



ST VINCENT'S  
HOSPITAL  
MELBOURNE

# A Histology Scientist in a Molecular World


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# Overview

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- Introduction of personalised medicine
  - What is Next Generation Sequencing(NGS)
  - Next Generation Sequencing in Anatomical Pathology Department, St. Vincent's Hospital, Melbourne (STVM)
  - A Histology Scientists Perspective
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# Personalised Medicine

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Customised strategies for prevention, detection and therapy based on individual characteristics of each patient.

# Why is Personalised Medicine Important?

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**One size does not fit ALL !!**

# Personalised Medicine

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Enables clinicians to prescribe:

# Personalised Medicine

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Enables clinicians to prescribe:

The **RIGHT** drug



# Personalised Medicine

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Enables clinicians to prescribe:

The **RIGHT** drug  
At the **RIGHT** dose

# Personalised Medicine

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Enables clinicians to prescribe:

The **RIGHT** drug

At the **RIGHT** dose

For the **RIGHT** disease





# Personalised Medicine

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Enables clinicians to prescribe:

The **RIGHT** drug

At the **RIGHT** dose

For the **RIGHT** disease

To the **RIGHT** patient



# Role of Molecular Pathology in Personalised Medicine

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- Personalised medicine and targeted therapies can only proceed if there is “personalised diagnostics”
- Molecular profiling has strongly contributed to the advancement of personalised medicine for cancer patients.
  - Patient management, more accurate prognosis and treatment options (eg. Targeted therapies)

# Why are targeted therapies better than standard chemotherapy?

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- Longer progression-free survival
- Higher response rates
- Significant reduction in symptoms and side effects
- Improvement in global quality of life

# What is Next Generation Sequencing? (NGS)

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## **Definition:**

A high-throughput technique used to determine portion of the nucleotide sequence in an individual's genome.

It is capable of massively sequencing DNA and RNA fragments in parallel.

# Next Generation Sequencing


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- Derived from “original” sequencing technique - Sanger sequencing.
- First next generation sequencers launched in year 2005.

# Next Generation Sequencing

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Advanced technologies provide:

- Massive parallel sequencing hence cost reduced
  - Much higher throughput
  - Shorter time required
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# Reasons why NGS at STVM

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- A major tertiary cancer referral centre in Victoria
- Increasing demand for molecular testing
- Test outsourced to other laboratories

# Benefits of performing tests in house

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- An improved turn around time
    - 8.3 working days for NGS and 5 working days for FISH
  - Better quality control
  - Ability to bring on new tests/panels
    - As requested by our clinicians
  - Opportunities to upskill scientists and registrars
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# NGS testing at STVM

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The Ion Torrent Personal Genome Machine(PGM) suits our clinical setting the best

- Low starting DNA required (10ng)
  - Small biopsies and cytology prepared slides
- Scalability

# Timeline of Molecular Development in Anatomical Pathology, STVM

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FISH NATA Accreditation achieved (Oct 2014)



NGS NATA Accreditation achieved (Feb 2015)



RNA Fusion Lung Cancer Panel  
Validated (June 2016)



RNA Fusion Lung Cancer Panel  
NATA Accredited (Oct 2017)




Multiple panels in development (Current)

# Molecular testing services in Anatomical Pathology, STVM

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## Next Generation Sequencing panels:

- 50 gene cancer panel
  - 22 gene colon and lung cancer panel
  - Thyroid panel (DNA + RNA)
  - Melanoma panel
  - RNA fusion lung cancer panel
  - Glioma panel
  - GIST panel
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# Molecular testing services in Anatomical Pathology, STVM

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## FISH

- 1p19q for oligodendroglioma
- ALK
- HER2 (Breast and gastric cancer)
- ROS1
- RET
- MET

# Overview of NGS Workflow



DNA/ RNA  
Extraction



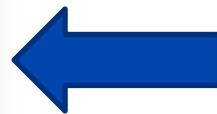
Library  
Preparation



Template preparation with  
Ion Chef™ System



Ion PGM Sequencing




Data Analysis with Ion  
Reporter Software

# A Histology Scientist's Perspective

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## Challenges:

- Steep learning curve
  - Dealing with FFPE tissues and small biopsies
  - Handling expensive reagents
  - Juggling between histology and molecular work
  - Working with RNA
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# A Histology Scientist's Perspective

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## Rewards:

- Working with a close knit molecular team led by a compassionate molecular pathologist
- Supportive colleagues in histology department
- Rewarding outcome