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https://github.com/markziemann

Breadth of expertise in bioinformatics analyses & specific strengths

Capabilities:

- Unix shell
- R
- Big data
- HPC/Cloud
- Containers
- “Soft” skills

1. Collaborative analyses

NGS analysis[1]

Epigenomics & Transcriptomics[2]

Integrative multi-omics[3]

Pathway analysis[4]

Phylogenetics & molecular evolution[5]

Diabetes[6]

Epilepsy[7]

Perioperative care[8]

Cardiovascular disease[9]

Plant/microbial genomics[10]

2. Bioinformatics infrastructure

Mass RNA-seq reprocessing[11]

Bioconductor multi-contrast enrichment package[12]

Galaxy tool factory[13]

3. Research methodology and rigour

Enrichment analysis[14]

Software/pipeline evaluations[15]

Spreadsheets[16]

Bibliography

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14. Wijesooriya K, Jadaan SA, Perera KL, et al. Urgent need for consistent standards in functional enrichment analysis. *PLoS Comput Biol* 2022; 18: e1009935.
15. Ziemann M, Kaspi A, El-Osta A. Evaluation of microRNA alignment techniques. *RNA* 2016; 22: 1120–1138.
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Specific strengths

- Depth of knowledge in omics
- Ability to pick up new things
- Teaching & training
- Patience & persistence

Translational Research
Volume 247, September 2022, Pages 79-98

Methylomic and transcriptomic characterization of postoperative systemic inflammatory dysregulation

Chris R. Bain [1 2 3], Paul S. Myles [2 3], Rachael Taylor [1], Hugh Trahair [1], Yin Peng Lee [4], Larry Croft [4], Philip J Peyton [5], Thomas Painter [6], Matthew T.V. Chan [7], Sophie Wallace [2 3], Tomás Corcoran [8 9], Andrew D. Shaw [10 11], Eldho Paul [12], Mark Ziemann [4 13 a], Kiymet Bozaoglu [1 14 a]

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In this study, we define and validate a state of postoperative systemic inflammatory dysregulation (PSID) based on postoperative phenotypic extremes of plasma C-reactive protein concentration following major abdominal surgery. PSID manifested clinically with significantly higher rates of sepsis, complications, longer hospital stays and poorer short, and long-term outcomes. We hypothesized that PSID will be associated with, and potentially predicted by, altered patterns of genome-wide peripheral blood mononuclear cell differential DNA methylation and gene expression. We identified altered DNA methylation and differential gene expression in specific immune and metabolic pathways during PSID. Our findings suggest that dysregulation results in, or from, dramatic changes in differential DNA methylation and highlights potential targets for early detection and treatment. The combination of altered DNA methylation and gene expression suggests that dysregulation is mediated at multiple levels within specific gene sets and hence, nonspecific anti-inflammatory treatments such as corticosteroids alone are unlikely to represent an effective therapeutic strategy.

	Baseline (t0)	Post-op (POD)
Low CRP	25	25
High CRP	21	21

↓

RNA-seq &
Infinium methylation array

↓

Correction for blood cell composition

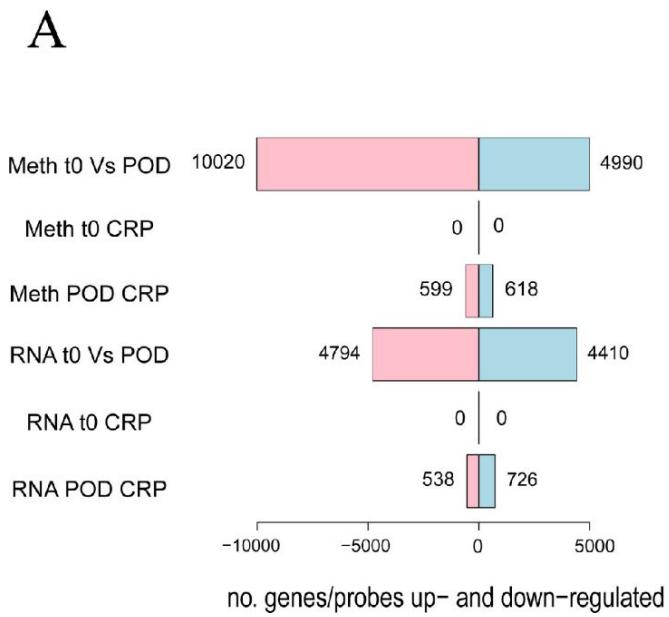
↓

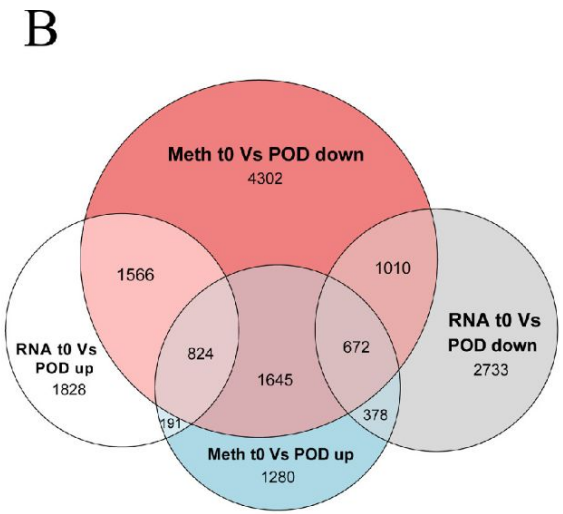
Differential analysis
- t0 vs POD
- CRP low vs high

↓

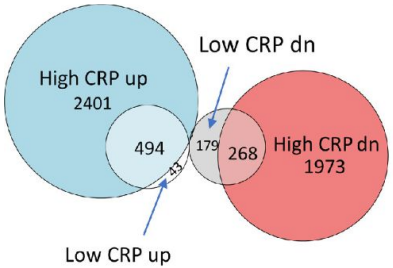
Integrative enrichment analysis

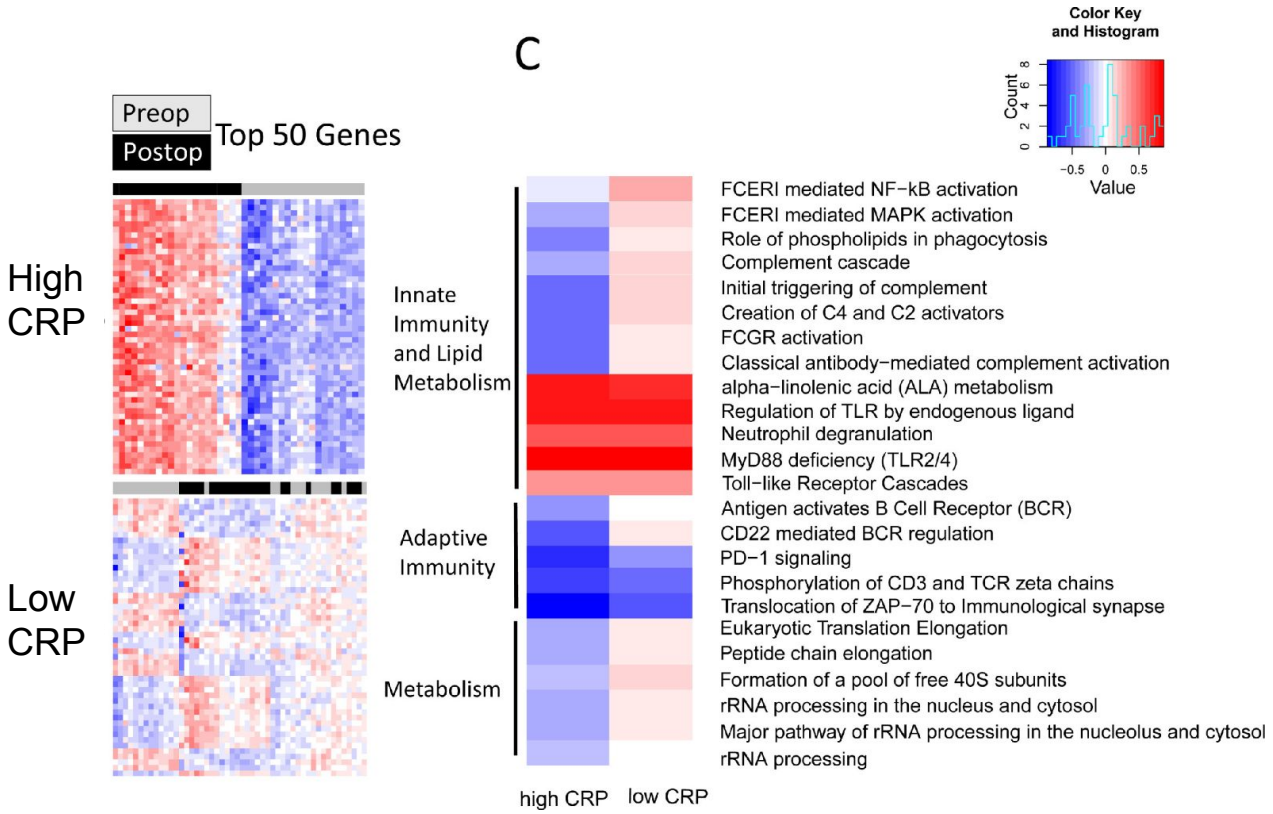
Expression and methylation differences observed during abdominal surgery



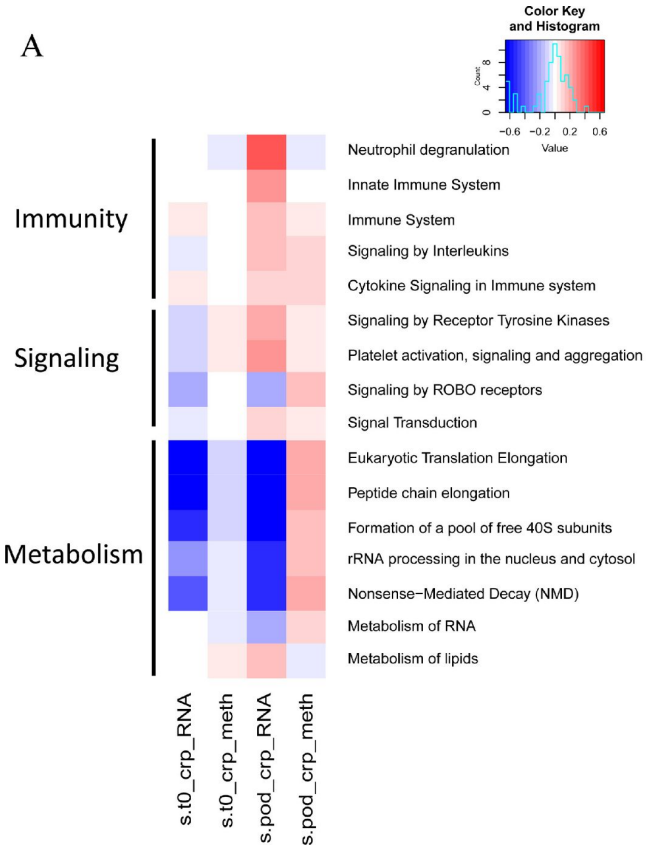


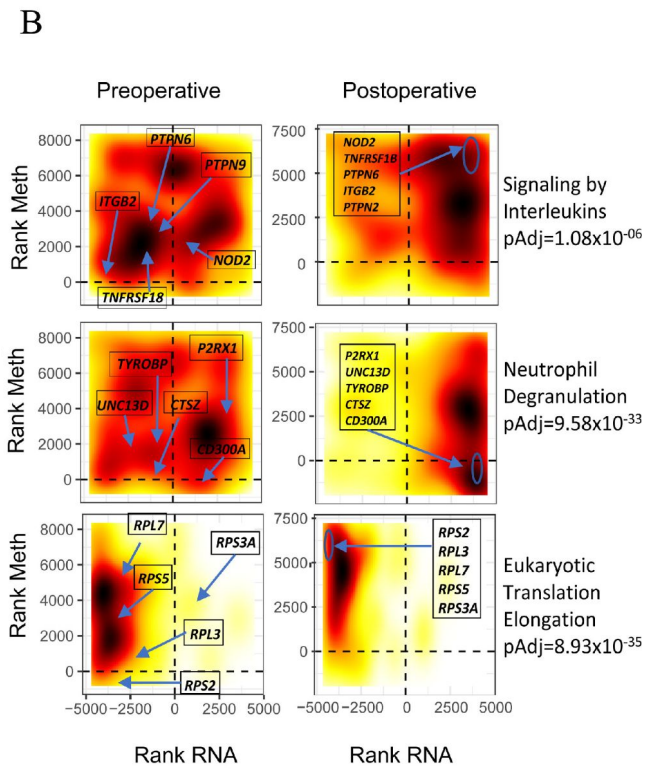
Transcriptome analysis - t0 vs POD





Integrated multi-omics enrichment analysis - CRP low vs high

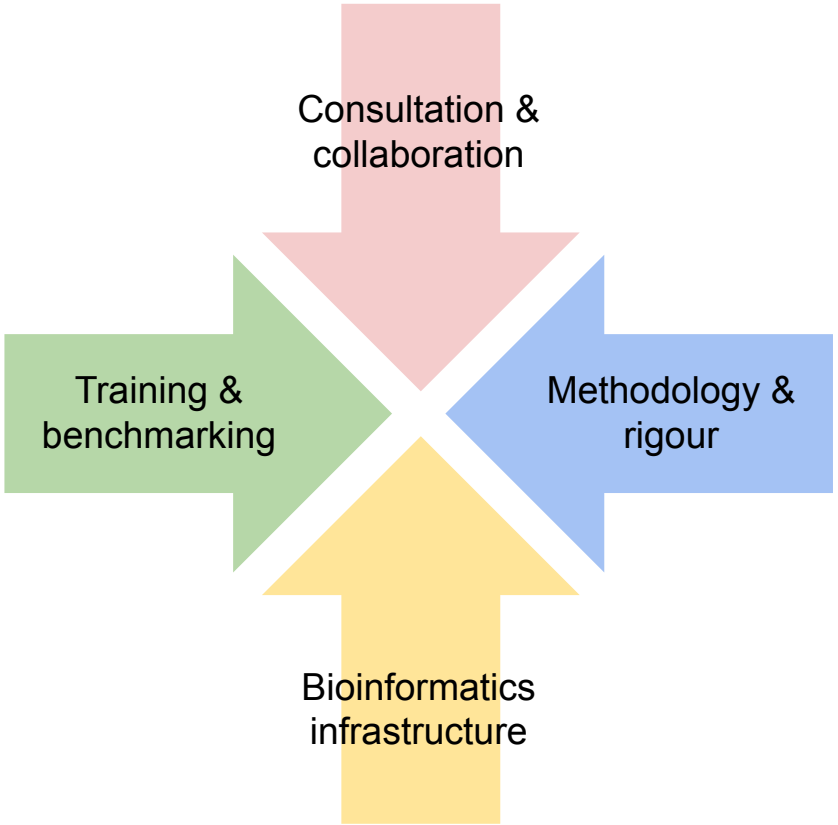




Outcome and impact

- Confirmed and further resolved genes regulated by major surgery
- First comprehensive analysis of perioperative DNA methylation
- First formal description of PSID, with corresponding genes and pathways
- New directions for drug development and patient management

Building a community of practice in bioinformatics



Key priorities

- Consult, scope needs and identify strengths & weaknesses
- Collaboration, service, dissemination
- Enable existing staff & students
  - eResearch training
  - Regular user group sessions
  - Troubleshooting slack group
  - Setting up common protocols & infrastructure
- Tap into existing networks and resources, eg: ABACBS, Australian BioCommons
- Recruit into specialist growth interest areas, eg: ML, single cell. Recognise diverse backgrounds and skill sets

Thanks for your attention

Copy of slides for future reference:

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