Imperial College London

camo centre for antimicrobial optimisation

Harnessing data to transform the power of molecular diagnostics and epidemiological modelling

Jesus Rodriguez Manzano, PhD

Lecturer in Antimicrobial Resistance and Infectious Disease at Imperial College London

Deputy Director of the Centre for Antimicrobial Optimisation (CAMO)

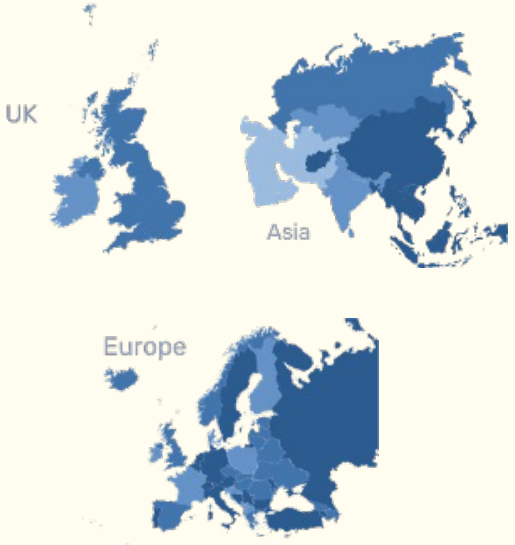
Analysis and prediction of carbapenem resistance

Imperial College London

The Alan Turing Institute

Outbreak Surveillance

Spatial-temporal inferences



Ashleigh Myall

Computational Researcher

Predicting Outbreaks

$$f\left(\text{🏥}\right) = \text{🦠}$$

Acquisition/Res Prediction

$$f\left(\text{🧍}\right) = \text{🧍}$$

Research topics:

Graph-based machine learning, Spatial-temporal data, Decision support systems & antimicrobial-resistance.

Funders:

Medical Research Foundation

NIHR | National Institute for Health Research

UKRI Engineering and Physical Sciences Research Council

Imperial College London

World Health Organization

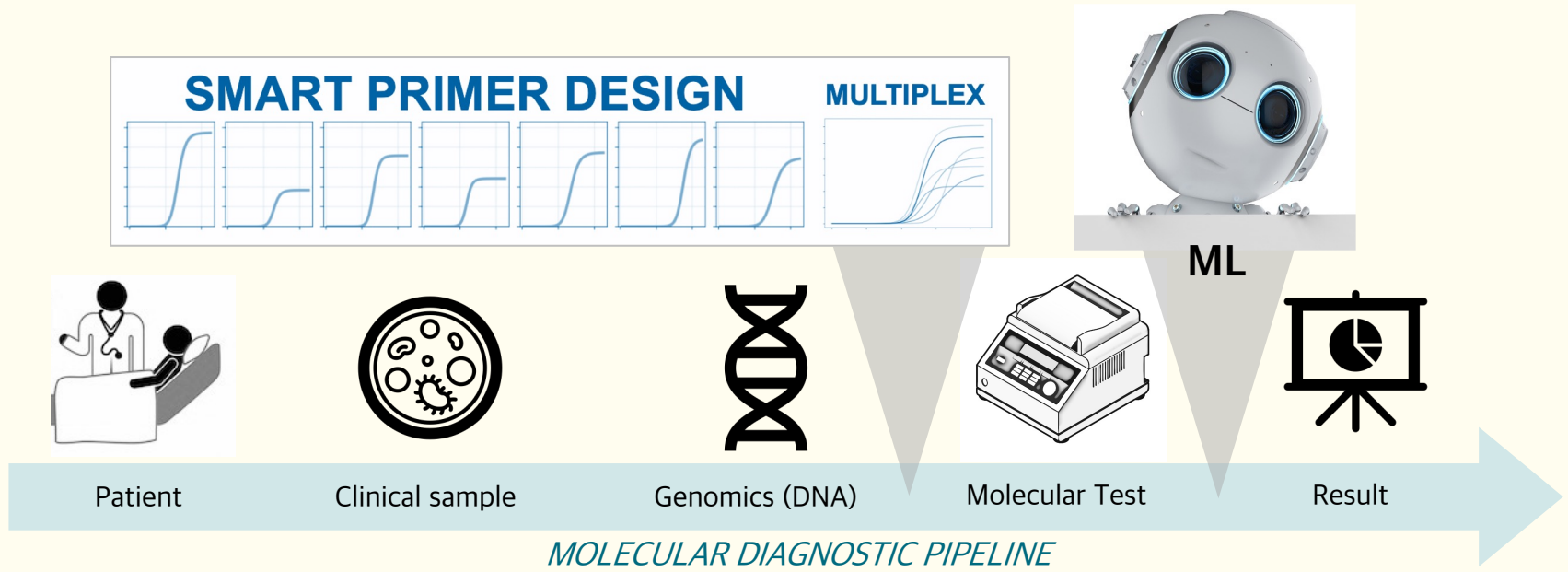
The Alan Turing Institute

BRITISH COUNCIL

UKRI Innovate UK

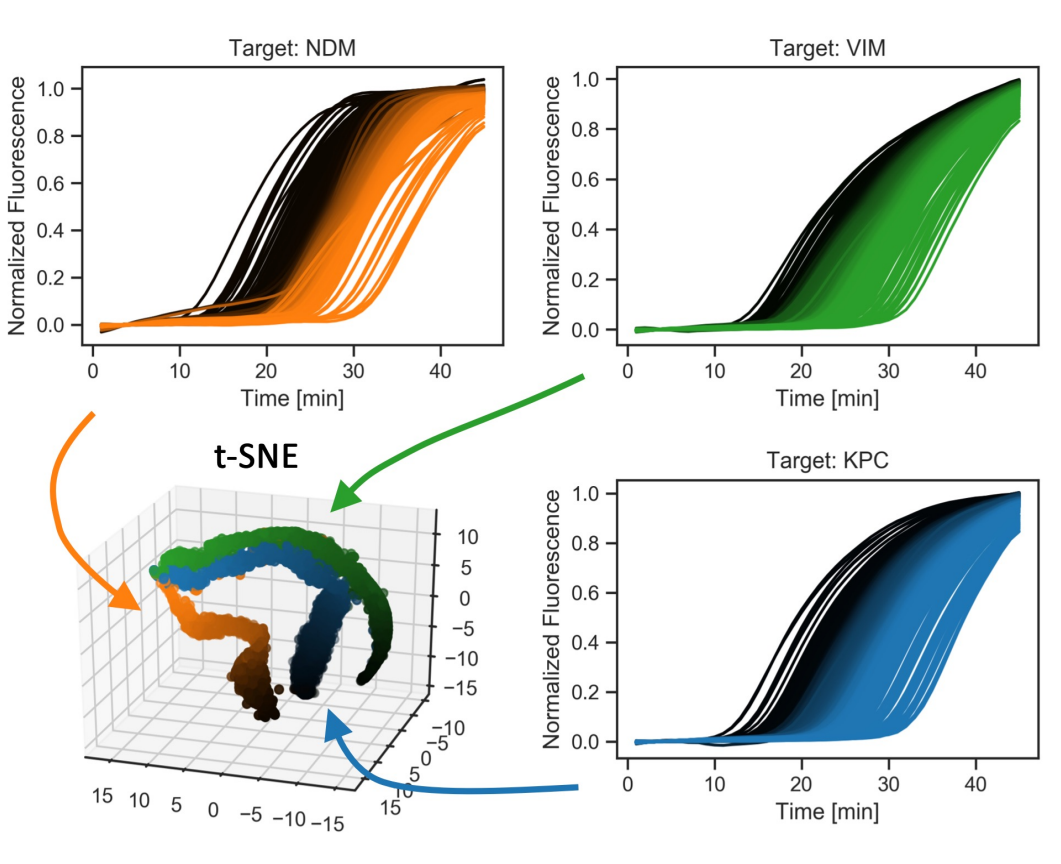
Data-driven multiplexing: concept

Maintain traditional qPCR workflow and instrumentation while streamlining data analysis and management

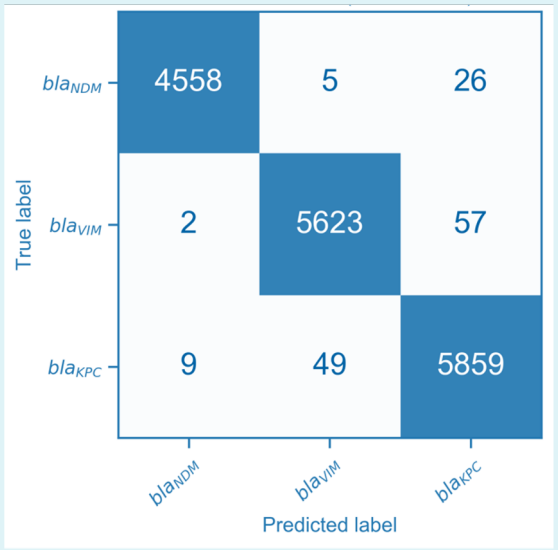


Patent reference numbers GB2108339.9 (2021), WO2022038279A1 (2020) and WO2019234247A1 (2018)

Data-driven multiplexing: how does it works?



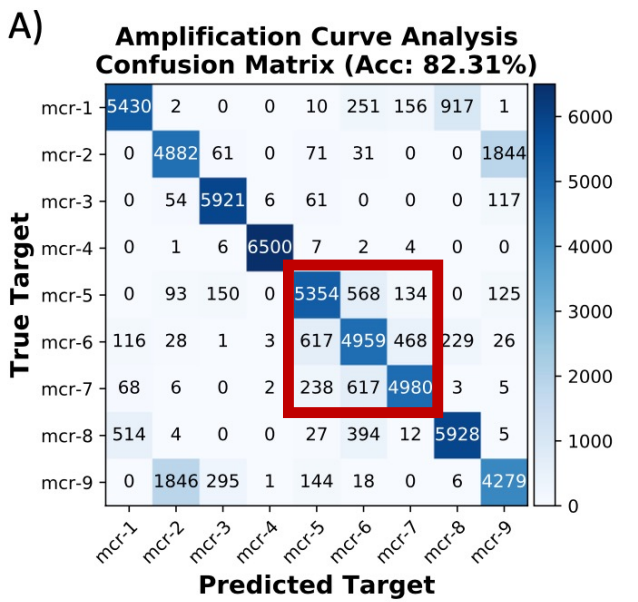
Accuracy: **99.1%**
(20% increase)

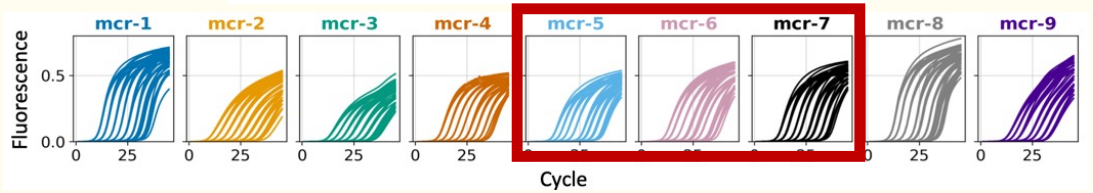


Amplification and melting curve analysis

AMPLIFICATION CURVE ANALYSIS (ACA)

Kinetics information



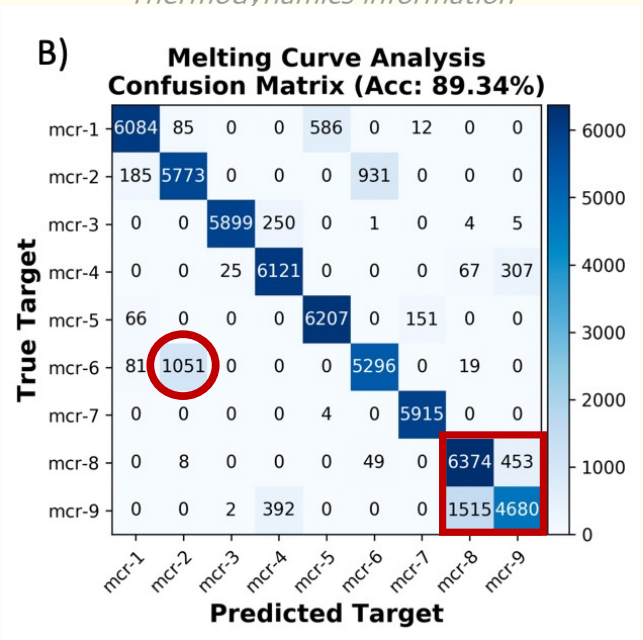


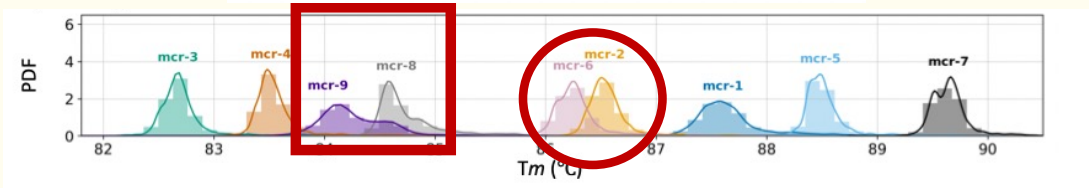
Accuracy

ACA	MCA
82.31%	89.34%

MELTING CURVE ANALYSIS (MCA)

Thermodynamics information

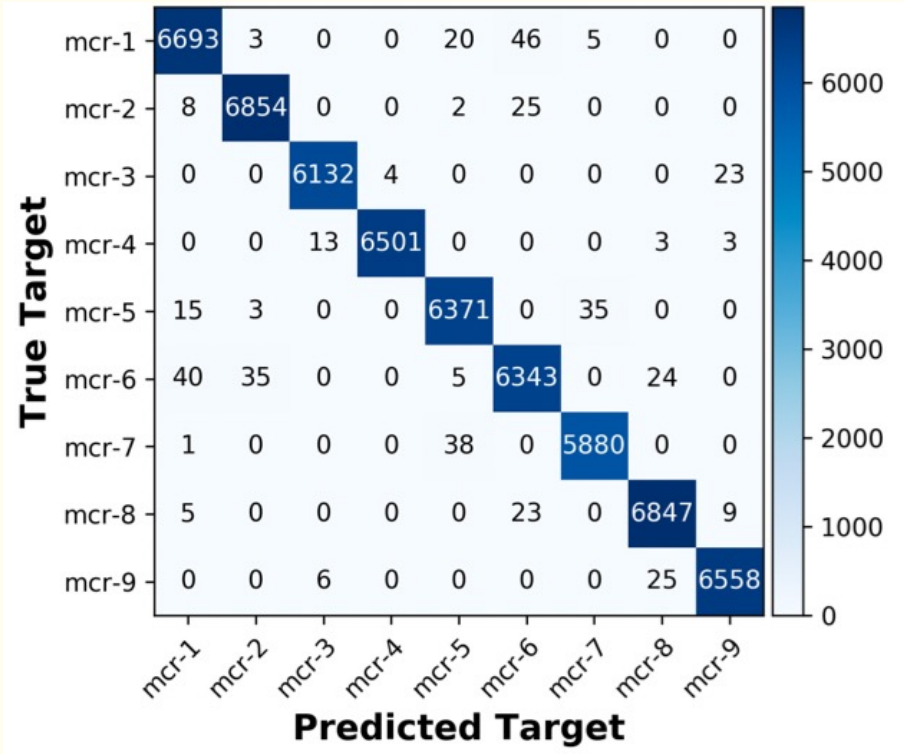




Amplification and melting curve analysis

Classification accuracy:

99.28%



Imperial College Healthcare NHS Trust

Data-driven multiplexing: CPE as case study

Target	N	TP	TN[a]	FP	FN	SEN	SPE	Accuracy (CI)
bla$_{IMP}$	45	45	32	0	0	100.0%	100.0%	100.0% (95.32 to 100.00%)
bla$_{KPC}$	9	9	32	0	0	100.0%	100.0%	100.0% (91.40 to 100.00%)
bla$_{NDM}$	74	73	32	1[b]	0	100.0%	96.97%	99.06% (94.86% to 99.98%)
bla$_{OXA-48}$	84	84	32	0	0	100.0%	100.0%	100.0% (96.87 to 100.00%)
bla$_{VIM}$	8	8	32	0	0	100.0%	100.0%	100.0% (91.19 to 100.00%)
bla$_{OXA-48}$ & *bla*$_{NDM}$	1	1	32	0	0	100.0%	100.0%	100.0% (97.24 to 100.00)
Total	**221**	**220**	**32**	**1**	**0**	**100.0%**	**96.97%**	**99.60% (97.82 to 99.99%)**

Abbreviations - N: number of samples; TP: True Positive TN: True Negative; FP: False Positive, FN: False Negative, SEN: Sensitivity, SPE: Specificity, CI: Confidence Interval.

[a]A total 32 negatives samples are considered across all the groups for sensitivity, specificity and accuracy calculation

7-plex for respiratory pathogens using TaqMan probes & LAMP (*Sensors & Diagnostics.* 2022)
5-plex for CPE using Sybr green (*Anal Chem.* 2019 & *Front Mol Biosci.* 2021)
9-plex for mobilized colistin resistance genes using Sybr green (*Anal Chem.* 2020)

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JRM group

NIHR | National Institute for Health Research

wellcome

UKRI UK Research and Innovation

Rosetrees Trust
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Community Jameel

3M

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