** New concepts of biobanks--strategic chance for uro-oncology. [Urol Oncol. 2010]
- Review** Biobanking: old activity or young discipline? [Semin Diagn Pathol. 2008]
- An empirical survey on biobanking of human genetic material and da [Eur J Hum Genet. 2003]
- A study of spectral integration and normalization in NMR-based metz [J Pharm Biomed Anal. 2005]

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Registries and Biobanks for Human Stem Cell Lines

Glyn Stacey, UK Stem Cell Bank, NIBSC

ESHRE Course, Valencia, 8th November 2010



National Institute for Biological Standards and Control
Assuring the quality of biological medicines

List of partners

The EBISC Consortium represents all relevant stakeholders from donors to clinical and academic iPSC researchers and industrial us thus provides the scientific expertise, facilities, networks and experience to achieve the project goals and respond appropriately to advances in science and society.

Led by Pfizer Ltd and managed by Roslin Cells, the Consortium has 8 active participant iPSC Centres with clinical and patient network leader in industrial iPSC supply, international experts in iPSC science, biobanking, bioengineering, regenerative medicine and data management and scholars in law and ethics.



EFPIA companies

Pfizer Ltd, United Kingdom

Novo Nordisk A/S, Denmark

AstraZeneca AB, Sweden

H. Lundbeck A/S, Denmark

Janssen Pharmaceutica NV a pharmaceutical company of Johnson & Johnson, Belgium

UCB Biopharma SPRL, Belgium

SME's

Roslin Cells Ltd, United Kingdom

ARTTIC, France

DefiniGEN Ltd, United Kingdom

Douglas Connect GmbH (working community) Germany

Bioneer A/S, Denmark

Stem Cell Banking for Personalized and Regenerative Medicine

Alkaterini Ntai^{1,4}, Tatiana Pellegrino¹, Simona Baronchelli¹, Davide Giuseppe D'Urso², Alberto La Spada², Alessandra Storaci², Monica Cattaneo², Andrea De Blasio¹, Ida Biunno^{2,3}, Pasquale De Blasio¹



¹Integrated Systems Engineering Srl, Via Fantoli, 16/15, 20138 Milan, Italy;

²Institute for Genetic and Biomedical Research, Via Fantoli 16/15, 20138 Milan, Italy;

³IRCCS MultiMedica, Via Fantoli 16/15, 20138 Milan, Italy

*alkaterini.ntai@gmail.com

Background

Regenerative medicine, tissue engineering and gene therapy offer the opportunity to treat and cure many of today's intractable afflictions. In recent years, knowledge gained from the study of human embryonic stem cells and transgenic somatic cell reprogramming has led to the routine production of iPSCs in laboratories worldwide, giving promise for use in transplantation, high-throughput drug screening, "disease-in-a-dish" modeling and gene discovery. The ability to cryopreserve pluripotent stem cells at their most potent state for later use, provides a potentially unlimited source for basic research and clinical applications. However, several factors need to be considered when banking stem cells, including the methodology required to bank each stem cell source. One of the biggest challenges in harnessing the potential of iPSCs is the variability in the cell production process, regarding the quality of the starting cell source, differences in the raw materials used for reprogramming and protocols employed for growth and differentiation. Identifying and controlling these variables by establishing standardized methods for growing and differentiating cells and performing quality control testing, minimizes the possibility of introducing unacceptable risk. ISE, a research-grade Stem Cell Biobank that provides, in a timely manner, a unique resource for human and animal pluripotent stem cells including iPSCs. Qualification services and QC assays, adapted to each stem cell source, ensure process reproducibility and the ability to consistently produce "high-quality bioprecursors" that meet key specifications (viability, purity, sterility, function and efficacy) and assure long-term storage and preservation of their original features.

ISE: Your Partner in Stem Cell Research and Quality Assurance

Stem Cell Biobank

ISE, as a research-grade stem cell biobank, represents a fundamental element that fulfills the most stringent standards. Taking part in a number of European and National Research Projects and by collaborating with academic stem cell laboratories, ISE acquires, preserves, characterizes and distributes well-documented bioprecursors. The stem cell represents the backbone of the different cell types stored in ISE biobank including human and mouse stem cells. Our cell line catalogue is available at www.ise.it

Cell type	Cell type description
hESC	Human Embryonic Stem Cells
hNPC	Human Neural Progenitor Cells
hNPC2	Human Neural Progenitor Cells
hESC	Human Embryonic Stem Cells
hNPC	Human Neural Progenitor Cells
hESC	Human Embryonic Stem Cells
hNPC	Human Neural Progenitor Cells
hESC	Human Embryonic Stem Cells
hNPC	Human Neural Progenitor Cells
hESC	Human Embryonic Stem Cells
hNPC	Human Neural Progenitor Cells



Sample Traceability

Ensuring the integrity of the stored samples is one of the most important goals of effective storage. ISE uses Powerworks to capture scientific and other relevant data that are directly linked to the physical cell stock.

All cell stocks, having a unique and universal sample ID that differs by their Sample Type, are linked to all associated data and information regarding their origin, phenotype, disease, STR diversity, genotoxicity, regional factor screen, epigenetic signature, gene expression profiles, pluripotency status etc.

Quality Assurance Stem Cell Services

Cell Line Authentication

STR Profiling

Cell identity is the first thing that should be checked when a cell line enters the biobank infrastructure. Possibility of mis-identification periodically requires in long term cultures due to for example cross contamination.

We perform short tandem repeat analysis on DNA on each cell line upon its arrival and it is re-performed after cell line cryopreservation before distribution.

Figure 1: STR profiling analysis performed on hESC SAZ2, p11 using the AutoStrat for PCR Amplification Kit.

Microbiological Testing

Close cell contamination and pathogen presence in the cell cultures may have severe consequences on the experimental results and for this reason sterility testing is recommended to be assessed on the cell lines before and after cryopreservation.

Mycoplasma detection

ISE performs sterility tests purpose during to assess the presence of contaminants in the cultures. These include mycoplasma (PCR analysis), bacterial growth in various media for 3 weeks and indirect DNA staining, bacterial, fungal and viral contamination (NAT technology).

Figure 2: hPSCs are negative for mycoplasma screening by PCR (Close Out: One flag kit) and (Heckel) staining (Mycoplasma Detection Kit).

Genetic/omic analysis

Genetic analysis is a fundamental process of cell monitoring, as genetic changes can occur by mistake in vivo culturing. It is thus recommended that cell cultures should be tested periodically to check whether they retain their diploid karyotype with the use of more than one technique.

QFQ - banding karyotyping

We perform standard karyotyping (QFQ-banding) in order to detect major chromosomal alterations (greater than 10 Megabases) and translocations.

Figure 3: QFQ-banding karyotype analysis of hESC SAZ2 (92,69% p17)

Array-CGH

We additionally perform high resolution molecular and cytogenetic studies to identify chromosomal variations. High-throughput array Comparative Genomic Hybridization (aCGH) is carried out to identify copy number variations (CNVs) at genomic level.

Figure 4: aCGH analysis performed on SAZ2 at passage 41 and hESC SAZ2 at passage 35.

Epigenetic/omic profiling analysis

DNA methylation

Epigenetic modification of the genome ensures proper gene activation for maintaining the pluripotency of stem cells and also differentiates into proper functional cells. We perform whole genome methylation profiles of the cell lines during extended passages and differentiation under appropriate conditions. Whole genome methylation analysis is performed by using the Illumina CpG Island Methylome Kit (Illumina Technology).

Figure 5: Global methylation levels of the human Embryonic Stem cell line ISE analysis before and after differentiation.

Potency/ Differentiation

We test potency and differentiation capacity of the stem cell lines under appropriate conditions, before and after cryopreservation both at early and late passages.

Quantitative-PCR analysis

Figure 6: Stem/progenitor cell marker expression monitored by q-PCR analysis in untreated (RhoAinh) (P002203) (Q0) and in the sequential steps of the direct reprogramming line (paracrine growth) (P01, P2 and P11).

Immunofluorescence analysis

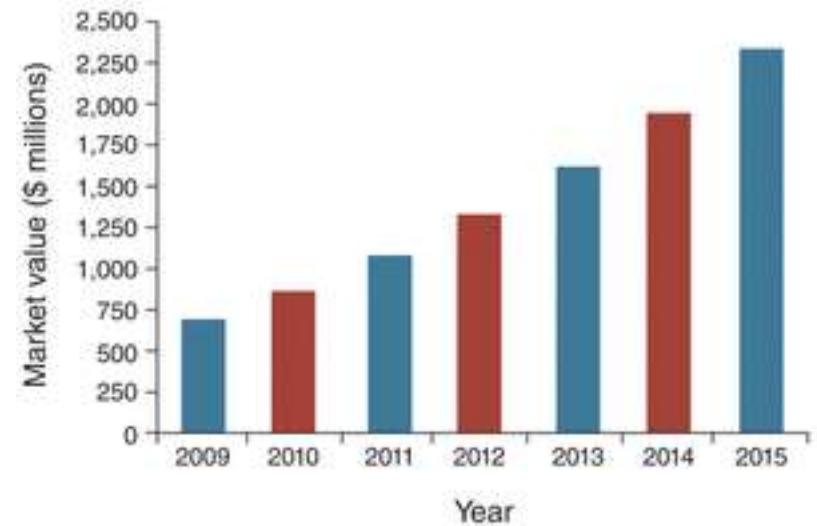
Figure 7: Immunofluorescence analysis performed on human hESC neural stem cells (SAZ2, h4F9) and induced hPSCs (CTR-403, P20) showing transcriptional activity (nuclei) by TRAP assay on Neural Stem Cell Lines. FISH analysis performed on metaphase spreads.

Telomere and telomerase analysis

Telomere maintenance appears to be essential for chromosomal integrity, cell senescence/apoptosis and aging.

Figure 8: hPSCs expression levels on human iPSC cell lines (CTR-403/CTR-404, SAZ2/SAZ3, P20-CTR-403) and the hESC (H4F9/SAZ2). Telomerase activity measured by TRAP assay on Neural Stem Cell Lines. FISH analysis performed on metaphase spreads.

- *Biospecimen banking is a growing enterprises crucial to health science research and other biological sciences.*



- *worldwide medical biobanking industry forecast is:*
 - *\$14.4 billion in 2014*
 - *\$22.7 billion in 2018.*

Most industries worldwide are dominated by a few large industry players, this is also true than for the “global private cord blood industry”.

Key market leaders within this space include:

- Cord Blood Registry (USA): 500,000+ cord blood and tissue units
- ViaCord (USA): 350,000 cord blood and tissue units
- China Cord Blood Corporation (China): 312,000 cord blood and tissue units
- **Cryo-Save (Europe): 268,000 cord blood and tissue units**
- Cryo-Cell (USA): 240,000 cord blood and tissue units

Even More Evidence That Growth Rates are Lower Than 33.5% CAGR



STAMINA
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ONLUS

Pay attention not to give false hope



LE STAMINALI
SONO LA MEDICINA
DEL FUTURO

IL FUTURO È OGGI

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ATTENZIONE: per qualsiasi informazione sulla fondazione, si prega di contattare - dalle 10:00 alle 12:00 - il dott. Marino Andolina, al numero:

 [Sostieni la fondazione](#)

Se vuoi sostenere la ricerca della Stamina Foundation sulle terapie con le cellule staminali adulte, è possibile effettuare una donazione.

Come sostenere la ricerca sulle staminali adulte

Human cryopreservation???:

Cryonics is the practice of freezing patients doomed to death down to ultralow (cryogenic) temperatures and their further preservation in liquid nitrogen. By means of cryonics patients can be preserved till some time in future when advanced technologies, in particular, nanotechnologies can repair cells, tissues and all functions of the human organism in the whole body



In the US cryonics services have been offered since the 1960

In Russia, since 2005



Thanks for your attention!

