

Development of an ISO17025 accredited, quantitative species- identification assay for mixed meat products – a work in progress

Matt Ashworth

Specialist Science Solutions

Manaaki Tangata Taiao Hoki
protecting people and their environment through science

ESR - a Crown Research Institute



- **Established July 1992**
- **New Zealand Government owned**
- **Two Shareholding Ministers**
 - Minister of Finance - Hon Bill English
 - Minister of Science + Innovation - Hon Wayne Mapp
- **One of eight Crown Research Institutes**
- **Covered by CRI Act (1992)**

Science Centre locations

Mt Albert Science Centre



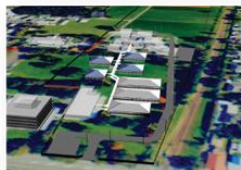
- Forensic Science

Kenepuru Science Centre



- Communicable Disease Labs
- Forensic Science
- Population & Environmental Health
- Pharmaceutical Testing Services

National Centre for Biosecurity and Infectious Disease-Wallaceville

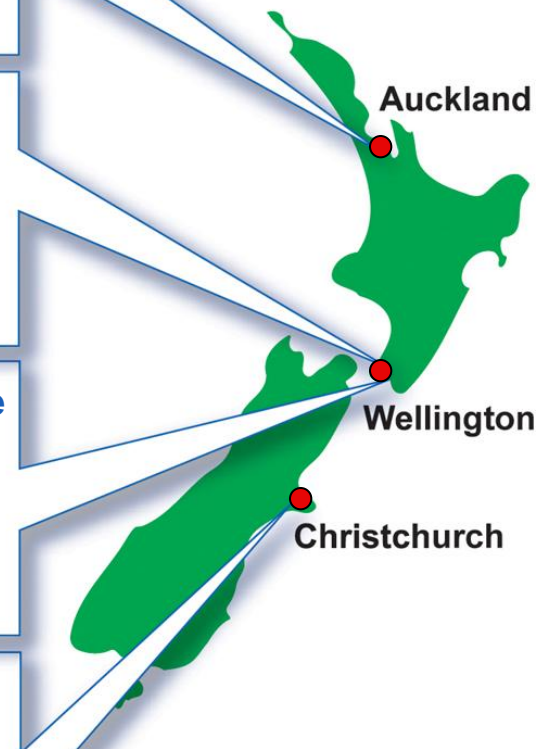


- Zoonoses research
- CBRE Science
- Aberrant event surveillance
- LRN coordination

Christchurch Science Centre



- Food Safety Group
- Analytical Chemistry Lab
- Water Management Group
- Public Health Lab
- Forensic Science



Scientific business focus

- **Key Clients (are government clients)**
 - **New Zealand Police (Police)**
 - **Ministry of Health (MoH)**
 - **Ministry of Agriculture and Forestry (MAF)**
 - **Ministry of Innovation + Science (MSI)**
- **Other clients include**
 - **MFE**
 - **MFAT**
 - **Corrections**

Major programme areas

- **Forensic science**
- **Human Biosecurity**
- **Communicable disease**
- **Population & environmental health**
- **Food safety**
- **Water quality & management**
- **Pharmaceuticals**
- **Workplace Drug Testing**



Core scientific strengths

- **Chemistry**
- **Epidemiology**
- **Genomics**
- **Microbiology**
- **Molecular biology**
- **Scientific advice and consultancy**
- **Surveillance and Information Management**
- **Toxicology**
- **Virology**



ESR in the NZ Science Sector

- **“ESR’s purpose is to deliver enhanced scientific and research services to the public health, food safety, security and justice systems and the environmental sector to improve the safety and contribute to the economic, environmental and social wellbeing of people and communities in New Zealand.”**

CAPABILITIES IN ESR'S FOOD SAFETY PROGRAMME (Christchurch, Wellington)

- Risk Analysis
- Food & Public Health Microbiology
- Molecular Biology
- Food Chemistry
- Food Virology

- *Accreditation; Consultation; Innovation*

- *Government; Industry; Academia*

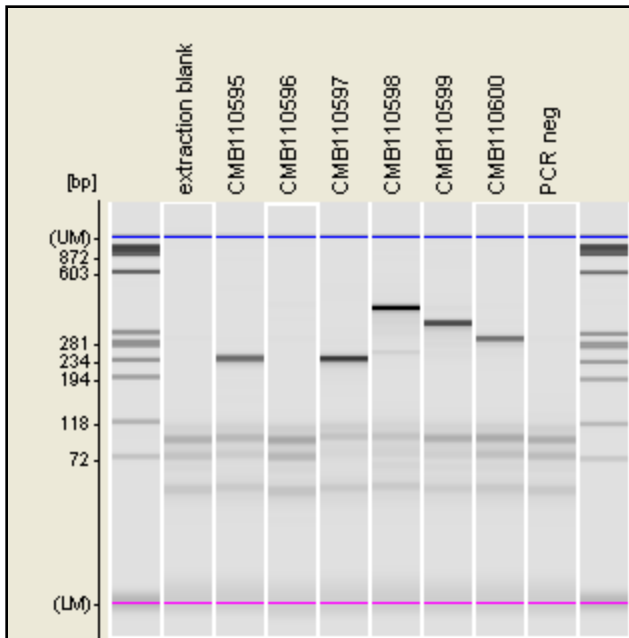
Meat Species ID

- **Techniques**
- **Instrumentation**
- **QA approach**
 - Reference materials
 - Stepwise QA stop/go points
- **Validation**

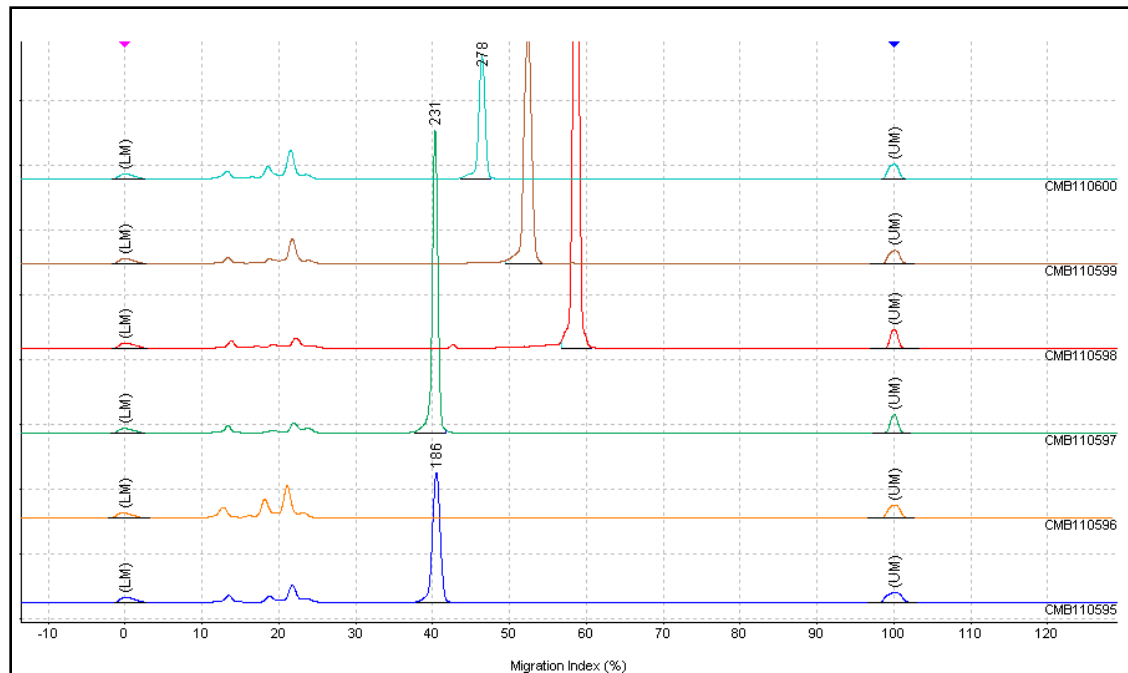


Current Techniques at ESR

- **ELISA antibody immunoassay technique**
- **Qualitative PCR based analysis using common primer and MultiNA microchip electrophoresis system**
- **Pig**
- **Cow**
- **Sheep**
- **Venison**
- **Chicken**



Lanes left to right:
 1000 kit ladder
 extraction blank 1/6/11
 CMB110595 - Duck
 CMB110596 - Venison
 CMB110597 - Chicken
 CMB110598 - Pork
 CMB110599 - Lamb
 CMB110600 - Beef
 PCR neg
 1000 kit ladder



Detection limits with PCR/MultiNA

	Sample	Beef	Supplemented species
	5% sheep in beef	detected	detected
	1% sheep in beef	detected	detected
	0.5% sheep in beef	detected	very faint
	5% pork in beef	detected	detected
	1% pork in beef	detected	detected
	0.5% pork in beef	detected	faint
	5% chicken in beef	detected	detected
	1% chicken in beef	detected	detected
	0.5% chicken in beef	detected	detected
	0.1% chicken in beef	detected	very faint
	controls	all OK	

Future techniques - aims

- **Quantitative**
- **ISO17025 accredited**
- **High throughput**
- **Competitive price**
- **PCR/MultiNA based, or**
- **Proteomic Mass spectrometry technique**

QA and Quantitation challenge

- **Calibration**
 - DNA from single species sources
 - Normalise
 - Mixed species standard
- **What reference materials are there?**
- **Reproducibility**
 - Sample homogeneity
 - Differential DNA extraction efficiency
 - PCR traceability
 - Matrix dependent inhibition

Validation

- **Matrix by matrix basis**
 - Bonemeal
 - Sausage meat
 - Milk powder
- Precision
- Repeatability
- Reproducibility
- Bias
- Ruggedness
- Detection limit
- Linearity
- Range
- Selectivity
- Measurement uncertainty

Developing uncertainty budget and analysis decision points

- **Use chemistry approach**
- **Stop/Go Points**
 - DNA separation
 - PCR amplification
 - Replicate sample consistency
 - Standard performance and band intensity

Additional work

- **Collaborate with ESR forensic science team**
- **Assess capability of PCR based technique**
- **Consider use of Mass spectrometry**

THANK YOU