BioCheetah
SPEED PRECISION HEALTH

Bladder Cancer Liquid Biopsy Test

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BioCheetah's Startup Journey

2012 - 2015

- **Discovery of novel bladder cancer biomarkers in Professor Thiery's A*STAR lab:**
  - publication in 2015 by BioCheetah's Scientific Founder, Prof Jean Paul Thiery in Oncotarget Journal

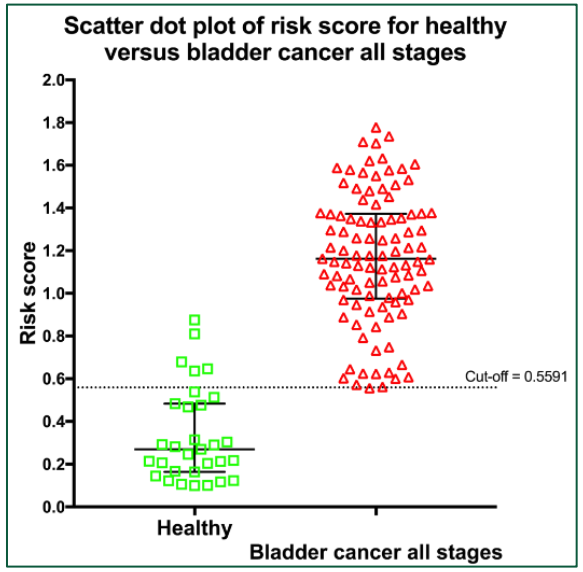
Reference: Kumar *et al.*, 2015 Oncotarget 6 (15):13539 - 49

Institute of Molecular and Cell Biology
A*STAR

Oncotarget

2016 - 2017

- **Gap funding by A*STAR:**
  - revalidation of Oncotarget publication to ensure data reproducibility
  - preclinical validation using 132 new clinical samples



2018 - 2019

- **Formation of spin-off company BioCheetah Pte Ltd:**
  - company incorporated in 2018
  - building of pilot manufacturing site in Singapore
  - bladder cancer biomarker patents granted in Singapore, Japan, Europe, China & USA

2020 - 2021

- **Product development & clinical trial:**
  - development of ELISA kit & POCT test kit
  - ISO13485 certification application
  - clinical trials on-going in Singapore, China & France
  - planned R&D expansion in Guangzhou, China

Singapore General Hospital
SingHealth

HOPITAL FOCH

Sengkang General Hospital
SingHealth

中山大學 附属第一医院
The First Affiliated Hospital, Sun Yat-sen University

大连医科大学附属第一医院伦理委员会

深圳市罗湖医院集团罗湖区人民医院
Shenzhen Luohu Hospital Group Luohu People's Hospital
深圳大学第三附属医院
The third Affiliated Hospital of Shenzhen University

Scenarios

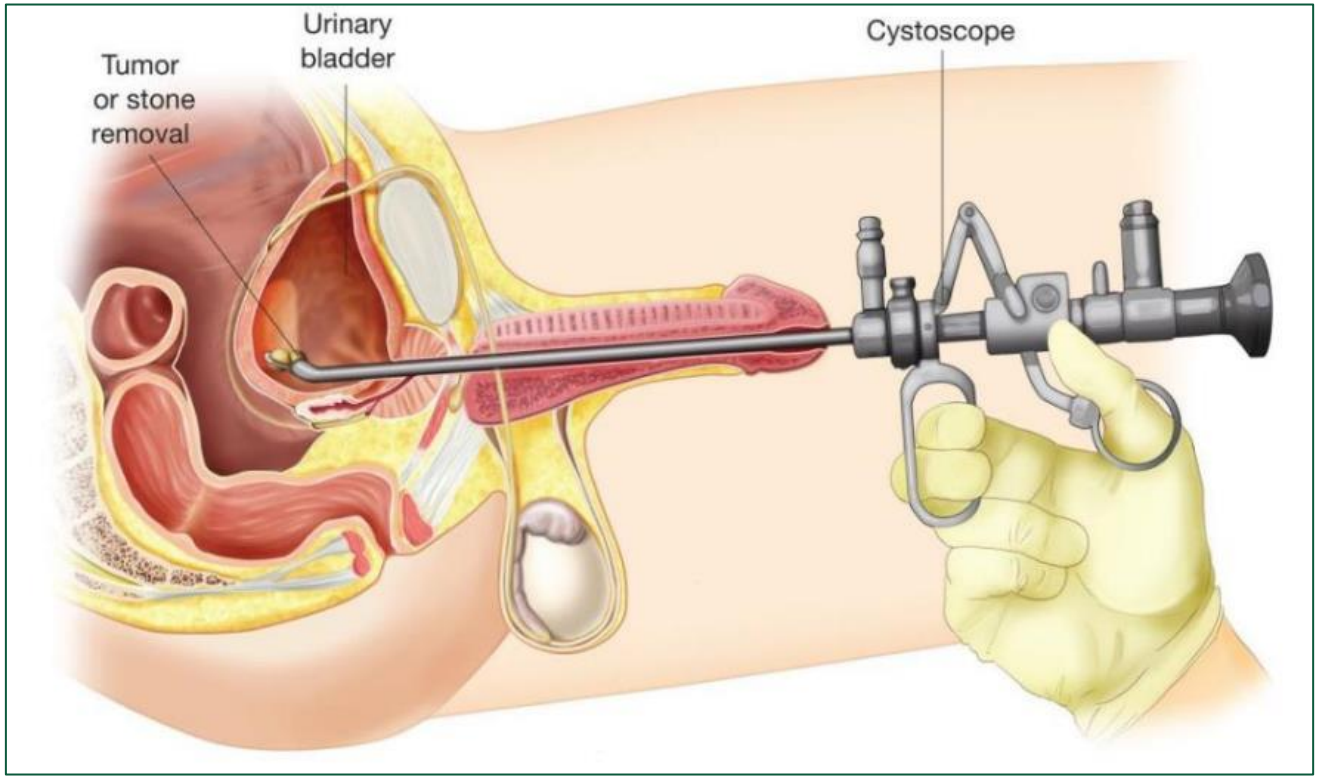
- Usual start in the day
  - **normal**

- Unusual start in the day
  - **blood in the urine ➡ cause for worry /anxiety**

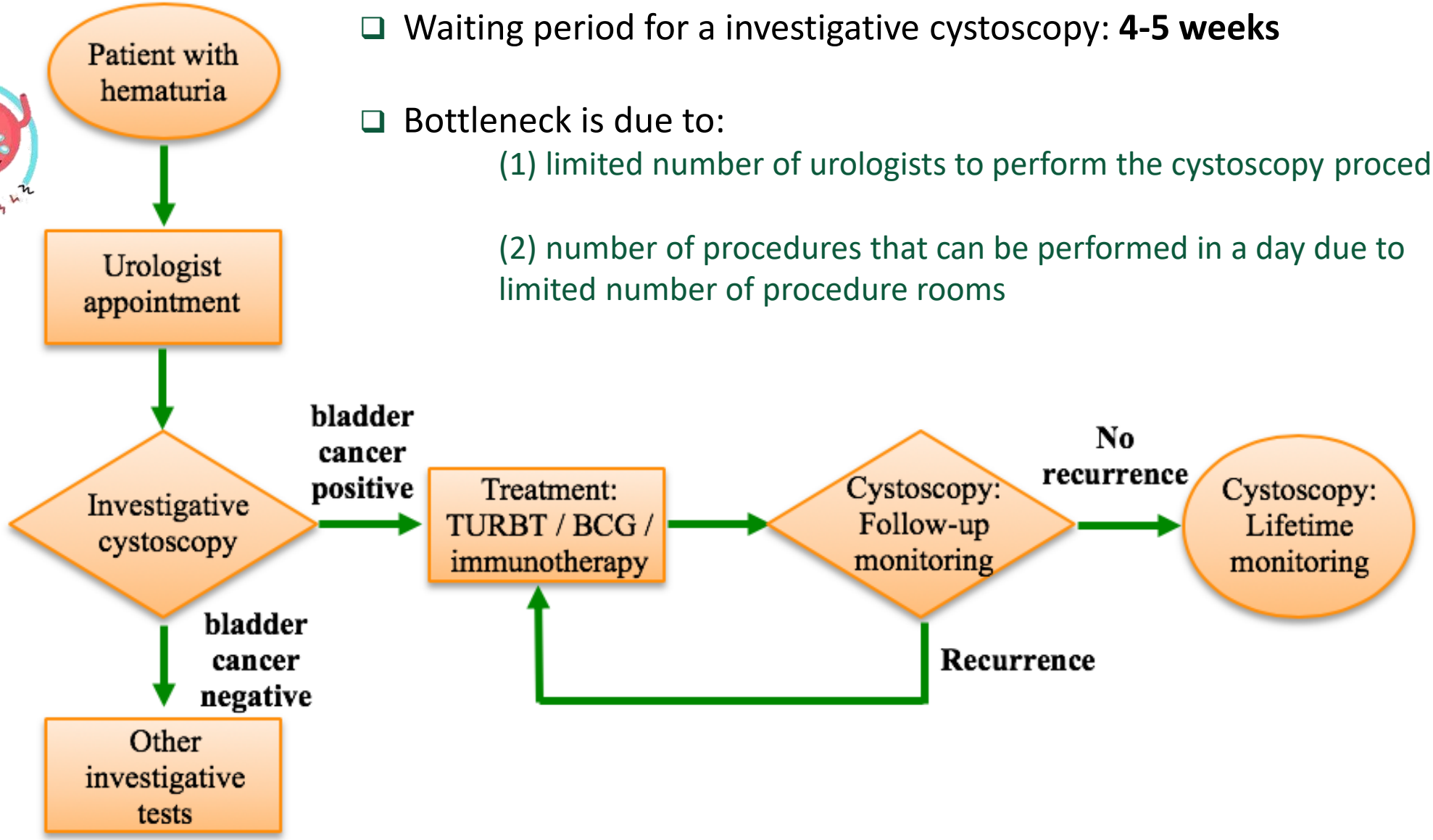
- Possible causes of hematuria:
  1. urinary tract infections (UTI)
  2. polycystic kidney disease, chronic kidney disease
  3. nephrolithiasis stones formed in kidneys, urinary bladder & ureters
  4. glomerulonephritis (acute inflammation of kidney)
  5. trauma
  6. strenuous exercise & vigorous workout
  7. kidney cancer or prostate cancer or **bladder cancer**

Diagnosis for Hematuria Causes

- Physical examination to check for injuries
- Urine tests for urinary tract infection
- Imaging tests eg. CT scan, MRI, ultrasound
- **Cystoscopy is the standard of care for hematuria** (invasive test, requires anesthesia & long waiting period)



Current Management of Bladder Cancer Cases



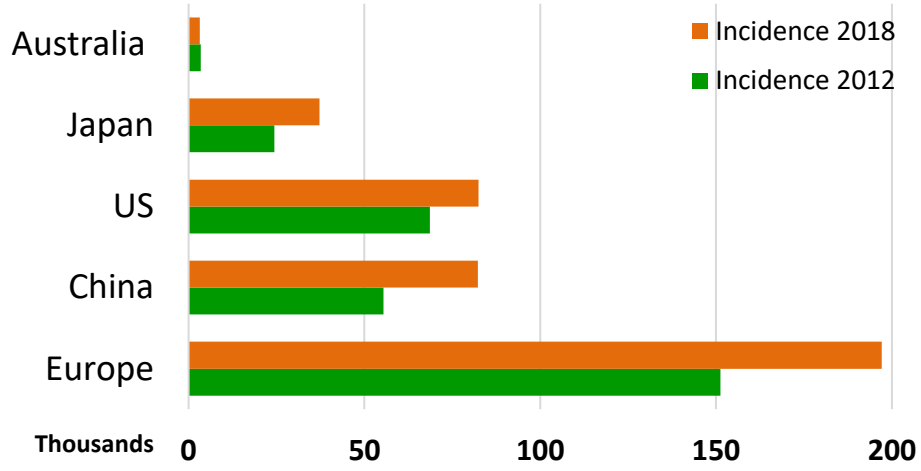
- Waiting period for a investigative cystoscopy: **4-5 weeks**
- Bottleneck is due to:
  - (1) limited number of urologists to perform the cystoscopy procedure
  - (2) number of procedures that can be performed in a day due to limited number of procedure rooms

Bladder Cancer Diagnostics: Market Potential

- Bladder cancer is the **10th** most common cancer in the world, 6th for men
- There are about **2.7million** bladder cancer patients globally
- About 549,000 new cases & 200,000 deaths per year (GLOBOCAN 2018)[1]
  - estimated 150,000 newly diagnosed in Asia and 80,500 in China (Chen et al., 2016)[2]
- Hematuria (blood in urine) is the most common sign of bladder cancer[3]:
  - 85% of bladder cancer patients have hematuria
  - macrohematuria : 10 - 20% confirmed bladder cancer
  - microhematuria: 1 - 5% confirmed bladder cancer
  - confirmed diagnosis of bladder cancer by cystoscopy
- Continuous patient surveillance after treatment – need a simple, repeat use and non-expensive solution:
  - 70% recurrence after treatment
  - 50% progression to late stages

} Ongoing monitoring needs

Global Bladder Cancer Incidence on The Rise



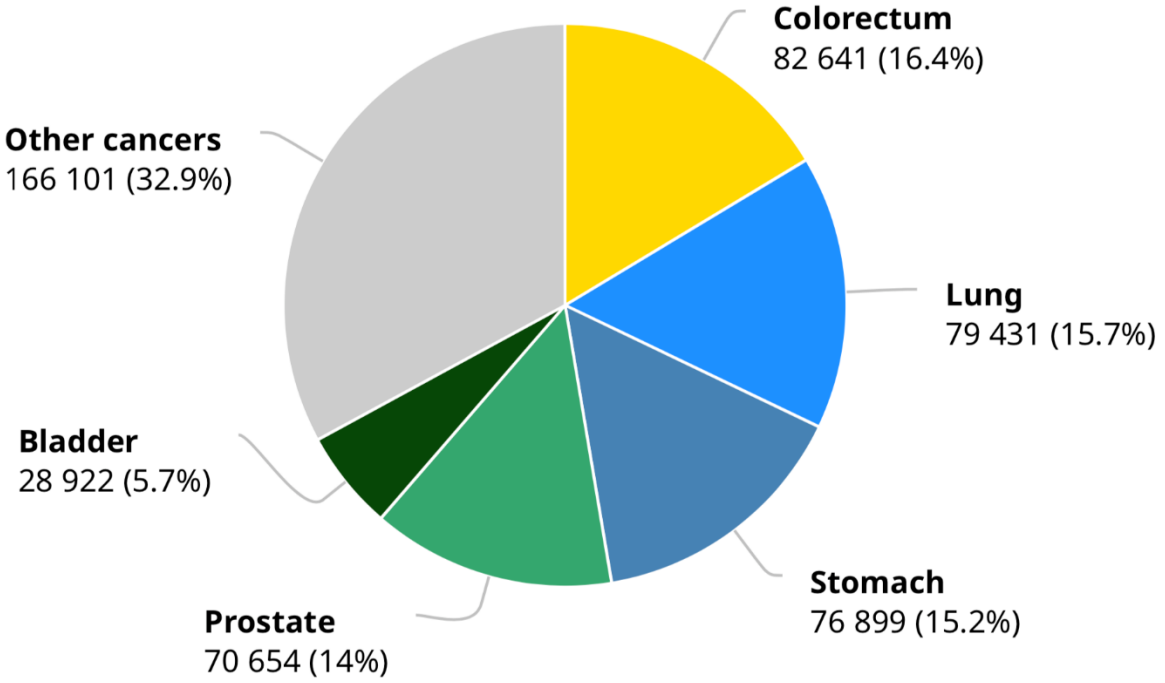
Comparison between Globocan 2012 and 2018 data on bladder cancer incidence in the world showing an increase of 27.7% new bladder cancer cases

References:

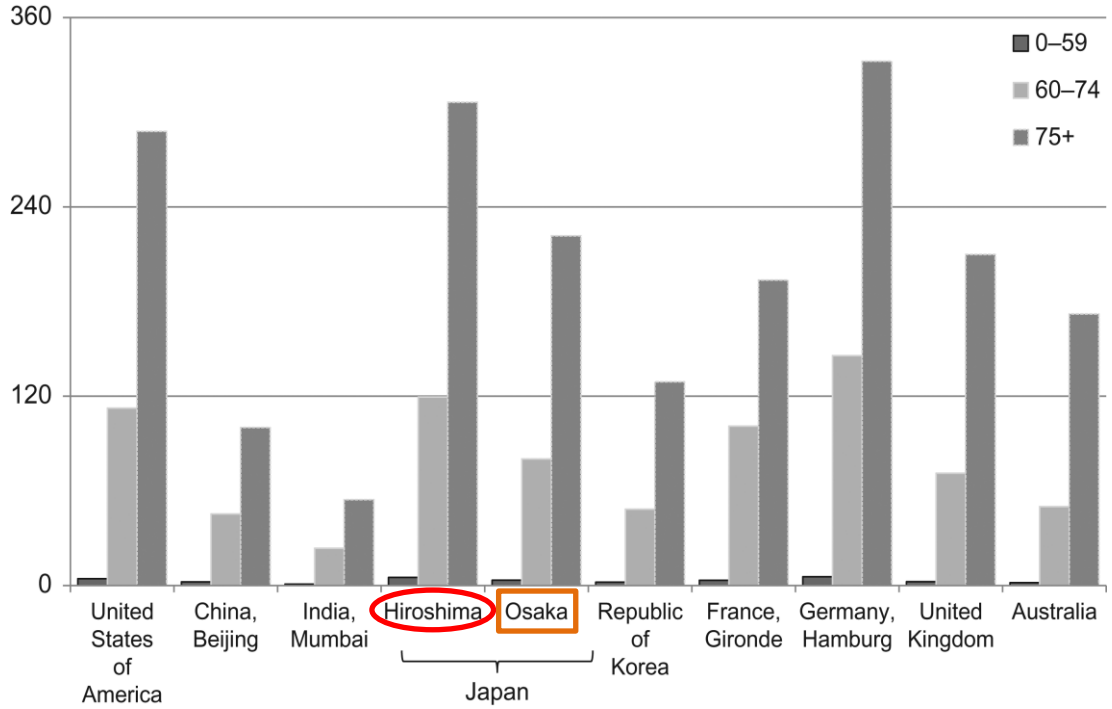
1) Globocan 2018
2) Chen *et al*., CA Cancer J Clin 2016; 66: 115-132
3) Shirodkar & Lokeshwar, Expert Rev Anticancer Ther. 2008 July; 8(7): 1111–1123
4) Diagnosis of bladder cancer with 3,500 cystoscopy in Singapore General Hospital (June 2016 - May 2017)

Bladder Cancer Incidence in Japan

- Bladder cancer is the 5th most common cancer among males (Globocan 2018)
  - age-standardized incidence rates for males in bladder cancer is high in Hiroshima & moderately high in Osaka



Number of new cancer cases in Japan in 2018; males, all ages was 504,648

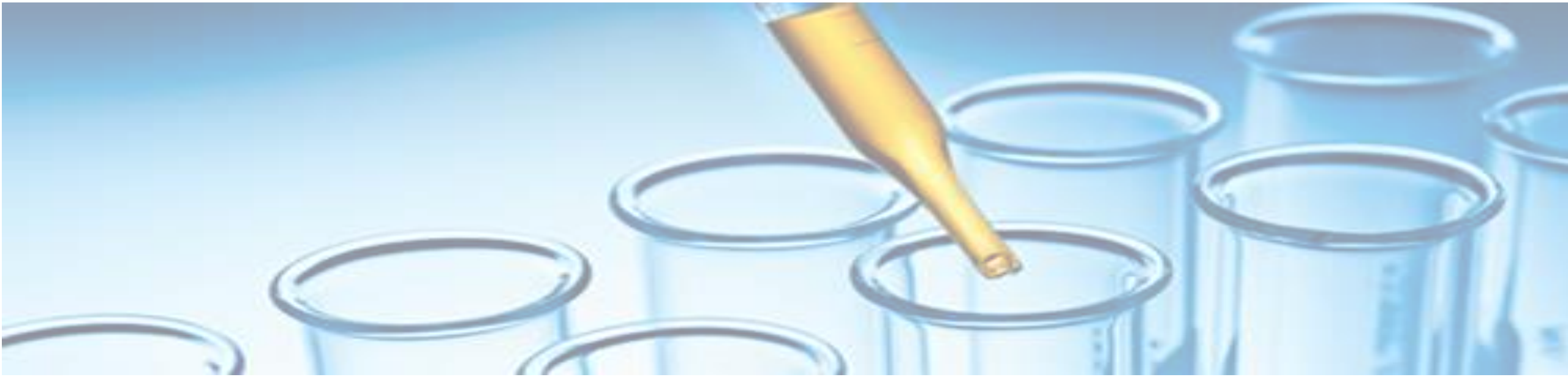


Age-standardized incidence rates for males in bladder cancer (per 100,000)

References:

1) Globocan 2018
2) Matsuda & Niino, Jpn J Clin Oncol 2018; 48: 953 - 954

BioCheetah's Solution: Urine Biopsy



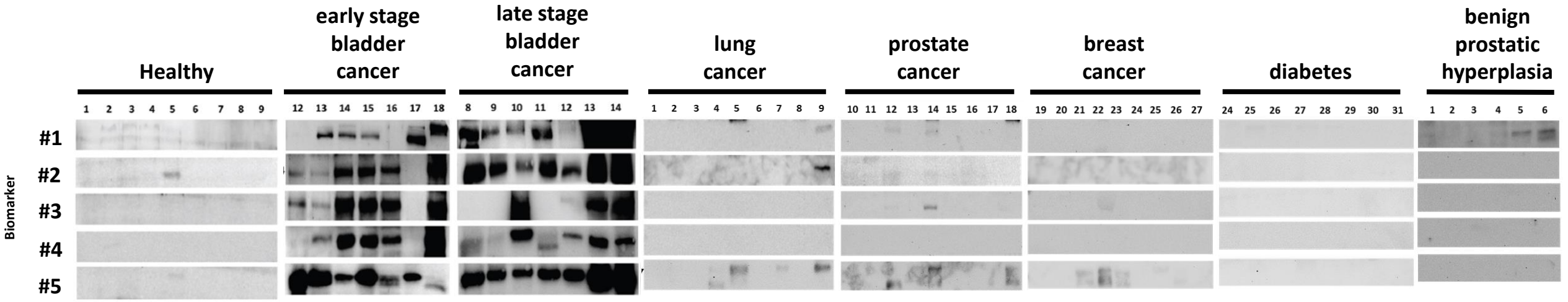
Speed - Rapid, non-invasive bladder cancer test

Precision - Offers accurate detection of bladder cancer

Health - Allows higher effective patient triage

Targeted For - Hematuria & High-risk Individuals

How It Works: 5 Urinary Biomarkers Present Exclusively in Bladder Cancer



*n = 451 patients with different stages of bladder cancer, other cancer types and other non-cancer chronic diseases

- High diagnostic performance based on Area under Receiver Operating Characteristic curve (AUROC): **0.981**
- High accuracy: **92.1%**
- Extremely high sensitivity: **99.0%**
- High Negative Predictive Value: **96.3%**

Competitors Landscape showing BioCheetah's Superior Diagnostic Performance among Competing Products: Preclinical data

Diagnostic Performance	BioCheetah	Company A	Company B	Company C	Company D	Urine cytology
Sens / spec% (all stages) ❑ **Ta/T1 low risk** ❑ **T2/T3 high risk**	• **99.0% / 83.9%** • **98.7% / 83.9%** • **100.0%/ 83.9%**	• 81.8% / 85.1% • not available • not available	• 58% / 88% • not available • not available	• 64% / 75% • not available • not available	• 63% / 87% • not available • not available	• 37% / 95% • not available • not available
Predictive value (all) ❑ **Negative** ❑ **Positive**	• **96.3%** • **95.2%**	• 97.0% • not available	not available	not available	• 94.1% • not available	not available
Turn around time ❑ **POC** ❑ **LDT / IVD**	• **10 minutes** • **2 days**	• not available • 5 days	• 30 minutes • not available	• 5 minutes • not available	• not available • 4-12 days	• not available • 3 days
Clinical use	**Diagnosis & Monitor**	Diagnosis & Monitor	Diagnostic only	Diagnostic only	Diagnostic only	Diagnosis & Monitor
Cost per test (US$)	**To be determined**	$$$	$	$	$$$	$$

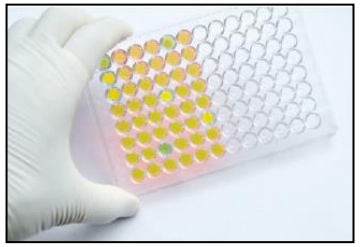
Products: Non-invasive Bladder Cancer detection in Hematuria & Bladder Cancer Patients

Phase 1: ELISA Kit (LDT/RUO & IVD)

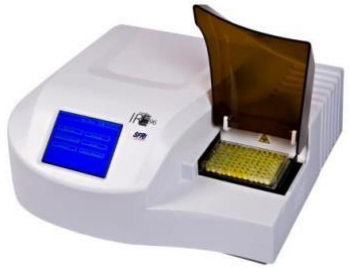
urine

ELISA kit

PRODUCT



ELISA test



ELISA plate reader

Performance Indication	Current results
Accuracy	92.1%
Sensitivity	99.0%
Specificity	83.9%

Singapore Target Customers:

Tan Tock Seng Hospital

Singapore General Hospital (SingHealth)

NUH National University Hospital

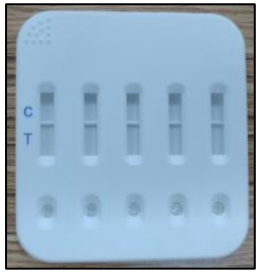
Khoo Teck Puat Hospital (Alexandra Health)

Changi General Hospital

Jurong Health Ng Teng Fong General Hospital

Phase 2: Rapid Point-of-Care Test (POCT)

urine



POCT

POCT Reader

PRODUCT

Performance Indication	POCT (under-development)
Accuracy	Target above 90%
Sensitivity	At least 3 out of 5 test bands
Specificity	At least 3 out of 5 test bands

Singapore Target Customers:

National Healthcare Group Polyclinics

Polyclinics (SingHealth)

HEALTHWAY MEDICAL

Northeast Medical Group

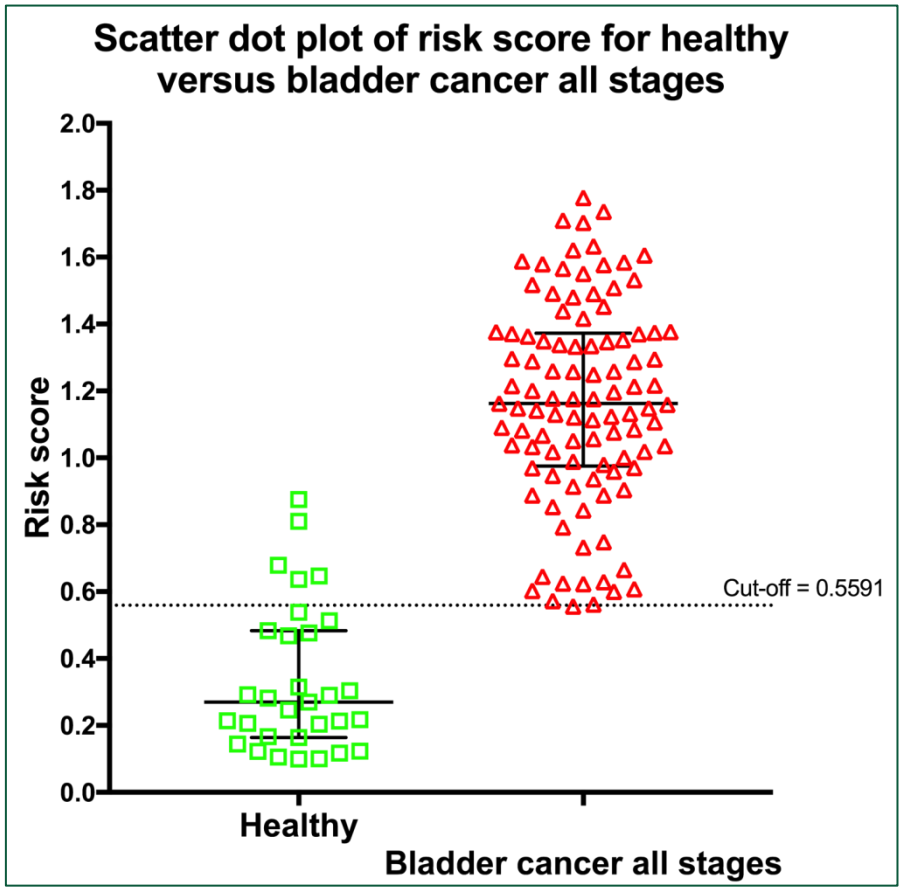
RafflesMedical

National University Polyclinics

GPs

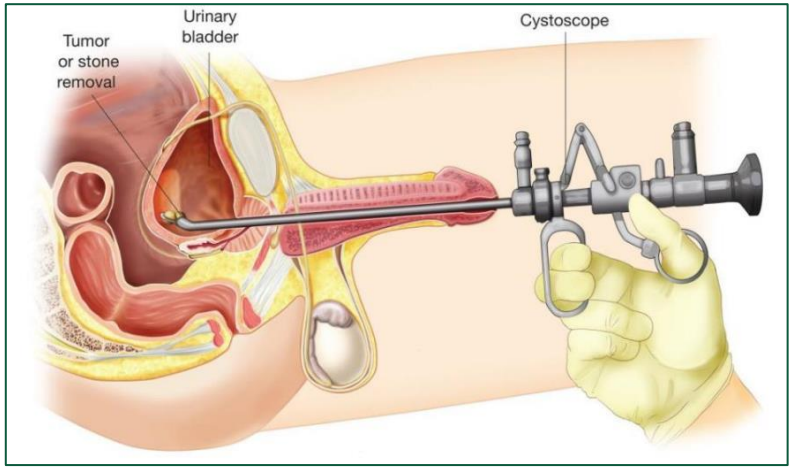
Bladder Cancer All Stages versus Healthy

- Discriminating bladder cancer patients from non-bladder cancer patients:



Scatter dot plot of risk score obtained from Ensemble K-fold cross validation model comparing healthy (n = 31) and bladder cancer all stages patients (n = 101). Colored bars indicate median and interquartile range.

Risk Score on & above cut-off

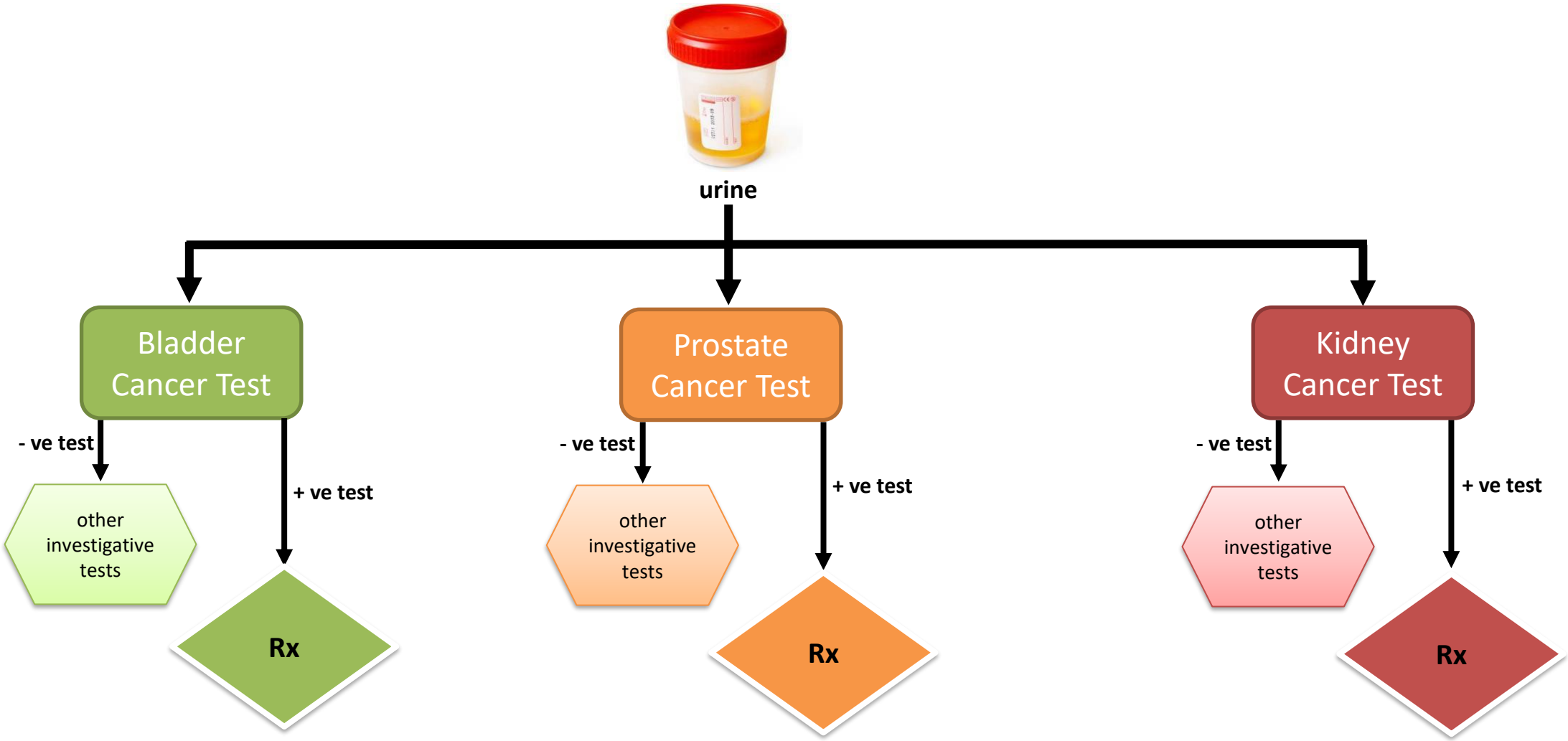


Risk Score below cut-off

- Other tests to check for cause of hematuria or urological issues eg. CT scan, MRI, ultrasound, urine culture

BioCheetah's Vision for the Future

- To be a leader in urinalysis for urological cancers:



THANK YOU

www.biocheetah.com

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