



# Mass Spectrometry Front-End Automation

Monash Health Pathology

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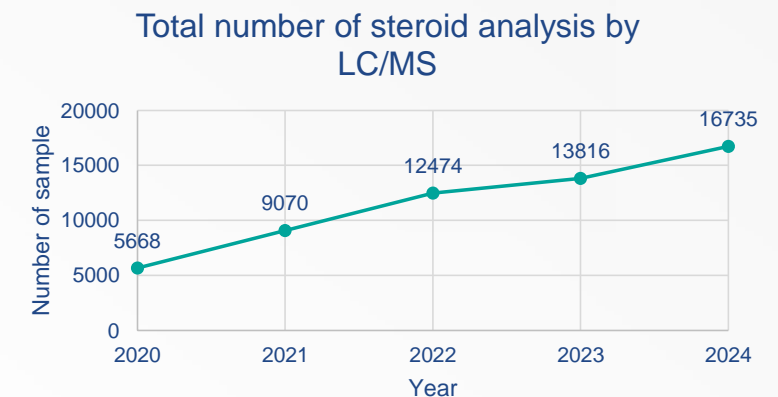
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# Aim of this Innovation

- Monash Health Pathology is the only reference centre in Victoria
  - for liquid chromatography mass spectrometry (LC/MSMS) serum steroid analysis.
  - LC/MSMS analysis is recognised internationally as preferred method
- The aim of this project
  - Full front-end automation to improve efficiency and reduce the risk of RSI
  - To meet the demand – External referrals increased by 3 fold since 2020
    - External private/public pathologies
    - Research groups



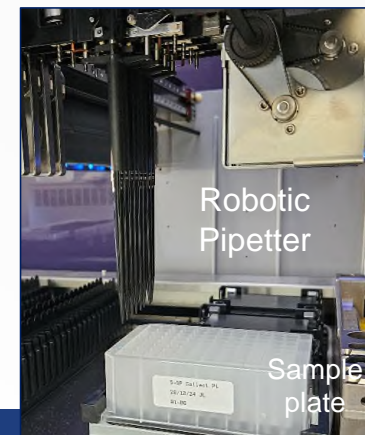
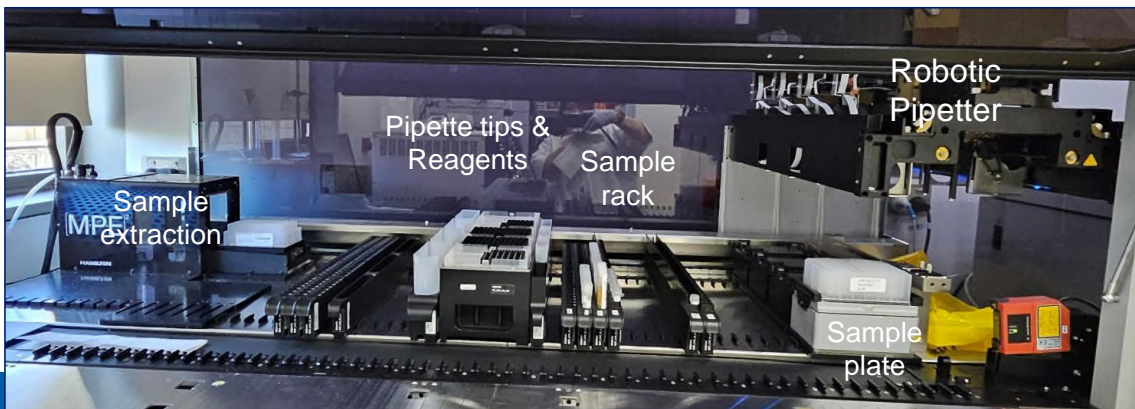
# Manual front-end process

- Sample extraction step - Liquid-liquid extraction (LLE)
  - Uses hazardous chemicals (processed in a fume cabinet)
    - Ethyl acetate, hexane and MTBE
  - Each steroid assay is processed as a batch on a weekly basis
    - Turnaround time is around 8 days
  - Labour intensive, time consuming
    - Risk of RSI from repetitive pipetting
    - Each batch takes around 6 hours



# Key Changes Implemented

- Hamilton Microlab STAR liquid handler
  - [MPE]<sup>2</sup> Automated solid-phase extraction (SPE)
  - Replaces liquid-liquid extraction with solid-phase extraction (SPE)
- 2x Shimadzu LCMS-8060NX
  - Latest model available – sensitivity down to parts per trillion (pg/mL)
- Combined 5 frequently requested steroid in one assay
  - Androstenedione, testosterone, 17-hydroxyprogesterone, dihydrotestosterone, estradiol

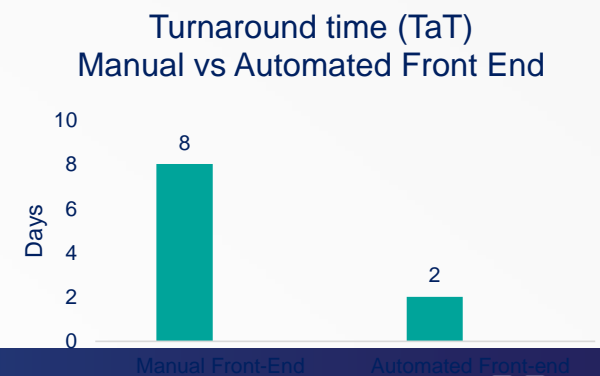
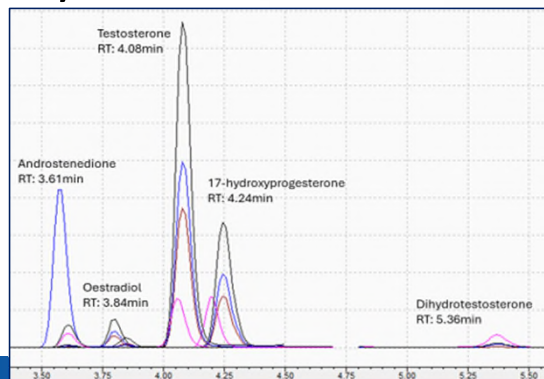


15/11/2024



# Outcomes so Far

- Automated Front-end
  - Eliminates the use of hazardous chemicals
    - Reduces the risk of RSI and chemical exposure
  - Extraction process reduced from 6 hours to 2 hours
- First in Australia to use WAX SPE for serum steroid analysis
- Combined 5 frequently requested steroid in one assay
  - Androstenedione, 17-hydroxyprogesterone, dihydrotestosterone, oestradiol, testosterone
- Daily batch analysis reduces turnaround time from around 8 days to 2 days



# Mass Spectrometry Front End Automation Monash Health Pathology

## Problem:

- Hazardous, labour intensive and time-consuming manual front-end
- Weekly batch analysis, 8 days turnaround time

## Solution:

- Introduction of Hamilton STAR robotic liquid-handling with automated-SPE
- Combined 5 frequently request steroid in one assay

## Results:

- Automated Front- End
  - Eliminates the use of hazardous chemicals
  - Reduces the risk of RSI and chemical exposure
  - Reduces extraction process from 6 hours to 2 hours
- Combined steroid panel allowing daily analysis
- Turnaround time reduced from around 8 days to 2 days

