PerMediNA
Personalized Medicine in North Africa

Personalized Medicine in North Africa: PerMediNA

Yosr Hamdi, PhD
On behalf of PerMediNA Consortium

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2nd EU- Africa PerMed Stakeholder Workshop – Cape Town, South Africa, February 2023

Institut Pasteur du Maroc
Institut Pasteur d'Algérie
معهد باستور تونس Institut Pasteur de Tunis
PASTEUR NETWORK

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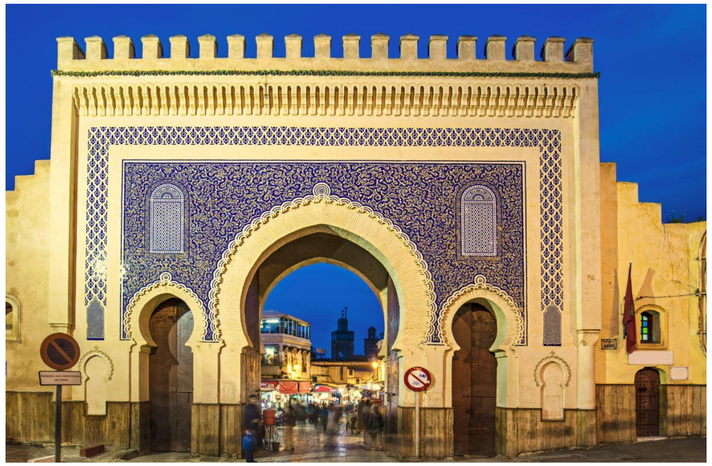

Morocco

Algeria

Tunisia

Crossroad of civilizations

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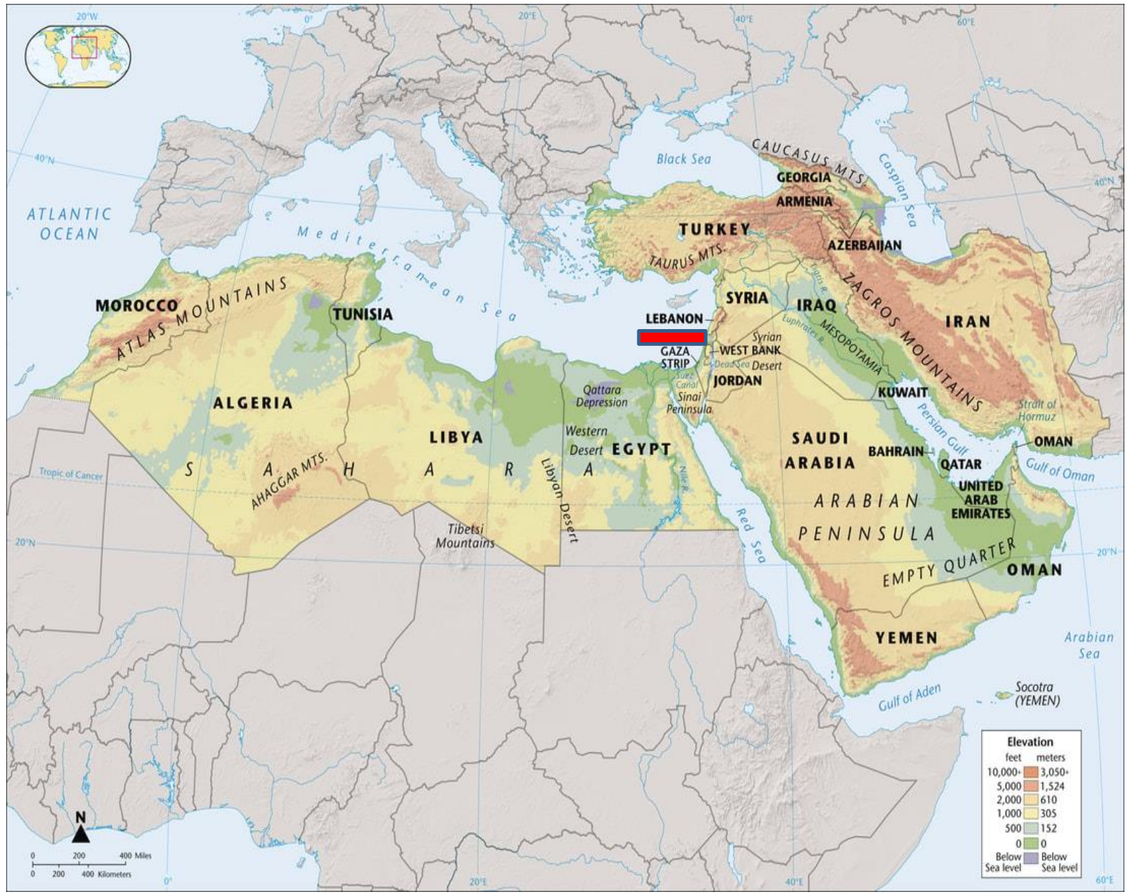
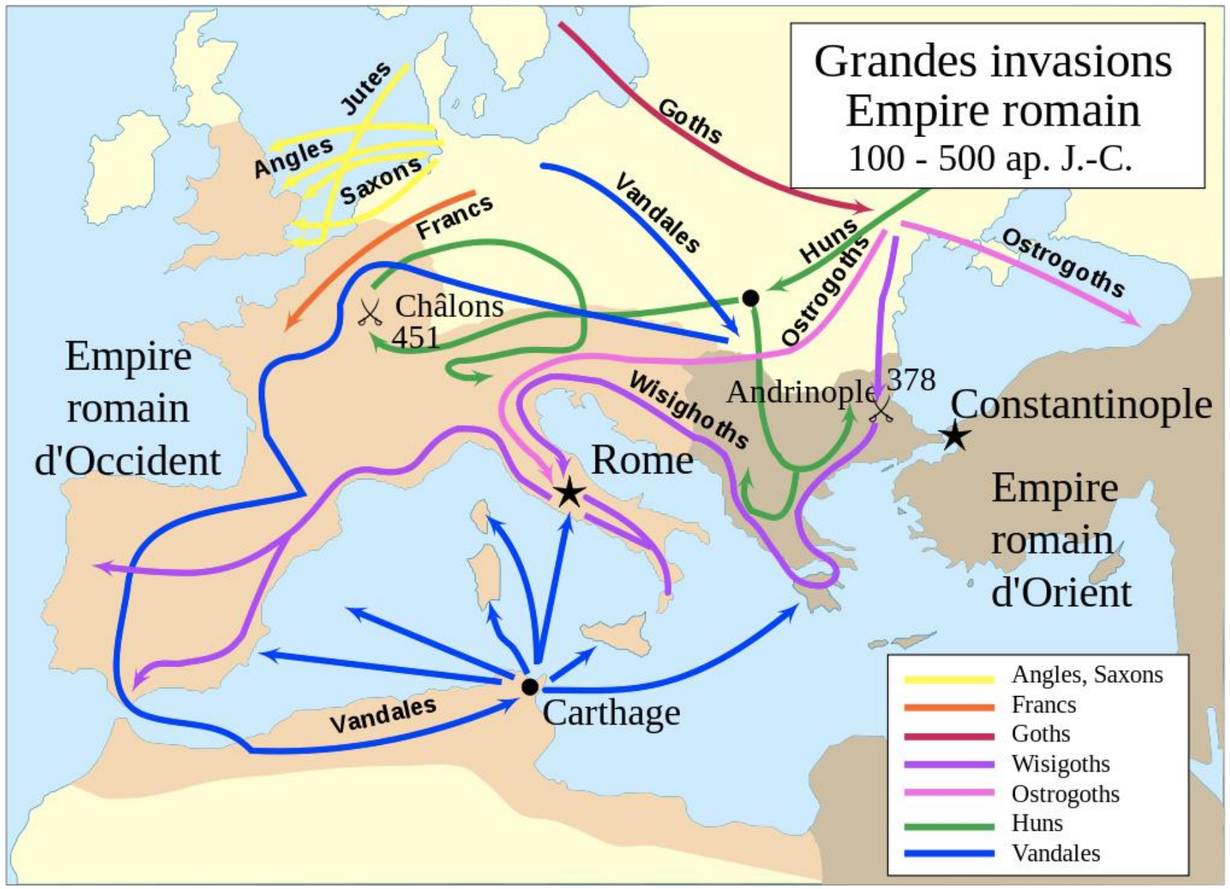




History **Culture** **Genetic Background**

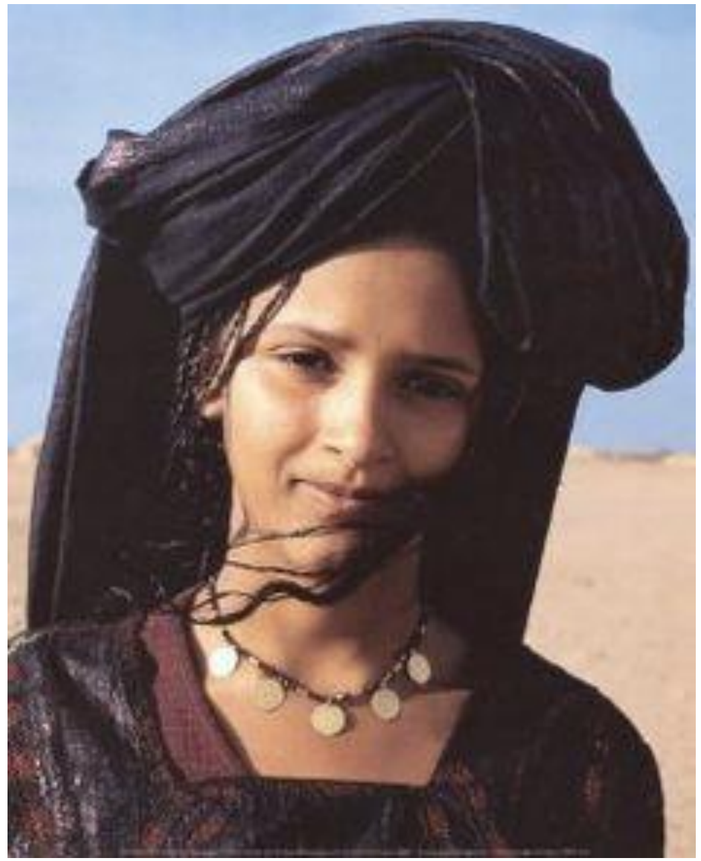
Population-scale sequencing and the future of genomic medicine

Learning from past and present efforts

Talitha Dubow, Sonja Marjanovic

RAND EUROPE

Berbers/Amazighen



Arabs

What we hope to gain from Genomics/Omics?

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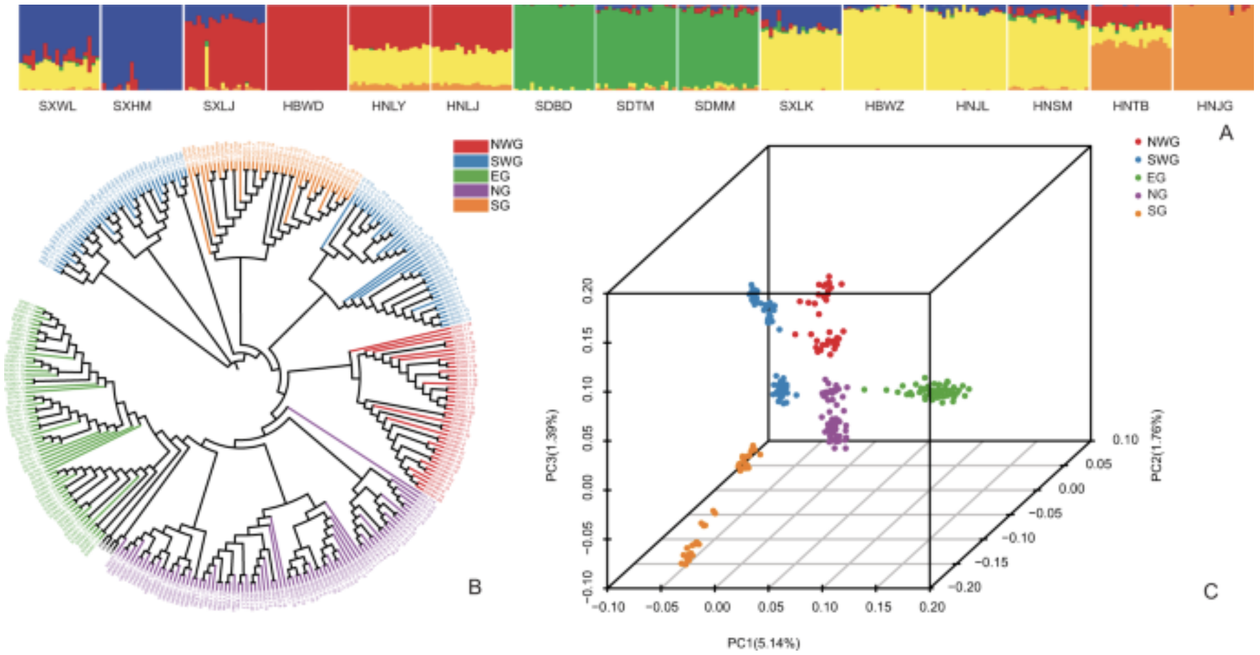
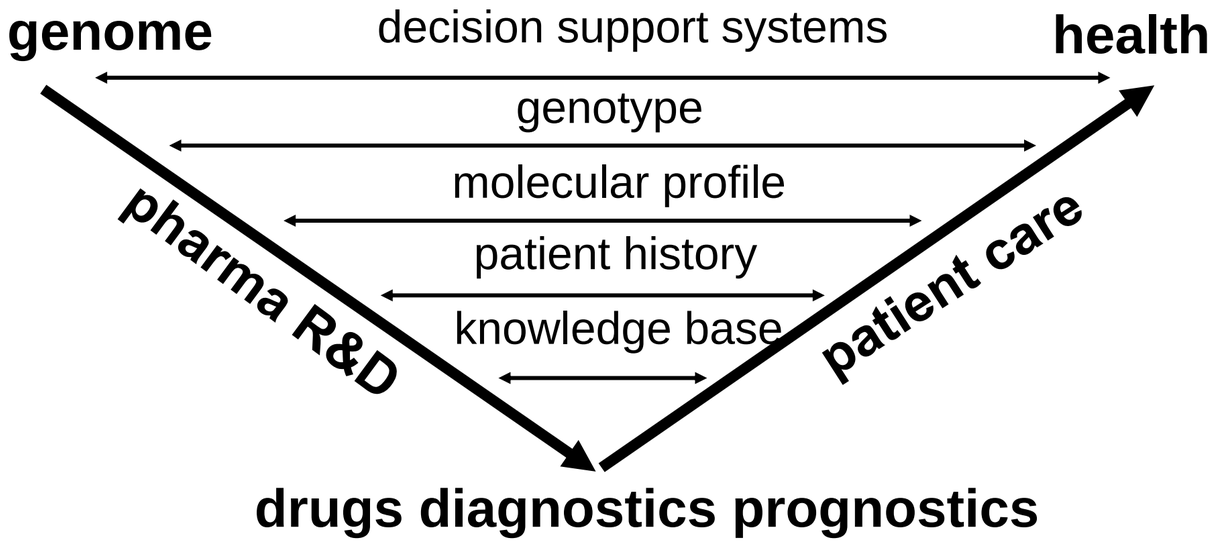
POPULATION LEVEL

Similarities Between NA populations



INDIVIDUAL LEVEL

Improve health



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Personalized Medicine in North Africa: PerMediNA

PerMediNA

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Personalized Medicine in North Africa

Funding

1 Million €

2 Years

The European Ministry of Foreign Affairs

MINISTÈRE
DE L'EUROPE
ET DES AFFAIRES
ÉTRANGÈRES

Liberté
Égalité
Fraternité

Partners

PASTEUR NETWORK

COVENANT UNIVERSITY
PROMOTING MENTAL PRODUCTIVITY

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

GUSTAVE ROUSSY
CANCER CAMPUS
GRAND PARIS

Institut de Cancérologie de l'Ouest

جامعة ٦ أكتوبر
OCTOBER 6 UNIVERSITY

PAN
POLISH ACADEMY of SCIENCES

Faculté de Médecine
Aix+Marseille Université

H3Africa
Human Heredity & Health in Africa

7

Investigators

- Tunisia (Coordinator)
- Algeria
- Morocco

معهد باستور تونس
Institut Pasteur de Tunis

Institut Pasteur du Maroc

Institut Pasteur d'Algérie

Main Goal

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Assessing the readiness level of Precision Medicine implementation in the North African region

Specific Aims

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1

Situation Analysis, inventory of existing Precision Medicine means

2

Precision Oncology Pilot Project:

500 WES, 500 WTS

3

Training, Dissemination and Communication

4

Roadmap and recommendations for health authorities

Situation Analysis

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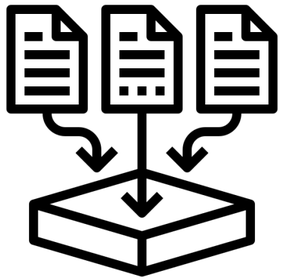
Identification of all stakeholders and their needs	**Literature review on PM in NA**	**Existing OMICS Data**	**Infrastructure , biobanks registries…**	**Ethical and regulatory ecosystem**	**Patients support groups**
			 		

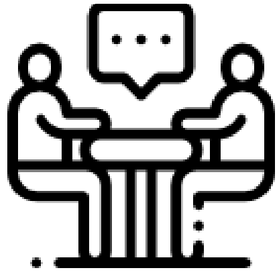
Data collection strategy



Public databases
Data curation
(>10 000 papers)

Surveys
(>100)

Focus Groups
(30)



Interviews with Experts
(150)

Tunisia: Overview on HS

11,94 M | **163.610 Km2**

Total population

154

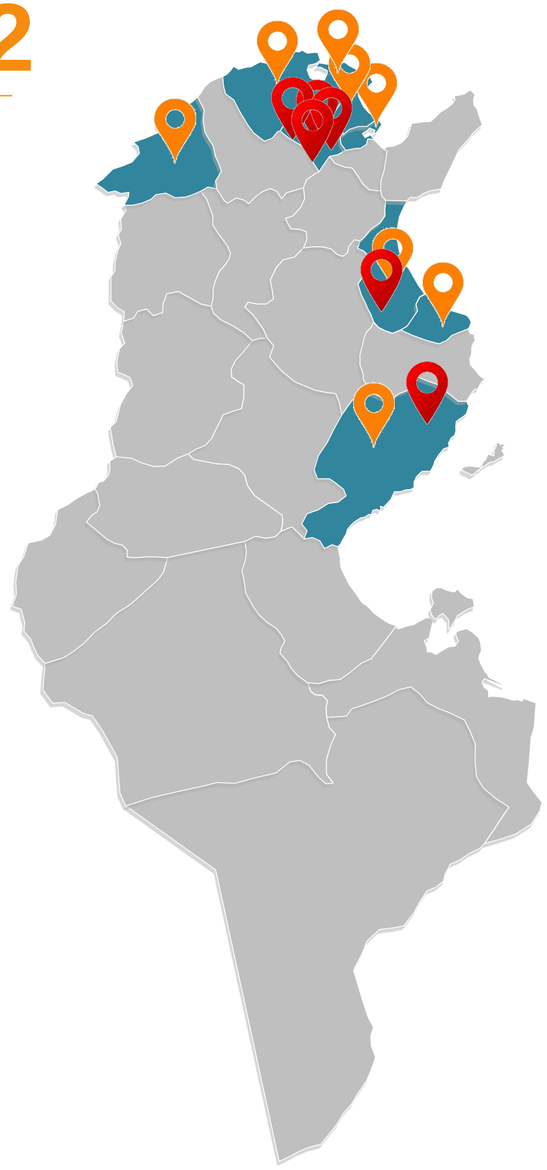
Public hospitals

102

Private hospitals

>3000

Primary Healthcare centres



8

Medical Oncology centres

6 **(2private)**

Medical Genetics

Stakeholders Mapping

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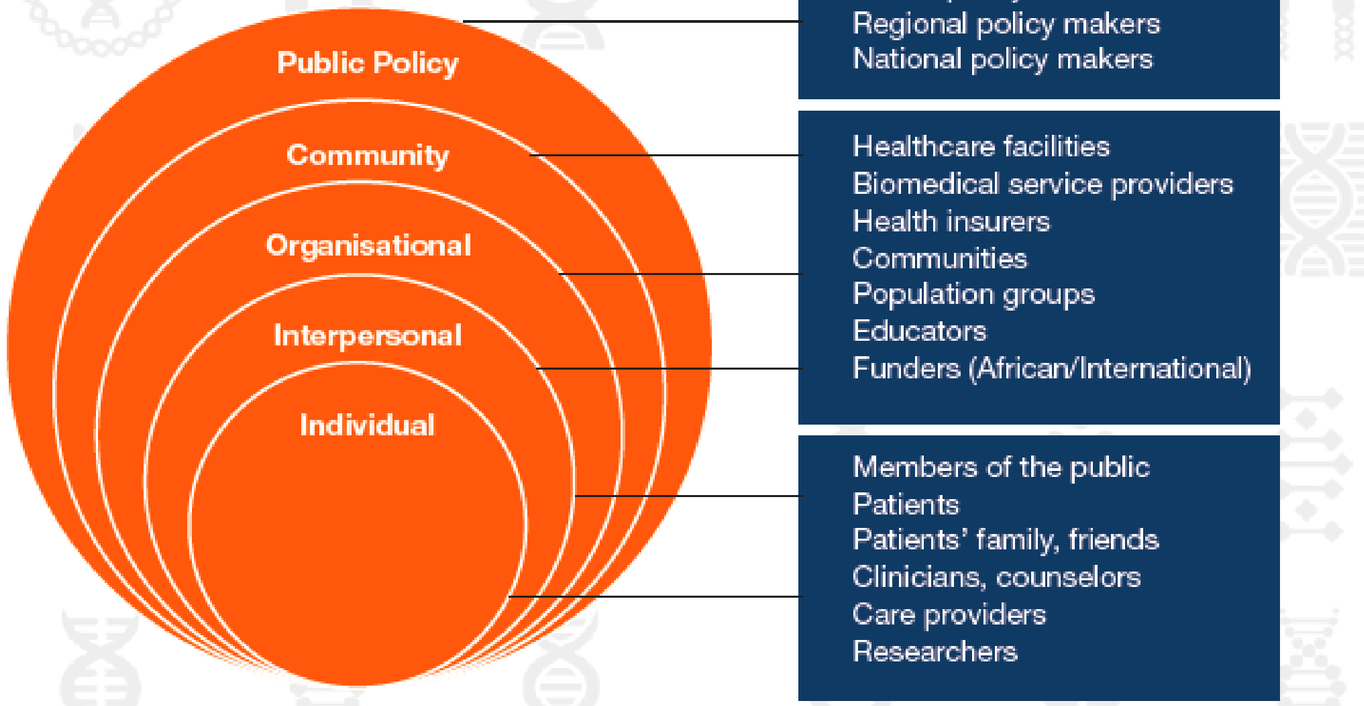
Stakeholder Categories



Source: Stakeholder Mapping Report by EU-Africa PerMed Project.pdf

Stakeholders mapping

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Stakeholders mapping in Tunisia

1- Innovation enablers/health research organizations

2- Research and innovation funders

3- Health system policymakers

4- Healthcare providers

5- Industry and private businesses

6- Civil society organizations

7- Ethical committees

8- Regulatory bodies

Infrastructure: Electronic Health Records

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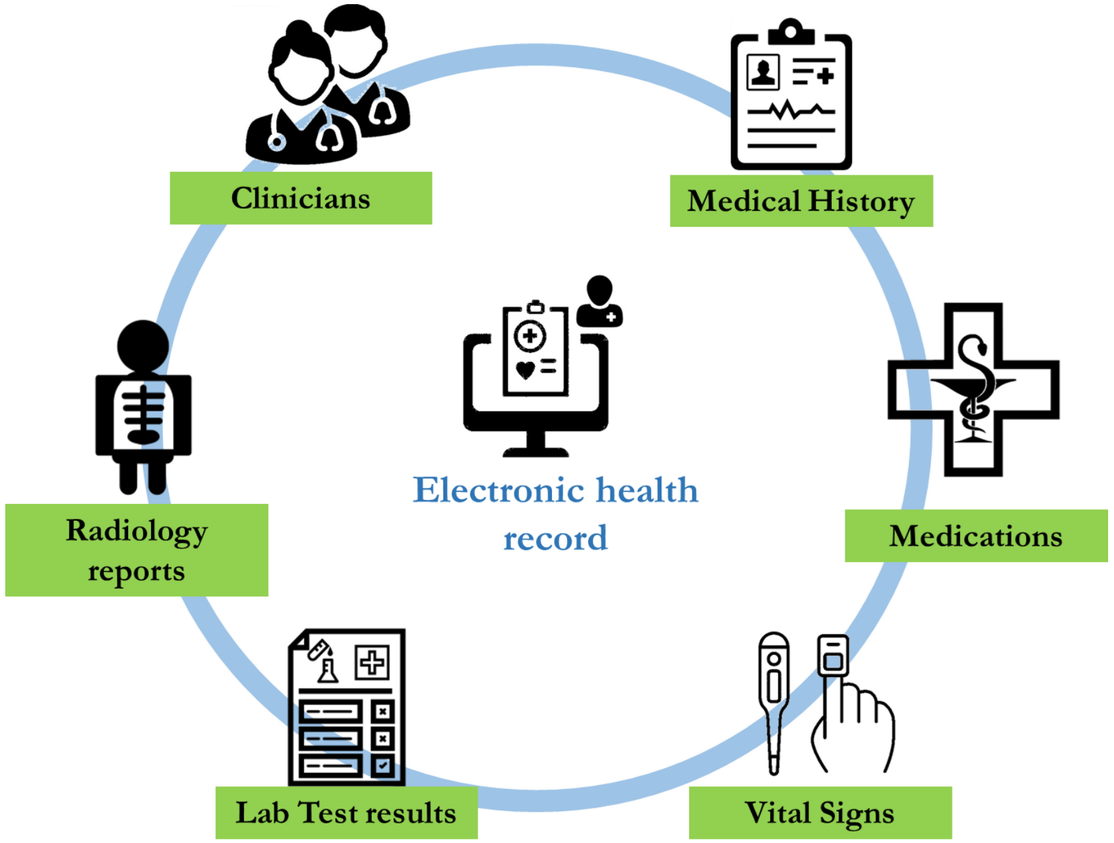
- **A national Program in Tunisia started in 2020**
- A real-time, patient-centered records that make information instantly and securely available to authorized users.
- Currently tested in some health care institutions (N= 80).



National Data Centers

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➢ Phenotypic Data

Epidemiology
Clinical
Phenotypic
Histological
etc

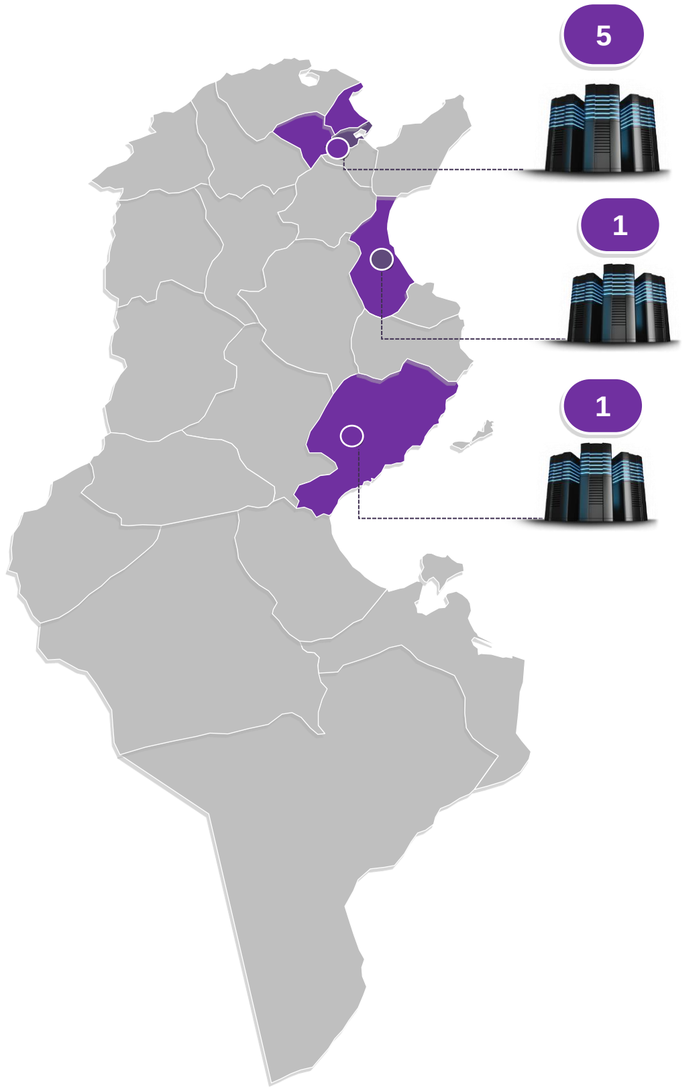
➢ Genotypic Data

GWAS
WES
Gene Panels
Other genetic data

- **Ongoing**

WGS…

➢ Environment



Research Projects &Training

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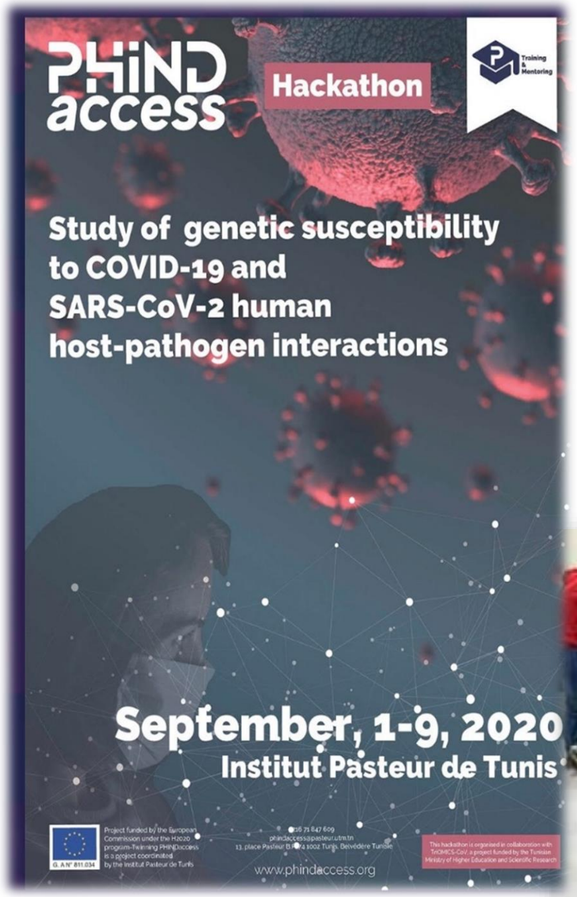
GENOMEDIKA > H3Africa/H3ABIONET > PHINDaccess > Genome Tunisia > SEED> PerMediNA

2010 2013 2016 2019 2019 2022

Hackathon-COVID19 PhindAccess



Hackathon- Precision Medicine Portal H3ABioNet

African Genomics Medicine Training Course for nurses (AGMT) H3ABioNet

NGS Bioinformatics training series PhindAccess

Training on ethical and Regulation

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WHO

Institut Pasteur de Tunis
Regional Training Center
Supported by TDR

Literature Review on genomic medicine in Tunisia

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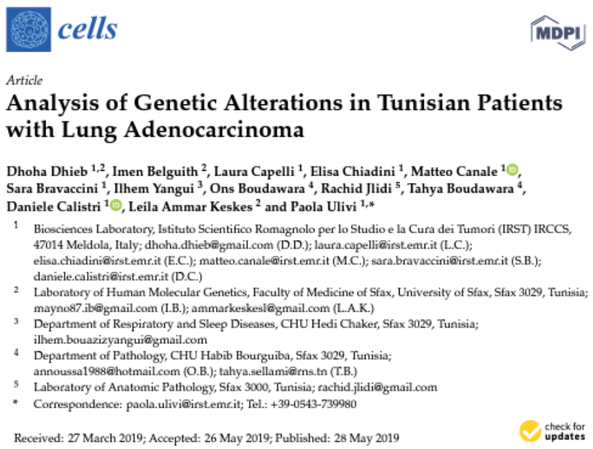
6490
Studies on cancer

909
Curated Studies

47
Studies on Lung Cancer

Period
2000-2022



cells

MDPI

Article

Analysis of Genetic Alterations in Tunisian Patients with Lung Adenocarcinoma

Dhoha Dhieb [1,2], Imen Belguith [2], Laura Capelli [1], Elisa Chiadini [1], Matteo Canale [1], Sara Bravaccini [1], Ilhem Yangui [3], Ons Boudawara [4], Rachid Jlidi [5], Tahya Boudawara [4], Daniele Calistri [1], Leila Ammar Keskes [2] and Paola Ulivi [1,*]

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check for updates

Taylor & Francis

Journal of Immunoassay and Immunochemistry

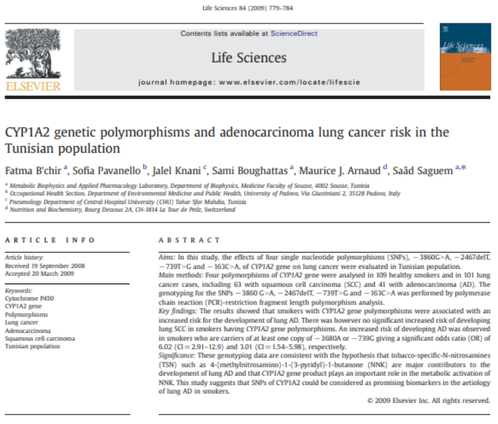
ISSN: 1532-1819 (Print) 1532-4230 (Online) Journal homepage: http://www.tandfonline.com/loi/ljii20

About molecular profile of lung cancer in Tunisian patients

Faouzi Mezni, Mona Mlika, Hamouda Boussen, Habib Ghedira, Thouraya Fenniche, Talmoudi Faten & Marie-Anne Loriot

To cite this article: Faouzi Mezni, Mona Mlika, Hamouda Boussen, Habib Ghedira, Thouraya Fenniche, Talmoudi Faten & Marie-Anne Loriot (2018): About molecular profile of lung cancer in Tunisian patients, Journal of Immunoassay and Immunochemistry, DOI: 10.1080/15321819.2017.1407339

To link to this article: https://doi.org/10.1080/15321819.2017.1407339



Life Sciences 84 (2009) 779–784

Contents lists available at ScienceDirect

Life Sciences

journal homepage: www.elsevier.com/locate/lifescie

CYP1A2 genetic polymorphisms and adenocarcinoma lung cancer risk in the Tunisian population

Fatma B'chir [a], Sofia Pavanello [b], Jalel Knani [c], Sami Boughattas [a], Maurice J. Arnaud [d], Saâd Saguem [a,*]

[a] Metabolic Biophysics and Applied Pharmacology Laboratory, Department of Biophysics, Medicine Faculty of Sousse, 4002 Sousse, Tunisia
[b] Occupational Health Section, Department of Environmental Medicine and Public Health, University of Padova, Via Giustiniani 2, 35128 Padova, Italy
[c] Pneumology Department of Central Hospital University (CHU) Taher Sfar Mahdia, Tunisia
[d] Nutrition and Biochemistry, Bourg Dessous 24, CH-1814 La Tour de Peilz, Switzerland

ARTICLE INFO

Article history:
Received 19 September 2008
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Keywords:
Cytochrome P450
CYP1A2 gene
Polymorphisms
Lung cancer
Adenocarcinoma
Squamous cell carcinoma
Tunisian population

ABSTRACT

Aims: In this study, the effects of four single nucleotide polymorphisms (SNPs), −3860G>A, −2467delT, −739T>G and −163C>A, of *CYP1A2* gene on lung cancer were evaluated in Tunisian population.
Main methods: Four polymorphisms of *CYP1A2* gene were analysed in 109 healthy smokers and in 101 lung cancer cases, including 63 with squamous cell carcinoma (SCC) and 41 with adenocarcinoma (AD). The genotyping for the SNPs −3860 G>A, −2467delT, −739T>G and −163C>A was performed by polymerase chain reaction (PCR)-restriction fragment length polymorphism analysis.
Key findings: The results showed that smokers with *CYP1A2* gene polymorphisms were associated with an increased risk for the development of lung AD. There was however no significant increased risk of developing lung SCC in smokers having *CYP1A2* gene polymorphisms. An increased risk of developing AD was observed in smokers who are carriers of at least one copy of −3680A or −739G giving a significant odds ratio (OR) of 6.02 (CI = 2.91–12.9) and 3.01 (CI = 1.54–5.98), respectively.
Significance: These genotyping data are consistent with the hypothesis that tobacco-specific-N-nitrosamines (TSN) such as 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK) are major contributors to the development of lung AD and that *CYP1A2* gene product plays an important role in the metabolic activation of NNK. This study suggests that SNPs of CYP1A2 could be considered as promising biomarkers in the aetiology of lung AD in smokers.

Human Immunology 74 (2013) 1368–1374

Contents lists available at SciVerse ScienceDirect

journal homepage: www.elsevier.com/locate/humimm

Association of IL-8 gene polymorphisms with non small cell lung cancer in Tunisia: A case control study

CrossMark

Ahlem Rafrafi *, Besma Chahed [1], Safa Kaabachi [1], Wajih Kaabachi [1], Haifa Maalmi [1], Kamel Hamzaoui [1], Fayçal Haj Sassi [1]

Homeostasis and Cell Dysfunction Unit Research 99/UR/08–40, Faculty of Medicine, University of Tunis El Manar II, Tunis 1007, Tunisia

ARTICLE INFO

Article history:
Received 19 December 2012
Accepted 14 June 2013
Available online 2 July 2013

ABSTRACT

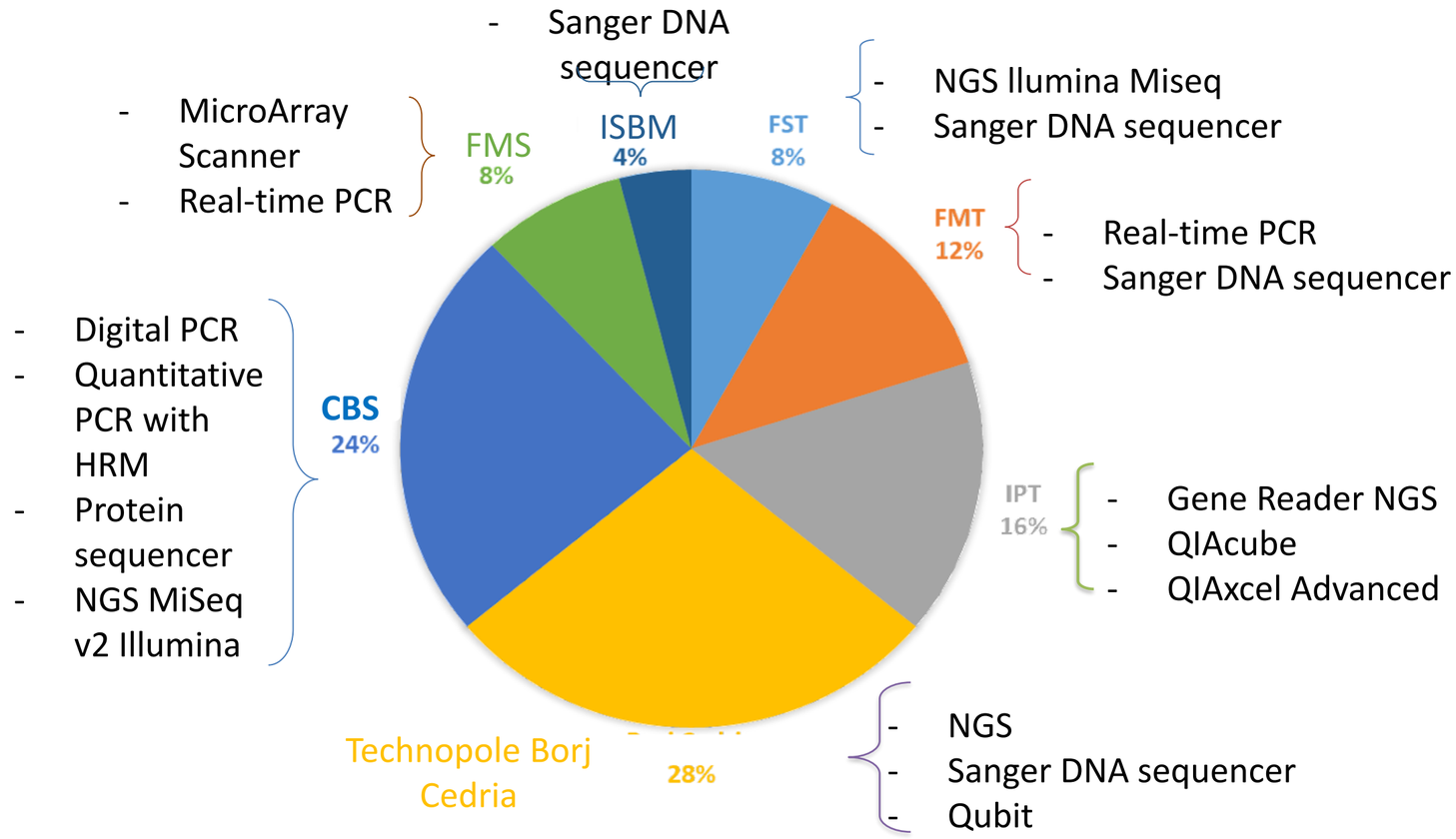
Interleukin 8 (IL-8), is a proinflammatory chemokine, has been reported to have angiogenic activity and to be responsible for tumor-associated angiogenesis in several cancers. In this study, we aimed to study the (IL-8) gene polymorphism in relation with risk development of non small cell lung cancer in Tunisian patient. Two single nucleotide polymorphisms (−251T/A [rs4073], +781C/T [rs2227306]) of the IL-8 gene were screened in 170 patients with NSCLC and 225 healthy controls by PCR–RFLP.

Significant association for the IL-8 −251T/T genotypes ($P = 0.004$) and an increased significant frequency of IL-8 −251T allele were noted in the patient's group ($P = 0.0007$). Clinical analysis indicated a borderline positive association of IL-8 −251T allele among adenocarcinoma patients ($P = 0.003$). Our study indicated that IL-8 −251T allele was highly associated with large tumor size and high grade stage of NSCLC. Moreover, a significantly increased risk of NSCLC was associated with IL-8 +781C allele in patients with large tumor size (T3 and T4) ($P = 0.004$). IL-8 mRNA expression was found highly expressed in NSCLC patients compared to healthy controls. The same higher level was even found in patients carrying IL-8 −251T/T genotype.

Our results indicated that the IL-8 promoter polymorphism is associated with NSCLC risk.

Existing equipments

http://www.pnes.tn



Ethical and Regulatory Ecosystem

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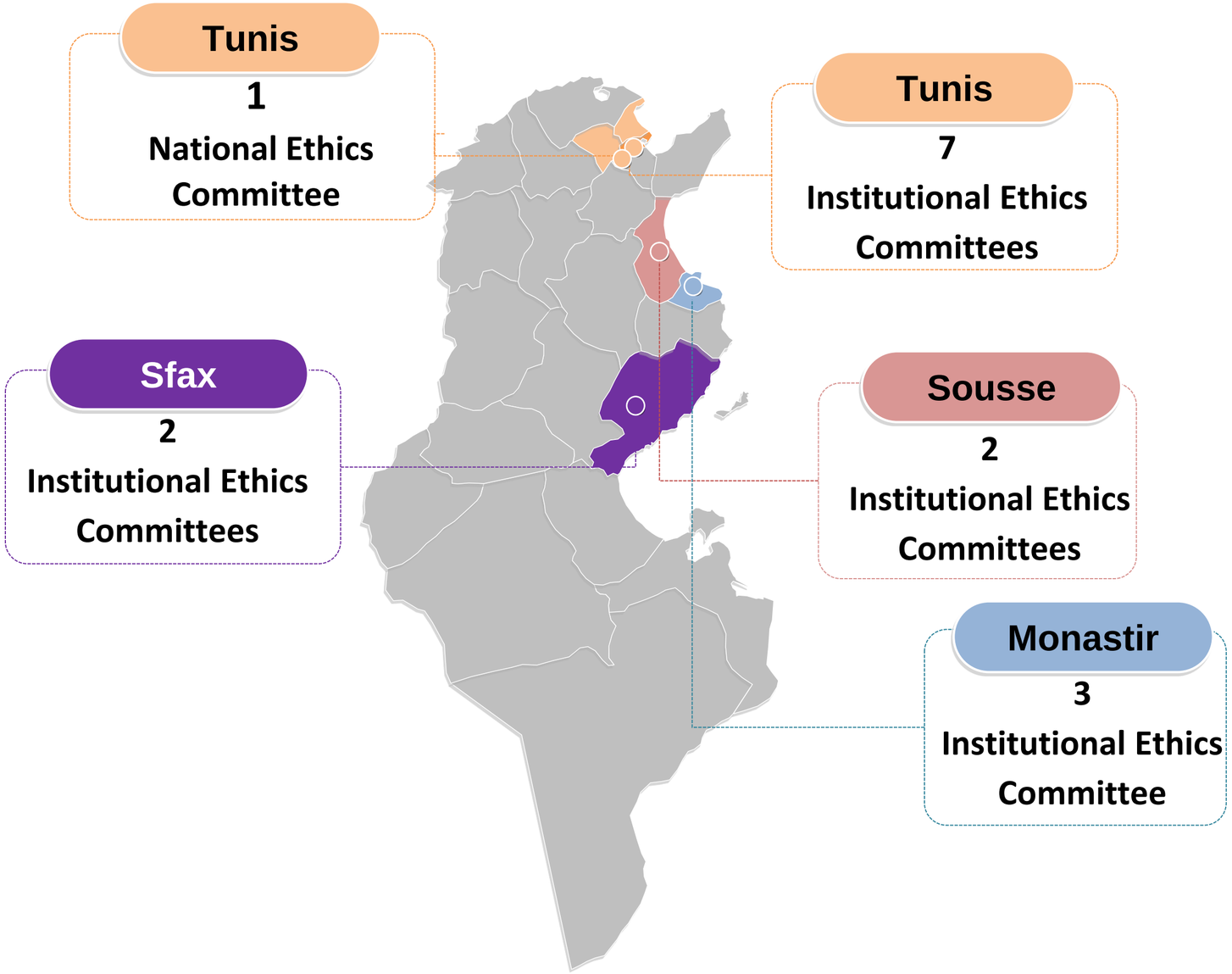
INPDP
الهيئة الوطنية لحماية المعطيات الشخصية
INSTANCE NATIONALE DE PROTECTION DES DONNÉES PERSONNELLES
NATIONAL AUTHORITY FOR PROTECTION OF PERSONAL DATA



Africa personal data protection regulatory landscape

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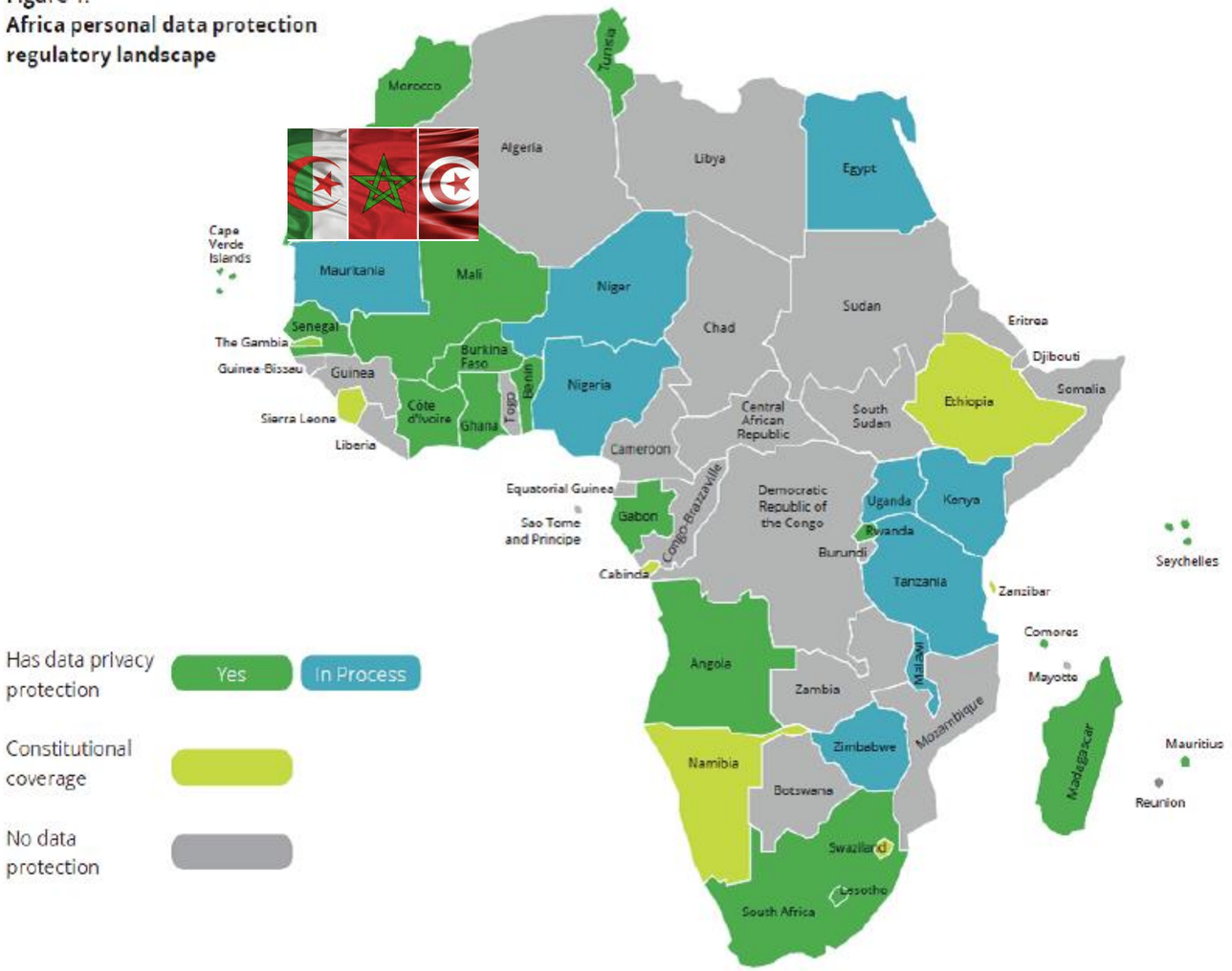
Figure 1:
Africa personal data protection regulatory landscape



Civil Society

11,400

Civil society organizations

Main activities

- Governance and accountability in the public sector
- Protecting minority rights
- Patients support groups

Science Education in Genomics

Inauguration of the space “DNA for All”, CST, April 25th, 2018

http://www.cst.rnu.tn/

Tunisian Precision Medicine Academy

1 **Ethics & Governance**

2 **Biobanking**

معهد باستور تونس
Institut Pasteur de Tunis
CBS
المستشفى الجامعي الهادي شاكر صفاقس
C.H.U. Hedi Chaker Sfax
Kopital Charles Nicolle
مستشفى شارل نيكول

3 **Sequencing**

illumina

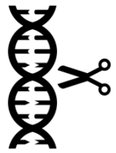
4 **Data Analysis**

Data Centers

INSTITUTE OF GENETICS AND ANIMAL BIOTECHNOLOGY of the Polish Academy of Sciences

JICA
Japan International Cooperation Agency

5 **Fonctionnal Validation**



6 **Drug Development & Clinical Trials**

A Pharma company

Its IS NOT (TOO) BAD!

Yet we still need a reference genome

RÉPUBLIQUE TUNISIENNE
MINISTÈRE DE LA SANTÉ PUBLIQUE

GTCA
GENOME TUNISIA
COLLABORATIVE ALLIANCE

GENOME TUNISIA

Launched in 2019

Funded by the Tunisian Ministry of Health

A multidisciplinary partnership bringing together experts from different Tunisian institutions came to the conclusion that there is a need to identify the reference sequence of the Tunisian Genome by:

- Sequencing 1% of the population (10 000 Whole Genomes)
- Using Illumina Technology

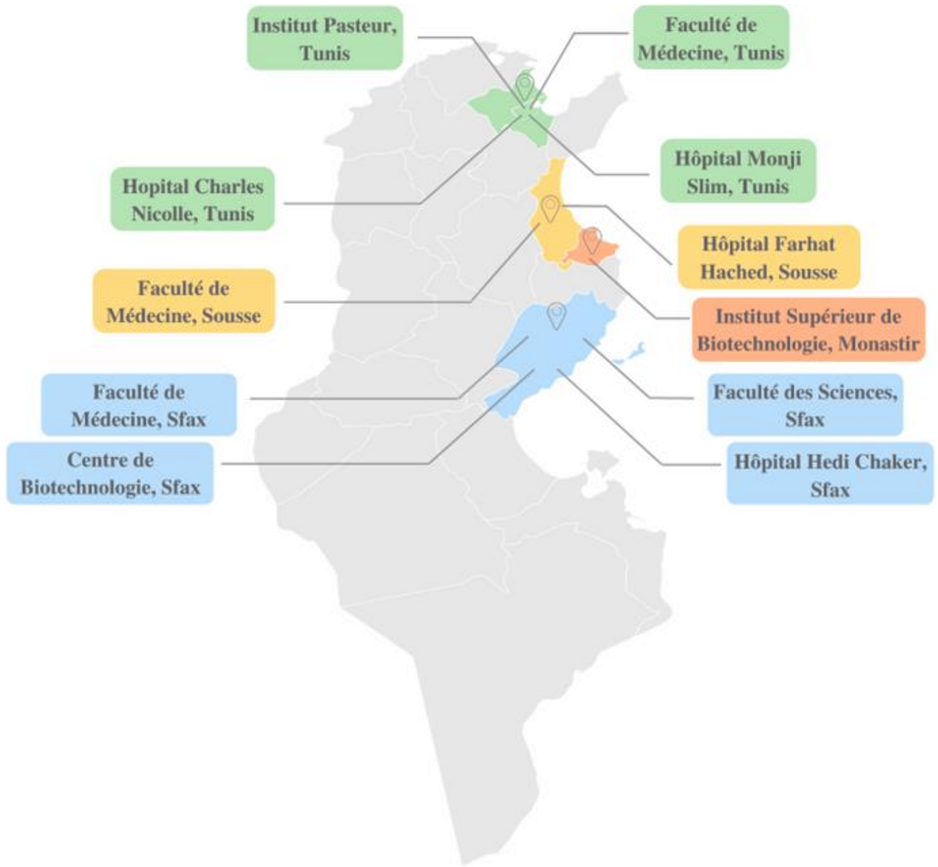
Our collaborating centers

RÉPUBLIQUE TUNISIENNE
MINISTÈRE DE LA SANTÉ PUBLIQUE

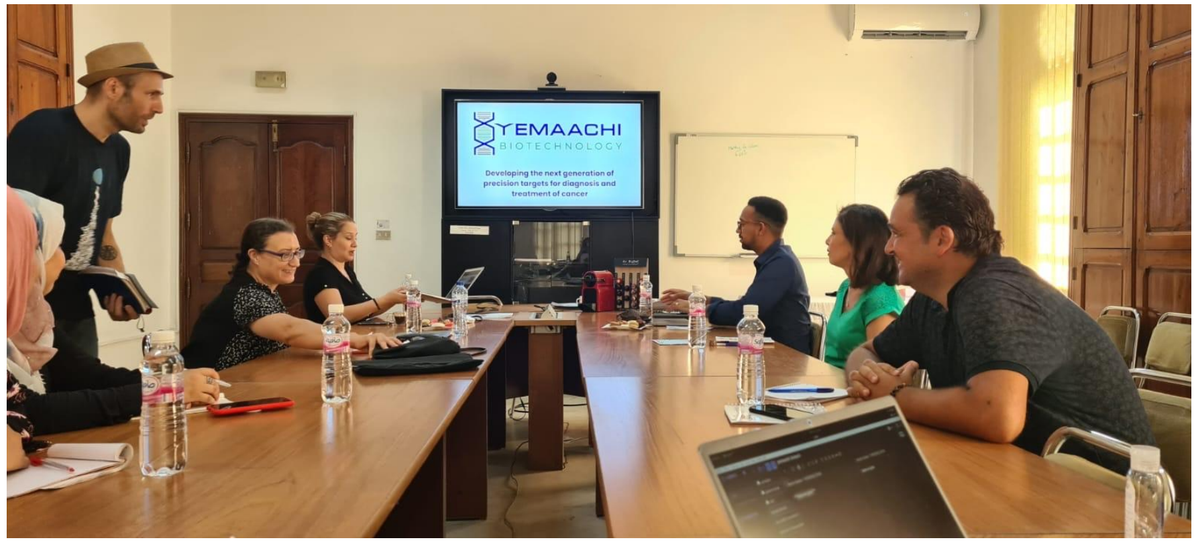
GTCA
GENOME TUNISIA
COLLABORATIVE ALLIANCE

Multi Center **Multi phase**

Multidisciplinary



Industry And Biotech



Are we ready for precision medicine ?

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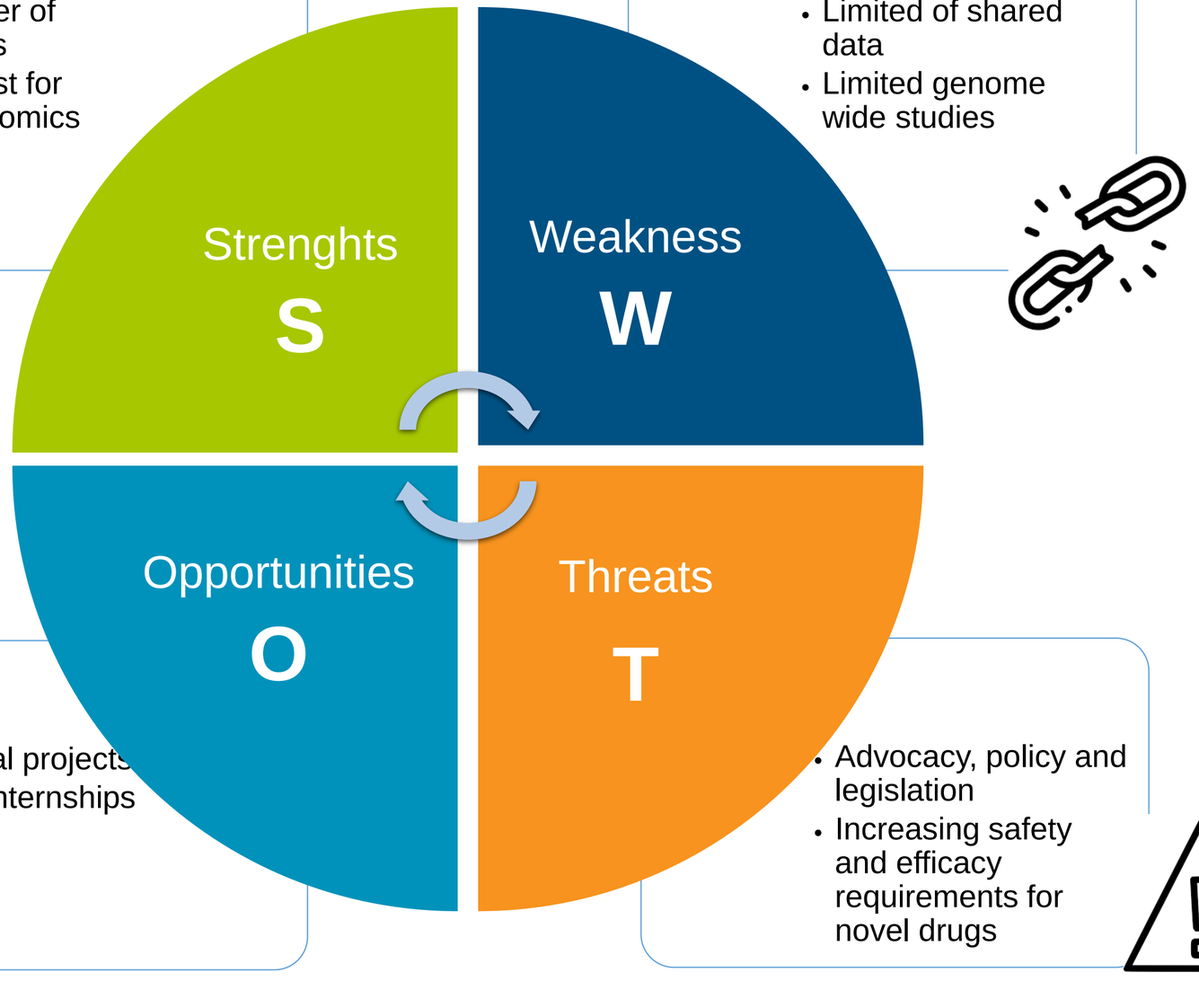


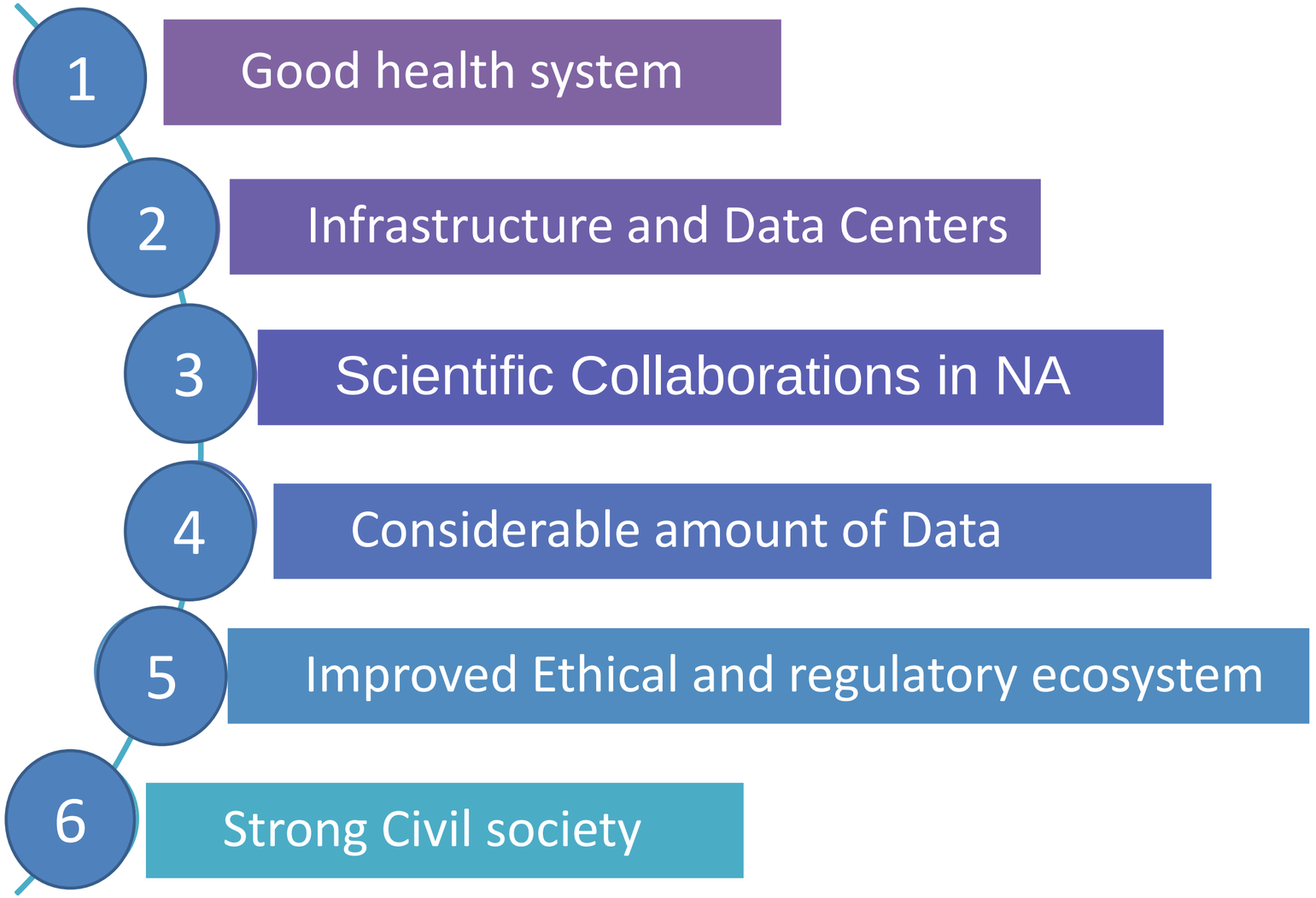
- High number of researchers
- High interest for human genomics

- Limited of shared data
- Limited genome wide studies

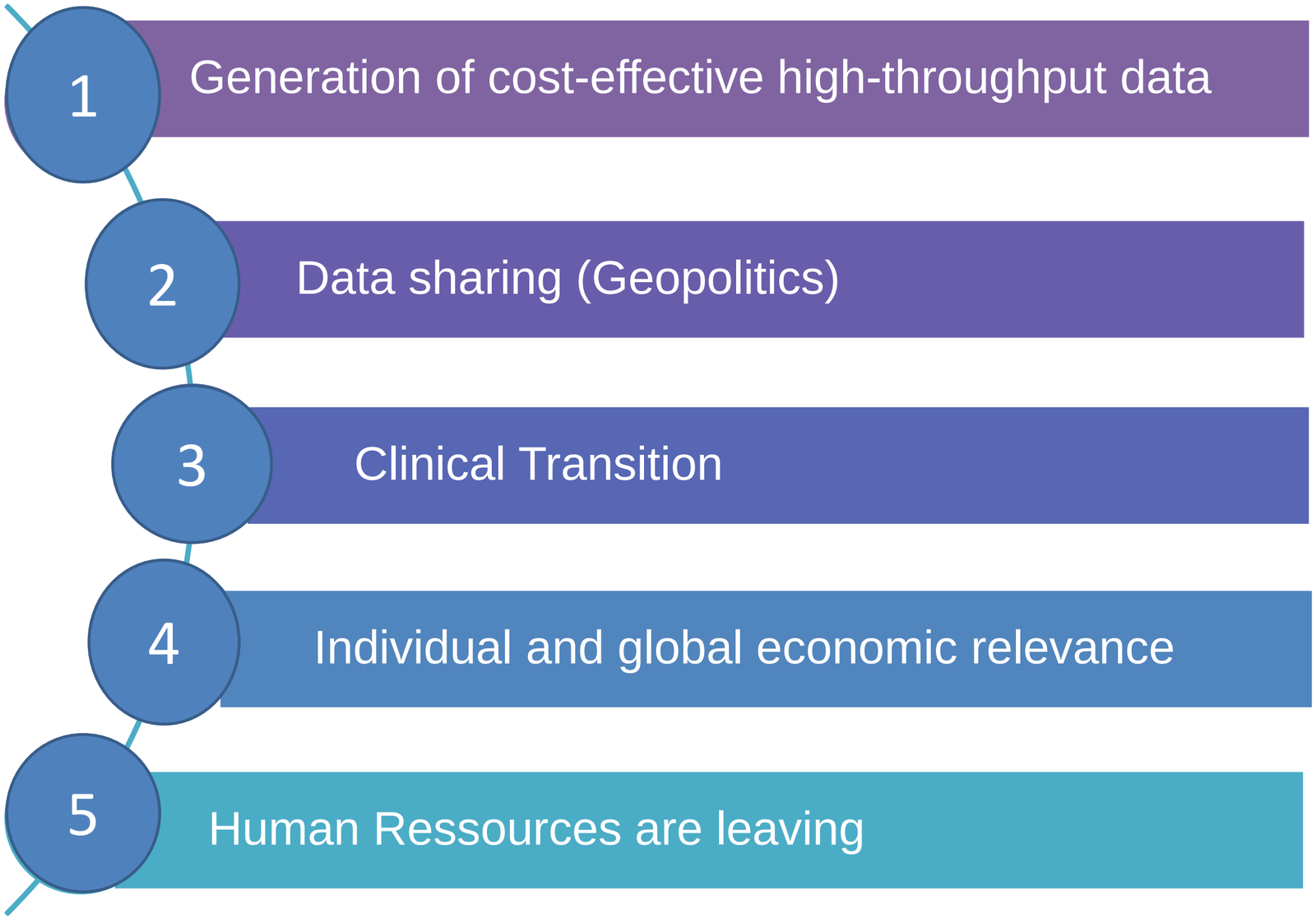
- International projects
- Research internships

- Advocacy, policy and legislation
- Increasing safety and efficacy requirements for novel drugs

SWOT-Strenghths



SWOT-Weakness



Take Home Messages

- We are not trying to show our diversity, we are showing our similarities.

- Long term Collaboration is extremely helpful

- Important Progress has been made in North Africa during the last years, But still…

  - Data Infrastructure
  - Data Generation
  - Building the Ecosystem
  - Brain Drain
  - Politics

-African Gouvernements´ Support is needed

-Connecting with Industry, biotech and Pharma is extremely imporant

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THANKS

GTCA
GENOME TUNISIA
COLLABORATIVE ALLIANCE

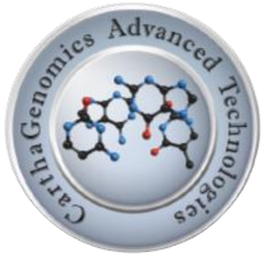
Institut Pasteur du Maroc

Institut Pasteur d'Algérie

معهد باستور تونس
IPT
Institut Pasteur de Tunis

PASTEUR
NETWORK

Partners and funders




where there is a will
there is a way...