



Biobank-enabled Clinical Diagnostics and Personalized Medicine

***CATALYZING DRUG AND BIOMARKER DEVELOPMENT USING
INSIGHTS FROM HUMAN PATIENT SAMPLES AND CLINICAL DATA***

"FROM THE PATIENT >> TO THE PATIENT"

www.sapienbio.co.in

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Sapien Partnership with Apollo Hospitals Accesses High Volumes Pan-India



Number of Patients accessible to Sapien from 73 hospitals of Apollo

- Inpatient : 10,250 beds
470,000 patients/year
- Outpatient : 4.3 Million patients/year

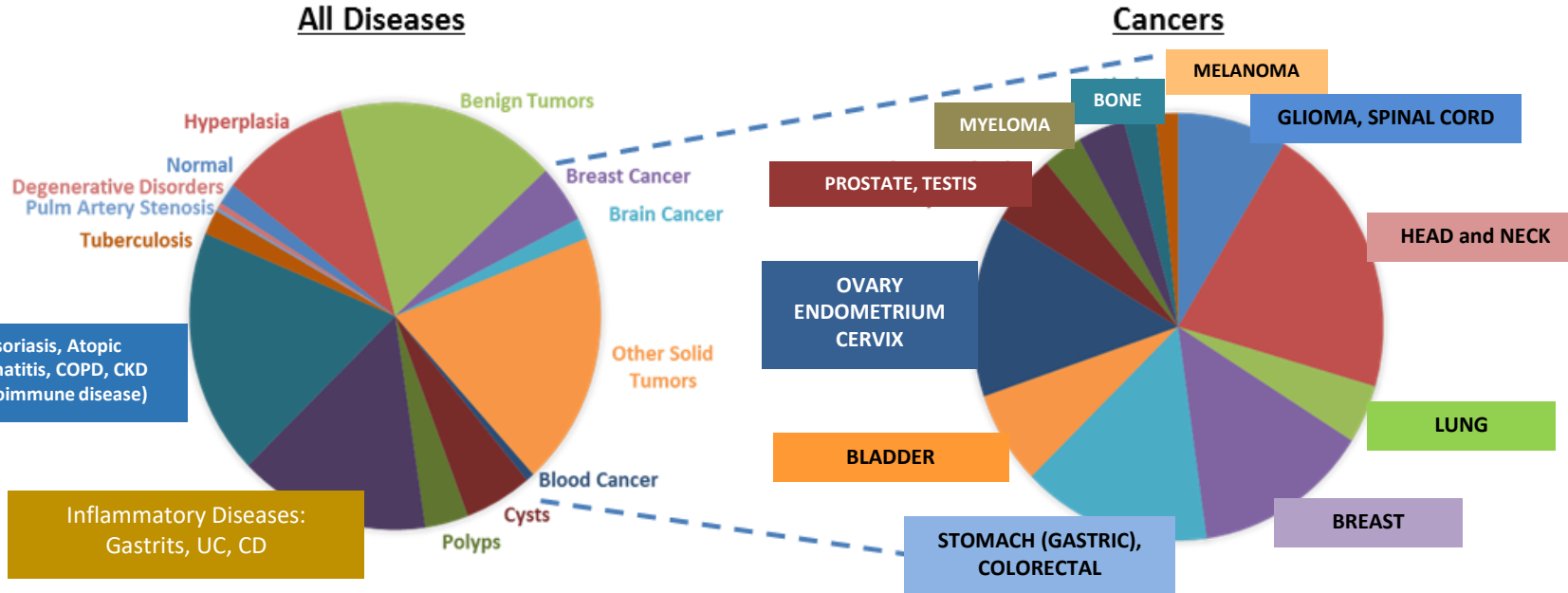
'Women Transforming India' entrepreneur award by Govt of India's Niti Aayog to Dr. Jugnu Jain

Sapien represented India at Global Entrepreneurs Summit, 2019 at Netherlands

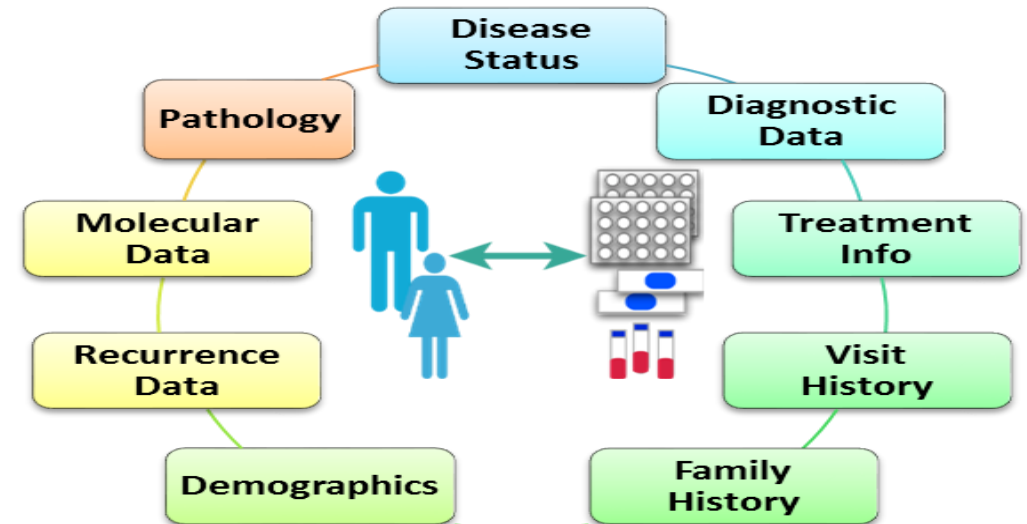
Sapien is Among World's 10 Largest, Multi-Diseases Biobank



Biobank Sample/Disease Diversity



Samples and Data for >300,000 Patients @ Sapien across All Diseases, (of which ~50,000 are Cancer Cases), making it one of the 10 largest global biobanks



Vision and Mission



Sapien's Vision:

- A premier bioscience enterprise at the interface of healthcare and life sciences, with clinically relevant products, platforms and services, enabling the development of personalized drugs and diagnostics to improve patient lives.

Sapien's Mission:

- Build a world-class biobank archiving ethically obtained, high quality patient samples and clinical data based in India.
- Harness biobank assets for the development of clinically important products with Pharma, Diagnostics, Genomics and Data Science partners.
- Mine longitudinal Outcomes data to optimize patient care at each stage - earlier detection, personalized treatment, monitoring of disease progression.

Sapien: A Differentiated CRO



- Multi-disease Biobank that combines personalized medicine products and drug discovery services for Pharma & Diagnostic companies
- Many types of patient samples and data for customized genomics, molecular, cellular, pathology assays for validating drugs, drug targets and predictive biomarkers
- Real World Evidence (RWE), data to support preclinical and clinical decision-making and patient stratification
- Export process, complying with ethical guidelines is well-established.
Long-term partnerships with reputed global R&D Pharma / Biotech companies
- Promoted by experienced scientist entrepreneurs with track record of international Pharma drug development and Global business experience

Sapien Leadership Team



Dr. Jugnu Jain – CEO, Co-Founder

- PhD - Cambridge UK, Post-doc - Dana Farber & Harvard Medical School
- Drug Discovery experience @ Vertex Pharmaceuticals, Boston
- Knows Pharma's need for translation and gaps therein very well
- Global professional network



Dr. Soma Chatterjee – Director, Biobank & Ethics

- PhD – Chonnam Nat'l Univ, S Korea & Business Strategy – IIFT, India
- 20 years experience at Lonza and other companies, specifically sourcing and providing quality human samples ethically, to Global businesses
- Also Leads ethical compliance, Liaison with Govt agencies and IRBs



Lonza



Dr. Rakesh Sharma – Scientist, Lab Assays

- PhD – Ruprecht-Karls-University & DKFZ, Germany
- 10+ years experience in cancer and immune biology
- Adept in patient tissue-based cell and molecular assays, Crispr-Cas9 gene editing, drug screening, target and biomarker studies
- Skilled in various microscopy and pathology techniques



RUPRECHT-KARLS-
UNIVERSITÄT
HEIDELBERG

dkfz.

Distribution of Diseases (in %) from just 3 of our Apollo Hospitals



ICD 10 Code	Diagnosis	Hosp 1	Hosp 2	Hosp 3
A	Infectious diseases	9	5	4
B	Infectious diseases	2	1	2
C	Cancer	9	27	4
D	Blood diseases including immune disorders	5	7	7
E	Endocrine, nutritional, metabolic diseases	20	18	33
F	Mental disorders	0	0	0
G	Nervous system	3	3	2
H	Eye, ear, mastoid diseases	6	2	2
I	Heart and circulatory	16	12	14
J	Respiratory	5	3	5
K	Digestive system	9	8	10
L	Skin and subcutaneous tissues	1	1	2
M	Musculoskeletal, orthopedics	7	4	9
N	Genitourinary, Kidney, Renal	7	9	6
	Others	0.6	0.3	0.3
	Total (in Percent)	100	100	100
	Average Yearly In-Patient Volume (approx)	12000	20000	18000

Patient Datasets Available to Sapien from our Partner Hospitals



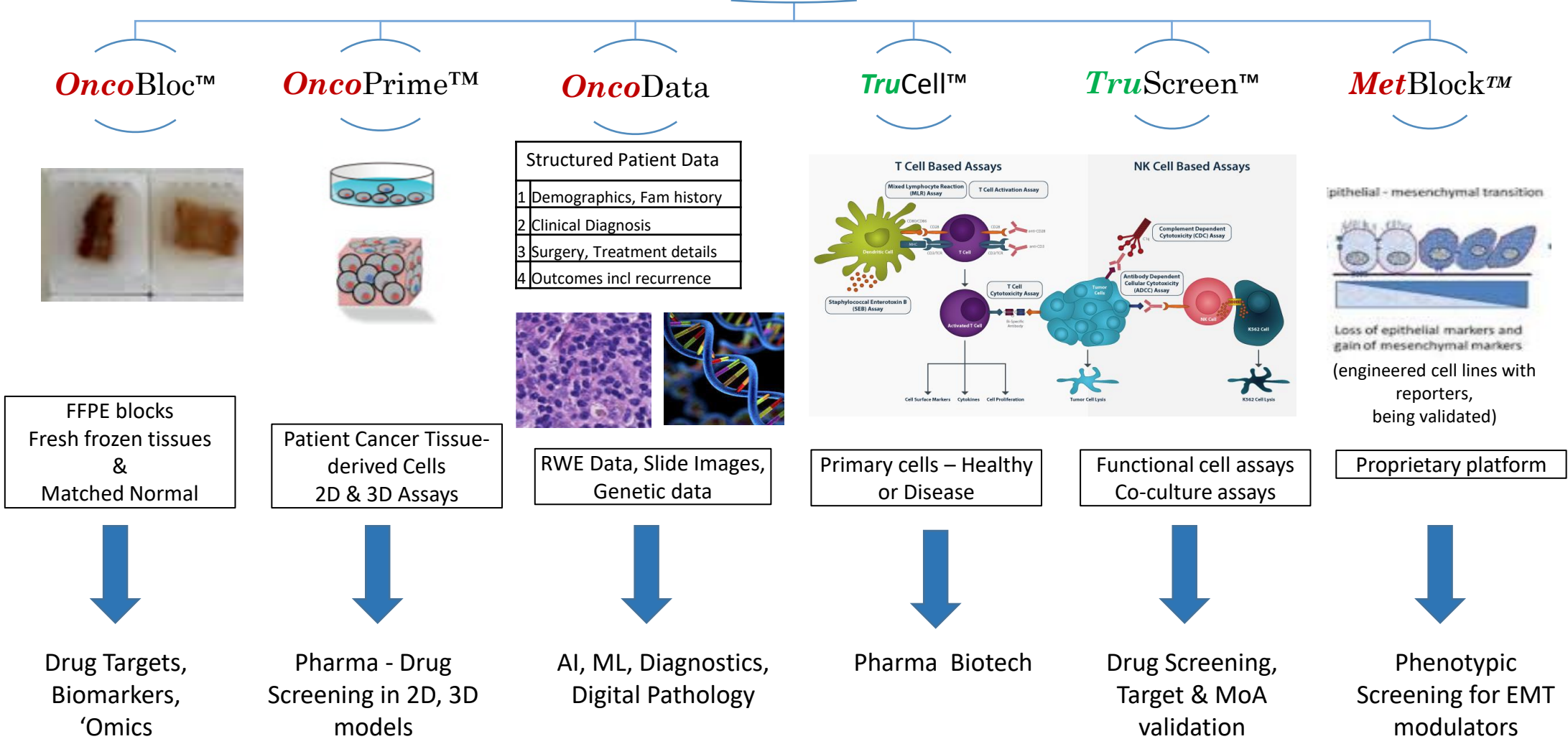
1. Medical History : Partially available.
2. Visit diagnoses: ICD10 diagnosis code available up to 1 decimal point e.g., C50.9 for breast cancer
3. Medications: Usually available.

Hospital Formulary List available for Indian brands for the most commonly used medications, stated in their generic form e.g., brand name Glivec (Gleevec in USA), generic name used in India is Imatinib which will be available
4. Procedures: Mostly available.
5. Demographics : Available. Typically includes vital signs, weight, height, BP (systole, diastole), age, gender.
6. Social history: Not commonly available.
 - Being collected manually for specific projects
7. Laboratory values: Mostly available.
8. Radiology : Summary of report usually available.
9. Treatment & Follow-up Data : Integrated from many medical records and data sources, manually curated & coded

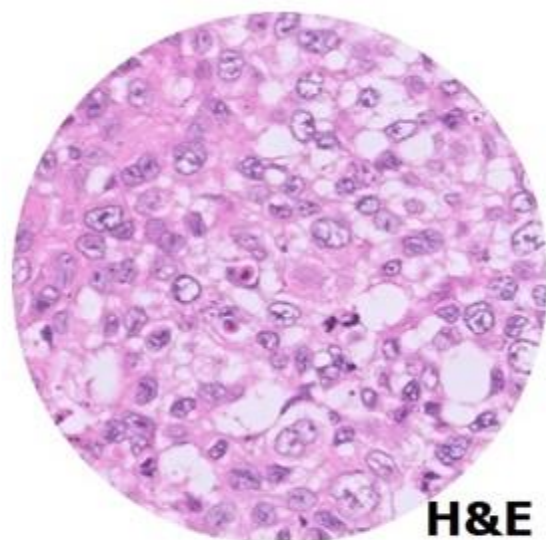


Sapien's Products & Services

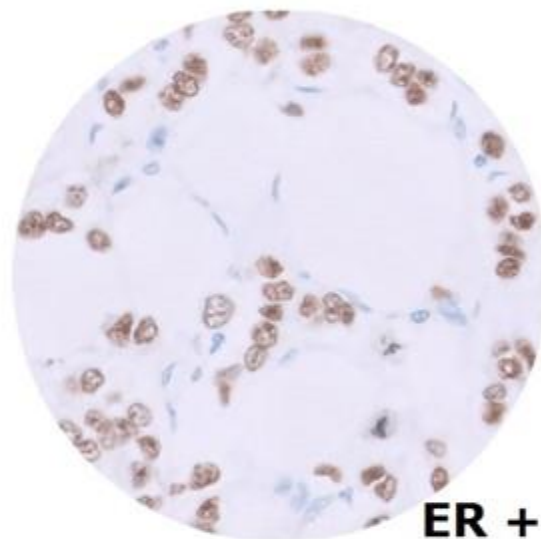
R&D Platforms established using Patient as well as Healthy Human Samples and Associated Medical Data



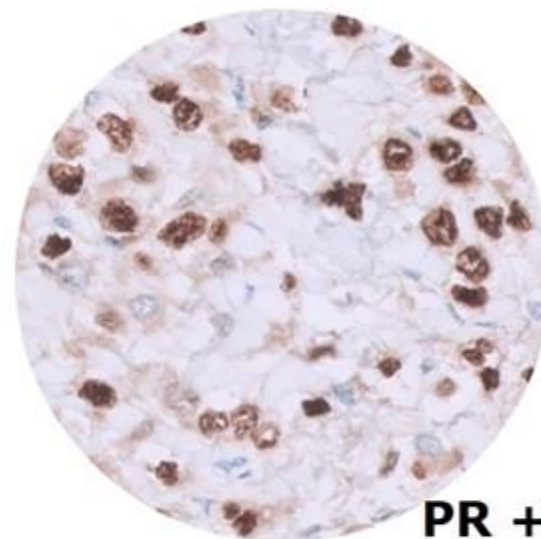
Matched Sets of Breast Cancer WSI : H&E, ER, PR, HER2, MIB / Ki67



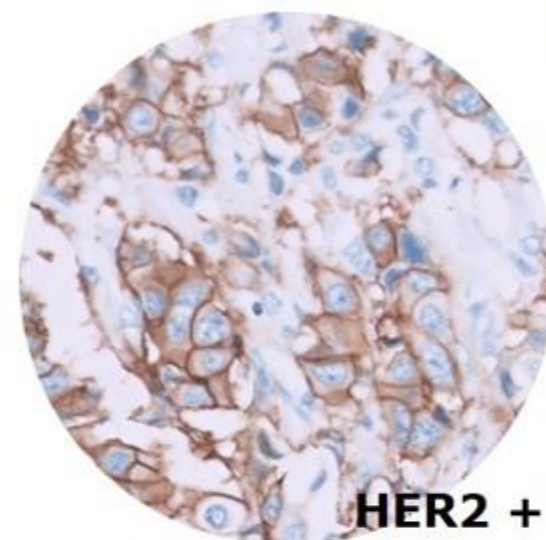
H&E



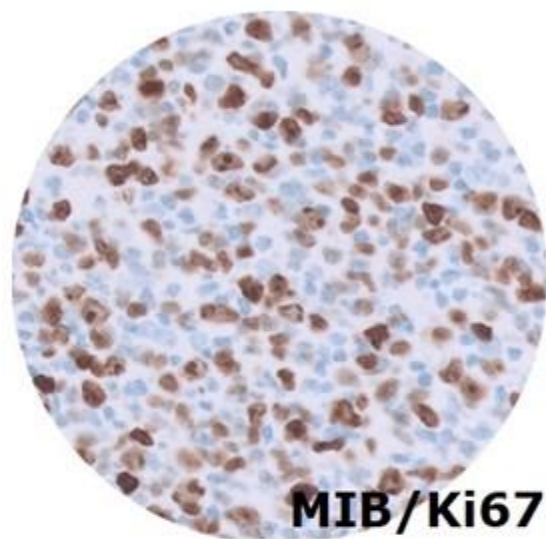
ER +



PR +

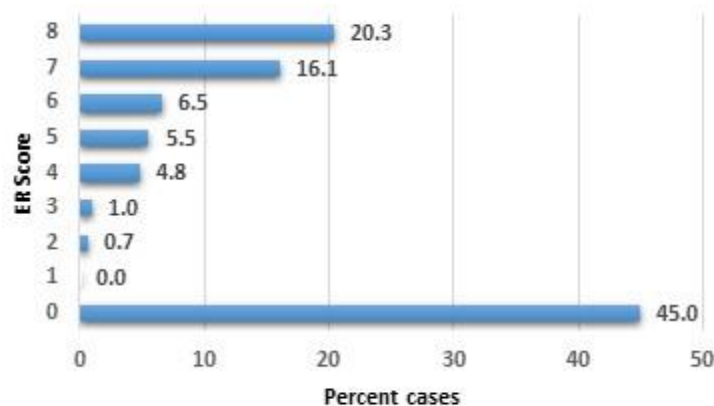


HER2 +

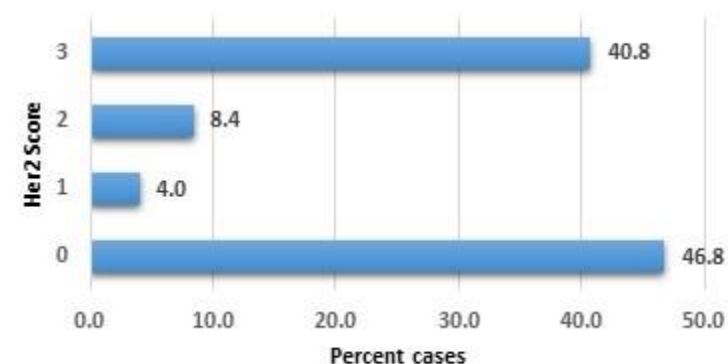


MIB/Ki67

Distribution of ER Scores



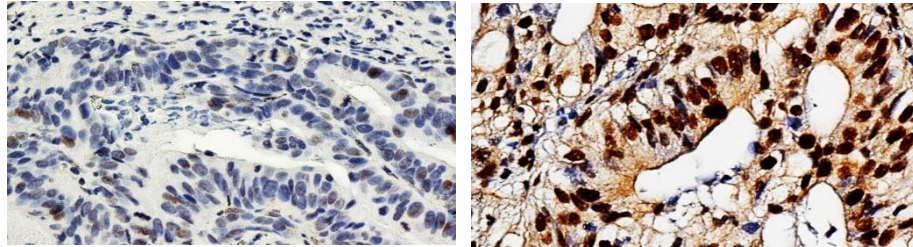
Distribution of HER2 scores



Testimonials from Clients & Collaborators : Details Available on Request



Ando K, Hamade Y et al. 2018. Developing a Phosphospecific IHC Assay as a Predictive Biomarker for Topoisomerase I Inhibitors.



Topoisomerase treatment response **predictive marker** in CRC
Non-responder (left) Responder (right)

OncoBloc™

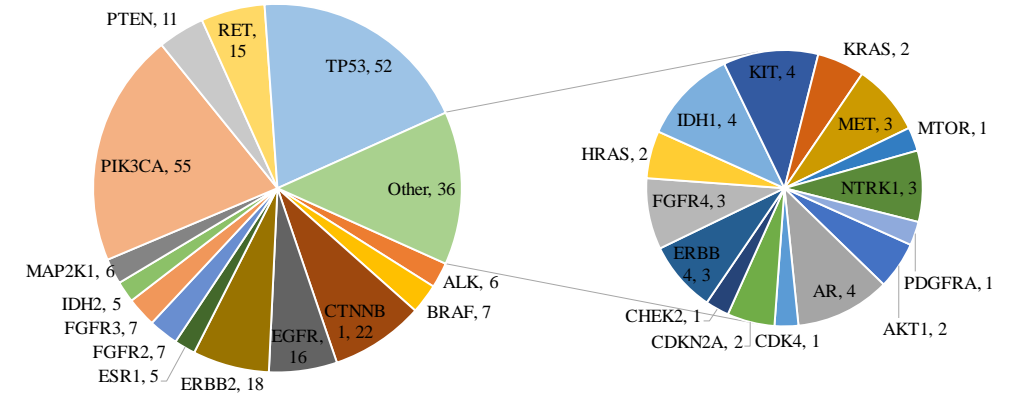


OncoPrime™

Boston-based Botanicals drug company

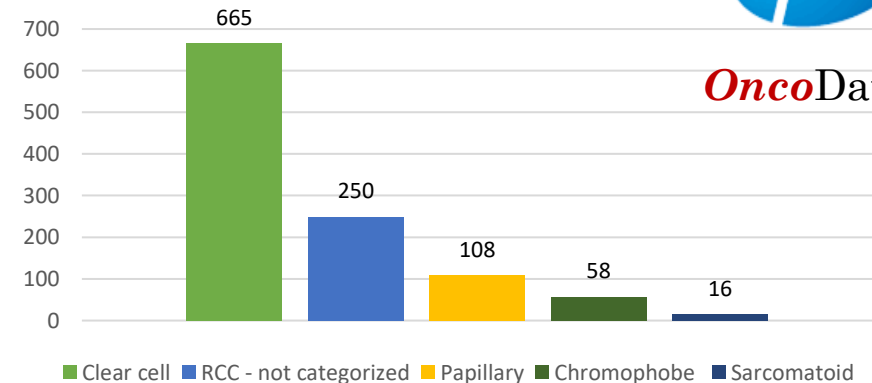
*"We approached Sapien because of their unique expertise and their **library of patient-derived tumor tissues**. Sapien's work is flawless and world-class and helped us get insights into the potencies of our drug candidates. **Sapienbio's 2D and 3D models are exactly what we needed**. The data that Sapien generated is part of our regulatory submission package."*

ThermoFisher
SCIENTIFIC



OncoMine NGS gene panel data using Sapien's Breast Cancer blocks: SNVs

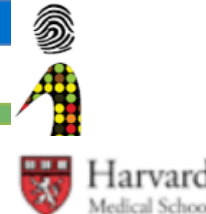
Renal Cell Carcinoma - Histotype



OncoData

Real World Data on treatment choices of 1097 Renal Cancer cases, including 215 post-recurrence cases

Sapien's Patient-Derived 3D Cell work Presented at AACR



A Novel QUATRAMER™ sustained injectable suspension for the intracellular delivery of Salinomycin, a stem cell inhibitor (HSB-1216), for the treatment of triple negative breast cancer

Anees Mohammad, Bhawana Gupta, Sireesh Appajosyula, Sandeep Laumas, Jugnu Jain, Donald Kufe, Harpal Singh and Surender Kharbanda

Department of Biomedical Engineering, Indian Institute of Technology, New Delhi, India; Sapien Biosciences, Hyderabad, India; Hillstream BioPharma Inc., Chester, NJ;

Department of Medical Oncology, Dana-Farber Cancer Institute, Harvard Medical School, Boston, MA

Background

Breast cancer continues to be the second cause of death in women worldwide. Triple-negative breast cancer (TNBC) is defined by the lack of expression of estrogen (ER), progesterone (PR) and HER2 receptors. TNBC represents approximately 15-20% of all diagnosed breast cancers. TNBC is known to have a poor prognosis and limited treatment options, namely chemotherapy. After many years without breakthroughs in the field of TNBC and with chemotherapy remaining the only treatment option in this setting, few promising agents are becoming available or are in late stage of clinical development giving hope for a more personalized therapy.

Emerging evidence suggests that breast cancer stem cells (BCSCs), which have tumor-initiating potential and possess self-renewal capacity, may be responsible for this poor outcome by promoting therapy resistance, metastasis, and recurrence. Conventional chemotherapy can reduce the bulk of TNBC lesions, BCSCs survive and reconstitute the tumor.

Salinomycin (SAL), a potassium ionophore, preferentially targets CSCs. SAL was identified as an effective anti-BCSCs compound by high-throughput screening. However, SAL is associated with substantial toxicity at higher doses, limiting its potential for anti-cancer activity in patients. We report a novel Quatramer polymeric NP-based formulation that potentially overcomes the toxicity of SAL.

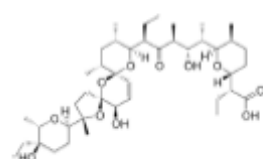


Fig.1 Structure of salinomycin (SAL).

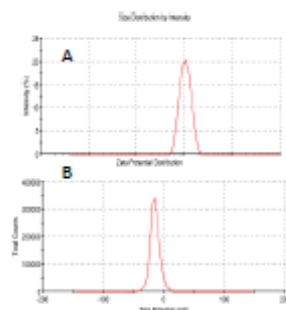


Fig.2 Physicochemical characterization of HSB-1216. A) Size distribution. B) Zeta Potential.

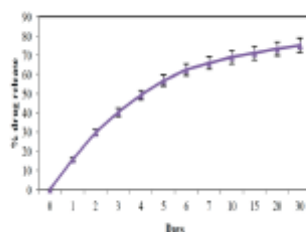


Fig.3 Release profile of SAL from HSB-1216. The release was studied in PBS (pH 7.4) at RT.

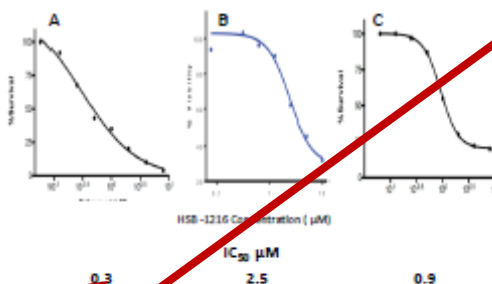


Fig.4 HSB-1216 dose-response curves for TNBC cell lines MDA-MB-149 (A), MDA-MB-231 (B) and MDA-MB-468 (C). Cells were exposed to HSB-1216 for 72 hours and cell survival determined in alamar Blue assay.

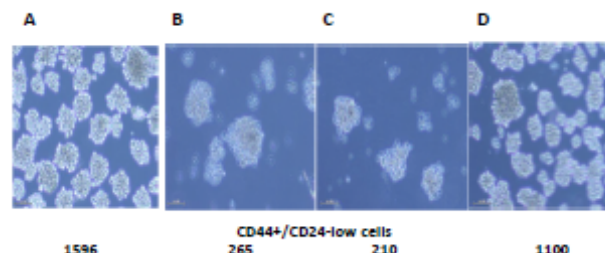


Fig.5 Effect of PBS (A), SAL (B), HSB-1216 (C) and Paclitaxel (D) on growth of BCSCs derived from TNBC patient and grown as spheroids. CD44+/CD24-low CSCs were isolated by FACS, grown as spheroids and exposed to different treatments for 72 hours.

Treatment (mg/kg)	Dosing Days		
	Lethality		
	2	9	16
SAL (10)	100%	D4	
HSB-1216 (10)	0	0	0
HSB1216 (12.5)	0	0	0

Tab.1. SAL and HSB-1216 lethality in wild type mice. CD2 wild mice were treated once weekly for 3 weeks.

Results

SAL was successfully encapsulated in QUATRAMER™ polymeric NPs comprised of a polyethylene glycol (PEG)-polypropylene glycol (PPG)-PEG-modified PLA-block copolymer (HSB-1216) with a size of ~ 100 nm, zeta potential of -16.

SAL release from the HSB-1216 in vitro, in a non-physiological buffer, was controlled and permitting time-dependent release over sustained periods (nearly 80% accumulated release over 30-day period).

Treatment of multiple human TNBC cell lines in vitro with HSB-1216 demonstrated substantial killing with an IC₅₀ between 0.3-2.5 μM.

Treatment of CD44+ve/CD24-ve-enriched BCSCs isolated from a TNBC patient tumor biopsy and grown as 3D-mammospheres, with HSB-1216 was associated with nearly complete inhibition of mammosphere formation. In contrast, Paclitaxel was not effective in this setting.

Noticeable difference in toxicity were seen in mice exposed to SAL and HSB-1216. Single dose of SAL 10 mg/kg resulted in lethality in all animals at day 4. In contrast, all animals in HSB-1216 arm receiving 3 doses of up to 12.5 mg/kg showed no visible sign of toxicity.

CONCLUSION

A novel QUATRAMER™ technology for sustained delivery of SAL represents a safe and efficacious approach for targeting TNBC cancer cells including BCSCs and potentially other cancer types.

Assays performed at Sapien

Sapien : Ideal Genomics Partner



1. Sapien can enable 100k+ large Genomics projects with Samples and structured, longitudinal data
2. Example 1: Collate 30K Unique patients/year, spanning all diseases, across Sapien's partner hospitals
 - Sapien can collect blood samples from 100K unique patients over 3-4 years + ICD 10 coded disease + baseline demographic, diagnostic data + 5 year treatment and outcomes data, similar to UK Biobank
 - Provide DNA /RNA along with Plasma & structured medical data. Perform WES, Genotyping, RNASeq, Liquid Biopsy
 - *Mix of patients can be customized by Sapien as per Partner's objectives.*

3. Example 2: Enable deep learning with Cancer patient samples
 - Matched tissue + Blood/ Plasma + Scanned Pathology slide images + Genomics data + Treatment & Outcomes data





Key Advantages of Sapien in 'omics

UK Biobank (UKB), and FinnGen (FG), are 2 large PPP consortia with 500K (~300K in FG) people's samples, longitudinal outcomes data (Phenotype data), combined with genomic data

*Sapien is uniquely positioned to be **THE** Asian partner with many advantages over UKB & FG*

UK Biobank, FinnGen

- a) **Age range Limited:** 40-69 years
- b) **Caucasian only**
- c) **Low Diversity :** UK, Finland are both small, Island nations with low geographic, environmental, dietary diversity - homogenous population
- d) **Heavily Pre-treated patients more common**
- e) **Low volume of patients :** small populations

Sapien biobank's Differentiators and Tremendous Potential

- a) **Age range VERY HIGH :** Sapien samples span <1 month to 102 years
- b) **Asian :** Addresses the gap of <5% global 'omic data being from Asia / Africa
- c) **High diversity :** India is the 7th largest country, with varied climate, lifestyle, food & microbiome – heterogeneity needed available @ Sapien biobank
- d) **Treatment-naïve patients common in India :** desirable for 'Omic studies
- e) **High volume of patients:** India is the world's 2nd most populous country (**China doesn't allow samples to be exported so only Sapien can enable access to the largest population in the world**), with 72+ hospitals network
- f) **Even Rare diseases :** Higher volume in India than elsewhere in the world due to sheer size of the population

Thank you



Please contact us at :

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Meet in-person at BIO, 5-8th June 2023 at Boston