M42, a first-of-its-kind integrated healthcare powerhouse

M42 combines G42 Healthcare's unique medical and data-centric technologies with Mubadala Health's world-class patient services and state-of-the-art facilities to provide the highest level of personalized, precise, and preventative care.

Operating at the forefront of medical advancement, **M42** is set to transform the way care is delivered, bridging the gap between the latest healthtech advancements and the clinical outcomes patients receive.

M42 Companies

مبادلة للرعاية الصحية
Mubadala Health

Mubadala Health was founded in 2006 and operates a vast network of integrated, state-of-the-art healthcare facilities across the United Arab Emirates and the region.

G42 Healthcare

G42 Healthcare was founded in 2018 to deliver advanced healthcare technology solutions with the aim to transform the future of healthcare.

M42 Shareholders

MUBADALA

Mubadala Investment Company is a sovereign investor managing a diverse portfolio of assets in the UAE and abroad.

G42

G42 is the leading Abu Dhabi-based AI technology holding group creating visionary artificial intelligence for a better tomorrow.

Vision

Transforming lives through innovation

Mission

To deliver world-class patient-centric care enabled by advanced technologies and innovative solutions

Values

الابتكار
Innovation

التميز
Excellence

الشراكة
Partnership

النزاهة
Integrity

التعاطف
Compassion

M42

M42 Healthcare Providers

- HealthPlus Fertility — هيلث بلاس للإخصاب — An M42 company
- HealthPlus — Network of Specialty Centers — شبكة هيلث بلاس التخصصية — An M42 company
- مركز إمبريال كوليدج لندن للسكري — Imperial College London Diabetes Centre — An M42 company
- Moorfields Eye Hospital Centre — A branch of Moorfields London
- كليفلاند كلينك أبوظبي — Cleveland Clinic Abu Dhabi — Brought to you by M42
- مستشفى دانة الإمارات — Danat Al Emarat Hospital — WOMEN & CHILDREN النساء والأطفال — An M42 company
- هيلث بوينت — Healthpoint — An M42 company
- DIAVERUM — An M42 company
- مبادلة للرعاية الصحية — Mubadala Health — An M42 company
- أمانة للرعاية الصحية — Amana Healthcare — An M42 company

M42 Services

- Digital Health Services
  - MALAFFI — CONNECTING HEALTHCARE
- OMICS as a Service
  - BIOGENIX LABS — An M42 company
  - GENSENSE — By M42
- Testing Labs
  - المختبر المرجعي الوطني — National Reference Laboratory — An M42 company
  - BIOGENIX LABS — An M42 company
- Health Screening
  - مركز توام للتصوير الجزيئي — Tawam Molecular Imaging Centre — An M42 company
  - مركز العاصمة للفحص الصحي — Capital Health Screening Centre — An M42 company
- Clinical Research Organization
  - IROS — An M42 company
- Environmental Sciences
  - ENVIRONMENTAL SCIENCES

M2

21K
Employees

450
Facilities

24
Countries

40
NVIDIA Super Computers

110
PB Data

400K
EGP Samples Collected

500K
Seq. Capacity per year

600K
Biobank Samples

DIAVERUM

Digital Health

Advanced Diagnostics

Multi-omics

Other **M42** Services

Pharma and Therapeutics

Environmental Sciences

Clinical Research

Impacting lives at scale where connected care, next-gen medicine, and innovation converge to realize the future of healthcare

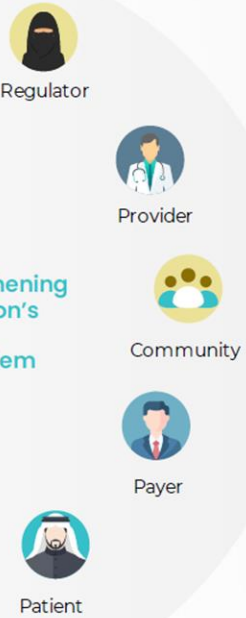
Future of Healthcare with M42

An integrated ecosystem for a seamless and connected care delivery

Empowering prevention, personalized treatment, and omics-driven discovery

Innovations driven by AI and technology, to realize the promise of the future in healthcare

Strengthening the region's health ecosystem



Impacting lives at a global scale

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M42

With the collected data, M42 is ready to venture into next-gen precision medicine for the population

	Today			Tomorrow	
Prevention & Early diagnosis	Disease Registries	Pre-Marital Screening	Population Health Screening	Direct-to-Consumer Genetic Testing	Proteomics Screening
Improved Treatment	Pharmaco-genomics (PGx)	Digital Therapeutics	Drug Discovery	Gene Therapy	Stem Cell Therapy
Enablers	Environmental Monitoring	Biobank	Digital Pathology	Nanotechnology	

12 Months & beyond

In partnership with Microsoft BROAD INSTITUTE Terra

M42 has developed a unique set of capabilities, by leveraging its expertise in the Omics segment

Diagnostics	Delivery of **tailored genetic diagnostic** services for a broad range of **applications tailored** to **individual needs**
Population Genomics	Integration of latest **sequencing** technologies **at-scale**, bioinformatics and analytics to provide **personalized genetic insights and health risk** assessments
Omics as a Service	Capabilities to **deliver genomics** & **proteomics sequencing** for **private / public partners**, for clinical or research applications, powered by our **secure platform**
Consumer genomics	**Direct** to **consumer** genomics services **empowering individuals** on discover their own **traits** and **potential health risks**
R&D	Ad-hoc services **supporting human** and **non-human research**, by leveraging our multi-omics capabilities

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Internationally accredited labs and hospitals ensure the highest standards of service and care

مبادلة للرعاية الصحية
Mubadala Health

Accredited Labs

- ISO 15189
- CAP Accreditation
- Good Clinical Lab Practices compliant
- Good Clinical Practice compliant

Accredited Hospitals

- Commission on Accreditation of Rehabilitation Facilities (CARF International)
- Joint Commission International (JCI)
- American Surgical Review Corporation (SRC)

CRO Qualifications

- Qualifications from international pharma companies
- Qualifications from global CROs

RESTRICTED

Why M42? We have a unique value proposition in the Omics ecosystem, tailored solutions to local dynamics, and flexible engagement models

- Proven models in OMICS and in chemistry / pathology with NRL
- Scalability for diverse test volumes
- Diverse team of experts covering various complex domains
- Deep understanding of local / regional dynamics
- Extensive global partnerships and affiliations
- Comprehensive end-to-end solutions`
- Utilization of advanced infrastructure and technology
- Uniqueness as a local turnkey provider
- Flexibility in engagement model

Secret

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We would like to be an enabler to support you building a value-driven healthcare ecosystem

THROUGH OUR VALUE-BASED SERVICES IN OMICS

- Local partnerships
- Data security
- Local R&D development
- Genome to Genome services
- Beyond Base Pair services
- Turnkey services
- Compliance strategies
- Our accreditations

AND OUR COMBINATION OF SKILLSETS

- **International vision** (not Abu Dhabi centric)
- **End-to-end expertise**
- **Strong local partners enhancing our adaptability**
- **Capable of managing funding via grants and loans**

We are ready to act and contribute with our **strategic blueprint** to **shape a legacy in the healthcare ecosystem**

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We're proud of our very large capacity & state of the art equipment, and commercial reach in the MENA region

10,000 sq ft of central testing laboratory

50,000+ capacity diagnostic tests per day

300+ comprehensive diagnostic testing panels

20+ ongoing clinical trials

10+ countries served in MENA

200+ SMEs

100% report accuracy backed by SMEs

18+ peer reviewed journals

700+ state of the art equipment

50+ advanced sequencing machines

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PGP
Our success stories

The UAE's Human Genome Project has become one of the richest genomic data sets worldwide, with multiple ongoing applications

Key statistics

+785k	Samples collected (Aug 2023)
+873k	Samples sequenced (Aug 2023)
+920k	Samples stored in biobank (buccal, blood)
World's largest long read dataset	
42,000	TB of data generated
500k	WGS sequencing capacity per annum

Key applications

Genomic screening

- Utilize BIX analysis to pinpoint **disease-carrying mutations**, identifying participants with elevated genetic disease risk
- Enable regulators to **identify disease burden** at a population scale, aiding informed policymaking
- **Identify high-risk** patients before **phenotypic symptoms emerge**, improving prognosis and reducing healthcare system burdens

Pharmaco-genomics

- **Enable precision medicine** via population-specific pharmacogenomic profiling by evaluating **28 genes**
- **Identify fast / slow** metabolizers for a total of **128 different drugs** and provide recommendations based on individual genotypes

Premarital screening

- Identifying **carriers of disease-associated genetic variants**
- **Assessing recessive condition risks** for offspring
- **Expanding variant knowledge** to guide **public health programs**

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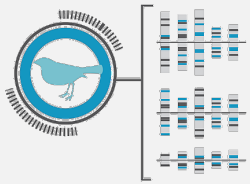
SaaS
Our services

Our success also materializes by empowering third parties to outsource genome sequencing (human or non-human)

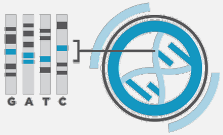
Large scale whole genome sequencing

- **Cost-effective low-pass Genome-Wide Association Studies** for large cohorts/complex diseases
- **Long** and **short read** sequencing platforms
- **25,000 genome/month capacity** across platforms



Large scale whole exome sequencing

- **Automated library** prep workflow
- **Optimized protocol** with latest enrichment tech
- Deep exon coverage
- **75,000 exomes/month capacity** across platforms

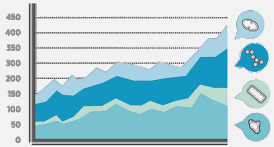


RNA sequencing

- **RNA-Seq for human**, plant, animal samples
- **Novel transcript** quantitative profiling
- Solutions for **gene expression**, **annotation**, **splicing**, **fusion gene discovery**

Metagenomic sequencing

- **Microbial composition** and function annotation
- **Detection** of **health**, **environmental**, and **energy-related microbes**
- In-depth **analysis** of microbial **genetics** and **metabolism** for **drug development**



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SaaS
Our success stories

Different local and international clients have trusted us to outsource their genomic sequencing

Large Scale Sequencing for Direct-to-Consumer Genomics

M42 is harnessing the potential of genetic data through **WGS and WES** applications in various regions **to enhance lifestyle wellness programs**

WGS, WES, RNA Seq for Research

M42 **partners with academic and research institutions** to conduct **sequencing** of animal and plant genomes across **diverse fields**, encompassing population genetics and agricultural breeding initiatives.

Metagenome for Environmental Research

Environment Agency – Abu Dhabi partners with OceanX, M42 and Bayanat to **advance marine research and conservation**

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R&D
Our services

We've developed a broad offering supporting R&D activities from large and small research institutions

OMICS

Most advanced & comprehensive OMICS sequencing in the region

Genomics

- *M42 has set-up the region's **largest** and **most advanced genomics** facility in terms of technology coverage, automation, computational capacity, and throughput*

Proteomics

- *M42 operates a **MENA-first proteomics** facility capable of querying over **7,000 proteins** for research and NCD disease risk prediction*
- *Capacity to **leverage proteomics** to **predict myocardial infarction**, **stroke**, **heart failure**, or even **death** up to 4 years before the event*[1]

Bioinformatics

Ad-hoc support at different levels

1 Primary Analysis

- *Analysis of hardware generated data*
- *Production of sequence reads & quality scores*

2 Secondary Analysis

- *Assembly of reads*
- *Variant calling on aligned reads*

3 Tertiary Analysis

- *Ancestry analysis*
- *Rare disease identification*
- *HLA reports & pharmacogenomics*
- *Disease – gene association*
- *Polygenic risk factors*

Biobanking

Storage capacity for a wide range of bio-samples and temperatures

- *Blood* (Plasma, -80°C)
- *DNA* (-80°C)
- *Swab* (-80°C)
- *Infectious* (-80°C)
- *Tissue/Cells*
- *FFPE Tissue*
- *Microbial cultures*
- *Industrial*
- *Crops and Livestock*
- *Environmental*

1) Williams SA et al., A proteomic surrogate for cardiovascular outcomes that is sensitive to multiple mechanisms of change in risk. Sci Transl Med. 2022 Apr 6;14(639):eabj9625

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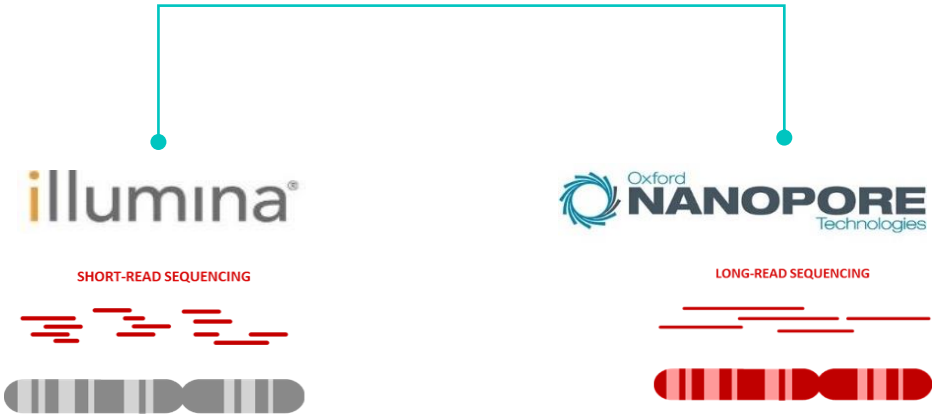
Our value proposition

An NGS offering across platforms with quality, reliability and scale at the centre

M42 Healthcare operates the only NGS facility in the world that hosts Illumina and Oxford Nanopore Technology sequencers under the same roof.



We are partners with major tech, automation, biobanking and reagent providers globally.

Microsoft HAMILTON somalogic NVIDIA ThermoFisher SCIENTIFIC QIAGEN TECAN

Long-read

Oxford NANOPORE Technologies

Short-read Sequencing

illumina

M42 is the only Omics Centre globally with all two core technologies under one roof

Oxford Nanopore Technology Laboratory

Illumina Laboratory

Automation Laboratory

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Diagnostics
Our Services

We offer a comprehensive range of diagnostic services, leveraging top genomic equipment

Our applications

Clinical Genomics

- Immunology
- Oncology
- Infectious Disease Sequencing

Non-genomic diagnostic

- Cytology
- Clinical Chemistry
- Allergy & Intolerance
- Hematology
- Viral Culture
- Microbiology

Our Genomic Partners

- illumina
- Thermo SCIENTIFIC
- bionano GENOMICS
- Oxford NANOPORE Technologies

Our Techniques

- Whole Genome Sequencing
- Whole Exome Sequencing
- Gene Panel Sequencing
- Optical Genome Mapping
- NIPT
- MLPA
- RT-PCR

Our added value

- **Largest sequencing capacity**, including two leading technologies
- Capacity to **do short** and **long readings**
- Full spectrum of genetic testing including **single gene tests, panels, WES and WGS**
- Ability to develop **custom panels based on WGS and WES**

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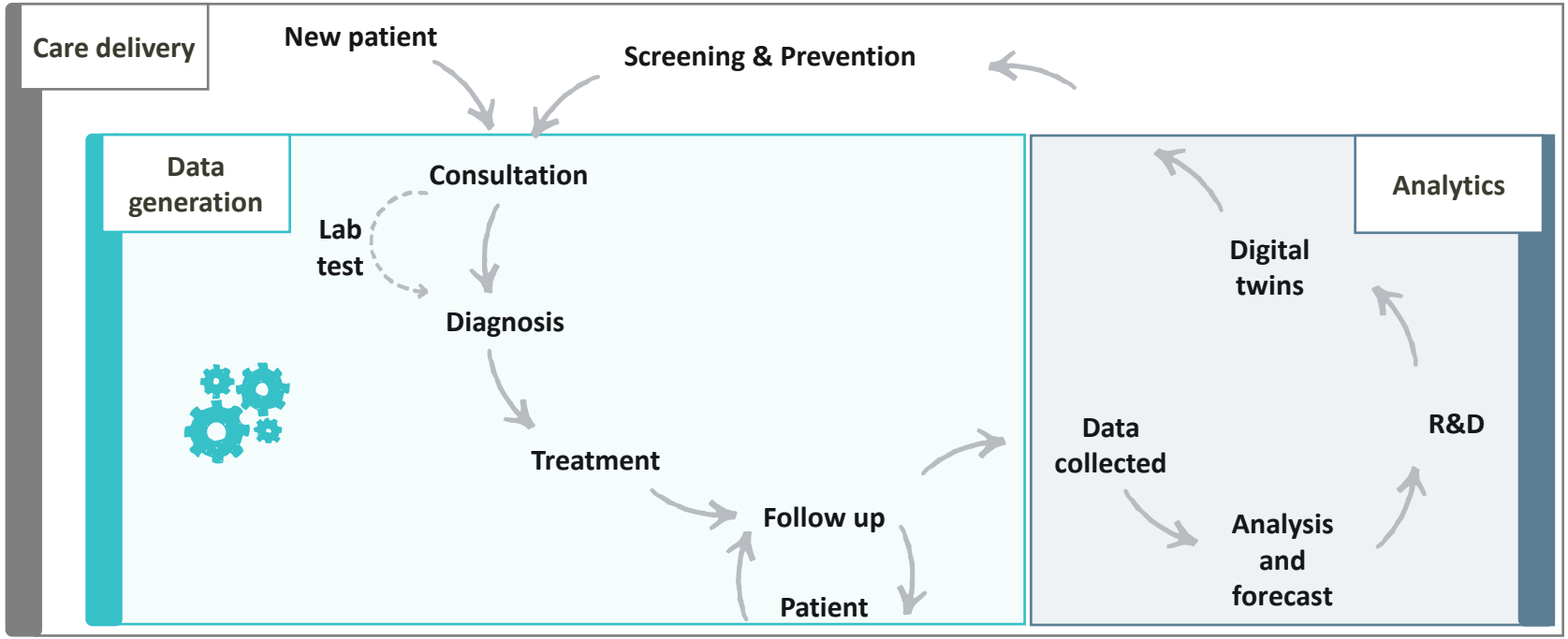
M42 empowers healthcare by leveraging data collected and using advanced analytics to deliver quality, efficiency, and value-based care



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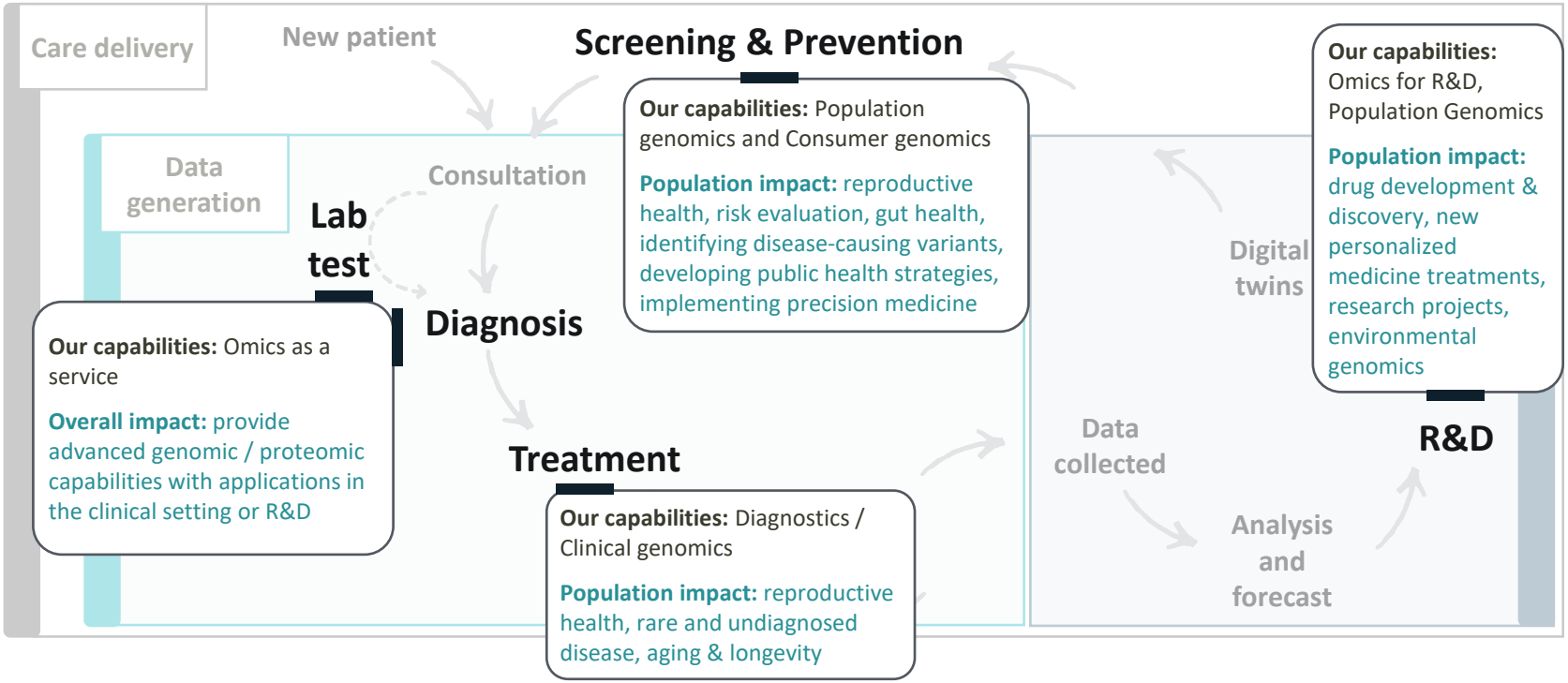
OMICs sciences enable multiple applications across the continuum of care, from screening & prevention, treatment until advanced R&D



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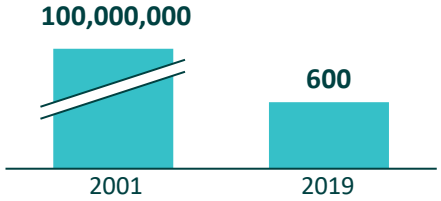
The utilization of genomics has risen substantially due to significantly reduced costs and growing knowledge and adoption

Decrease in sequencing costs

Since 2001 the **cost of sequencing** a human genome **has been reduced considerably** [1] (USD, 2001 – 2019)



The **projected trend** for the coming years is **expected to continue its decline**

Rise in genomics knowledge and utilization

The **Genomics market**[2], **valuated** at **$21 billion in 2020**, is expected to grow at a **CAGR** of **15.7%** from 2021 to 2028

The **number** of **known genetic diseases** has steadily increased[3] over the last years:

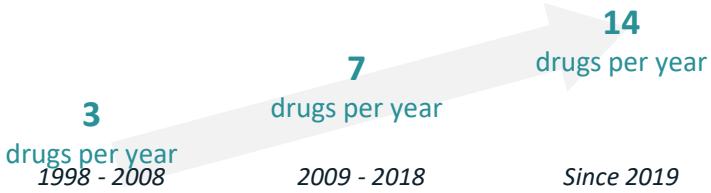
965	c. 10,000	Over 27,000
in 1966	*in 1923*	*In 2000*

Prevalence of clinically actionable disorders

- Approximately **11.6%**[4] of adults in the US have them[5]
- For **Middle Easterners and Europeans, 2.1% and 2.3%** respectively have them **linked** to inherited **cancer syndromes** such as hereditary breast cancer and lynch syndrome
- Around **50% of patients** with a **rare disease** remain **undiagnosed** even in advanced expert clinical settings (where WES is applied routinely)

Growing adoption of personalized medicine

Average number of **Personalized medicine drugs approved** by the **FDA**[5]



1) National Human Genome Research Institute; 2) Grandview Research; 3) OMIM statistics, Johns Hopkins University; 4) Mayo Foundation for Medical Education and Research (2021); 5) Communications Biology (2024)

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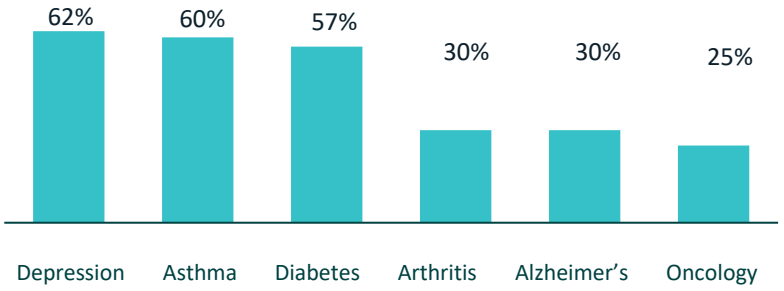
Furthermore, genomics is providing innovative solutions for various medical conditions, contributing to the alleviation of the disease burden

Adverse Drug Reactions (ADR) and Drug Inefficacy

- **Adverse drug reactions** reached **106K deaths** and **2.2M hospitalizations** in the United States each year[1]
- **ADR's prevalence** in the primary care setting is **8.3%**[2]
- Average **response rate** by condition is only **1 person** out of **3 or 4**, for conditions such as **Arthritis, Alzheimer & Oncology**

Average drug response rate by condition



Burden of rare disease[3]

- **8.3% of inpatient** pediatric admissions are associated with **genetic disease**, which compared to patients who did not have a genetic disease diagnosis **mean cost of up to**:
  - **USD 46,500 higher** for **neonatal admissions**
  - **USD 14,500** for **pediatric admissions**

Economic burden of rare diseases in the US is approx. **USD 966 Bn per year**[4]

1) JAMA (1998); 2) Prevalence of adverse drug reactions in the primary care setting: A systematic review and meta-analysis (2021); 3) Genetics in Medicine (2018); 4) The national economic burden of rare disease in the United States in 2019 | Orphanet Journal of Rare Diseases | Full Text (biomedcentral.com)

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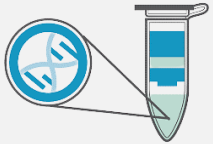
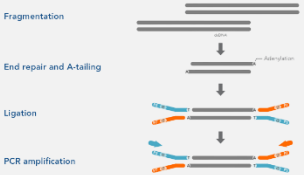
Workflow – Human Whole Genome Sequencing on Illumina

1 Sample receipt & Management



2 Genomic DNA Quality Check



3 PCR Free DNA Library Preparation

4 Sequencing on Illumina/ ONT Platform

- ~100 Gb data per sample using PE 150bp module (30X)

5 Sequence Data Quality Check

6 Variant Calling

7 BAM & VCF file transfer

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Bioinformatics – Team Capabilities

Interdisciplinary team of 13 members. Skills combining computer science, statistics, biology and pop gen analytics to develop methods and tools to analyse biological data

Customers & Projects

- 1M Emirati genomes by 2025
- COVID samples for genomics surveillance
- Genomics surveillance of waste-water samples
- Consumer genomics
- Analysis for unresolved clinical cases
- Enabling on-board environmental DNA samples

Production & Infrastructure

- Analytical readiness – setting up one of the largest set ups in the world, implementation of state-of-the-art workflows such for rare diseases, pharmacogenomics, HLA, CNVs (Illumina & ONT)
- SaaS operations – management and processing of high-throughput sequencing data for customer delivery (e.g. genetic variants, genomics surveillance)

Support & Process Development

- OU / Customer support – rapid customer-facing bioinformatics support & consulting (e.g. CAP accreditation, ADEO audit, pre-sales)
- Enabling new analysis workflows – healthcare data platform, live genetic screening, marine sequencing, clinical pipelines validation

Data Mining & Research

- Scientific excellence – peer-review publications, communications at scientific events (e.g. ONT London Calling)
- Outreach – engaging with research and clinical community as well as showing synergies with partners (e.g. AWS, BCM, KU)

Collaborators & Outreach

- Building the UAE genomics community
- Collaborating with international top researchers
- Participation on industry and academic healthcare events
- Publication of scientific peer-reviewed articles
- Technical / marketing communications showcasing synergies with partners

Selected partners

- >100K human genomes analyzed with clinical-grade software
- A newer and more powerful technology that is revolutionizing genomics & sequencing
- Computational infrastructure for G42HC projects
- Expanding our computational infrastructure to scale globally
- State-of-the-art analysis software for rapid TAT and advanced features
- Leveraging third-party software for clinical and consumer genomics reporting

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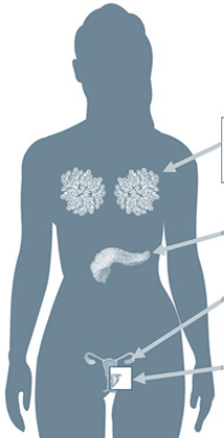
In May 2024, we partnered with AstraZeneca to advance prevention & precision medicine for breast cancer in the UAE



Prevalence

	BRCA1	BRCA2
Breast cancer:	**50% to 65%** Males: 1.2%	**40% to 55%** Males: Up to 9%
Pancreas cancer:	1-3%	2-7%
Ovarian cancer:	**40% to 65%**	**15% to 25%**
Prostate cancer:	9%	15%

كليفلاند كلينك أبوظبي
Cleveland Clinic Abu Dhabi
Brought to you by Mubadala

AstraZeneca

Development of a pilot with CCAD to identify BRCA gene mutation for breast cancer

Used WGS to test for a comprehensive oncology panel for 40 patients who were at a high risk of developing cancer (Emirati Population)

- **8 out of 40 patients** were identified as having highly penetrant mutations which explained their illness
- These patients **successfully received targeted therapy** based on their results

The success of this pilot, lead to partnership with AstraZeneca for companion diagnostics

- AstraZeneca is sponsoring tests for BRCA 1 & BRCA 2 tests across **17 hospitals in UAE**
- More test have been added to the lists and **several geographies** have also **been added**

Next steps will focus on **extending partnership** success to **new diseases** and **regions**, with particular attention to **somatic analyses**

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PGP
Our
Services

We uniquely orchestrate a seamless, integrated and customizable turnkey solution for population genomics

01 **Outreach and Sample Collection**

02 **Sample Transportation**

03 **Preparation & Sequencing**

04 **Data Processing & BIX**

05 **Data Storage and access**

06 **Sample Biobanking**

07 **Modular applications**

- *Population screening*
- *Risk assessment*
- *Pharmacogenomics*
- *Clinical genomics*
- *Reference genome*
- *Clinical trials*
- *Drug discovery*

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We employ best-in-class sequencing technologies

The region's largest and most advanced omics facility in terms of technology coverage, automation, computational capacity and throughput

The Centre has a current capacity for sequencing **500,000 genomes annually** and has the highest level of automation in sample and library preparation, as well as the region's largest computational resources in terms of processing power and storage.

Long-read Sequencing

Oxford Nanopore Technology Laboratory

Short-read Sequencing

Illumina Laboratory

Automation Laboratory

Automation

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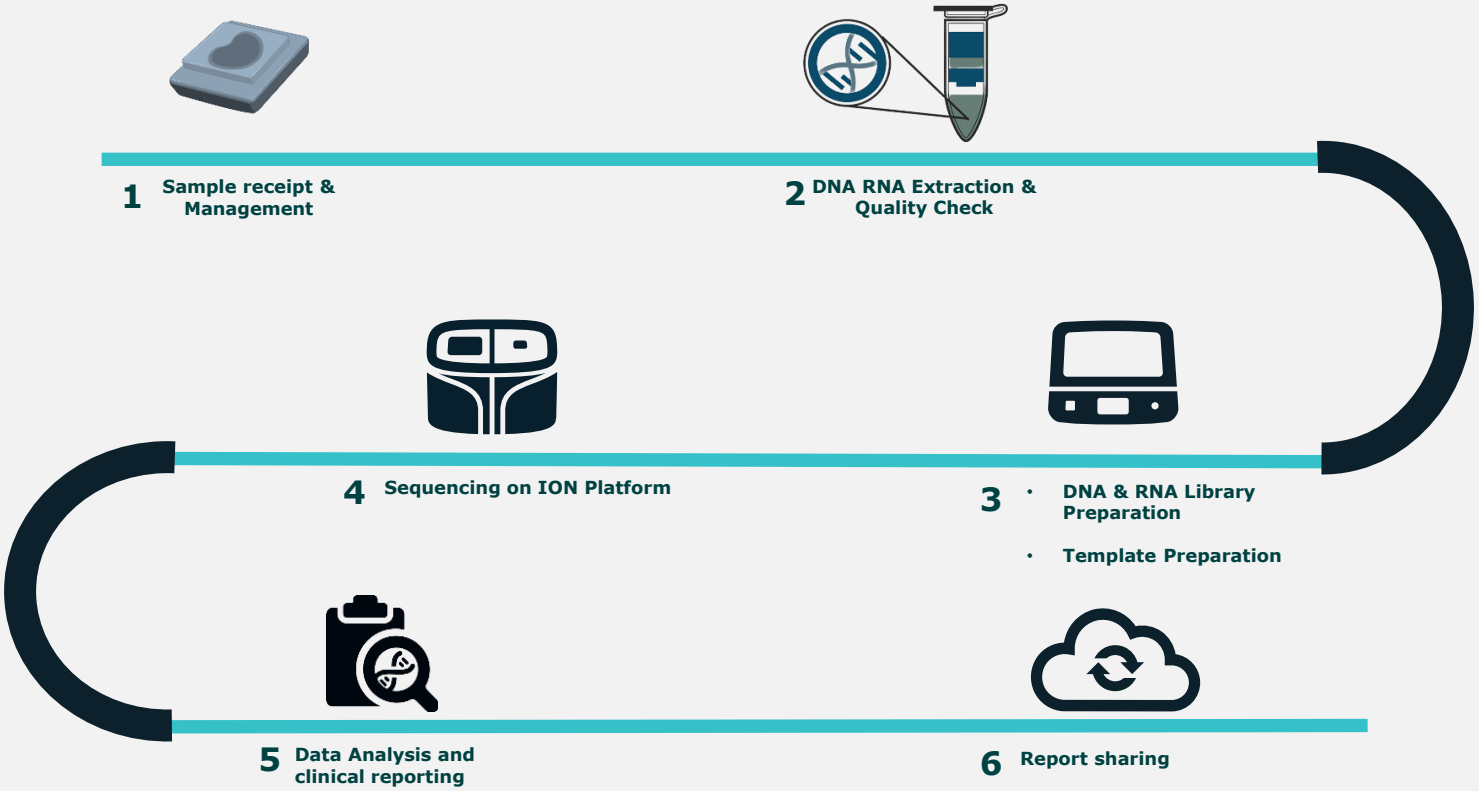
Testing Workflow



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Robust gene content and complex biomarkers detection

Oncomine Comprehensive Assay Plus (500+ genes)

165	genes with recurrent hotspot mutations
333	genes with focal CNV gains or loss
227	genes with full-coding DNA sequence (CDS)
>1 mb	Exonic footprint for Tumor Mutational Burden (TMB)
MSI-H/MSS	Markers for Microsatellite Instability (MSI)
49	Fusion driver genes
MET	exon skipping detection at DNA and RNA level
Cellularity	(Tumor fraction) calculation
46	Genes in Homologous Recombination Repair pathway

Loss of heterozygosity detection – gene level and sample level

Powerful bioinformatics solution for analyzing and visualizing **Mutational signatures**

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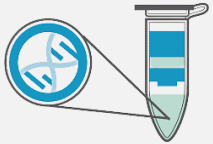
Workflow – Microbial Whole Genome Sequencing on ONT

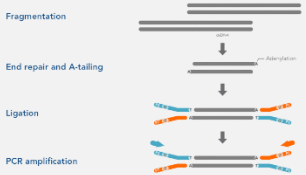
1 **Sample receipt & Management**



2 **Genomic DNA Quality Check**

4 **Sequencing on ONT Platform**

- ~1 Gb data per sample on Long read seq kit (30X)



3 **PCR Free DNA Library Preparation**

5 **Sequence Data Quality Check**

6 **FASTQ files transfer**

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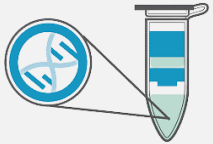
Workflow – Shotgun Whole Metagenome Sequencing

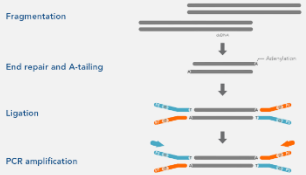
1 Sample receipt & Management



2 Genomic DNA Quality Check

4 Sequencing on ONT Platform

- ~10 and 30 Gb data per sample on 150PE reads



3 DNA Library Preparation

5 Sequence Data Quality Check

6 FASTQ files transfer

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Thank You

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