Honours in Medical Research Handbook

2025

School of Biomedical Sciences

Honours Coordinators:

Prof. Jeffrey Keelan
Tel: 08 6457 1686
Email: jeff.keelan@uwa.edu.au

Dr. Mitali Sarkar-Tyson
Tel: 08 6457 2662
Email: mitali.sarkar-tyson@uwa.edu.au

Administrative Office:

Mr. Ian Chen
Tel: 08 6488 8971
Email: honours-sbms@uwa.edu.au

Welcome to the School of Biomedical Sciences' Honours Program

This 2025 Handbook introduces the Honours in Medical Research program in the School of Biomedical Sciences at the University of Western Australia.

An Honours in Medical Research is an invaluable postgraduate qualification that expands your employment opportunities and competitiveness and provides the training and launching pad for a wide variety of professional and postgraduate careers, including those in science, health-related disciplines, and/or postgraduate research.

For many of you, undertaking an Honours project will be your first real taste of scientific research, and you will be faced with exciting - and perhaps daunting - new challenges. You will have to confront and master the rigours of scientific writing, experimental design, time management, data analysis and oral presentations. You will learn to undertake and master cutting-edge scientific techniques and methodologies, and become familiar with a range of experimental tools, m odels and equipment. You will need to be both diligent and resilient, for in science (as in life) things often do not go as planned and there are hurdles and disappointments to be overcome. Your experienced supervisors will be there to guide you and help you to achieve your goals and do the very best you can.

For some of you this will be a transformative year in your life and will set you on a career path of lifelong research and discovery. For others it will be a stepping-stone to other ventures. For all of you it will be an invaluable learning experience that will teach you a range of technical, analytical, intellectual and communication skills that will prove invaluable wherever life takes you.

I encourage you all to embrace the challenges ahead, keep your minds open to new experiences and knowledge, make friends and become part of the school community, and make the most of being in a stimulating environment at the cutting edge of biomedical research.

Good luck!

Professor Jeffrey Keelan, BSc (Hons) Liv., MSc PhD Auck., FSRB

Head of School of Biomedical Sciences

Table of Contents

Introduction

The purpose of the Honours program in UWA's School of Biomedical Sciences is to introduce students to contemporary scientific medical research practices and develop their practical research and communication skills and competencies.

The Honours course comprises an academic year of full-time research and training, centered on an individual research project, resulting in the preparation and submission of a compact medical research thesis under the supervision of an experienced researcher and/or co-supervisors. Students will develop enhanced skills in critical and lateral thinking, experimental design, problem solving, time-management and scientific literacy and communication, as well as mastery of a variety of laboratory and/or analytical skills and an understanding of laboratory safety, professional responsibility and ethical conduct in research.

The Honours program is structured as a 48-point course (24 points per semester) composed of six units that encompass different components of the program. Some of the units are split into two parts that span both semesters (colour coded below). The course structure is summarized in the diagram below:

<table>
<tr><th>SEM 1</th><th>SEM2</th></tr>
<tr><td>BMED4001. 6 pts – Literature Review and Research Proposal in Biomedical Sciences</td><td rowspan="4">BMED4005. 6 pts – Research Communication in Biomedical Sciences - part 2

BMED4006. 18 pts – Medical Research Thesis part 2: completion, assembly, submission and examination</td></tr>
<tr><td>BMED4002. 6 pts – Research Communication in Biomedical Sciences - part 1 (assessment continuing)</td></tr>
<tr><td>BMED4003. 6 pts – Medical Research Thesis part 1: Preparation, induction and training (assessment continuing)</td></tr>
<tr><td>BMED4004. 6 pts – Research Ethics, Rationale & Design (ungraded pass/fail)</td></tr>
</table>

Final marks breakdown across the units:

- Literature review and research proposal: 15%
- Research communication parts 1 … plus… plus part 2 25%
- Research Ethics, Rationale & Design: Pass/fail
- Thesis part 1 …. plus… Thesis part 2: 60%

At the beginning of the year, students receive general training in biostatistics and chemistry, laboratory safety induction, and the appropriate use of research infrastructure. Additional specific training may also be required for certain types of research. For example, research using non-human animals will require completion of the PAWES training course offered by Animal Services; projects that involve human participants or their tissues/samples will need human ethical approval, while research using genetically modified organisms will require OGTR approval. General laboratory training, student-specific training, and instruction in research design, results presentation and analysis will contribute to BMED4003. Training in research ethics, rationale and design will be covered in BMED4004.

Scientific communication skills are taught and developed throughout the Honours year. Research contributing towards the research thesis commences at the start of the year and continues throughout the

program, culminating in the submission of the thesis and presentation of the project at a conference-style event. Honours graduates who achieve a 2A or higher degree are eligible to enroll in a PhD programme.

Learning outcomes

Students who complete Honours in Medical Research should be able to:

1) Critically evaluate literature relevant to the area of research and compile references in an appropriate style;
2) Demonstrate advanced oral and written scientific communication skills;
3) Develop a research plan to address the aims of the project;
4) Execute a range of statistical analyses relevant to biomedical research;
5) Discuss considerations relevant to laboratory safety;
6) Demonstrate an advanced understanding of the responsible conduct of research in the biomedical sciences;
7) Demonstrate a thorough understanding of good clinical practice as it pertains to medical research;
8) Evaluate and design a research project based on a biomedical question;
9) Perform experiments, interpret data, solve scientific problems, identify limitations and future directions
10) Apply chemistry fundamentals in a laboratory setting

Entry Requirements for Honours in Medical Research

Students require a minimum weighted average mark (WAM) of 65 per cent in the Level 3 units of a Biomedical Science-related discipline, such as Genetics, Neuroscience, Pathology, Pharmacology, Microbiology, Immunology, Anatomy, Human Biology, Physiology, Biochemistry, Molecular Biology, Psychology, Public health. The student's undergraduate program should be pertinent to the topic of the project. Students must be accepted by at least one Academic supervisor from the School of Biomedical Sciences, UWA.

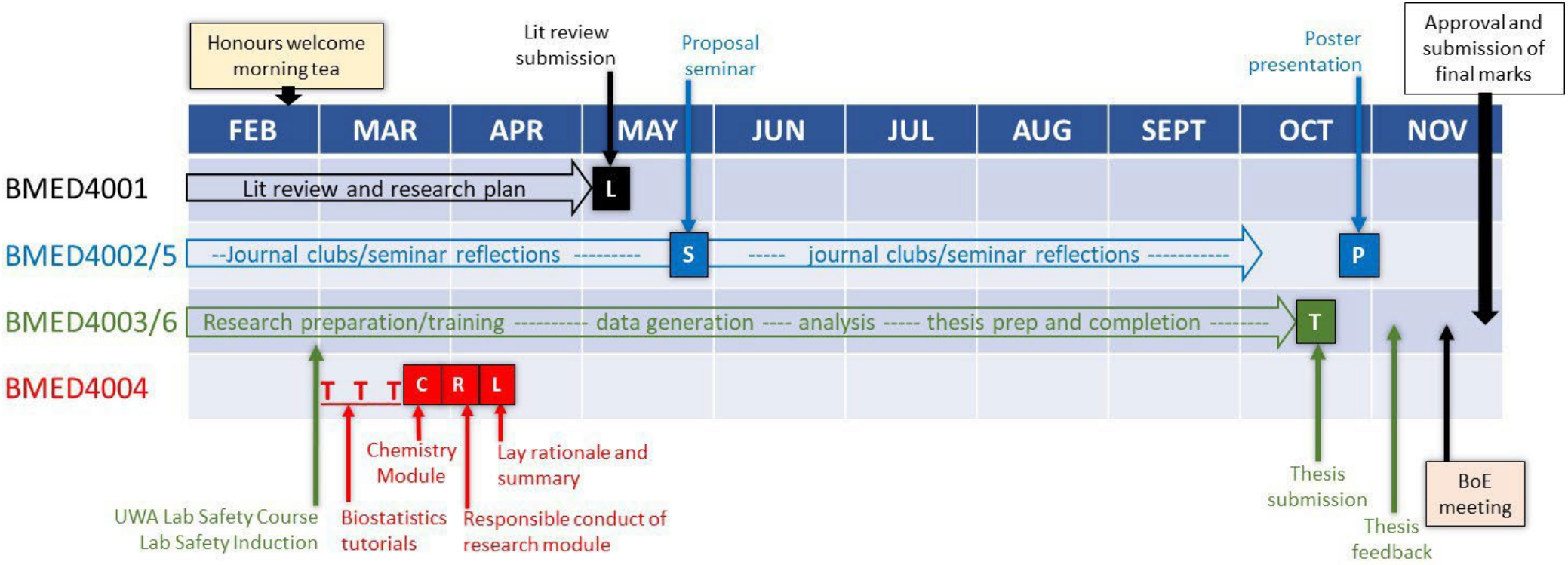
Details of the enrolment process can be found here

Outline and Structure of the Honours in Medical Research Program

The Honours program consists of a combination of research-based training modules and activities, attendance/presentation at research seminars and journal clubs, development and completion of an original research project with analysis and interpretation of the data generated, and submission of a written condensed literature review, research proposal and research thesis. These activities are organised and assessed via the six BMED units as outlined in the Table above: BMED4001, 4002, 4003, 4004, 4005, 4006. **All units must be passed to complete the course**. Failing any one unit will fail the course.

The course is a 1 year program of fulltime study, with research training commencing in February and the final assessment completed in November. There is no mid-year entry into the course. A typical timeline for the activities and assessments of the course is depicted in the diagram below:

Honours 2025 Schedule and Timeline



Unit content, learning outcomes and assessment structure

BMED4001 (6 pts)

Literature Review and Research Proposal in Biomedical Sciences

UNIT Coordinators: *Professor Jeff Keelan and Dr Mitali Sarkar-Tyson*

Students will write a literature review summarising the knowledge base and rationale underpinning the project, and present a research plan outlining the principle aims of the study and an overview of the design and methodology used to achieve the study objectives.

Learning outcomes: students will be able to:

a) Compile, read and critically evaluate literature relevant to the area of research;

b) Format bibliography in the Vancouver style of citation and bibliographic referencing;

c) Identify gaps in current knowledge;

d) Formulate aims to address the gaps in research;

e) Develop a research plan to address the aims of the project

f) Demonstrate high level written communication skills.

The literature review and research plan document is assessed by the two independent examiners nominated by the project supervisor(s); they will also assess the thesis. The literature review and research plan will comprise the first chapter of the thesis. It can be edited and improved following feedback after assessment prior to inclusion in the final thesis. The document can be up to 5000 words (not including references); a word count must be included at the end of the document. The mark for the Literature Review and Research Plan represents 100% of the mark for this unit.

Further details can be found in the **Assessment Details and Timelines** section below.

BMED4002 and BMED4005 (6 pts each)

Research Communication in Biomedical Sciences Parts 1 and 2

UNIT Coordinators: *Professor Jeff Keelan and Dr Mitali Sarkar-Tyson*

BMED4002 Part 1 and BMED4005 Part 2 are paired communications units taken over semester 1 and 2. These units have similar outcomes and assessments, with BMED4002 Part 1 being “assessment continuing”.

These two units are comprised of four components:

1) Research proposal seminar (50% of mark, received in the 1st semester)

2) Specific engagement with/presentation at weekly lab journal clubs (both semesters; ungraded pass/fail)

3) Attendance at School seminars, with submission of six structured personal reflections (both semesters; ungraded pass/fail)

4) Conference poster presentation and oral defence (50% of mark; 2nd semester)

These units deliver and assess key advanced biomedical research communications skills, including:

a) Oral presentation to staff and students in the School of Biomedical Sciences of the project proposal (an in-depth overview of the literature pertaining to the field of study; an outline of the principal aims of the study and an overview of the approaches used to achieve the aims)

b) Review and analysis of scientific papers in a discipline-related journal club;

c) Attendance at the School Seminar program (or equivalent) and completion of Seminar Reflection Worksheets (6 minimum)

d) Final conference poster presentation and oral Q&A/defence

BMED4003 (6 pts)

Medical Research Thesis part 1

UNIT Coordinators: *Professor Jeff Keelan and Dr Mitali Sarkar-Tyson*

This unit represents the preparative portion of the student's research project and training, which culminates in the submission of a medical research thesis at the end of semester 2 (BMED4006). It covers all aspects of laboratory safety, specialist training requirements, development of wet-/dry-lab bench skills, equipment operation/credentialing, ethical compliance issues, laboratory management awareness, and preliminary work on project establishment, rationale and design.

This unit is designated as 'assessment continuing', with thesis submission and examination occurring in BMED4006 at the end of semester 2. There are no specific marks allocated to this unit.

In addition to the preparative work undertaken on the research thesis, the unit encompasses a number of modules and courses that students may need to take to comply with safety and training regulations, in addition to project-specific training and upskilling. These include:

1) Basic biomedical statistics: Between-subjects and within-subjects designs, time-series and formal qualitative design; concepts of Bayesian and frequentist approaches to statistical analyses; standard group comparison methods (e.g., t-tests, ANOVAs, ANCOVAs, regression including correlations, methods of curve fitting, and nonparametric statistics); the concepts of power analysis and effect size;
2) General laboratory safety training (online);
3) Reading and sign-off on the School Laboratory Safety manual;
4) Project-specific training on individual equipment and infrastructure;
5) PAWES course for those working with animals;
6) Radiation Safety Course for those working with isotopes;
7) Gene Technology Awareness Session for those working with genetically modified organisms;
8) First-aid and aggressive incident management for those working with clinical samples;

Not all students will need to take all courses/modules. Completion of modules is pass/fail, but they are not graded and do not contribute to the marks for the unit.

BMED4004 (6 pts)

Research Ethics, Rationale and Design

Unit Coordinator: *Dr Lynette Fernandes*

Knowledge and understanding of medical research ethics are integral to research. In this unit, students participate in a face-to-face discussion of an interactive movie at the start of semester. Students are required to subscribe to the BMED4004 Discussion Forum on LMS and check their UWA emails every day for updates.

Students will also complete two online courses:

1. Global Health Training Centre Research Ethics Online Training Modular course

2. Global Health Training Centre Good Clinical Practice short course
3. Chemistry refresher module (via LMS)

Students will also be required to submit a clinical OR scientific rationale for their thesis project written in lay language in the format of a grant or ethics application summary.

All components of this unit are required to be completed satisfactorily to pass the unit. The unit is pass/fail and is not graded.

More details will be provided by the beginning of the first semester of 2025.

BMED4006 (18 pts)

Biomedical Research Thesis Part 2

UNIT Coordinators: *Professor Jeff Keelan and Dr Mitali Sarkar-Tyson*

This 2nd semester unit (18 pts) follows on from BMED4003 (6 pts; Thesis part 1); collectively these two units comprise the medical research thesis component of the course and are worth 24 credit points in total.

In brief, the thesis is a body of original research consisting of a title page, statement of contributions and acknowledgment, abstract, introduction and literature review, aims and objectives, methods, results, discussion, references/bibliography and appendices. The first section of the thesis (literature review, aims and objectives) is submitted in the first semester and examined independently (BMED4001). This allows first semester feedback to the student on progress and the opportunity to edit the literature review and make changes to the project if suggested by the examiners. The final completed thesis is submitted (BMED4006) for examination at the end of the program.

For this Honours course, the structure and length of the Medical Research Thesis is carefully prescribed and all students must follow the guidelines carefully (*see page 15*). Students must adhere to strict work limits for the various sections; this is to ensure the thesis is concise and readable. Adhering to word limits and writing succinctly is an important skill in the world of scientific writing; word limits are frequently imposed on research publications, so learning how to write within space constraints is a valuable "real world" skill. There are also strict instructions regarding referencing and attribution that must be followed, similar to those that apply to submission of research manuscripts for publication. Full details are provided below in the Assessment Instructions and Deadlines section.

The marks for the Medical Research Thesis (encompassed in BMED4003 and 4006) represent 60% of the total marks for the course. Completion of the thesis teaches students how to:

a) Present, cite and critique biomedical literature supporting their research;
b) Describe appropriate methodologies and statistical techniques used in their studies;
c) Generate, analyse and present research findings clearly, accurately and professionally;
d) Critically appraise and discuss their research in the context of the existing knowledge in the field and identify any strengths and weaknesses in their findings.

Detailed assessment instructions and deadlines

BMED4001 Literature Review and Research Proposal

Students will write a literature review introducing the background and rationale behind the project, and research plan outlining the principal aims and objectives of the study and an overview of the approaches and methodologies used to achieve the objectives. The submitted document is examined by two independent external examiners, who will provide comments and feedback via the examination process. The work undertaken to prepare this document will form the basis of your proposal seminar presented at the end of semester 1.

Layout: The structure, scope and breadth of the literature review should be decided in consultation with the supervisor, who will also edit drafts and give guidance on content, quality and style. Students will need to demonstrate an understanding of the literature supporting the project and its significance, identify areas where there are gaps or inconsistencies in knowledge, and demonstrate they are able to synthesise and interpret the findings of others in their own words. Mastery of written scientific English is a key aspect of this unit. Grammar, punctuation, layout and readability will all be taken into account in the marking process.

Students should work with their supervisor to establish the topic and order of the headings and sub-headings; structure and flow is very important in a review. A logical hierarchical numbering system should be employed, which should be used consistently and adhered to.

The title of the review should be stated on the first page in bold text (NB: this does not contribute to the page count or word count). It does not need to be the same as the title for the research thesis, but should accurately and succinctly describe the topic of the review.

The body of the text must be in Calibri 12 point font, single spacing throughout. A4 page size should be used. Figure/table legends should be single space, 11 point font. Page margins should be 20 mm for left and right, and 25 mm for top and bottom.

Following the literature review, the hypothesis, aims and objectives of the project should be stated. The research proposal should contain an outline of the experimental design, the primary and secondary outcomes of the study (where appropriate), a justification of the numbers of samples/animals/repeats, the main methodological / analytical approaches to be used, and a description of the planned statistical analyses.

Finally, a bibliography should be included, listing all the publications and sources of the literature cited in the review and research plan. The Vancouver style of citation and bibliographic referencing must be used. Students must comply with the University's referencing requirements, and are strongly encouraged to use Endnote or a similar referencing software package to insert citations and manage/format their bibliography. The UWA library has several helpful online referencing resources to help students navigate the demands of referencing:

https://guides.library.uwa.edu.au/referencinguwa**Diagrams and Tables**: The use of figures and diagrams is strongly recommended to improve the clarity and readability of the review. Each figure, diagram and table should be accompanied with an explanatory legend (not included in the word limit); avoid splitting the figure/diagram and legend across different pages. Figures and diagrams should be embedded within the pages of text; they do not need to be on a separate page.

The inclusion of original figures is strongly encouraged; however, images or figures may be reproduced from published sources. They must, however, be appropriately referenced and cited in the bibliography to comply with the University's plagiarism policy. Poor quality, pixelated figures with small illegible text should be avoided.

Word length and formatting: The literature review and research proposal should be no more than 5000 words (not including title and bibliography); a word count must be included at the end of the document. If the word count is exceeded, the document will be returned to the student for editing. Page numbers should be positioned in the footer at the bottom right of each page, commencing with the first page of the literature review and ending with the last page of the bibliography.

Submission and assessment: On or before the due date (which will be posted on LMS), one copy of the literature review and research proposal must be submitted in electronic format as a PDF document via LMS. The document will be assessed by two examiners against the following criteria:

(a) How well does the literature review demonstrate an understanding of the central concepts in the field of study?

(b) To what extent does the review summarise the current state of knowledge and identify gaps in that knowledge?

(c) Does the review contain an appropriate number of figures, diagrams and tables and are they of high quality?

(d) Does the review have a well-designed, logical structure and appropriate use of subheadings?

(e) Does the review comply with the wording and formatting guidelines?

(f) Does the document demonstrate an appropriate use of grammar and punctuation? Has care been demonstrated to avoid spelling mistakes and typographical errors?

(g) Have the source materials been properly cited and formatted in a bibliography according to the style guide?

(h) Are the *hypotheses* and *aims* clearly stated?

(i) Is the proposed methodology and statistical analysis clear, appropriate and accurate?

(j) Does the research proposal clearly establish how the hypotheses will be tested and the aims accomplished?

Marks and feedback: Marks will be deducted for late submission – *5% for every day late*, unless an extension has been granted. Remember, supervisors are busy and need time to read and edit their students' work. **Students should not demand a response within 24 hours to meet a deadline**!

Students will receive their marks at the end of semester 1. The marks for the literature review and research plan constitute 100% of the marks for this unit, which represents 15% of the entire grade for the course.

Following completion of the assessment process, students will receive written comments from the examiners, including a list of any typographical or stylistic changes recommended before final inclusion as part of your final research thesis submitted at the end of the year. Any changes made as a result of feedback will not be re-assessed and will not contribute to your final mark. However, the feedback gives students a final chance to do minor editing before a permanent thesis is submitted. The examiners may also comment on the content of the research plan and suggest changes if they have significant concerns regarding the proposed approach, power, methodology or feasibility.

BMED4002 and BMED4005 Research Communication Parts 1 and 2

The two research communication units contain four assessable items: *a research proposal seminar; participation in a journal club; attendance at the School Seminar program; and a conference-style poster presentation with oral defense*. The marks for these two units comprises 25% of the total marks for the Honours course.

1. Proposal seminar

Students are required to give an in-depth PowerPoint presentation of the literature pertaining to their field of study, an outline of the principal aims of the study and an overview of the approaches used to achieve the aims; this will be scheduled in mid-April. Preliminary data may be included if available. Students can and should receive guidance from their supervisors with respect to preparing the PPT presentation for this seminar and rehearsing the delivery of the seminar.

The seminar will consist of a 20-minute presentation followed by a 5-10 minute question and answer session. The seminar will count towards 50% of the Unit mark and will be assessed via a rubric given to all attending academics (with the exception of the supervisor(s)) in the audience against the following criteria:

(a) Clarity and quality of the overall presentation: oral and visual	33%
(b) Quality of the scientific content of the seminar	33%
(c) Ability to answer questions in a clear and logical manner	33%

Seminar marks will be released to students at the end of semester 1 of their seminar, with feedback where available.

2. Journal club

Students must regularly attend and participate in a lab journal club (or equivalent), presenting at least once to the group for discussion during the year. The supervisor will provide the Unit Coordinator a confirmation of attendance and participation. This activity is not directly assessed and is a pass/fail component.

3. School seminars

Students are required to attend ***at least six*** School Seminars and fill out a one-page Seminar Reflection Sheet for each, which must be forwarded to the Unit Coordinator within 24 h of the seminar. The Seminar Reflection Sheet template will be located on LMS. This is a pass/fail component and is not graded. Attendance at an alternative, equivalent seminar program is allowable, but must be approved by the Unit Coordinator.

4. Poster presentation and oral defense

At the end of the year, after submission of the thesis, students will prepare and present a 'conference-style' poster. This provides a concise overview of the entire research project completed by the student during the year. Examples of high-scoring posters from previous years will be made available via LMS. Formatting guidelines are listed below:

- Dimensions: up to 1 m wide and 1.41 m high (B0 page size)
- Material: uncoated paper (160 gsm) or fabric; gloss or lamination not necessary
- Title: located at the top of the poster in lettering of 4 cm or greater
- Content: Introduction; Methods: Results: Conclusions; References; Acknowledgements

- Style: the visual style, colours, font and layout are determined by the student.
- Pointers: Keep the poster simple, with logical flow/layout, and as concise as possible; rely on your presentation to expand, add clarity and explanation. Ensure text is large enough to be legible from 2 metres away. Avoid jargon/acronyms. Ensure figures are clearly labelled. Employ consistent formatting/colour options. Employ use of boxes and emphasis techniques to make key aspects stand out.

Posters can be printed by Uniprint or commercial suppliers such as Officeworks or Clockwork Print; note, printing may take up to 3 days.

Posters will be presented at a conference-style format, at a time and venue chosen by the discipline coordinator approximately 2 weeks after the thesis submission deadline. All students in the discipline will have their posters on display in the same session and are encouraged to view others' posters and actively engage with their colleagues to learn more about their project. Students are advised to bring a copy of their thesis along in case it needs to be referred to.

Students will individually present their poster to their examiners, supervisor and discipline coordinator, where they will be expected to explain the basic rationale and description of the study, present the findings, and discuss the significance and implications of the work. The examiners will then question the student on various aspects of the project over 10 minutes. Students may be asked to defend the use of specific methodology or approaches, their interpretation of the findings, or an aspect underpinning the rationale for the study.

During the presentation and Q&A session, it is important to speak loudly, fluently and clearly, avoid long rambling statements, and demonstrate a solid depth of knowledge and understanding of the topic. Students are advised to rehearse their presentations in front of a supportive audience and get feedback. The poster and presentation will be marked against the following criteria:

a) Visual clarity, impact and effectiveness of the poster (50% of poster grade)

b) Quality of the oral interpretation of the poster (20%)

c) Student's ability to answer questions and demonstrate in-depth knowledge of the topic and area of research (30%)

Collectively, the poster presentation is worth 50% of the marks for the two communication units BMED4002 and 4005 (which equates to 25% of the marks for the Honours course).

BMED4003 Medical Research Thesis part 1

This unit encompasses the commencement of research that will contribute to the medical research thesis (completed in BMED4006), in particular the initial training, credentialing and induction required. The unit is "assessment continuing" and contributes (with BMED4006) to the 60% of marks allocated to the thesis.

A variety of various modules and credentialing/training activities are undertaken as part of the preparative work are required to safely undertake a research project; they are classed as pass/fail, but do not contribute to the grade. A copy or screenshot of the badge/certificate of completion must be uploaded into LMS as confirmation of completion.

Specific training modules

General lab health & safety training typically involves Building Safety Inductions, reading and certifying the lab safety manual and the UWA Biosafety 1 (Biohazards) unit, an online quiz that is completed via LMS (look under the *Community* tab, find *Biosafety* under "organizations" and enrol under *'UWA-Biosafety- Induction'*). A range of information on health services can be accessed here:

http://www.student.uwa.edu.au/experience/health

Students who are using laboratory animals during their Honours Project must complete the PAWES (Program in Animal Welfare, Ethics and Science) course, taught by the UWA Office of Research. Please note that this course fills up quickly and students should reserve a space as early as possible. The course is time- tabled on the Research UWA website and usually becomes available in January of the year of your Honours:

http://www.Research.uwa.edu.au/staff/animals/pawes

The online Gene Technology Awareness Session is essential for students who work with Genetically Modified Organisms (GMOs), and for anyone who works within (or administers) a facility certified by the Office of the Gene Technology Regulator (OGTR). Details can be found at:

https://www.class2go.uwa.edu.au/enroll/3MHEFE

Students carrying out clinical research involving recruitment of patients may need to do additional training (e.g. CPR; Defibrillation; Aggressive Incident Management; Manual Handling; How to obtain Informed Consent; etc); supervisors will need to be aware of these requirements and organise the appropriate modules for their students. Projects involving human participation will require approval from a Human Research Ethics Committee before commencement; applying for ethical approval may be part of the Honours project.

BMED4004 Research Ethics, Rationale and Design

1. **Basic Chemistry for Lab Researchers module:** Students will be required to successfully complete this refresher module available via the LMS. Students must obtain a minimum of 80% in the associated quiz to pass this module.
2. **Research Ethics module**: Students will watch and actively participate in interactive videos, provided via the LMS, at the start of semester. Students will successfully complete the following online courses: i) Research Question (Global Health Training Centre), ii) Essential Elements of Ethics (Global Health Training Centre) and iii) Good Clinical Practice (Western Australian Health Translation Network). Students must obtain a minimum of 80% in quizzes associated with each course to obtain a certificate and pass this module.
3. **Project rationale:** Students will also be required to prepare and submit a project summary and rationale by late March (this allows timely feedback for preparing the literature review and research plan). The objective of this task is for the student to clearly and succinctly describe the study rationale, objectives and design in lay-friendly language similar to that required for a grant or ethics application. The project rationale must be no more than two A4 pages in length (Submission must be in English, typewritten using 12 point, Times New Roman Font, 1.5-spacing throughout. Each page should consist of a single column of text with the following margins: 15 mm for left and right, and 25 mm for top and bottom) including references; figures and tables are not allowed. Feedback will be provided by the unit coordinator. Students must obtain at least 50% to pass this module.
4. **Statistics in Medical Research module:** An understanding of basic statistical approaches and techniques is necessary to design a robust study and properly analyze and interpret research data. The statistics module will be run as three weekly workshops, using real-world data to teach practical biomedical statistical analytical principles. Attendance at all workshops is required and completion of short assessment pieces are required in order to pass this module.

Note: where specialised statistical approaches and facilities are required (e.g., genetic analysis, multivariate statistics, 'omic data analysis), these will be taught by your supervisor using the own tools and platforms employed within their labs.

The Statistics in Medical Research module will cover the following:

- *Descriptive statistics:* Mean, median, mode; standard deviation and standard error; confidence intervals; normalcy of distribution; statistical outliers; data visualization, graphing and plotting.

- *Parametric statistics:* Probability testing; t-test, ANOVA, ANCOVA, analysis of repeated measures.
- *Nonparametric statistics:* Chi-Square, Fisher's exact test, Wilcoxon (paired or unpaired), Kruskal-Wallis ANOVA, Survival Analysis, etc.
- *Curve fitting*: Correlations, smoothing, linear regression, multiple linear regression, non-linear regression (e.g., dose-response curves), logistic regressions (where the dependent variable is categorical), factor analysis, principle component analysis.
- *Power analysis*: hypothesis testing, assumptions, effect size, sample size.

The modules will include training on the use of the free software package ***Jamovi*** to conduct statistical analyses and presentation of data (https://www.jamovi.org/download.html).

Students are required to pass each module in order to pass BMED4004. Furthermore, failure in any or all of these components will result in failure in the entire Medical Research Honours course**.** Attendance at all workshops is required and completion of short assessment pieces are required in order to pass this module. More details on teaching delivery and deadlines for completing each module will be provided by the beginning of the first semester.

BMED4006 Biomedical Research Thesis Part 2

At the completion of the Honours program, students will be required to submit a compact medical research thesis for marking, consisting of a brief introduction, followed by description of the research methods, findings and conclusions; the thesis ends with the bibliography and appendices. The introduction can be based on the original literature review and research proposal (submitted in BMED4001), significantly reduced in size, taking into account feedback suggested by the examiners and reflecting any changes in project scope that occurred during the Honours year. No figures or tables should be included. The bibliography should be trimmed and updated to include new references and papers relating to the Materials & Methods, Results and Discussion.

The thesis must be submitted as a PDF file for examination. Supervisors can and should provide feedback to the student before submission with respect to writing style, content, formatting and referencing. Feedback can be provided on the Introduction, Methods and Results, but **NOT** the discussion, which should entirely reflect the student's own work. The size and content of the thesis is outlined below; students must note the structure, layout and word limits and ensure these are followed. **Word limits are NOT optional.**

Structure and layout:

The thesis should be laid out according to the following guidelines:

1. Title page: stating the title of the thesis, the name and number of the submitting student and the name(s) and affiliations of the supervisor(s).
2. Contribution statement page: A signed statement indicating the contribution of the student to the work contained in the thesis submitted as part of the requirement for the Honours degree (a pro forma page will be provided). Contributions by others should be specifically stated, quantified if necessary.
3. Acknowledgement page: formal acknowledgement and thanks to those who helped with the project or who provided materials, data or other support.
4. Table of contents: neatly formatted and accurately paginated, listing major and minor headings.
5. Structured abstract: A single page summary of the project with the following sub-headings: introduction/rationale and aims, methods, results and conclusions.
6. Introduction, hypothesis and Aims: An updated and condensed version of the literature review providing a concise summary of the background, rationale and aims of the project. Bibliography should be included and augmented to encompass references cited in the remainder sections. Sources should be numbered according to the order in which they are cited (Vancouver referencing style).
7. Materials and Methods: relatively succinct description of the methodological and analytical aspects of

the study, written so that a suitably trained reader will be able to understand the approaches and procedures undertaken and replicate them. Reagents, platforms and equipment should be briefly defined in text as per a research manuscript. All methods and approaches should be properly referenced.

8. Results: A concise listing and description of the data and findings generated by the project; the use of properly formatted and labelled diagrams, figures and tables is strongly recommended (note: figure legends and tables are not included in the word limit). Statistical significance of findings should be clearly annotated. Discussion and interpretation should be avoided in this section.
9. Discussion: A structured, logical, informed and balanced discussion of the findings and significance of the project, noting any strengths, flaws or gaps in the study, and identifying opportunities or requirements for further study. Importantly, the Discussion must not be read or edited by the supervisor – it should reflect the student's work alone.
10. Bibliography: A full, complete and accurate listing of all of the papers and sources of information cited in the thesis, numbered according to the order in which they are cited. Students are encouraged to use recent, high-quality reviews to support general statements and the state of knowledge around broad topics, while specific studies of particular relevance (old and/or new) should be cited individually.
11. Appendices: supplementary information, figures or data generated during the research, supplied for information but not formally assessed.

Word limits:

It is intended that the Honours research thesis should be a compact, readable document that provides a vehicle for students to adequately present their research work in a concise, lucid and easily examinable format. Word limits are in place to prevent the thesis becoming too large and unwieldy, and to reflect the reality of research practice where size constraints are commonplace when publishing or reporting research.

The word limits for the various sections of the thesis are as follows:

Section	**Word limit**
Title	25 words
Abstract	500 words
Acknowledgments	No limit
Table of Contents	No limit
List of Figures/List of Tables/Abbreviations	No limit
Introduction, Hypothesis and Aims	1000 words
Materials & Methods*	*3000 words combined
Results	
Discussion	2500 words
Bibliography	No limit
Appendices**	No limit

*Combining the Materials & Methods and Results in a single word limit is intended to allow projects that have a major method development/optimisation component (with few results) to be properly and adequately presented without being penalised.

** Appendices will not be formally assessed by the examiners (no word limit).

Printing and formatting:

The Thesis should be formatted in Word, in colour, and saved as a PDF file for submission and printing if desired. File size should be less than 10 MB if possible. The page size should be A4 with margins of 2 cm (width) and 2.5 cm (height). All pages from the Introduction onward should be numbered, with the page number located on the bottom right of the footer. The header should be left blank.

Electronic submission (as a PDF file) is required for the Honours thesis submission; these will be emailed to the examiners. Hard copies can be printed at the student's expense if needed.

Submission

Thesis is to be submitted electronically for examination via LMS.

Assessment grade guidelines

The marking bands for assessment are as follows:

Class	When apportioning marks please take into account the grades used by UWA
First class	90% - 100% H1: HD+ 80% - 89% H1: HD- Outstanding ability in research and communication.
2A Honours	75% - 79% H2A: D+ 70% - 74% H2A: D- Very competent. Candidate still very worthy of consideration for a postgraduate research award.
2B Honours	60% - 69% H2B: CR Competent but some inadequacies in content, scope understanding and/or presentation such that the person would be unlikely to make a good independent research worker.
Third class honours	50% - 59% H3: Pass Evidence of effort but inadequacies in research competence, understanding and/or presentation.
Fail	Fail: N+ Less than 50 % Unsatisfactory. Very serious inadequacies in all or most areas.

Similar general expectations to these will apply to the other items of assessment, that is, the Literature Review & Research Plan, the Preliminary Seminar, and the Poster Presentation & Interview.

ALL UNITS MUST BE PASSED TO PASS HONOURS.

LATE PENALTIES: All late submissions will incur a 5% mark penalty per day.

Thesis assessment policy

Thesis documents are emailed to two independent examiners for assessment. Where there is a difference in mark greater than 10%, or the examiners' score the thesis in a different grade band (e.g. H1 *vs*. H2A), then the examiners are requested to undertake a review of their assessment; a discussion chaired by the UC may be undertaken to resolve any differences. If, after the review, the discrepancy still remains significant, a third examiner will be asked to assess the thesis. The marks of the closest two examiners will be averaged to generate the final mark.

Responsibilities of the Honours Student

One of the exciting challenges of the Honours year is that you will encounter many challenges and learning curves. The inevitable downside of this is that each task will take longer than anticipated, so it is important to be highly organised. As an Honours students you should:

- Ensure you are aware of all the important dates and deadlines, as penalties for late submissions do apply.
- Ensure you manage your time carefully so that the requirements of the Honours course are completed within the stipulated time limits. Although it is understood that many students need to take on part-time work for financial reasons, ensure that this is kept to a reasonable level (e.g. less than 8 hours per week).
- Obtain a Medical Certificate to receive a special consideration if you are ill during the year. Consultation with the unit coordinator(s) is compulsory for requesting extensions longer than a week.
- Ensure you are aware of Unit requirements, particularly with respect to security and the safe and responsible usage of facilities such as the Internet and core equipment. If in doubt, consult your Supervisor, the Honours coordinators or the Senior Technical Officer (Sarah Power).
- Document all your experimental work in a laboratory book and show it to the Supervisor on a regular basis. It is a requirement that the laboratory notebook is accurately completed and remains the property of the Supervisor for up to five years post-Honours. Make sure that you protect electronic data by backing it up regularly (where your supervisor can get access) and having copies saved on several different sites. Don't store data where it can be lost or stolen.
- Be aware of the Guidelines on Research Ethics and Research Conduct, as outlined in http://www.Research.uwa.edu.au/policies3/guidelines_on_Research_ethics_and_Research_conduct
- Arrange regular meetings with your Supervisor to discuss all aspects of your work.
- Be open to suggestions and advice from your Supervisor, particularly during the early stages; as the year progresses you should grow in confidence and show signs of independence and initiative.
- Ensure that any conflicts that might develop with Supervisors or others are brought to the attention of the Honours Coordinators so that problems can be resolved quickly and amicably.
- Uphold the academic standards and good reputation of the School of Biomedical Sciences.

Responsibilities of the Honours Supervisor

The Supervisor is responsible for all matters directly related to the Research project. Specifically, the Supervisor should:

- Provide academic guidance with respect to the overall direction, day-to-day running of the research project, and editing and feedback on written and oral tasks.
- Meet frequently with the student, and establish open and good communication
- Ensure the appropriate level of support and training is provided to the student, including resourcing and regulatory approvals
- Be a good listener, and offer encouragement for good ideas and well-developed thoughts, with constructive criticism where appropriate.
- Keep the student informed about relevant regulations and administrative processes in the Unit, School and University
- Guide, advise, help, constructively criticise, but not push – it is the student's responsibility to be motivated to succeed and to assume ownership of the research project.

- Make arrangements for continuing supervision during periods of absence.
- Provide advice and guidance on the preparation of the:

  Research proposal seminar,

  Literature Review & Research Plan,

  Research thesis, and

  Poster presentation & defense
- Provide relevant feedback to the Honours Coordinator and Examiners by completing the 'Supervisor's Assessment' form (Appendix B).
- Participate as an observer during the poster presentation and defense.
- Attend an Examiners Meeting at end of year, if required, to enable major differences in thesis marking between examiners to be resolved.

Responsibilities of the Honours Examiner

Each student will have two examiners with expertise in the area of the project. The Examiners take part in multiple aspects of assessment of students. Specifically, the Examiners should:

- Attend and assess the research proposal seminar (late April)
- Read and assess the literature review & research plan and provide feedback on the work.
- Read and mark the research thesis (late October)
- Attend and participate in the Poster Presentation & defense (late October/early November)
- Contribute to achieving a fair and equitable grade for the student through discussions and negotiation with the Course Coordinator(s) via email, phone or online communication (early November)

Responsibilities of the Honours Coordinator

The Honours coordinator is responsible for organising and overseeing the entire Honours course. Specifically, the Honours Coordinator will:

- Call for Honours projects (July) and prepare the Honours booklet (September).
- Coordinate conditional enrolment of Honours students (from September onwards).
- Ensure all students are correctly enrolled and installed in the supervisors' labs (January/February).
- Organise Honours Orientation program and safety/training modules (for late-February).
- Organise welcome function for Honours students (late-February) and introduce them to the structure, assessment expectations and timelines of the course.
- Assign examiners to each student (late February).
- Organise Project proposal seminars (early May)
- Collect Literature Review/Research Plan from Students and distribute to examiners (late May); provide feedback to students from the examiners.
- Informally check on students' progress (May to August).
- Distribute the Research Thesis to examiners, together with marking guidelines (mid-October) and coordinate with examiners regarding the final grade.

- Organise and run the conference Poster Presentation sessions (late October) and collate the examination marks.
- Present the final marks and grades to the Board of Examiners for approval and submission.

Plagiarism

Plagiarism is defined as appropriating someone else's words or ideas without acknowledgment. New ideas and findings are crucial to the advancement of knowledge and are typically published in international journals under particular authors' names. It is extremely important that this credit be properly assigned for personal, ethical, financial and historical reasons. As scholars, we have to rigorously acknowledge previous contributions if we are to expect that in turn, we will be acknowledged in the future.

Copying material from a published source without properly citing the source, or copying from another Honours student or other thesis constitutes plagiarism. The University has strict rules about academic integrity, and views plagiarism within a thesis as major misconduct.

If you are in doubt as to what constitutes plagiarism, make sure you consult your Supervisor or Honours Coordinator, and/or consult the University policy on Academic Misconduct:

https://www.uwa.edu.au/students/-/media/Project/UWA/UWA/Students/Docs/UWA-Academic-Conduct-Policy.pdf

Appendix A: Marking Guides

Literature Review and Research Plan Assessment Sheet

Page 1 of 2, please see below

Examiners: please complete the ***assessment sheet (page 2) and email it back to the Honours Coordinator within*** 2 weeks of receipt.

Some criteria to aid in your assessment have been listed below:

The review:

- Provides an appropriate and informed review of the relevant literature to introduce and support their hypothesis and does not include irrelevant Literature?
- Demonstrates critical thinking.
- Follows a logical flow and progression.
- Identifies gaps in knowledge leading into research question.
- Contains high quality and appropriately labelled diagrams and tables.
- Discusses the potential significance and impact of the project?

The proposal:

- Describes a well-designed program of research.
- Includes an overall hypothesis that is subdivided into well-defined objectives or specific aims.
- Provides an overview of the proposed experiments that are linked to the proposed aims. This should include experimental materials and methods, data management, analysis and statistics, ethics and recruitment of participants as required.
- Demonstrates that the student understands their project.

Grammar and formatting:

- Is there use of clear and concise scientific English with accurate spelling, punctuation & grammar?
- Is the document formatted correctly (page size, numbering etc) with appropriate use of the correct font (12 point Calibri) and headings?
- Are all figures/tables labelled and referred to in text?

Referencing:

- Are all scientific/factual statements and descriptions correctly referenced?
- Is the formatting of in-text citations uniform?
- Does the bibliography include an appropriate mix of reviews, original research, and recent plus older publications?
- Is the bibliography content and format consistent and accurate?

Student Name: _____ *Assessor Name*_____

Assessment Criteria	Mark
Literature review (50 marks) a) Does it provide a review of the relevant literature to support the hypothesis and does not include irrelevant literature? b) Demonstrate critical thinking? c) Follow a logical progression? d) Identify gaps in knowledge leading into research question. e) Appropriate use, quality and labelling of diagrams and tables. f) Include an overall hypothesis that is subdivided into well-defined objectives or specific aims? g) Discuss the potential significance of the project?	
Research proposal (35 marks): a) Provide a well-designed program of research? b) Provide an overview of the proposed experiments that are linked to the proposed aims? This should include experimental materials and methods, data management, analysis and statistics, ethics and recruitment of participants as required. c) Demonstrate that the student understands their project?	
Grammar, formatting and referencing (15 marks): a) Is it clear and concise scientific English? b) Is the document formatted appropriately and the spelling, punctuation & grammar correct? c) Is the document in 12pt Calibri font? d) Is the page size A4 with margins of 2 cm (width) and 2.5 cm (height) used consistently throughout the text? e) Are subheadings, page numbers, headers/footers consistent? f) Are all figures/tables labelled and referred to in text? g) Is the document fully and accurately referenced: • Statements correctly referenced. • Formatting of in-text citations is uniform. • Inclusion of reviews, original research, and recent plus older publications in the bibliography. • Consistency and accuracy of the bibliography content and format.	

Assessor Signature_____ Date_____

Scales: ***H1-D+*** (90 – 100%); ***H1-D-*** (80 – 89%); ***H2A-D+*** (75 – 79%) ***H2A-D-*** (70 – 74%); ***H2B*** (60 – 69%); ***H3*** (50 – 59%); ***F*** (<50%)

Thesis Assessment Sheet

Page 1 of 2, please see below

Thesis Assessment Criteria	Mark
Abstract, Introduction, Aims and hypothesis (15 marks) a) Is the Abstract structured correctly and did it summarise succinctly and accurately the rationale, aims, findings and outcomes of the study, and could it be understood without reading the rest of the Thesis? b) Did the Introduction provide a summary of the study's background and rationale, including identification of any pertinent gaps or controversies? c) Did the Introduction cite appropriate references from the scientific literature? Were the Aims and Hypotheses clear and valid?	
Materials and Methods (15 marks) a) Were the Materials and Methods clearly described and fully referenced? b) Were the Methods used appropriate and valid for the stated aims?	
Results (30 marks): a) Does the Results section represent an adequate body of work? b) Are the results presented clearly and accurately? c) Were appropriate choices of experimental conditions, such as doses, concentrations, time-points, etc. used? Were sufficient controls and replicates performed? d) Were appropriate numbers of observations performed? e) Was there sound and appropriate use of statistical analyses and tests? f) Was the presentation of results (Figures, Tables, etc.) clear and logical?	
Discussion (20 marks): NB Please take into account that the discussion is written by the student with NO input from the supervisor. a) Is the Discussion relevant to the Introduction, Methods and Results? b) Is it logical in presentation and content? c) Is there evidence of critical and creative analysis? d) Does it place the findings in the context of past studies? e) Are there suggestions for future studies? Is there evidence of over-interpretation of data? f) What is frequency and extent of bias in interpreting the data? g) Have unexpected or inconsistent results been fairly and skillfully discussed?	
References (10 marks): a) Is the in-text citation style appropriate and consistent? b) Is the reference list free from careless errors? c) Is the content of the Thesis supported with appropriate in-text primary research citations, or is there over-reliance on reviews?	
Style and Presentation (10 marks): a) Is the Thesis well-organised (e.g. appropriate use of subheadings), succinct and clear? b) Is it of an appropriate length? c) Does the Thesis demonstrate an appropriate use of grammar & punctuation? d) Has care been demonstrated to avoid spelling mistakes and typographical errors? Has the nominated bibliographic style been followed consistently	

Assessor Signature_____ Date_____

Scales: ***H1-D$^+$*** (90 – 100%); ***H1-D$^-$*** (80 – 89%); ***H2A-D$^+$*** (75 – 79%) ***H2A-D$^-$*** (70 – 74%); ***H2B*** (60 – 69%); ***H3*** (50 – 59%); ***F*** (<50%)

Student Name: _____ Assessor Name_____

Thesis Assessment Criteria	Comments
Abstract, Introduction, Aims and hypothesis (15 marks)	
Materials and Methods (15 marks)	
Results (30 marks):	
Discussion (20 marks): *NB Please take into account that the discussion is written by the student with NO input from the supervisor.*	
References (10 marks):	
Style and Presentation (10 marks):	

Comments:

Assessor Signature_____ Date_____

Appendix B: Supervisor's Assessment Form

Student Name:
Supervisor Name:

The aim of this form is to allow supervisors the opportunity to provide confidential feedback on the overall level of commitment, engagement, communication, effort and achievement on the part of their students. You are encouraged to consult with any co-supervisors or team members. This form will not be shared with the students.

Please assess your student's performance against the five key attributes listed below, using the four qualitative descriptors provided. Two examples are provided at the end of the form to help with calibration.

You may also provide written feedback if desired, but this is not a requirement.

Attribute	**Assessment***
1. Motivation & commitment	
2. Participation, collegiality & engagement	
3. Communication	
4. Written submissions and deadlines	
5. Effort and accomplishment	

*Poor, satisfactory, good, excellent

What is your overall assessment of the student's Honours performance, taking into account project challenges, complexity, effort and accomplishments?	**/100**

NB: this feedback evaluation is worth 10 of the 60 total marks awarded for this unit.

For your information the marking bands for assessment are as follows:

Class	**Mark breakdown**
HD1	90% - 100%H1: HD+ 80% - 89%H1: HD-
HD2A	75% - 79%H2A: D+ 70% - 74%H2A: D-
HD2B	60% - 69% H2B: CR
Third Class	50% - 59%H3: Pass
Fail	Fail: N+ Less than 50 %

Any other feedback/comments (optional):

Example 1 (poor):

1. Lacked enthusiasm and engagement for the project; unmotivated and needing frequent prompts/reminding to get things done; no initiative; poor work ethic.
2. Frequently absent from lab meetings/journal clubs; rarely contributed to discussions or asked questions; no attempts made to integrate with the rest of the team.
3. Poor oral and/or written communication with supervisor or team members.
4. Late to submit work for feedback; not meeting submission deadlines; poor quality drafts with little evidence of improvement after feedback.
5. Minimal effort in mastering new skills; large amounts of unproductive time; required constant supervision, with poor technical competency; slow to generate data or outputs; poor project awareness and problem-solving abilities.

Example 2 (Excellent):

1. Extremely enthusiastic and engaged in the project; self-motivated, independent, showed high levels of initiative; excellent work ethic.
2. Always present at lab meetings/journal clubs; frequently contributed to discussions and asked questions; highly collegial and active, valued team member..
3. Excellent oral and written communication with supervisor and/or team members.
4. Submitted work with plenty of time for feedback; consistently met submission deadlines; provided well-written and edited drafts, demonstrating significant improvement after feedback
5. Worked very hard to master new skills; worked productively and independently, with negligible down-time time; highly competent technically; generated large amounts of data or outputs; highly developed and mature project awareness and excellent problem-solving abilities.

School of Biomedical Sciences

Honours in Medical Research

Seminar Reflection Worksheet

Student name and date:

Seminar presenter (name):

Seminar title or topic:

Background and rationale:

Design & methodology:

Findings and take-home message:

Presentation lessons:

Enrolment in Honours in Medical Research for 2025

DECIDING ON AN HONOURS PROJECT

A list of Honours projects for 2025 is provided in the final section of this Booklet. Once you have identified a project of interest you should promptly contact the project Supervisor(s) to discuss the project. If you and a Supervisor agree to you undertaking a particular project you should then you can formally apply for entry to the Honours program.

All students must identify a project and supervisor before attempting to enrol.

Note: supervisors often have other projects that may not be listed in this booklet; if you are interested in undertaking an Honours project with a specific supervisor, arrange to meet with them and discuss options.

Identify the appropriate Entry Requirements

Students with a Biomedical Sciences or Biomedical Major:

If you have completed a Biomedical Science Major with an average of 65% or better in third year Units contributing to the major, you are eligible to apply directly online:

https://handbooks.uwa.edu.au/undergraduate/honoursdetails?code=HON-BIOMS

Students without a Biomedical Sciences or Biomedical Major:

The key requirement is that both UWA- and non-UWA applicants can demonstrate the equivalent of a 65% average in third year major units in disciplines that are relevant to their proposed project. Supporting documentation uploaded must include a brief research proposal with confirmation from the relevant supervisor, School or Research Institute that general facilities are available to support the project.

Submit an application

Step 1: Register your agreed project with the UWA Biomedical Sciences office.

Once you have met with your prospective supervisor, the project has been confirmed, and the necessary induction programmes have been advised, please complete the yellow 'Application for Medical Research Honours form' included in this Handbook. This Form must be submitted to the Administrative Office, School of Biomedical Sciences, UWA, prior to enrolling so that the School knows that a project and Supervisor have been assigned to you, when making a decision regarding approval of your on-line application.

Step 2: Apply to the Honours Programme.

Visit the UWA Honours page for links to the UWA application portals
http://www.studyat.uwa.edu.au/courses-and-careers/honours#aust
Use the following codes when applying:
BMED (Honours), Course Code: BH006, Major/Program Code: HON-BIOMS,

Step 3: Enrol in the appropriate units.

You will need to enrol in the Bachelor of Biomedical Science (Honours) six units shown below: BMED4001, BMED4002, BMED4003, BMED4004, BMED4005, BMED4006.

Please refer to Student Central for advice on enrolment dates and fees.

THIS PAGE IS INTENTIONALLY LEFT BLANK

Application for Honours in Medical Research 2025

To be filled in by STUDENT:

Name: Student No:

Primary Supervisor:

E-mail address: Contact Number:

Mailing address:

Biomedical Sciences Supervisor (if different from above):

E-mail address: Contact Number:

Mailing address:

Project Title:

Honours Booklet Page No: (if applicable)

To be filled in by SUPERVISOR:

Names of **two** suitably qualified examiners who have agreed to examine the student:

Name:

Position & Institution:

Email address: Contact number:

Name:

Position & Institution:

Email address: Contact number:

Honours Induction Checklist *– Supervisors, please indicate whether the above student will need to take any of the following induction programmes or ethics approvals:*

☐ PAWES (Program in Animal Welfare, Ethics and Science)

☐ Gene Technology

☐ Radioisotope handling course

Other programmes required:

☐

☐

Ethics Requirements:

Non-human animal Research ethics approval - required ☐ already approved ☐

Human Research ethics approval - required ☐ already approved ☐

I agree to supervise this student in honours for 2025.

Supervisor's signature: Date:

THIS PAGE LEFT BLANK INTENTIONALLY

Honours Projects Available in 2025

Research Project Proposal 2025

Primary supervisor (name):	Dr Andrew Stevenson
Contact details (phone; email; location)	Andrew.stevenson@uwa.edu.au, 0411153512, Harry Perkins North level 5
Other supervisor/s if any (name):	Mark Fear, Yu Suk Choi, Fiona Wood
Contact details (phone; email; location)	Mark.fear@uwa.edu.au yusuk.choi@uwa.edu.au, Fiona.wood@health.wa.gov.au, Harry Perkins North level 5 and Anatomy, Physiology and Human Biology - North
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**The impact of matrix stiffness on skin fibroblasts**
Project location:	Harry Perkins North Level 5 and Anatomy Building
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	The Burn Injury Research Unit aims to reduce or eliminate the scarring that occurs after burn injury, and one of the areas we are examining is the effect of the stiffness of the extracellular matrix on the phenotype of the scar and normal skin cells. Scars have a stiffer matrix than normal skin, and cells can sense this through a process called mechanotransduction. This 'abnormal' stiffness can cause the cells to proliferate and may prevent the cells from returning to a 'normal' phenotype. This project will examine the effects of different stiffness matrices on different types of scar and normal skin cells, using a variety of cell culture models such as polyacrylamide gels, and measure changes using molecular biology and image analysis techniques. The student will be integrated in a team of researchers from a variety of fields such as chemistry, molecular biology and medical practitioners. The project will further our understanding of skin fibroblasts subtypes, providing important insight into possible therapeutic approaches to promote regeneration rather than scar formation after injury.

Research Project Proposal 2025

Primary supervisor (name):	Dr August Mikucki
Contact details (phone; email; location)	Ph: +61 421 244 570 Email: august.mikucki@telethonkids.org.au or august.mikucki@uwa.edu.au Telethon Kids Institute, 15 Hospital Ave, Nedlands WA 6009
Other supervisor/s if any (name):	Dr Janessa Pickering
Contact details (phone; email; location)	Ph: +61 422 847 654 Email: janessa.pickering@telethonkids.org.au Telethon Kids Institute, 15 Hospital Ave, Nedlands WA 6009
Other supervisor/s if any (name):	Dr Jua Iwasaki
Contact details (phone; email; location)	Email: jua.iwasaki@telethonkids.org.au Telethon Kids Institute, 15 Hospital Ave, Nedlands WA 6009
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Determining the role of a novel RNA chaperone in the virulence of Group A *Streptococcus***
Project location:	Telethon Kids Institute, 15 Hospital Ave, Nedlands WA 6009
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	**Background:** *Streptococcus pyogenes* (Group A *Streptococcus*, GAS) is a global priority pathogen causing a spectrum of illnesses from mild pharyngitis and impetigo to life-threatening invasive disease and lifelong immune complications including acute glomerulonephritis and rheumatic heart disease (1). Although regulation of bacterial gene expression is best understood to occur through modulation of gene transcription, an entire additional layer of gene regulation exists which operates post-transcriptionally. Post-transcriptional regulation of RNA often acts on the expression hundreds of genes simultaneously and is a critical tool used by bacteria to respond to their environment or host. Such regulation commonly involves multiple RNA-binding proteins which modulate mRNA translation or stability through direct protein-RNA interactions or indirectly by facilitating interactions with small regulatory RNAs (sRNAs) (2, 3). Although GAS is known to encode multiple sRNAs with important roles in virulence (4), this organism does not encode homologs for common RNA binding proteins and the role of RNA binding proteins in GAS is unknown. A recent study by our collaborators has identified that a homolog of conserved virulence factor D (CvfD) from *S. pneumoniae* is present in GAS genomes and is essential for survival under in vivo conditions (5). This project will characterise the CvfD homolog in GAS and determine its potential role in GAS virulence. **Aims:**

1. Construct and verify an inducible *cvfD* knock-down mutant using a recently published doxycycline-inducible CRISPR interference system.
2. Characterise the growth, antimicrobial resistance profile, and stress response of the knock-down mutant in vitro using a combination of growth studies, antimicrobial susceptibility testing, and stress-response assays.
3. Determine the impact of *cfvD* knock-down on GAS infection into human cell-lines.
4. Measure the impact of *cvfD* knockdown on virulence gene expression using RT-qPCR.

Outcomes: In this project you conduct the first investigation into the role of RNA chaperone proteins in GAS virulence. By characterising a mutant GAS strain lacking CvfD, you will determine the role of this protein in regulating colonisation of human cells, antimicrobial resistance, stress response, and bacterial growth. You will also determine the role of this regulator in virulence by measuring its impact on the expression of important virulence factors known to play a role in GAS disease. This project will lay the foundation for larger RNAseq, RNA-RNA interaction, and RNA-protein interaction studies to help determine the role of CvfD and other proteins in coordinating gene expression in GAS to better understand and control this important pathogen.
Techniques: bacterial culture; molecular cloning; bacterial mutagenesis; gene knock-down using CRISPR interference; maintenance of human cell-lines; primer design; RT-qPCR; antimicrobial susceptibility testing.
References/further reading:

1. Brouwer S, Rivera-Hernandez T, Curren BF, Harbison-Price N, De Oliveira DMP, Jespersen MG, et al. Pathogenesis, epidemiology and control of Group A *Streptococcus* infection. Nature Reviews Microbiology. 2023;21(7):431-47.
2. Amemiya HM, Schroeder J, Freddolino PL. Nucleoid-associated proteins shape chromatin structure and transcriptional regulation across the bacterial kingdom. Transcription. 2021;12(4):182-218.
3. Hołówka J, Zakrzewska-Czerwińska J. Nucleoid Associated Proteins: The Small Organizers That Help to Cope With Stress. Frontiers in Microbiology. 2020;11.
4. Xiong Z-Q, Lv Z-X, Song X, Liu X-X, Xia Y-J, Ai L-Z. Recent Research Advances in Small Regulatory RNAs in *Streptococcus*. Current Microbiology. 2021;78(6):2231-41.
5. Jespersen MG, Hayes AJ, Tong SYC, Davies MR. Pangenome evaluation of gene essentiality in *Streptococcus pyogenes*. Microbiology Spectrum. 2024;0(0):e03240-23.

Research Project Proposal 2025

Primary supervisor (name):	Dr Belinda Guo
Contact details (phone; email; location)	6457 2980; belinda.guo@uwa.edu.au; M Block QEII
Other supervisor/s if any (name):	A/Prof Kathy Fuller
Contact details (phone; email; location)	6457 3192; kathy.fuller@uwa.edu.au; M Block QEII
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Next-generation sequencing of platelets to monitor blood cancers**
Project location:	Translational Cancer Pathology Laboratory, UWA, M block, QEII Medical Centre
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Myelofibrosis is an aggressive bone marrow cancer that can ultimately lead to bone marrow failure due to scar tissue (fibrosis) forming in the bone marrow which prevents production of blood cells. This can be highly debilitating with increased infections, bleeding, and anaemia and risk of developing acute myeloid leukaemia. The only possibility of cure is with a bone marrow transplant and this treatment is offered in WA. Leading work from our group demonstrated that platelets in patients with myelofibrosis have altered gene expression and we have developed a novel blood sequencing method to detect this. The aim of this project is to determine whether monitoring for changes in the abnormal expression is able to inform us about the disease status and success of the transplant. If this is proven, then monitoring platelet gene expression may provide a better method to assess patient outcome than what's currently possible. In this project, you will take a world-first approach, using our new genomic techniques, to address this problem by studying gene expression in blood platelets of patients who have received a transplant for myelofibrosis. You will use research methods pioneered in our Translational Cancer Pathology Laboratory at UWA. This includes handling patient samples, blood cell isolation, RNA extraction and next generation sequencing as well as bioinformatics. Keywords: haematology, cancer, next-generation sequencing, biomarkers, bioinformatics

Research Project Proposal 2025

Primary supervisor (name):	Dr Janessa Pickering
Contact details (phone; email; location)	Ph: +61 422 847 654 Email: janessa.pickering@telethonkids.org.au Telethon Kids Institute, 15 Hospital Ave, Nedlands WA 6009
Other supervisor/s if any (name):	Dr August Mikucki
Contact details (phone; email; location)	Ph: +61 421 244 570 Email: august.mikucki@telethonkids.org.au or august.mikucki@uwa.edu.au Telethon Kids Institute, 15 Hospital Ave, Nedlands WA 6009
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Characterising novel inter-microbial interactions for the control of Group A *Streptococcus***
Project location:	Telethon Kids Institute, 15 Hospital Ave, Nedlands WA 6009
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	**Background:** *Streptococcus pyogenes* (Group A Streptococcus, GAS) colonises the oropharynx (throat) and skin of humans, with around 10% of people thought to be colonised at any given time (1). Although commonly asymptomatic, infection with GAS can result in mild infections including pharyngitis and impetigo or, more rarely, sever invasive disease which is life-threatening. Repeated pharyngitis in an individual places them at risk of developing acute rheumatic fever, which after multiple episodes may result in rheumatic heart disease (RHD). A massively disproportionate burden of RHD in Australia is carried by Indigenous Australians living in remote communities, and novel strategies for GAS treatment and prevention are urgently needed. Primary prevention of GAS infection is the best way to prevent RHD. However, no vaccines are currently licenced for GAS. One strategy of recent interest for the prevention of bacterial disease is to exploit the antagonistic interactions between microbes sharing the same niche to prevent colonisation with the pathogen. Probiotic prevention has been proposed for several other respiratory bacteria including *Haemophilus influenzae (2), Streptococcus pneumoniae (3)*, and *Neisseria meningitidis (4)*, with each at varying levels alone the implementation pipeline. Our team is interested in exploiting the oropharyngeal microbiota for the prevention of GAS infection. To this end, we utilised a subset of 240 swabs collected from the throat and skin of school-aged children. Using an agar-overlay method, we have identified 215 commensal isolates with some inhibitory activity against GAS. These isolates are currently undergoing species identification, and this project will seek to characterise our most promising leads. **Aims:**

1. Characterise the range of inhibitory activity of lead candidates against a range of GAS isolates and related members of the oropharyngeal microbiome in agar-overlay and cross-streaking assays.
2. Determine if the mechanism of inhibition in lead candidates is contact-dependent or -independent using a combination of co-culture and cell-free conditioned media experiments.
3. Search the genome of lead candidates for potential genes or gene clusters which may be responsible for the inhibitory phenotype and assess the distribution of these genes in publicly available genomes.

Outcomes: This project is the first step in the development of a novel probiotic or postbiotic for the control of GAS colonisation and infection. You will determine the suitability of lead candidate organisms in terms of range of activity and begin to characterise the mechanisms through which inhibition occurs. This project has significant potential to build into further work to develop our lead candidates into a product which may be used for GAS prevention in the future.

Techniques:
Bacterial culture; bacterial identification; interbacterial inhibition assays including agar overlay, spot tests, cross-streaking, co-culture, and conditioned media experiments; bacterial genomics including assembly, annotation, and functional gene cluster identification.

References/further reading:

1. Brouwer S, Rivera-Hernandez T, Curren BF, Harbison-Price N, De Oliveira DMP, Jespersen MG, et al. Pathogenesis, epidemiology and control of Group A *Streptococcus* infection. Nature Reviews Microbiology. 2023;21(7):431-47.
2. Pickering JL, Prosser A, Corscadden KJ, de Gier C, Richmond PC, Zhang G, et al. Haemophilus haemolyticus Interaction with Host Cells Is Different to Nontypeable Haemophilus influenzae and Prevents NTHi Association with Epithelial Cells. Frontiers in Cellular and Infection Microbiology. 2016;6.
3. Horn KJ, Jaberi Vivar AC, Arenas V, Andani S, Janoff EN, Clark SE. *Corynebacterium* Species Inhibit *Streptococcus pneumoniae* Colonization and Infection of the Mouse Airway. Frontiers in Microbiology. 2022;12.
4. Custodio R, Johnson E, Liu G, Tang CM, Exley RM. Commensal *Neisseria cinerea* impairs *Neisseria meningitidis* microcolony development and reduces pathogen colonisation of epithelial cells. PLOS Pathogens. 2020;16(3):e1008372.

Research Project Proposal 2025

Primary supervisor (name):	A/Prof Jason Waithman Dr Bree Foley Dr Jesse Armitage Dr Hannah Newnes (dependent on specific project)
Contact details (phone; email; location)	jason.waithmain@uwa.edu.au M Block bree.foley@uwa.edu.au M Block jesse.armitage@uwa.edu.au M Block hannah.newnes@uwa.edu.au M Block
Project title:	**Improving the Immune Response to Cancer**
Project location:	M Block, QEII Campus
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Our research program focusses on understanding and improving the immune response to cancer. Cancer immunotherapy as a discipline is delivering promising and vital alternatives for both adults and children in our efforts to control and cure cancer. However, immunotherapies overall provide vastly diverse outcomes between different patients and cancer types. Several key questions about why this might occur, or how to maximise the potential of immunotherapy, still remain. Our team deliberately seeks to answer the most complex immunological questions to provide meaningful, functional data so the full promise of immunotherapy can be realised. Our team harnesses the power of basic science, molecular biology, and genomics to forge tangible solutions that can dramatically improve the survival of people with cancer; with a specific focus on individual's with melanoma, sarcoma and leukaemia. We have three main areas of focus: 1. Utilising genetic engineering to develop tailored immunotherapies to tackle the barriers limiting treatment of solid cancers (Led by A/Prof Jason Waithman and Dr Hannah Newnes) 2. Enhancing natural killer (NK) cells to eliminate cancer and developing 'off the shelf' adoptive cell therapies from healthy donors (Led by Dr Bree Foley) 3. Utilising multiomics technologies to identify differences in the anti-tumour immune response and applying the latest bioinformatics analytical tools (Led by Dr Jesse Armitage) The core values underpinning our team are research excellence and innovation, which we achieve by embracing an entrepreneurial mindset in all our studies and by applying a multi-disciplinary lens on our work with the help of our collaborators. We are applying the latest disruptive technologies, such as single cell sequencing, to challenge existing dogma and assumptions associated with many of the significant problems and frustrations faced in the clinic. Finding solutions to complex issues requires an exceptionally capable team, which we have assembled. While there is no doubt that future

	obstacles will impede our ability to treat every person successfully – a key goal of our team is to continue to train the next generation of great researchers with the requisite skills to overcome those challenges on the horizon. We encourage all interested students (PhD, Masters, Honours) to contact us and discuss specific project options.

Research Project Proposal 2025

Primary supervisor (name):	Dr Jessica Buck
Contact details (phone; email; location)	Jessica.buck@telethonkids.org.au Telethon Kids Institute
Other supervisor/s if any (name):	TBD, Project Dependent
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	TBD, Project Dependent
Contact details (phone; email; location)	
Project title:	**Understanding cancer in Indigenous kids**
Project location:	Telethon Kids Institute
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Very little is known about cancer in Indigenous children. Research has shown that Aboriginal kids with some types of cancer, such as leukaemia, have worse outcomes. Our clinicians believe that Aboriginal kids are more likely to experience side effects from their cancer treatment, though currently we have no evidence of this. Our research aims to study cancer in Indigenous kids, including cancer biology, genomics, and community attitudes to research. This project would involve co-designing with Aboriginal communities culturally safe ways of conducting laboratory research in cancer. In particular, we will examine the creation of patient derived cancer cell lines from Aboriginal and Torres Strait Islander patients, along with the ethical and cultural implications of biobanking samples. A second potential project, conditional on achieving ethics approval, could be designed around understanding the genomics of cancer and long-term side effects in Indigenous children, for those with an interest in bioinformatics or genomics. This research is Aboriginal-led, and preference will be given to Indigenous students. Top-up scholarships are available for Indigenous students, along with opportunities for further masters or PhD study.

Research Project Proposal 2025

Primary supervisor (name):	Dr Annabel Short, Dr Jessica Buck, Dr Brittany Dewdney
Contact details (phone; email; location)	Dr Jessica Buck – jessica.buck@telethonkids.org.au; Dr Annabel Short – annabel.short@telethonkids.org.au; Dr Brittany Dewdney – brittany.dewdney@telethonkids.org.au; Telethon Kids Institute
Other supervisor/s if any (name):	A/Prof Raelene Endersby
Contact details (phone; email; location)	Raelene.endersby@telethonkids.org.au; Telethon Kids Institute
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	Dr Sonia Fernandez
Contact details (phone; email; location)	Sonia.fernandez@uwa.edu.au
Project title:	**Developing innovative treatments for paediatric brain cancers**
Project location:	Telethon Kids Institute
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	The Brain Tumour Research team at Telethon Kids is co-directed by Professor Nick Gottardo and A/Prof Raelene Endersby. The overarching goals of our group are to define the poorly understood basic biology of several types of childhood brain tumours and improve therapies. We achieve this in the following ways: • Elucidate the molecular basis of different brain tumour types, including medulloblastoma and ependymoma among others, through the analysis of primary patient specimens. • Improve understanding of the molecular events contributing to these diseases, by analysing the impact of altered signalling pathways on survival, proliferation, invasiveness and tumorigenicity of brain tumour cells. • Develop comprehensive preclinical models of paediatric brain tumours in which to test new treatments. We utilise transplantable xenograft, patient derived xenograft, and genetically engineered tumour models representative of paediatric brain cancer in our translational research. • Obtain and test new therapies within our preclinical pipeline that considers all aspects of standard of care treatment, including brain tumour resection surgery, MRI imaging, clinical chemotherapy, and radiation protocols in appropriate brain tumour models. We acquired Australia's first X-RAD SmART platform to model clinical radiation treatment and are currently investigating new therapies that can enhance its efficacy to hopefully reduce the harmful radiation dose. • Translate our findings into improved therapies through clinical collaborations. We currently have a project opportunity for a self-motivated and enthusiastic individual. We invite you to meet with us to discuss

	specific projects. The student will develop expertise in a wide range of technologies including: • Animal techniques • Histology such as paraffin sectioning and immunohistochemistry • Cell/tissue culture from mouse and human specimens • Molecular techniques including DNA/RNA analysis, PCR and cloning • Biochemical techniques such as protein extraction, western blotting and IP Students are expected to have or develop excellent writing and oral presentation skills.

Research Project Proposal 2025

Primary supervisor (name):	Dr Jessica Mountford
Contact details (phone; email; location)	(08) 9381 0799 Jessica.mountford@lei.org.au Jessica.mountford@uwa.edu.au Lions Eye Institute, 2 Verdun St, Nedlands.
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	Prof Jeffery Keelan
Contact details (phone; email; location)	jeff.keelan@uwa.edu.au
Project title:	**Investigating causative factors of early-onset myopia in zebrafish as a model of refractive error.**
Project location:	Lions Eye Institute
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	**Background:** Myopia, or near-sightedness has rapidly become one of the world's leading causes of distant visual impairment. Following excessive axial elongation of the eye, myopia results in refractive error, the second leading cause of disability in the world, as light entering the eye is focused in front of, rather than on the neural retina. Left untreated, high myopia (>-5.00 diopters) can lead to other visual disorders such as retinal detachment, retinal atrophy, myopic maculopathy, glaucoma, and cataracts. Prevalence rates are as high as 97% in some countries (namely within East Asia) and at 25% here in Australia. However, the World Health Organisation has predicted approximately 3.36 billion people worldwide will become myopic by the year 2030 and this is expected to increase to 50% by the year 2050, with 10% of those developing into high myopia. Therefore, it is a condition that is forecast to increasingly burden the healthcare system globally. Sadly, the fastest rise in prevalence is occurring in school-aged children as young as 6 years of age, whereby early-onset or juvenile myopia develops. There are several contributing factors attributed to the development of myopia, including both genetics and environmental determinants such as near-work (reading, screen time and schoolwork) and time spent outdoors. The rise in myopia prevalence, however, is occurring at a rate too rapid to be attributed to genetic variance or environmental factors alone, suggesting a compelling association between complex genetic interactions and environmental risk factors, yet the fundamental causal mechanisms remain unknown. **Aims:** This project aims to help understand the roles of myopia- associated

genes selected from large human Genome Wide Association Studies (GWAS) by testing them experimentally in a reverse genetics model of refractive error.

Design: This project will utilise a morpholino anti-sense oligonucleotide knockdown approach in zebrafish embryos within our established, robust, and rapid myopia-associated gene screening platform. By utilising the rapid, *ex vivo* development of the zebrafish embryo and larvae, genes of interest were chosen from large human GWAS and identified in our group as contributing to increased axial length, the greatest contributing factor leading to refractive error, and diagnostic metric used in humans. This project aims to characterise the role of these identified genes through a range of both structural and functional analyses as well as molecular techniques such as qPCR and gene expression.

Techniques: Single cell microinjection of morpholino oligomers (MO) in zebrafish embryos; live imaging microscopy (fluorescence microscopy; optical coherence tomography (OCT); zebrafish handling and husbandry; RNA extraction; generation of cDNA; RT-PCR; qPCR; gel electrophoresis; gene sequencing; and live functional optokinetic response testing.

Outcomes: The potential significance emerging from the outcomes of this project are anticipated to contribute considerably to the framework of understanding the biological pathways and links between genetic and environmental factors in the development of myopia and in particular early-onset myopia. Identifying which GWAS selected genes are responsible for a myopic phenotype forms an initial screening for further testing, including generation of stable knockout lines of zebrafish and pharmaceutical testing.

References:

Holden, B. A., Fricke, T. R., Wilson, D. A., Jong, M., Naidoo, K. S., Sankaridurg P. *et al.* (2016). Global prevalence of myopia and high myopia and tempora trends from 2000 through 2050. Ophthalmology **123**, 1036-42.

Baird, P. N., Saw, S., Lanca, C. *et. al.* (2020). Myopia. Nat Rev Dis Primers. **6** 99.

Hysi, P. G., Choquet, H., Khawaja, A. P., Wojciechowski, R. and Tedja, M. S. *et al.* (2020). Meta-analysis of 542, 934 subjects of European ancestry identifies new genes and mechanisms predisposing to refractive error and myopia. Nat Genet **52**, 401-407.

Research Project Proposal 2025

Primary supervisor (name):	Dr Jonathan Chee
Contact details (phone; email; location)	Jonathan.chee@uwa.edu.au; QEII Medical Centre, Harry Perkins Institute Level 5
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
Project title:	**Developing a novel T cell biomarker of islet pathology**
Project location:	School of Biomedical Science, Perkins Level 5
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Type 1 Diabetes (T1D) is an organ-specific autoimmune disease in which T cells destroy insulin producing beta cells within the pancreatic islets. There is no cure for T1D, and the disease is managed by insulin injections. Islet pathology occurs before clinical disease, and this project seeks to develop novel blood biomarkers of islet pathology based on T cells. T cells that target islet antigens can be detected in the blood of patients that developed T1D. However, a bottleneck is the identification of T cells that are actually specific for islet antigens. The current approach involves isolating islet-reactive T cell clones from patient blood or islets, but the process is technically challenging. We propose the use of deep learning on T cell receptor sequencing (TCR) data to identify islet-specific TCRs in the peripheral blood and pancreatic islets. Each unique TCRβ sequence is a tag for a unique T cell clone, sequence based profiling of T cells is a useful tool for monitoring antigen-specific T cells In this project, we will apply a published deep learning algorithm on TCR data in a well characterised model of autoimmune diabetes (NOD mouse). In this model, we were the first to describe that the frequency of CD8+ T cells specific for an islet antigen (IGRP) in the peripheral blood increased with the severity of islet pathology. We have extensively characterised the TCRs of IGRP specific CD8+ T cells. In this project, we will isolate blood and islets from NOD mice at different stage of disease, sequence TCRβs and apply deep learning algorithms to identify TCRs that are predictive of islet pathology. We hypothesize that this approach will be able to identify a peripheral blood TCR signature predictive of islet pathology, and that this signature will consist of IGRP reactive clones. There are promising immunomodulatory agents that can delay diabetes onset by targeting T cells. This project is important for developing novel, non-invasive strategies to monitor islet autoimmunity.

Research Project Proposal 2025

Primary supervisor (name):	Dr Kofi Stevens
Contact details (phone; email; location)	Jonathan.chee@uwa.edu.au; QEII Medical Centre, Harry Perkins Institute Level 5
Other supervisor/s if any (name):	Dr Jonathan Chee Dr Andrew Crowe Dr Delia Nelson
Contact details (phone; email; location)	Jonathan.chee@uwa.edu.au
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Repurposing anti-copper drugs to improve mesothelioma immunotherapy**
Project location:	
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Mesothelioma is an incurable cancer. While new therapies that increase anti-cancer immune responses have shown promise, most patients do not benefit from immunotherapy. Metals such as copper accumulate in mesothelioma, are essential for tumour growth and help cancers evade the immune response. Using copper-binding drugs, we aim to reduce the copper available to the cancer, and understand how it improves the function of anti-cancer immune cells. We will investigate the changes in gene and protein expression of tumour cells in response to copper and copper chelation therapy. Additionally we will characterise the effect of treatments on immune cell (Tcells and macrophages) activity in-vitro. We will assess Tcell mediated killing of tumour cells using in-vitro coculture assays in the presence of copper chelation therapies. Finally, we will determine the activity of copper chelation therapies in-vivo, and their effect on the tumor microenvironment. As these copper-binders are clinically approved for use in other diseases, they are novel drugs that can be repurposed to improve immunotherapies for patients with mesothelioma

Research Project Proposal 2025

Primary supervisor (name):	Dr Jua Iwasaki
Contact details (phone; email; location)	Jua.Iwasaki@telethonkids.org.au; Telethon Kids Institute
Other supervisor/s if any (name):	Dr Timothy Barnett
Contact details (phone; email; location)	timothy.barnett@uwa.edu.au; School of Biomedical Sciences and Telethon Kids Institute
Other supervisor/s if any (name):	Ms Alisha Wilson
Contact details (phone; email; location)	Alisha.Wilson@telethonkids.org.au; Telethon Kids Institute
SBMS Coordinating supervisor (for non-SBMS supervisors)	Dr Timothy Barnett
Contact details (phone; email; location)	timothy.barnett@uwa.edu.au; School of Biomedical Sciences and Telethon Kids Institute
Project title:	**A novel vaccine to prevent Group A *Streptococcus* attachment to the tonsils**
Project location:	Telethon Kids Institute
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Group A *Streptococcus* (GAS) is responsible for over 500,000 deaths each year due to invasive infections and autoimmune sequelae. Underlying these severe diseases is GAS infection of the tonsils, commonly called "Strep throat". Globally, there are more than 600 million cases of Strep throat each year. The World Health Organization has declared development of a GAS vaccine a global priority to reduce mortality and morbidity from GAS infections and associated antibiotic use. Current GAS vaccine approaches are aimed at preventing symptomatic disease, yet asymptomatic GAS infections are immunologically significant and potentially trigger autoimmune diseases and seed GAS infections in sterile sites (invasive infections). To combat the burden of GAS diseases, we are developing a pre-clinical vaccine candidate to stop the initial attachment of GAS to healthy tonsils, which is the first step in a Strep throat infection. As part of this vaccine development, this project aims to: 1. Identify targets of antibodies that can block diverse GAS strains. 2. Develop a multi-valent vaccine against GAS. This project will involve bacterial culturing, molecular cloning, tissue culture and protein expression and purification.

Research Project Proposal 2025

Primary supervisor (name):	Dr Henry Hui
Contact details (phone; email; location)	henry.hui@uwa.edu.au; M Block QEII
Other supervisor/s if any (name):	A/Prof Kathy Fuller
Contact details (phone; email; location)	6457 3192; kathy.fuller@uwa.edu.au; M Block QEII
Other supervisor/s if any (name):	Prof Wendy Erber
Contact details (phone; email; location)	6457 3165; wendy.erber@uwa.edu.au; M Block QEII
Project title:	**Precision diagnosis for the care of patients with blood cancers**
Project location:	Translational Cancer Pathology Laboratory, UWA, M block, Queen Elizabeth II Medical Centre. Nedlands 6009
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Blood cancers are the third most common cancer and the second highest cause of cancer-related death in Australia. The incidence is increasing, and Australia is concerned about the number of cases and deaths. There are many types of blood cancers and these are characterised by different clinical behaviour, genetics and response to treatments. Detection of genetic abnormalities is critical to ensure the diagnosis is accurate, the risk to the patient accurately predicted and optimal treatment offered. Current genetic methods used in pathology focus on chromosomes with up to 200 cells being analysed. This may be insufficient to identify subsets of cells with prognostically-important genetic changes. Our team has invented a new type of flow cytometry test that is fast and automated and can be used to analyse thousands of blood cancer cells. This method can focus on the cells of interest (the cancer cells) by quantifying proteins to determine the cell identity (immunophenotype) and, simultaneously, detect chromosomes within the cells. This method, called “immuno-flowFISH”, is exquisitely sensitive in detecting critical genetic abnormalities in blood cancers. We have studied acute leukaemia, chronic leukaemias and multiple myeloma, and in each, been able to identify the cancers cells in blood and bone marrow with key genetic changes that will impact patient care. The aim of this project will be to identify high risk cytogenetic chromosomal changes, such as del(17p) or loss of the TP53 gene by immuno-flowFISH in leukaemia. In this project, you will use research methods pioneered in our Translational Cancer Pathology Laboratory at UWA. This includes handling patient samples, immuno-flowFISH processing, imaging flow cytometry and data analysis. Keywords: Haematology, leukaemia, cytogenetics, fluorescence *in situ* hybridisation, imaging flow cytometry

Research Project Proposal 2025

Primary supervisor (name):	Dr Liz Johnstone
Contact details (phone; email; location)	6151 0747, liz.johnstone@uwa.edu.au, SBMS and Harry Perkins Institute of Medical Research
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Investigation of G Protein-Coupled Receptor Molecular Pharmacology**
Project location:	Harry Perkins Institute of Medical Research
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Background: G protein-coupled receptors (GPCRs) are critically important targets for pharmaceuticals due to their crucial role in responding to hormonal, neurotransmitter and environmental stimuli. We are looking to develop the next generation of medicines targeting these receptors that are not only more effective, but also have fewer side effects. This requires improved understanding of how GPCRs function at the molecular and cellular level, in terms of ligand binding, signalling, regulation, and cellular trafficking. Aim: to investigate various novel aspects of GPCR molecular pharmacology Design/Techniques: Receptor pharmacology will primarily be monitored using bioluminescence resonance energy transfer (BRET) and other cell-based assays. Receptors and interacting biomolecules (protein and ligands) will be labelled with BRET tags and transfected or added to cells, with resulting interactions monitored using BRET. Outcomes: The results will aid in future drug discovery efforts for the GPCRs under investigation.

Research Project Proposal 2025

Primary supervisor (name):	Prof Mark Nicol
Contact details (phone; email; location)	mark.nicol@uwa.edu.au
Other supervisor/s if any (name):	Dr Ritika Kar Bahal Email: ritika.karbahal@uwa.edu.au Robbie Haines 20919353@student.uwa.edu.au Dr Tim Barnett timothy.barnett@telethonkids.org.au
Contact details (phone; email; location)	
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
Project title:	**Targeted mutagenesis of *Corynebacterium* – a key member of the nasopharyngeal microbiome**
Project location:	The Marshall Centre of Infectious Diseases, School of Biomedical Sciences, The University of Western Australia
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	A range of different species belonging to the genus *Corynebacterium* are thought to play an important role in human nasopharynx. The members of this genus are important for maintaining a stable microbiome and reduce susceptibility to respiratory tract infections. In this project we aim to understand the mechanisms that *Corynebacterium* uses to provide colonization resistance against pathogens. This will be achieved through making knockout mutants of key genes of *Corynebacterium* and then screening these mutants for loss of function phenotype. **Aims:** Research questions: What are the key genes of *Corynebacterium* involved in interactions with respiratory pathogens? **Techniques:** Microbiology culturing, *in silico* primer designing, in silico designing of cloning strategy, polymerase chain reaction (PCR), cloning of genes into vectors, transformation of vectors into bacterium, mutant screening and selection, sequencing for mutant confirmation, bioassays for screening of loss of phenotype. **Reference(s):** 1. Claassen-Weitz S, Gardner-Lubbe S, Xia Y, Mwaikono KS, Mounaud SH, Nierman WC, et al. Succession and determinants of the early life nasopharyngeal microbiota in a South African birth cohort. Microbiome. 2023;11(1):127. 2. Chang, Chungyu, Minh Tan Nguyen, and Hung Ton-That. "Genetic manipulation of Corynebacterium diphtheriae and other Corynebacterium species." Current protocols in microbiology 58.1 (2020): e111.

Research Project Proposal 2025

Primary supervisor (name):	Prof Mark Nicol
Contact details (phone; email; location)	mark.nicol@uwa.edu.au L block, QEII campus
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Systematic reviews to support WHO guideline development for diagnostic stewardship for patients with sepsis**
Project location:	The Marshall Centre of Infectious Diseases, School of Biomedical Sciences, The University of Western Australia
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	We are conducting a series of scoping and umbrella reviews to support the development of global guidelines for diagnostic stewardship (DS) by WHO. DS encompasses interventions that modify "the process of ordering, performing, and reporting diagnostic tests to improve the treatment of infections and other conditions." These interventions can be categorised into pre-analytic, analytic, and post-analytic interventions. Pre-analytic interventions take place before a diagnostic laboratory test (e.g. test ordering and transport), analytic interventions describe specific laboratory test procedures (e.g. specimen quality assessment), and post-analytic interventions take place after a laboratory test has been conducted (e.g. how results are reported). DS is important since it may reduce unnecessary antimicrobial use and testing costs and optimise patient outcomes. This project will focus on diagnostic stewardship for patients with sepsis, and will include (i) a scoping review of clinical practice guidelines for sepsis, with extraction of diagnostic stewardship recommendations, and organizing and mapping these recommendations, (ii) a detailed narrative synthesis of the findings of the scoping review, (iii) umbrella review of selected interventions identified through the scoping review process, which have been prioritized by a WHO expert panel. **Aims:** To identify diagnostic stewardship recommendations for patients with sepsis and identify the evidence underlying these recommendations. **Techniques:**

	Develop search strategy, conduct literature search, perform quality assessment of guidelines, present findings in videoconference with expert panel, develop an understanding of the WHO guideline development process, draft summary of findings report for WHO. **Reference(s):** 1. Morgan DJ, Malani P, Diekema DJ. Diagnostic Stewardship—Leveraging the Laboratory to Improve Antimicrobial Use. JAMA [Internet]. 2017 [cited 2024 Mar 5];318(7):607-608.. 2. Fabre V, Davis A, Diekema DJ, Granwehr B, Hayden MK, Lowe CF, Pfeiffer CD, Sick-Samuels AC, Sullivan KV, Van Schooneveld TC, Morgan DJ. Principles of diagnostic stewardship: A practical guide from the Society for Healthcare Epidemiology of America Diagnostic Stewardship Task Force. Infect Control Hosp Epidemiol. 2023 [cited 2024 Mar 5];44(2):178-185.

Research Project Proposal 2025

Primary supervisor (name):	Prof Mark Nicol
Contact details (phone; email; location)	mark.nicol@uwa.edu.au
Other supervisor/s if any (name):	Dr. Ritika Kar Bahal ritika.karbahal@uwa.edu.au Dr Luke Garratt luke.garratt@telethonkids.org.au
Contact details (phone; email; location)	
Project title:	**Does Staphylococcus aureus modulate the severity of respiratory syncytial virus (RSV) infections?**
Project location:	The Marshall Centre of Infectious Diseases, School of Biomedical Sciences, The University of Western Australia, and Telethon Kids Institute
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	*Staphylococcus aureus* is understood to occasionally cause bacterial superinfection of people with respiratory viral infections, particularly those due to influenza virus. However, recent data suggests that children who have nasopharyngeal colonization with *S. aureus* are less likely to develop symptomatic disease when infected with RSV, than children who are not colonized by *S. aureus.* This is in keeping with previous epidemiological observations by other researchers. *S. aureus* is known to inhibit innate immune responses to establish colonization in the nasal cavity, and strong innate immune responses are known to be associated with increased severity of RSV disease. In this project we will use samples from human subjects infected with RSV with or without *S. aureus* to compare innate immune profiles. In parallel, we will develop a model of *S. aureus* and RSV coinfection on a primary human airway epithelial cell model to explore the underlying mechanisms. **Aims:** Research questions: Does Staphylococcus aureus modulate the severity of RSV infection? **Techniques:** RNA extraction, quantitative real-time PCR, human primary cell culture, viral and bacterial culture, RNASeq, ELISA. **Reference(s):** 1. de Steenhuijsen Piters WA et al. Nasopharyngeal Microbiota, Host Transcriptome, and Disease Severity in Children with Respiratory Syncytial Virus Infection. Am J Respir Crit Care Med. 2016 Nov 1;194(9):1104-1115. 2. Kelly AM, Leech JM, Doyle SL, McLoughlin RM. Staphylococcus aureus-induced immunosuppression mediated by IL-10 and IL-27 facilitates nasal colonisation. PLoS Pathog. 2022 Jul 1;18(7):e1010647.

Research Project Proposal 2025

Primary supervisor (name):	A/Prof Mary Sharp
Contact details (phone; email; location)	mary.sharp@health.wa.gov.au, School of Medicine. King Edward Memorial/Perth Children's Hospital
Other supervisor/s if any (name):	Dr Donna Geddes
Contact details (phone; email; location)	64887006/0415419881; donna.geddes@uwa.edu.au, Molecular Sciences
Other supervisor/s if any (name):	Dr Giselle Yikilmaz
Contact details (phone; email; location)	PREM bank, KEMH. 64581563
SBMS Coordinating supervisor (for non-SBMS supervisors)	A/Prof Demelza Ireland
Contact details (phone; email; location)	demelza.ireland@uwa.edu.au; Biomedical Sciences
Project title:	**Bacterial Composition of Human Milk Bank Donations**
Project location:	King Edward Memorial Hospital/Molecular Sciences
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Often mothers struggle to produce enough milk for their preterm or vulnerable, sick babies due to maternal comorbidities. In this situation, donor human milk is the most desirable option to feed these infants whilst mothers establish their own milk supply. Microbial screening of donor human milk is carried out prior to, thermal processing of donor human milk. Thermal processing is carried out to reduce the bacterial and viral content of the milk to ensure no bacterial transmission to the recipient infant. This study aims to explore the microbial profiles of human milk donations to the sole human milk bank located in WA, the Perron Rotary Express Milk (PREM) bank based at King Edward Memorial Hospital. a. A retrospective audit will be conducted at the Perron Rotatory Express Milk Bank to determine microbial screening findings in donated breast milk. b. Analyses will also determine the volume of milk discarded because of microbial screening. c. Further investigation will determine environmental and maternal associations with Investigate associations microbial screening results. Clifford V, Klein LD, Sulfaro C, et al. What are Optimal Bacteriological Screening Test Cut-Offs for Pasteurized Donor Human Milk Intended for Feeding Preterm Infants? *Journal of Human Lactation*. 2021;37(1):43-51. doi:10.1177/0890334420981013

Research Project Proposal 2025

Primary supervisor (name):	A/Prof Matthew Linden
Contact details (phone; email; location)	(08) 6457 2739 matthew.linden@uwa.edu.au M-Block, QEII (UWA)
Other supervisor/s if any (name):	Dr Blair Johnson
Contact details (phone; email; location)	(08) 9202 1145 blair.johnson@uwa.edu.au Harry Perkins Institute (North)
Other supervisor/s if any (name):	Dr Jacob Kenny
Contact details (phone; email; location)	jacob.kenny@uwa.edu.au M-block, QEII (UWA)
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Characterising an atherogenic model of burn-induced cardiovascular disease**
Project location:	M-block, QEII (UWA); and, Harry Perkins Institute (North)
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Burn injuries are one of the most prevalent traumas, resulting in thousands of hospital admissions across Australia each year. In the past decade, epidemiological studies have demonstrated that burn injuries contribute to an increased risk of morbidities in subsequent years, long after the initial injury itself has healed. We have been investigating mechanisms that could contribute to the cardiovascular disease risk seen in burn survivors, and have evidence that suggests platelets from burn patients are hyperreactive for a prolonged period. Platelets are known to contribute to cardiovascular disease through atherogenesis, the process by which atherosclerotic plaques form (and may subsequently lead to ischemic heart disease). Aims: To directly assess the contribution of burns (and platelets) to atherogenesis in a mouse model Design: In a mouse model that is prone to developing atherosclerosis (Apolipoprotein E knockout), we will compare the number and size of atherosclerotic plaques before and after burn injury. Techniques: Animal care, tissue dissection, sectioning, staining and measuring atherosclerotic plaques in murine vascular tissues by histochemistry. Outcomes: This study will provide evidence of the contribution of burn injury to atherosclerosis. Characterisation of the model will inform subsequent mechanistic studies of burn-associated platelet, endothelial and immunological dysfunction, their contributions to burn-associated atherogenesis, and potential strategies to prevent or treat this condition.

	Further Reading: Johnson BZ, Stevenson AW, Barrett LW, Fear MW, Wood FM, Linden MD. Platelets after burn injury – hemostasis and beyond. Platelets 2022;0:1–11. Johnson BZ, O'Halloran E, Stevenson AW, Wood FM, Fear MW, Linden MD. Non-severe burn injury causes sustained platelet hyperreactivity. Burns 2023.

Research Project Proposal 2025

Primary supervisor (name):	A/Prof Matthew Linden
Contact details (phone; email; location)	M Block, QEII Medical Centre matthew.linden@uwa.edu.au
Other supervisor/s if any (name):	Dr Tara Talebi
Contact details (phone; email; location)	M Block, QEII Medical Centre tahoura.talebikahaki@uwa.edu.au
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**A synthetic hydrogel mimic for training competency in cytometric detection of haematological malignancy**
Project location:	M and L Block, QEII Medical Centre
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Recent innovations in hydrogel technology allow us to design and produce tunable, synthetic hydrogels with optical and antigen properties that mimic cells of diagnostic significance. These cell mimics have potential applications in scientist training and competency assessment in clinical cytometry. Aims: This project aims to evaluate the effectiveness of a prototype cellular mimic of leukaemic cells in a practical laboratory. Design: Students enrolled in the AIMS Accredited Master of Clinical Pathology undertake practical training and competency assessment for flow cytometry cell preparation, staining, and analysis as part of a module on advanced haematological malignancies To assess the effectiveness of incorporating the hydrogel mimic into practical training, a multifaceted evaluation strategy will be implemented. Students will undertake practical training exercises using both healthy control blood only and healthy control blood spiked with the cell mimic. The order in which students undertake the training will be randomized. Post-training competency assessment will be conducted after each exercise. Only the final assessment will contribute to student competency assessment for their studies. To gather qualitative data on the training experience, students will be surveyed upon completion of the module. These surveys will ask about the perceived usefulness of the cell mimic in enhancing their understanding of flow cytometry analysis, their confidence in handling real-world samples, and any suggestions for improvement. Open-ended questions will provide insights into students' subjective experiences and perceptions of the training material's effectiveness. Instructors and laboratory technicians involved in the course will be asked to provide their reflections on the effectiveness of the hydrogel mimic in the training program. This could include observations on student engagement, ease of use of the material, its integration into the

	curriculum, and any noticeable differences in student performance and understanding. These reflections can offer valuable insights into the practical aspects of using the hydrogel mimic in an educational setting. To ensure the ongoing improvement of the training material and curriculum, a feedback loop will be established. This involves the regular collection and analysis of both quantitative and qualitative data to identify areas for refinement. Based on these insights, iterative modifications to the hydrogel properties, training protocols, and instructional methods can be made, enhancing the overall effectiveness of the training program. Techniques: Flow cytometry, scholarship of teaching and learning, student assessment, qualitative research, surveys, interviews, reflective writing. Outcomes: This innovative approach will improve clinical flow cytometry training through a previously unachievable practical learning-by-doing approach in the classroom. To achieve this, we will use a novel, tunable, stable hydrogel material which mimics the optical and antigenic properties of leukaemic cells, thus providing a consistent and readily available material for practical training.

Research Project Proposal 2025

Primary supervisor (name):	A/Prof Matthew Linden
Contact details (phone; email; location)	M Block, QEII Medical Centre matthew.linden@uwa.edu.au
Other supervisor/s if any (name):	Dr Belinda Guo
Contact details (phone; email; location)	M Block, QEII Medical Centre Belinda.guo@uwa.edu.au
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Platelet abnormalities in myeloproliferative neoplasms**
Project location:	M Block, QEII Medical Centre
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Myeloproliferative neoplasms (MPN) are bone marrow cancers that are driven by genetic mutations in progenitor cells and accumulation of somatic mutations in megakaryocytes (MK), which produce blood platelets. Using proteomic pathway analysis, we have identified MK and platelet abnormalities likely related to dysfunctional DNA transcription and abnormal neutrophil emperipolesis. Aims: Measurement of transcription factor 3 (TCF3) network and neutrophil associated proteins in MPN platelets Design: MPN platelets will be purified from patient blood samples or generated from a megakaryoblastic cell line. Protein expression will be measured by cytometric and biochemical assays. Candidate protein expression in MPN will be compared to controls. Techniques: Centrifugation, cell enumeration, cell culture, flow cytometry, absorbance spectrophotometry, enzyme-linked immunosorbent assay, western blot. Outcomes: Improved understanding of MK and platelet abnormalities that contribute to bone marrow pathology in MPN.

Research Project Proposal 2025

Primary supervisor (name):	Prof Peter Le Souef
Contact details (phone; email; location)	Peter.lesouef@uwa.edu.au 0419 915 795 School of Medicine
Other supervisor/s if any (name):	Dr Melinda Judge
Contact details (phone; email; location)	Melinda.Judge@uwa.edu.au 0415 702 573 School of Mathematics and Statistics/Kids Research Institute of Australia
Other supervisor/s if any (name):	Prof Corey Bradshaw Flinders University, Adelaide, South Australia
Contact details (phone; email; location)	Corey.bradshaw@flinders.edu.au
Project title:	**Last call for future children – changing climate change's impacts on children's health by changing 'social constructs'**
Project location:	Kids Research Institute of Australia
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Climate change scientists predict with high confidence that without an immediate and comprehensive change in human behaviour, the Earth's climate will reach a 'tipping point' whereby climate will rapidly deteriorate and render much of the planet unliveable, especially for children. Prof Bill Rees has proposed that the major obstacle stopping humans acting decisively is intransigent 'social constructs'. A 'social construct' is defined as a set of beliefs that compel an individual to think in simplistic ways about complex issues. A ubiquitous, incorrect and exceedingly dangerous social construct is the belief that human ingenuity can develop technologies to reverse climate change while preserving high living standards for a global population of 8+ billion people. The student will explore ways in which individuals with the above social construct can be educated to adopt the more accurate understanding that only massive reversals in economic and population growth have any chance of preventing catastrophic environmental destruction that will endanger all future children. Initially, a survey will establish the scale of the problem of 'dangerous environmental social constructs' in the general population, those with a tertiary education, senior scientists and politicians. A series of educational approaches will then be developed and tested in the above population groups with the aim of changing social constructs from 'dangerous' to 'demanding' (of immediate, decisive action). The successful approaches will then be tested for efficacy in large population groups using multi-media strategies. This project has the potential to make a major contribution to saving the planet and its inhabitants, including humans and especially children, from the ghastly future that we are accelerating towards. We will assist and support selected candidates in obtaining a competitive or philanthropically funded scholarship

Research Project Proposal 2025

Primary supervisor (name):	Dr Melinda Judge
Contact details (phone; email; location)	Melinda.Judge@uwa.edu.au School of Mathematics and Statistics/Kids Research Institute of Australia
Other supervisor/s if any (name):	Prof Peter Le Souef
Contact details (phone; email; location)	Peter.lesouef@uwa.edu.au School of Medicine
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Comparison of gene expression during acute infection**
Project location:	Kids Research Institute of Australia
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Acute HIV infection is the period after initial infection but before seroconversion (approximately 3 -12 weeks). During this time, infection has indistinct symptoms, is not detectable using widely-available antibody-based rapid tests, and has the highest risk of onward transmission due to incredibly high viral load. Enhanded understanding of this stage of infection is crucial. After screening 3,000 patients presenting to Manhiça District Hospital in rural Mozambique with febrile symptoms, we identified 29 acutely HIV-infected individuals (Fiebig I-III). Blood was collected, PBMC, were isolated and mRNA extracted. RNA-sequencing was used to identify gene expression , and compared to contemporaneously collected HIV-negative control samples. A total of 3873 genes were found to be dysregulated. This project involves: • Searching the literature to identify gene expression data during other acute infections by any pathogen type (viral, bacterial, fungal) • Comparison of gene expression patterns during acute infection Potential to: • Identify gene expression common to all acute infections • Identify gene expression common to acute infection pathogen types e.g. viral, bacterial or fungal • Co-author a paper for publication

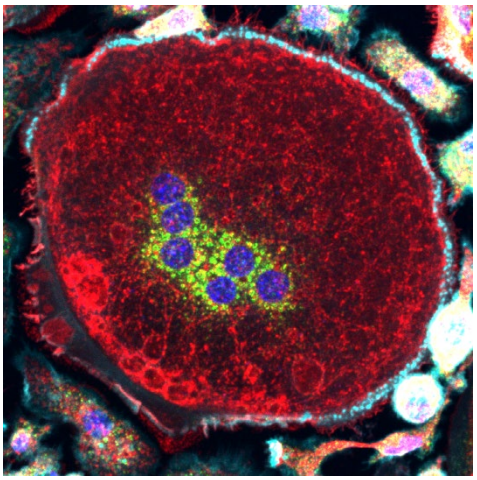
Research Project Proposal 2025

Primary supervisor (name):	Dr Melinda Judge
Contact details (phone; email; location)	Melinda.Judge@uwa.edu.au 0415 702 573 School of Mathematics and Statistics/Kids Research Institute of Australia
Other supervisor/s if any (name):	Prof Peter Le Souef
Contact details (phone; email; location)	Peter.lesouef@uwa.edu.au 0419 915 795 School of Medicine
Other supervisor/s if any (name):	Dr Syeda Hira Fatima, Prof Corey Bradshaw Flinders University, Adelaide, South Australia
Contact details (phone; email; location)	Syeda.fatima@flinders.edu.au Corey.bradshaw@flinders.edu.au
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Systematic review and meta analysis: the impact of climate change on aspects of child health**
Project location:	Kids Research Institute of Australia
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Climate change is affecting every aspect of human health. Children are the largest and most vulnerable group and work is needed to consolidate the disparate and emerging research in this field. The student project will investigate an aspect of climate change and child health by way of a systematic review using databases such as PubMed, Scopus, PsycINFO, CINAHL, Embase, and Web of Science. Quality appraisal will be conducted using a risk of bias tool. Reporting will follow the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) framework. Suggested topics include: • Impact of extreme heat and heatwaves on antimicrobial resistance and childhood infectious disease • Climate change and sexually transmitted infectious diseases in adolescents • Impact of air pollution on mental health and wellbeing of children and adolescents • Alternatively, if you have a specific area of interest we are open to discussing your suggested topic. Ethical permission is not required as the information is publicly available through databases. The student will have the opportunity to be a co-author on the resultant publication.

Research Project Proposal 2025

Primary supervisor (name):	Dr Melinda Judge
Contact details (phone; email; location)	Melinda.Judge@uwa.edu.au School of Mathematics and Statistics/Kids Research Institute of Australia
Other supervisor/s if any (name):	Prof Peter Le Souef
Contact details (phone; email; location)	Peter.lesouef@uwa.edu.au School of Medicine
Other supervisor/s if any (name):	Prof Corey Bradshaw
Contact details (phone; email; location)	Flinders University
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Systematic review of indigenous health relative to non-indigenous populations**
Project location:	Kids Research Institute of Australia
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Climate change has been recognised as the greatest threat to human health, with children being most affected. Furthermore, disadvantaged children will disproportionately bear the brunt of poor health outcomes due to climate change, as they have the least resources for mitigation and adaptation strategies. Our group's program of research aims to be the first to quantify how current and future environmental changes affect child health. We lead a multi-disciplinary team with the expertise to establish this ground-breaking area of research. It is widely accepted that Indigenous children experience higher rates of chronic illness compared to non-Indigenous children, globally. They may also be especially vulnerable to the effects of climate change. This project involves: • Undertaking a systematic review of the literature (and possible meta-analysis) to identify which factors contribute to poorer child health for Indigenous populations, controlling for socio-economic factors on a global scale • This information will be used to identify how the changing climate will further impact the health of indigenous populations. Ethical permission is not required as the information is publicly available through databases. The student will have the opportunity to be a co-author on the resultant publication.

Research Project Proposal 2025

Primary supervisor (name):	A/Prof Nathan Pavlos
Contact details (phone; email; location)	6457-2085, nathan.pavlos@uwa.edu.au, Bone Biology & Disease Laboratory, UWA School of Biomedical Sciences. 2nd Floor M Block, QEII, Nedlands 6009
Other supervisor/s if any (name):	Dr Vanessa Fear
Contact details (phone; email; location)	0438 983 999, Vanessa.Fear@telethonkids.org.au, Translation Genetics, Precision Health, Genetic and Rare Diseases, Telethon Kids Institute, 15 Hospital Ave, Nedlands 6009
Project title:	**Development of a human cell model to study rare bone diseases**
Project location:	(1) Bone Biology & Disease Laboratory, UWA School of Biomedical Sciences and (2) Translation Genetics, Precision Health, Genetic and Rare Diseases, Telethon Kids Institute
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	**Background:** Paradoxically, rare diseases are common. Hundreds of millions of lives are globally affected by ~10,000 unique rare genetic diseases. In Australia alone, two million individuals suffer with a rare disease, a figure that is similar to the proportion of people living with diabetes or asthma. Despite this, people with rare diseases face disproportionate and longstanding inequity in care, including gruelling diagnostic delays and lack of treatment. Development of new diagnostics and treatments for patients with rare diseases ultimately requires a better understanding of the mechanisms underlying disease pathobiology. Autosomal Recessive Osteopetrosis (ARO) is a rare (1:250,000 births) but devastating high bone mass disease that occurs in children and is fatal unless a suitable bone marrow transplant is performed. Children suffering ARO commonly exhibit bone fractures, poor growth, absence of a bone marrow cavity and vision loss due to optic nerve compression. Currently, very little is known about the pathogenesis of ARO, partly due to the rarity of ARO and limited patient samples available to study ARO pathobiology in depth. ARO is typically associated with dysfunction of osteoclasts, giant bone-digesting cells that regulate bone turnover and homeostasis. Osteoclasts are multinucleated cells derived from the fusion of mononuclear macrophage precursors (**Figure 1**).  **Figure 1**: Morphology of an osteoclast Presently, we lack suitable cellular models of human osteoclasts that

	can be manipulated genetically to introduce ARO disease causing mutations and thus be used as a testbed to study the mechanisms underpinning osteoclast dysfunction in ARO patients. **Aim:** This project aims to develop a new cellular model of ARO using osteoclasts derived from human inducible Pluripotent Stem (iPS) cells carrying ARO-disease causing gene mutations. **Techniques:** Students will become familiar with the following key methods: stem cell and osteoclast culture, immunofluorescence confocal microscopy, CRISPR gene editing, sequencing, bone resorption assays etc. **Outcomes:** (i) Optimise and characterise the differentiation of human iPS cell into functional osteoclasts (hiPSdOCs). (ii) Introduce an ARO causing genetic mutation in hiPSdOCs.

Research Project Proposal 2025

Primary supervisor (name):	A/Prof Phil Burcham ([Pharmacy [SAH] and Pharmacology & Toxicology [BMS], UWA).
Contact details (phone; email; location)	0422 350 132 Philip.burcham@uwa.edu.au Lab 1:20, M-block, Pharmacology & Toxicology, QE2
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Effectiveness of Antioxidants and Carbonyl Trappers in a Yeast Model of Cellular Ageing**
Project location:	Lab 1:20, M-block QE2 Medical Centre
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Normal cell metabolism is accompanied by the ongoing release of reactive oxygen species (ROS) from the mitochondrial respiratory chain. These oxidants mediate damage to unsaturated lipids in cell membranes, initiating lipid peroxidation (LPO) and the release of electrophilic aldehydes that readily attack proteins to form protein carbonyl adducts. Due to rising knowledge of the role of LPO-derived carbonyls in human disease, there is a growing interest in "carbonyl-trapping" drugs that can intercept these species in cells, sparing macromolecules from damage. This approach may lack shortcomings that accompany use of conventional antioxidants in human subjects, namely unexpected adverse effects due to suppression of important signalling roles played by ROS in various organs and tissues of the body. This project addresses the need for better cellular models when studying carbonyl trappers that can distinguish them from conventional antioxidants. This project will evaluate a yeast-based model of cell ageing to see whether it permits discrimination between carbonyl- and ROS-trapping molecules. It will also address the possibility that carbonylation of membrane proteins is especially prominent in ageing cells. **AIMS**: *1) To optimise a method for extraction of aqueous versus membrane phase proteins from yeast cells to permit quantitation of protein carbonyl adducts via immunoblotting.* *2) To optimise a yeast model of cellular ageing that involves extended cell growth in low versus high dextrose media, with protein carbonyls, reduced glutathione levels and MTT*

	metabolism used as the endpoints of cellular well-being. *3) To use the model to test the abilities of various antioxidants and carbonyl-trapping molecules to prevent ageing-related changes in these cellular endpoints. The compounds will also be tested for inherent antioxidant activity in the galvinoxyl assay.* **DESIGN:** An initial goal will be establish a detergent-based protein extraction method to permit determination of carbonyl adducts in membrane proteins from yeast cells. Once the method is established, a low/high dextrose model of cell ageing will be employed to confirm conditions that produce reliable protein carbonylation. Assays for cell GSH and MTT metabolism will also be established. The model will then be used to evaluate several antioxidants and carbonyl-trapping molecules for efficacy against ageing-related changes in protein carbonylation, formazan production and GSH loss. **TECHNIQUES**: Yeast culture, protein extraction, SDS/PAGE electrophoresis, protein carbonyls immunoassay, use of multiwell plate imager for GSH, MTT and galvinoxyl assays, etc. **OUTCOMES**: 1) Candidate will gain skills in the propagation and use of yeast cultures in biochemical toxicology experiments. 2) Project will reveal the suitability of a yeast ageing model as a screening tool for antioxidants and carbonyl-trappers. 3) Candidate will gain skills in the generation of lab data and analysis of experimental findings using statistical methods. **REFERENCES**: 1. da Cunha, FM *et al* (2011) Aging & calorie restriction modulate yeast redox state, oxidized protein removal, & the ubiquitin–proteasome system. *Free Rad Biol Med* **51:** 664–670. 2. von der Haar, T (2007) Optimized protein extraction for quantitative proteomics of yeasts. *PLoS One*, 2(10):e1078. 3. Burcham PC (2018) Carbonyl scavengers as pharmacotherapies in degenerative disease: Hydralazine repurposing and challenges in clinical translation. *Biochem Pharmacol.* **154:** 397-406. 4. Burcham, PC (2007) Modified protein carbonyl assay detects oxidised membrane proteins: a new tool for assessing drug- and chemically-induced oxidative cell injury. *J Pharmacol Toxicol Methods*, **56:** 18-22.

Research Project Proposal 2025

Primary supervisor (name):	Prof Girish Dwivedi
Contact details (phone; email; location)	girish.dwivedi@perkins.uwa.edu.au Harry Perkins Institute of Medical Research- South Campus 5 Robin Warren Dr, Murdoch, WA
Other supervisor/s if any (name):	Prof Sulev Koks
Contact details (phone; email; location)	sulev.koks@murdoch.edu.au Murdoch University
Other supervisor/s if any (name):	Dr Silvia Lee
Contact details (phone; email; location)	silvia.lee@uwa.edu.au Harry Perkins South
Other supervisor/s if any (name):	Dr Shelley Waters
Contact details (phone; email; location)	shelley.waters@uwa.edu.au Harry Perkins South
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Modifying gene expression to combat obesity and metabolic syndrome**
Project location:	Harry Perkins Institute of Medical Research – South Campus
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	**BACKGROUND:** In Australia, approximately 1.2 million children and adolescents (or 25% of the population) suffer from overweight or obesity, while approximately 12.5 million adults (or 67% of the population) live with overweight or obesity. Being overweight, including obesity, is the second leading risk factor for disease and premature death in Australia, contributing to 10% of deaths and 8.4% of the disease burden. In addition, obesity is associated with over 30 diseases, such as various types of cancer, cardiovascular diseases, musculoskeletal disorders, type 2 diabetes, dementia, asthma, and chronic renal disease. Leptin resistance is the primary biological mechanism that causes obesity and metabolic syndrome, making controlled diets ineffective for weight loss. Normally, leptin, a hormone produced by fat cells, signals the brain when enough fat is stored, promoting a balance between caloric intake and burning. However, when the brain, specifically the hypothalamic arcuate nucleus, doesn't respond to leptin (leptin resistance), over consumption occurs. Unfortunately, leptin resistance cannot be reversed by simply reducing fat mass because the body interprets decreased fat as deprivation and activates signals to store energy and fat. Our project concentrates on the treatment of obesity by focusing on the genes responsible for leptin resistance, LEPROT and LEPROTL1[1,2], which interfere with the signalling of the hormone leptin produced by fat cells, leading to a decrease in

available leptin receptors and a disruption in leptin signalling[3,4]. Experimental evidence demonstrates that downregulating these genes prevents obesity, improves glucose regulation, boosts metabolic activity and endurance capacity, and preserves lean body mass[3-5].

We developed an antisense oligonucleotide-based therapeutic utilizing safe chemistry called phosphonodiamidite morpholino oligomers (PMO). These PMO efficiently reduce the levels of the leptin resistance causing LEPROT and LEPROTL1 genes. Here, we will investigate the effect of PMO treatment on adipose tissue morphology, liver health, blood lipid profiles, systemic inflammation, and gene expression related to metabolism regulation using C57BL/6 mice.

AIM OF THE PROJECT:

Investigate the optimal dosage and route of administration of PMO-based treatment on leptin resistance in a diet-induced obesity (DIO) model using C57BL/6 mice.

HYPOTHESIS:

PMO-based antisense oligonucleotides effectively target and modify LEPROT and LEPROTL1 gene expression, restoring leptin sensitivity and promoting weight loss.

TECHNIQUES:

Animal handling, sample collection/processing, RNA isolation, gene expression (qPCR), bioassays and histology.

REFERENCES:

1. Huang, Y. et al. Cloning and characterization of a novel human leptin receptor overlapping transcript-like 1 gene (LEPROTL1). Biochim Biophys Acta 1517, 327–331 (2001).
2. Séron, K. et al. Endospanins regulate a postinternalization step of the leptin receptor endocytic pathway. J Biol Chem 286, 17968–17981 (2011).
3. Couturier, C. et al. Silencing of OB-RGRP in mouse hypothalamic arcuate nucleus increases leptin receptor signaling and prevents diet-induced obesity. Proc Natl Acad Sci U S A 104, 19476–19481 (2007).
4. Vauthier, V. et al. Endospanin 1 silencing in the hypothalamic arcuate nucleus contributes to sustained weight loss of high fat diet obese mice. Gene Ther 21, 638–644 (2014).
5. Sommer, C. et al. Soluble Leptin Receptor Predicts Insulin Sensitivity and Correlates With Upregulation of Metabolic Pathways in Men. The Journal of Clinical Endocrinology & Metabolism 103, 1024–1032 (2018).

Research Project Proposal 2025

Primary supervisor (name):	Dr Vanessa Fear
Contact details	vanessa.fear@telethonkids.org.au; Telethon Kids Institute
Other supervisor/s	Dr Nicole Shaw
Contact details	nicole.shaw@telethonkids.org.au; Telethon Kids Institute
SBMS Coordinating supervisor	A/Prof Mark Fear
Contact details	mark.fear@uwa.edu.au
Project title:	**CRISPR gene editing and stem cell disease modelling for genetic diagnosis of children in WA**
Project location:	Telethon Kids Institute
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Today clinical genetic testing provides a diagnosis for only 30-50% of children with a genetic disease. For the majority of children, a genetic variant is identified whose significance is undetermined. Currently diagnosis takes on average 5 years, and in the interim the opportunity for early, effective, and appropriate intervention is often missed. The aim of this study is to provide a diagnosis for children in WA with a suspected genetic condition. We use CRISPR gene editing to create isogenic induced pluripotent stem cells and then model patient disease in the laboratory. This is possible as stem cells can be stimulated to form many different cell types that are relevant to the patient's disease including heart, nerve, lung, or kidney. Healthy and genetic variant cells are compared to determine changes in cell function that indicate disease and understand the molecular and cellular pathways affected. Techniques in the project include: stem cell culture; CRISPR gene editing; targeted amplicon sequencing; PCR; RT-PCR; qPCR; karyotyping; gDNA preparation; RNA preparation; and other techniques specific to the patient genetic variant. The project will deliver an informative and accurate analysis for genetic variants identified in WA children. A diagnosis is powerful as it enables future planning and access to early interventions or treatments that will improve life trajectory.

Research Project Proposal 2025

Primary supervisor (name):	Dr Warren Pavey
Contact details (phone; email; location)	0430389600; w.pavey@hlri.org.au; Heart & Lung Research Institute WA – Harry Perkins Building (South Campus, Murdoch)
Other supervisor/s if any (name):	Dr Herbert Ludewick
Contact details (phone; email; location)	0424776201; h.ludewick@hlri.org.au; Heart & Lung Research Institute WA – Harry Perkins Building (South Campus, Murdoch)
Other supervisor/s if any (name):	Ms Rebbecca Hahn
Contact details (phone; email; location)	0439975880; r.hahn@hlri.org.au; Heart & Lung Research Institute WA – Harry Perkins Building (South Campus, Murdoch)
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Improving outcomes in heart and lung transplantation**
Project location:	Heart & Lung Research Institute of WA – Harry Perkins Building (South Campus, Murdoch)
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	In your honours year you will work within our team of researchers from basic science, nursing and medical backgrounds. Our laboratory conducts various translational projects aimed at improving outcomes from heart transplantation. Areas of research include • investigating the ability of currently used medications and dietary supplements to reduce ischaemia reperfusion injury • developing novel DNA based screening diagnostic tests for thoracic organ damage • exploring methods to extend the viable storage times for donated thoracic organs before transplantation We will teach you current bench top biomedical laboratory techniques as well as give you skills in small animal (rodent) cardiovascular research models. You will have the opportunity to present your work to, and get ideas from, clinicians working in cardiothoracic medicine/surgery who may become the eventual users of your research findings. You can expect to be included as a contributing author on one or more publications resulting from your work. We are offering 3 honours places for 2025. Do contact us for more information.

Research Project Proposal 2025

Primary supervisor (name):	Dr Zoya Gridneva
Contact details (phone; email; location)	zoya.gridneva@uwa.edu.au
Other supervisor/s if any (name):	Dr Sharon Perrella
Contact details (phone; email; location)	sharon.perrella@uwa.edu.au
Other supervisor/s if any (name):	Dr Donna Geddes
Contact details (phone; email; location)	donna.geddes@uwa.edu.au
SBMS Coordinating supervisor (for non-SBMS supervisors)	A/Prof Demelza Ireland
Contact details (phone; email; location)	demelza.ireland@uwa.edu.au
Project title:	**Why do women exclusively pump – understanding demographics, pregnancy and health complications and pumping dynamics of these human milk feeding dyads, a mixed study**
Project location:	School of Molecular Sciences
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	The aim of this study is to evaluate the unique feeding experiences of mothers who exclusively pump to provide human milk for their infants. Design: This is study is comprised of an online survey study and previously collected data on 24h milk production and infant feeding in exclusively pumping mothers. Methods: An online survey/questionnaire capturing current human milk feeding status and expressing patterns, reasons for exclusively pumping, mother's concerns with milk supply and infant growth and professional support provided as well as an open text box for reporting the experiences. Analysis: Descriptive statistics for 24h milk production data. Computerised software will be used to measure the trends in exclusively expressing and feeding human milk, and participant experiences data.

Research Project Proposal 2025

Primary supervisor (name):	A/Prof Kate Hammer
Contact details (phone; email; location)	Lab 1.4 L block 6457 2137; katherine.hammer@uwa.edu.au
Other supervisor/s if any (name):	Robbie Haines
Contact details (phone; email; location)	Robbie.haines@uwa.edu.au
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
Project title:	**Interactions between antimicrobial components and physicochemical parameters in honey**
Project location:	Lab 1.4 L block, QEII Medical Centre
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Honey is a complex mixture containing sugars, water, phenolic compounds, proteins, minerals and vitamins, produced largely by the European honeybee *Apis mellifera*. Honey has antibacterial and antifungal activity, which varies according to the specific floral source, and is largely attributed to osmotic activity (since it is essentially a saturated sugar solution), low pH, production of hydrogen peroxide and the activity of plant-derived phenolic compounds. Although antibacterial activity can be attributed to these factors described above, the contribution of each component has not actually been well characterised. In addition, the possibility that the various antimicrobial factors within honey are acting synergistically is often hypothesised, but has also not been systematically investigated. Therefore, this project aims to investigate the contribution of components (such as sugars) or conditions (such as pH) that are universally present in honeys to total antimicrobial activity. This will be achieved by investigating each component or condition in isolation, as well as combined. Activity will be assessed against a range of microorganisms, including Gram positive and negative bacteria, to ensure that a broad and representative understanding of the relationship between each component and activity is obtained. Interactions between components and conditions will be investigated using checkerboard assays in 96-well microtitre trays. A series of dilutions of each agent in prepared and then each is dispensed into the tray to create a wide range of combinations (a checkerboard). If interesting relationships are identified in the checkerboard assays, time permitting these may be followed up with time kill assays, with bacterial viability determined using viable counting techniques. Kwakman PHS, Zaat SAJ. Antibacterial components of honey. IUBMB life. 2012;64(1):48-55. doi: 10.1002/iub.578. Masoura, M., Passaretti, P., Overton, T.W. et al. Use of a model to understand the synergies underlying the antibacterial mechanism of H2O2-producing honeys. Sci Rep 10, 17692 (2020).

Research Project Proposal 2025

Primary supervisor (name):	Dr Jenette Creaney
Contact details (phone; email; location)	6151 0896, jenette.creaney@uwa.edu.au, Institute of Respiratory Health
Other supervisor/s if any (name):	Dr Xiao Zhong
Contact details (phone; email; location)	6151 0895, xiao.zhong@uwa.edu.au, The National Centre for Asbestos Related Diseases
Other supervisor/s if any (name):	Dr Alec Redwood
Contact details (phone; email; location)	6151 0895, alec.redwood@uwa.edu.au, Institute of Respiratory Health
SBMS Coordinating supervisor (for non-SBMS supervisors)	NA
Contact details (phone; email; location)	NA
Project title:	**Developing a comprehensive and fully automated computational pipeline for neoantigen detection from diverse sequencing data**
Project location:	The National Centre for Asbestos Related Diseases, Harry Perkins Institute of Medical Research
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	**Background:** Neoantigens are unique molecules on the surface of cancer cells that arise from mutations in the cancer's DNA. Identifying neoantigens is a two-step process. First, cancer-specific mutations are identified by comparing the tumour DNA sequence with the matched normal germline. Subsequently, a combination of prediction algorithms and RNA sequence data are used to assess the immunogenicity of these mutations. Predicting neoantigens computationally often requires multiple algorithms and substantial computational resources. A sophisticated workflow integrating state-of-the-art of algorithms or tools including those developed in house are essential for accurate prediction of neoantigens from sequencing data. **Aim:** To optimise and automate a scalable Nextflow bioinformatic pipeline for accurate neoantigen detection. **Design:** Leveraging available datasets and prediction algorithms we will design and implement a scalable Nextflow pipeline to automate neoantigen prediction. The pipeline performance will be optimised for efficient execution on high-performance computing resources. Finally, a user-friendly interface for the pipeline and output visualisation with be developed. **Outcomes:** knowledge and skills in immunogenomics, bioinformatics, scientific workflow development, high performance computing. **Candidates:** background in bioinformatics, computer science or relevant disciplines are preferred.

Research Project Proposal 2025

Primary supervisor (name):	Dr Jenette Creaney
Contact details (phone; email; location)	6151 0896, jenette.creaney@uwa.edu.au, Institute of Respiratory Health
Other supervisor/s if any (name):	Dr Xiao Zhong
Contact details (phone; email; location)	6151 0895, xiao.zhong@uwa.edu.au, The National Centre for Asbestos Related Diseases
Other supervisor/s if any (name):	Dr Alec Redwood
Contact details (phone; email; location)	6151 0895, alec.redwood@uwa.edu.au, Institute of Respiratory Health
SBMS Coordinating supervisor (for non-SBMS supervisors)	NA
Contact details (phone; email; location)	NA
Project title:	**Developing a bioinformatics pipeline for the accurate identification of gene fusions from long read sequencing.**
Project location:	The National Centre for Asbestos Related Diseases, Harry Perkins Institute of Medical Research
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	**Background:** Gene fusions are prevalent cancer drivers across various cancer types. Precise identification of fusion transcripts is crucial for both cancer research and clinical treatment. While long-read sequencing technology offers immense potential for accurate detection of fusion genes and transcripts, the computational landscape for analyzing such data remains limited. JAFFAL, a commonly used tool in this domain, suffers from a significant drawback: its reliance on well-annotated genes hinders its ability to discover novel fusions, which are frequently observed in cancer tissues. Although a few newer tools have emerged, they lack peer review, underscoring the urgent need for a more robust computational solution. **Aim:** To develop a novel computational tool capable of swiftly and accurately identifying gene fusions from sequencing data. **Design:** Leveraging available datasets, we will design and implement a bioinformatic fusion detection tool using Julia, Python or R languages. There is the opportunity to validate findings in laboratory experiments. **Outcomes:** knowledge and skills in genomics, bioinformatics, software development, high performance computing, linux command line. **Candidates:** background in bioinformatics, computer science or relevant disciplines are preferred. With passion for programming is also encouraged. **References:** Davidson, Nadia M., et al. "JAFFAL: detecting fusion

	genes with long-read transcriptome sequencing." Genome biology 23.1 (2022): 10. Wang, Wenjia, et al. "IFDlong: an isoform and fusion detector for accurate annotation and quantification of long-read RNA-seq data." bioRxiv (2024). Qin, Qian, et al. "CTAT-LR-fusion: accurate fusion transcript identification from long and short read isoform sequencing at bulk or single cell resolution." BioRxiv (2024).

Research Project Proposal 2025

Primary supervisor (name):	Dr Alistair Cook
Contact details (phone; email; location)	0426951425 Alistair.cook@uwa.edu.au Level 5, Harry Perkins Institute
Other supervisor/s if any (name):	Prof Martin Ebert
Contact details (phone; email; location)	martin.ebert@health.wa.gov.au Sir Charles Gairdner Hospital, Dept of Radiation Oncology UWA School of Physics
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	n/a
Contact details (phone; email; location)	n/a
Project title:	**Exploring the effects of radiation on the tumour immune microenvironment**
Project location:	Level 5, Harry Perkins Institute
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Cancer immunotherapy using immune checkpoint inhibitors (ICI) has revolutionised the field of oncology in the last 5-10 years. However, whilst ICI drugs can produce remarkable responses, they are still only effective for a minority of people. Recent preclinical work in our lab, focussing on mesothelioma, has shown that certain types of radiotherapy can increase likelihood of successful ICI therapy through functional remodelling of tumour blood vessels – boosting the cure rate from around 20% to almost 100%. We are looking for an honours student to join our team with the aim of broadening our understanding of the mechanisms responsible for these improvements. We wish to examine the presence or absence of a range of immune cell types and their activational status, to identify characteristics of tumours that have the best chance of response to this type of therapy – with the aim of carrying out a clinical trial in the near future. This project will use techniques such as flow cytometry, immunofluorescent tissue staining and RNA sequencing.

Research Project Proposal 2025

Primary supervisor (name):	Dr Noor-Ul-Huda Ghori
Contact details (phone; email; location)	noor-ul-huda.ghori@uwa.edu.au QEII, L block, Marshall centre, room 2.11, The University of Western Australia
Other supervisor/s if any (name):	Prof Mark Nicol
Contact details (phone; email; location)	Prof Mark Nicol Email: mark.nicol@uwa.edu.au
SBMS Coordinating supervisor (for non-SBMS supervisors)	NA
Contact details (phone; email; location)	NA
Project title:	**Establishment of skin microbiome cell model to study skin barrier function**
Project location:	The Marshall Centre, QEII, UWA
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	**Description of Research Project:** Skin, and more specifically its outermost layer, the epidermis, represents a first physical barrier preventing penetration of environmental factors such as pollutants, allergens, and microbes into the body (Uberoi et al., 2021). The top later of epidermis called stratum corneum plays a crucial role in maintaining skin barrier function. The skin barrier function is maintained through a joint effort of immune cells, chemicals, and skin microbes (Tryon and Grice., 2022). The skin microbiome contributes to the differentiation of keratinocytes (skin cells) to form a physical barrier and stimulates innate and adaptive immunity. A compromised skin barrier function can lead to many inflammatory disorders, the most common being atopic dermatitis. Short chain fatty acids (SCFA) are well described metabolites derived from the fermentation of dietary fibre by colonic bacteria. It is previously reported that gut-derived short chain fatty acids such as butyrate modulate skin barrier integrity by promoting keratinocyte metabolism and differentiation (Trompette et al., 2022). Although these studies showed the potential of improving skin barrier function through a high fibre diet, the mechanistic roles for the skin microbiota in development, regeneration, and function of the skin barrier function in presence or absence of butyrate were not defined. For this project we propose to study the role of skin microbiome in skin barrier function, and its interaction with butyrate. We propose to establish skin a microbiome community on a skin cell line and examine how butyrate and the microbiome interact to modulate skin barrier function. Our results will help develop therapeutic targets for improved skin barrier function. This project will equip the student in cell culture skills and microbiome data analysis skills.

Aims:

1. Set up a skin cell model of infection
2. Study the role of skin microbiome and butyrate in maintaining skin barrier function

Techniques:

1. Keratinocyte culture
2. qPCR
3. Bacterial culture
4. 16S rRNA short read sequencing
5. Immunofluorescence analysis

Reference(s):

1. Uberoi, Aayushi, et al. "Commensal microbiota regulates skin barrier function and repair via signaling through the aryl hydrocarbon receptor." Cell Host & Microbe 29.8 (2021): 1235-1248.
2. Trompette, Aurélien, et al. "Gut-derived short-chain fatty acids modulate skin barrier integrity by promoting keratinocyte metabolism and differentiation." Mucosal Immunology (2022): 1-19.
3. Harris-Tryon, Tamia A., and Elizabeth A. Grice. "Microbiota and maintenance of skin barrier function." Science 376.6596 (2022): 940-945.

Research Project Proposal 2025

Primary supervisor (name):	A/ Prof Lynette Fernandes
Contact details (phone; email; location)	6457 4517 Lynette.Fernandes@uwa.edu.au M Block QEII Medical Centre
Other supervisor/s if any (name):	Dr Roisin-Kelly Laubscher
Contact details (phone; email; location)	roisinkelly@ucc.ie University College Cork, Ireland
Other supervisor/s if any (name):	Dr Orla Barry
Contact details (phone; email; location)	O.Barry@ucc.ie University College Cork, Ireland
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Identifying the processing demands of summative assessments in pharmacology**
Project location:	M Block QEII Medical Centre
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Assessment is probably the most important event to drive student learning. However, unless students understand what is being asked of them in exams, learning may be steered in the wrong direction. While students may readily address the knowledge demands of exam questions, they often address processing demands poorly or not at all. This may be due to a misinterpretation of the action words / phrases in exam questions. While many action words have universal meanings, others have nuanced meanings within certain disciplines. This project aims to research, document and address the processing demands associated with assessment literacy in Pharmacology. This project would appeal to students who are interested in working on a project that involves education research.

Research Project Proposal 2025

Primary supervisor (name):	A/Prof Lynette Fernandes
Contact details (phone; email; location)	6457 4517 Lynette.Fernandes@uwa.edu.au M Block QEII Medical Centre
Other supervisor/s if any (name):	Dr Betty Exintaris
Contact details (phone; email; location)	Betty.Exintaris@monash.edu Monash University
Other supervisor/s if any (name):	Dr Nilushi Karunaratne
Contact details (phone; email; location)	Nilushi.Karunaratne@uwa.edu Monash University
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Cultivating teamwork skills to prepare Science graduates for the workplace**
Project location:	M Block QEII Medical Centre
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	"Being a team player is the most valuable quality a person should develop in order to thrive in the world of work and life" (Patrick M. Lencioni - The Ideal Team Player: How to recognize and cultivate the three essential virtues). Teamwork skills are teachable qualities that students need to succeed in a 21st century workplace. However, teamwork does not automatically occur as a consequence of putting people together. Teamwork is a dynamic skill that requires instruction, guidance, and mentorship. This project aims to develop resources to (1) assist staff to deliver Teamwork and modules and (2) assist students to grow their teamwork skills. This project would appeal to students who are interested in working on a project that involves education research.

Research Project Proposal 2025

Primary supervisor (name):	Dr Stephanie Trend
Contact details (phone; email; location)	stephanie.trend@telethonkids.org.au Telethon Kids Institute
Other supervisor/s if any (name):	Dr Tao Wang
Contact details (phone; email; location)	tao.wang@telethonkids.org.au Telethon Kids Institute
Other supervisor/s if any (name):	Dr Kimberley Parkin
Contact details (phone; email; location)	kimberley.parkin@telethonkids.org.au Telethon Kids Institute
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Identifying triggers of autoimmunity in multiple sclerosis**
Project location:	Telethon Kids Institute
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	**Background:** Multiple sclerosis (MS) is an autoimmune condition that can result in episodes of neurological inflammation and progressive disability. Currently, the cause is not known and there is no cure, however we and others have identified changes in B cells associated with MS episodes. Our team are utilising cutting-edge single cell technologies such as single cell RNA-sequencing, VDJ-sequencing and full-spectrum flow cytometry to identify B cells that are activated in early MS. **Aims:** The aim of this project is to investigate the antigens that trigger of B cell responses in early MS. Identifying triggers of B cell activation in MS could lead to novel therapies that specifically address the underlying cause of the condition or prevention of MS in future. **Role:** As a student in our team, you will lead the investigations of identifying factors that activate B cells from people with MS. You will gain hands-on experience with advanced laboratory techniques, such as cell transfection, immune cell culture, antigen binding assays including ELISA and flow cytometry. We have opportunities for motivated individuals to contribute to this extremely rewarding field of research, and learn a variety of skills within our team. For more information or to join this exciting project, we invite you to contact us to discuss this opportunity.

Research Project Proposal 2025

Primary supervisor (name):	Dr Baca Chan
Contact details (phone; email; location)	6151 1264, baca.chan@uwa.edu.au, Vaccines and Viral Immunology, Institute for Respiratory Health.
Other supervisor/s if any (name):	Associate Professor Alec Redwood
Contact details (phone; email; location)	6151 0895, alec.redwood@uwa.edu.au. Vaccines and Viral Immunology, Institute for Respiratory Health.
Other supervisor/s if any (name):	Associate Professor Aron Chakera
Contact details (phone; email; location)	6457 2799, aron.chakera@health.wa.gov.au Harry Perkins Institute for Medical Research
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Multistrain cytomegalovirus infections in transplantation**
Project location:	5th Floor Harry Perkins Building
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	**Background**. Cytomegaloviruses (CMV) are betaherpesviruses that establish life-long infections with periods of reactivation. Infection with one strain of CMV does not prevent infection from other strains and therefore multistrain infections can occur. These are often detected in immunocompromised individuals, for example transplant recipients, and has been linked with enhanced disease and poorer transplant outcomes. The frequency of multistrain infection is not fully known. **Design**. In this project you will establish a multiplex system to detect and differentiate different strains of CMV. You will validate the assay using multistrain infection models in cell culture and potentially clinical samples. **Techniques**. This project is laboratory based and will include a range of techniques such as; virology, qPCR and genomics. **Outcomes**. This study will establish an assay for detecting different strains of CMV to serve as the foundation for determining the frequency of multistrain infection in transplant patients.

Research Project Proposal 2025

Primary supervisor (name):	A/Prof Cecilia Prêle
Contact details (phone; email; location)	Cecilia.prele@resphealth.uwa.edu.au Institute for Respiratory Health, Perkins Building, QEII Medical Centre, Nedlands
Other supervisor/s if any (name):	A/Prof Wilhelmina Mulders
Contact details (phone; email; location)	Helmy.mulders@uwa.edu.au
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Modelling and regulating extracellular matrix deposition in the inner ear**
Project location:	Institute for Respiratory Health, Perkins Building, QEII Medical Centre, Nedlands
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Fibrosis in the inner ear can occur following surgery and as a complication of infection. Local tissue responses to cochlear implants can result in the formation of a fibrotic barrier between the electrode and the target neurons, causing loss of residual hearing and function of the implant. In patients with meningitis, cochlear fibrosis and subsequent ossification profoundly limits the capacity for cochlear implantation, which can also adversely affect hearing outcomes. In this study we will examine the efficacy of anti-fibrotic drugs in regulating extracellular matrix protein deposition by inner ear fibroblasts. Dose response curves will be performed and the effect of drug treatment of TGFB-induced, SMAD, MAPK and PI3K pathway activation will be confirmed by western blot. The effects of drug treatment on inner ear fibroblast cell proliferation, differentiation and ECM protein deposition by inner ear fibroblasts confirmed using *in vitro* assays. The project will involve the following activities. • Preparation of cells and tissues for immunocyto/histochemistry • Preparation of cells for RNA isolation and real time PCR • Preparation of cells for protein isolation and western blot analysis • Cell function assays • Confocal laser scanning microscopy • Analysis and interpretation of data generated using image analysis techniques

Research Project Proposal 2025

Primary supervisor (name):	A/Prof Cecilia Prêle
Contact details (phone; email; location)	Cecilia.prele@uwa.edu.au Institute for Respiratory Health, Perkins Building, QEII Medical Centre, Nedlands
Other supervisor/s if any (name):	A/Prof Steven Mutsaers
Contact details (phone; email; location)	6151 0891, steven.mutsaers@uwa.edu.au SBMS M block and Institute for Respiratory Health, Perkins Building, QEII Medical Centre, Nedlands
Other supervisor/s if any (name):	TBD
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Determining the role of plasma cells in lung fibrosis**
Project location:	SBMS M block and Institute for Respiratory Health, Perkins Building, QEII Medical Centre, Nedlands
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Idiopathic pulmonary fibrosis (IPF) is an aggressive interstitial lung disease with no cure and a mean survival of three years from diagnosis. The wide-ranging impact of fibrosis affects millions of people of all ages and has only limited and largely ineffective treatment options available for most sufferers. Given the central role collagen deposition plays in fibrosis, it is understandable that drug development to date has focused on targeting fibroblasts and myofibroblasts to prevent excess matrix production and deposition. Our data from genetically modified mice models without an active immune system demonstrates that these mice are protected from bleomycin (BLM)-induced fibrosis and suggests a role for the blood cells, called B and T cells, in fibrosis. (O'Donoghue et al. 2012 EMBO Mol Med). Our recent published studies have demonstrated that one type of B cell in particular, called plasma cells, may be required for the onset of lung fibrosis (Prêle et al., Eur Respir J. 2022 60:2101469). The aim of the study is to determine the role of plasma cells in driving lung fibrosis. We will use two immunomodulatory approaches to deplete plasma cells in a mouse model of lung fibrosis. The project will involve the following activities. • Animal model of lung fibrosis • Micro CT analysis • Preparation of cells and tissues for immunocyto/histochemistry • Confocal laser scanning microscopy • Preparation of cells for RNA isolation and real time PCR • Analysis and interpretation of data generated using image analysis techniques

Research Project Proposal 2025

Primary supervisor (name):	A/Prof Steven Mutsaers
Contact details (phone; email; location)	6151 0891, steven.mutsaers@uwa.edu.au SBMS M block and Institute for Respiratory Health, Perkins Building, QEII Medical Centre, Nedlands
Other supervisor/s if any (name):	TBD
Contact details (phone; email; location)	
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Characterisation of free-floating mesothelial cells and their mechanism of avoiding apoptosis**
Project location:	SBMS M block and Institute for Respiratory Health, Perkins Building, QEII Medical Centre, Nedlands
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Little is known about the mechanisms regulating repair of the cells lining the body cavities and internal organs (mesothelial cells). Mesothelial cells are unique as although they are principally adherent cells, they survive in a free-floating state in serosal fluid (thin layer of fluid between organs). The only other adherent cells that do not undergo apoptosis when removed from their basement membrane are malignant cells (allows them to metastasise through blood and lymphatics). Upon serosal injury, the number of free-floating mesothelial cells increase. These cells participate in the healing process by several mechanisms, but one mechanism is landing on the wound surface from the serosal fluid that surrounds the mesothelial cells, dividing and repopulating the injured area. Little is known about these cells and what mechanisms they use to remain viable. This study will test the hypothesis that free-floating mesothelial cells have increased expression of cell survival genes and decreased expression of apoptosis genes when compared with adherent mesothelial cells. More specifically, this study aims to: 1. Isolate and characterise the free-floating mesothelial cell population in serosal fluid before and after injury. 2. Examine the profile of known apoptosis and cell survival genes in free-floating compared with adherent mesothelial cells. *The project will involve the following activities.* • Preparation of cells and tissues for immunocyto/histochemistry • Preparation of cells for RNA isolation and real time PCR • Preparation of cells for protein isolation and western blot • Cell function assays • Animal models of serosal injury and repair

Research Project Proposal 2025

Primary supervisor (name):	Kai Chen
Contact details (phone; email; location)	08 6488 7106; kai.chen@uwa.edu.au; R1.25, M Block, QEIIMC
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Investigating novel regulators for osteoclast and bone disorders**
Project location:	Lab 1.09, M Block, QEIIMC
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Osteoclasts are unique bone-degrading cells which are crucial for maintaining bone homeostasis. In this project, we will use high-throughput single-cell RNAseq to identify key regulators for osteoclast formation and function. Next, murine osteoclast differentiation will be induced using cell culture method. We will use molecular assays (e.g., WB, qPCR) and advanced imaging technology (e.g., electron and ion microscopy) to verify the regulator(s) of interest. We expect to identify novel regulators which could serve as therapeutic targets for osteoclast-related bone disorders such as osteoporosis and cancer bone metastasis.

Research Project Proposal 2025

Primary supervisor (name):	Kai Chen
Contact details (phone; email; location)	08 6488 7106; kai.chen@uwa.edu.au; R1.25, M Block, QEIIMC
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Nanoscale imaging of skeletal cells and tissues**
Project location:	Lab 1.09, M Block, QEIIMC
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	This project aims to develop and apply advanced nanoscale imaging techniques to investigate the intricate cellular and subcellular structures within skeletal tissues. By leveraging cutting-edge imaging modalities, such as NanoSIMS and electron microscopy, we seek to achieve unprecedented spatial resolution, enabling the detailed visualisation of bone and cartilage cells, their interactions, and the extracellular matrix at the nanoscale. The outcomes of this project are expected to significantly advance our understanding of skeletal biology and disease, with potential implications for the diagnosis and treatment of musculoskeletal conditions.

Research Project Proposal 2025

Primary supervisor (name):	A/Prof Holly Chinnery
Contact details (phone; email; location)	Holly.chinnery@uwa.edu.au Phone: 0400080766
Other supervisor/s if any (name):	Dr Danial Roshandel
Contact details (phone; email; location)	Danial.roshandel@lei.org.au Lions Eye Institute, Perkins
Other supervisor/s if any (name):	Dr Zahra Tajbakhsh
Contact details (phone; email; location)	zahra.tajbakhsh@uwa.edu.au UWA Optometry, Crawley
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**The mystery of T cell paucity in mouse corneas: investigating factors that induce memory T cells into the mouse eye**
Project location:	Lions Eye Institute at Perkins
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Using a combination of intravital microscopy and immunohistochemistry, we recently reported that the healthy human cornea contains resident T cells (Downie et al, PNAS 2023), a finding that contradicts the prevailing dogma in ocular immunology that the healthy cornea only contains dendritic cells (Wu et al, Nat Rev. Immunol, 2024). We hypothesise that T cells were not identified in the human cornea until recently because there are no T cells in the healthy central cornea of laboratory mice, which are housed in specific pathogen-free settings. As most studies on corneal immunology rely on mouse models, this unexpected revelation was likely overlooked for decades due to inter-species differences in the immune landscape of the eye. This project will involve inducing local inflammation to the mouse cornea, using topical microbial products, to investigate whether the immunological profile of the mouse cornea can be manipulated to more closely resemble the human corneal immune profile. Techniques will include animal handling, induction of corneal inflammation using topical application of bacterial products (i.e. heat-killed *Pseudomonas aeruginosa* and *Staph aureus*), immunohistochemistry and confocal microscopy and image analysis. Study outcomes will provide new insights into the phenomenon of T cell paucity in the corneas of laboratory mice. References: Downie LE, Zhang X, Wu M, Karunaratne S, Loi JK, Senthil K, Arshad S, Bertram K, Cunningham AL, Carnt N, Mueller SN, **Chinnery HR.** Redefining the human corneal immune compartment using dynamic intravital imaging. Proc Natl Acad Sci U S A. 2023 Aug;120(31):e2217795120 Wu M, Fletcher EL, **Chinnery HR,** Downie LE, Mueller SN. Redefining our vision: an updated guide to the ocular immune system. Nat Rev Immunol. 2024 Aug 30. doi: 10.1038/s41577-024-01064-y. PMID: 39215057.

Research Project Proposal 2025

Primary supervisor (name):	A/Prof Holly Chinnery
Contact details (phone; email; location)	Holly.chinnery@uwa.edu.au Phone: 0400080766
Other supervisor/s if any (name):	Dr Danial Roshandel
Contact details (phone; email; location)	Danial.roshandel@lei.org.au Lions Eye Institute, Perkins
Other supervisor/s if any (name):	Dr Zahra Tajbakhsh
Contact details (phone; email; location)	zahra.tajbakhsh@uwa.edu.au UWA Optometry, Crawley
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Mapping immune cell distribution based on cellular morphodynamics in the living human cornea**
Project location:	Lions Eye Institute at Perkins
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	The cornea of the eye contains a population of resident immune cells that can be visualised non-invasively in humans using functional in vivo confocal microscopy (Fun-IVCM). Using a combination of Fun-IVCM and immunohistochemistry, we recently reported that the healthy human cornea contains resident T cells (Downie et al, PNAS 2023), a finding that contradicts the prevailing dogma in ocular immunology that the healthy cornea only contains dendritic cells (Wu et al, Nat Rev. Immunol, 2024). This project will involve mapping the distribution of corneal T cells and dendritic cells, based on their shape and motility characteristics, across different corneal regions (i.e. central, peripheral and limbal). A cross-sectional clinical study will be performed in healthy participants. Following informed consent, participants will attend the Lions Eye Institute for one study visit and confocal images of the cornea will be collected. Images will be converted into videos in Matlab using established protocols, and cell morphodynamics analysed using ImageJ. The outcomes of this research will provide novel information about the distribution of immune cell subsets in the healthy human cornea. References: Downie LE, Zhang X, Wu M, Karunaratne S, Loi JK, Senthil K, Arshad S, Bertram K, Cunningham AL, Carnt N, Mueller SN, **Chinnery HR.** Redefining the human corneal immune compartment using dynamic intravital imaging. Proc Natl Acad Sci U S A. 2023 Aug;120(31):e2217795120 Wu M, Fletcher EL, **Chinnery HR,** Downie LE, Mueller SN. Redefining our vision: an updated guide to the ocular immune system. Nat Rev Immunol. 2024 Aug 30. doi: 10.1038/s41577-024-01064-y. PMID: 39215057.

Research Project Proposal 2025

Primary supervisor (name):	Dr Samuel McLenachan
Contact details (phone; email; location)	0450179646; Samuel.mclenachan@uwa.edu.au; Lions Eye Institute; COVS; UWA Medical School
Other supervisor/s if any (name):	Dr Danial Roshandel
Contact details (phone; email; location)	0416772853; danial.roshandel@uwa.edu.au; Lions Eye Institute; COVS; UWA Medical School
Other supervisor/s if any (name):	A/Prof Holly Chinnery
Contact details (phone; email; location)	0400080766; holly.chinnery@uwa.edu.au; Lions Eye Institute; School of Allied Health, Optometry; UWA
SBMS Coordinating supervisor (for non-SBMS supervisors)	Dr Mitali Sarkar-Tyson
Contact details (phone; email; location)	mitali.sarkar-tyson@uwa.edu.au; School of Biomedical Sciences, UWA
Project title:	**Characterisation of Induced Pluripotent Stem Cell Lines Generated from Patients with Congenital Aniridia**
Project location:	Lions Eye Institute, Centre for Ophthalmology and Visual Science, UWA Medical School
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	*PAX6* is a key developmental gene. Heterozygous mutations in the *PAX6* gene occur in up to 1 in 40,000 live births and cause congenital aniridia (the absence of the coloured part of the eye) and other eye conditions including corneal cloudiness that can lead to blindness. Our team at the Lions Eye Institute has established the first biobank of patients with *PAX6* mutations in Western Australia and generated induced pluripotent stem cell (iPSC) lines from their skin fibroblasts. This study aims to characterise the iPSC lines for future use of these stem cells as a disease model for congenital aniridia and therapeutic development. Techniques that will be used in this project include stem cell culture and differentiation, mycoplasma screening, digital karyotyping, immunocytochemistry, and quantitative real-time PCR. The results will be published in the *Stem Cell Research* journal.

Research Project Proposal 2025

Primary supervisor (name):	Dr Mitali Sarkar-Tyson
Contact details (phone; email; location)	08 9346 4872, mitali.sarkar-tyson@uwa.edu.au Marshall Centre for Infectious Disease Research and Training
Other supervisor/s if any (name):	Ashley Johnson
Contact details (phone; email; location)	ashley.johnson@research.uwa.edu.au Marshall Centre for Infectious Disease Research and Training
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Two's a crowd: Investigating two branched chain amino acid biosynthesis genes in *Burkholderia pseudomallei***
Project location:	Marshall Centre for Infectious Disease Research and Training, Room 2.04, School of Biomedical Sciences, L Block, QEII Medical Centre
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	**Background**: *Burkholderia pseudomallei*, the bacterium responsible for the disease melioidosis, is highly pathogenic and causes severe infections associated with high mortality rates. The decline in novel antimicrobial development over the past two decades, coupled with increasing resistance to existing treatments, highlights the urgency for new therapeutics. Biochemical pathways unique to bacteria, such as the branched-chain amino acid (BCAA) biosynthesis pathway, offer promising targets due to their critical role in bacterial survival and pathogenicity. The BCAA pathway has already proven successful for antibiotic development, exemplified by cycloserine, an anti-tuberculosis drug targeting the enzyme IlvE. Interestingly, *B. pseudomallei,* and *B. thailandensis*, a PC2 surrogate model for *B. pseudomallei*, appear to be the first bacterial species identified with two *ilvE* genes. Characterising the two genes encoding the IlvE proteins in these species could reveal novel species-specific virulence mechanisms, and provide new avenues for targeted therapeutic interventions. **Aims:** The aim of this project is to characterise the two *ilvE* genes and their role in the BCAA biosynthesis pathway in *Burkholderia thailandensis*, a PC2 surrogate model for *B. pseudomallei*. Specific aims: 1. Construction of *ilvE1*-pDM4 and *ilvE2*-pDM4 plasmids for the deletion of the *ilvE1* and *ilvE2* genes in *B. thailandensis,* 2. Generation of *ilvE1 and ilvE2* gene deletion mutants in *B. thailandensis*. 3. Characterise the role of *ilvE1* and *ilvE2* in the virulence of *B. thailandensis*: Conduct microbiological assays such as bacterial growth curves and test virulence of the mutant strains using cell infection models. **Techniques:**

	Bacterial culturing and aseptic techniques; gene cloning and vector construction; PCR for gene amplification and verification; mutagenesis; bacterial growth assays and supplementation studies; tissue culturing; cell infection assays. **Outcomes:** This project aims to elucidate the role of *ilvE* genes in *B. thailandensis*. Insights gained from this research will contribute to the broader knowledge of bacterial metabolism, and could lead to the development of novel, targeted antibiotics. By focusing on these unique enzymes, the study seeks to characterise both *IlvE* genes in BCAA biosynthesis in *B. thailandensis* and understand their role in virulence.

Research Project Proposal 2025

Primary supervisor (name):	Prof Charlene Kahler
Contact details (phone; email; location)	0864572058 Charlene.Kahler@uwa.edu.au L block Marshall center
Other supervisor/s if any (name):	Dr Van Thai
Contact details (phone; email; location)	Vanchi.thai@uwa.edu.au
Other supervisor/s if any (name):	A/Prof Matt Payne
Contact details (phone; email; location)	Matthew.payne@uwa.edu.au
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Meningococcal disease in pregnancy**
Project location:	Marshall Center, QE II Medical Center, L block
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	*Neisseria meningitidis* (Nme) is a resident bacteria of the human nasopharynx, which causes life-threatening invasive meningococcal disease (IMD). Infants under the age of 1 yr are most at-risk for fatal IMD. Current vaccination programs start at 2 months of age, but still leaves an unvaccinated cohort under 2 months old. Maternal meningococcal vaccination is not routinely recommended as risk assessments suggest the co-occurrence of pregnancy and IMD is relatively low. However, three IMD events in mother-child pairs occurred at the peak of the Western Australian IMD outbreak of 2013-2020 [1]. These cases resulted in maternal or infant death. The Nme strain causing this outbreak was characterised by unusual IMD symptoms suggesting a shift in the ability of the bacteria to cause disease and colonise human urogenital tract including the placenta. This study will assess the prevalence of meningococcal bacteria in pregnant women during the IMD outbreak (2013-2018), using 3,653 vaginal swabs collected from pregnant mothers enrolled in a clinical trial led by A/Prof Matt Payne. The prevalence of meningococcal bacteria in the vagina of pregnant mothers will be assessed and risk factors associated with this noted. The goal is to guide public health interventions and policies, protecting both mothers and neonates during IMD outbreaks. The aims of the study will be: Aim 1: Prevalence of meningococcal carriage in pregnant women in Western Australia between 2018-2023.

	Aim 2: Association of risk factors with vaginal meningococcal carriage in pregnant women Methods: We have a collection of 3,653 vaginal swabs which have been extracted. We will use RT-PCR to screen these samples for the presence of the meningococcal infections. Using the meta-data associated with these samples we will test a number of hypotheses regarding risk factors typically associated with oropharyngeal meningococcal carriage or gonococcal vaginal infections. These are age, smoking, bacterial vaginosis, and pre-term birth. We will use a Fisher's exact test followed by adjusted odds ratios for each characteristic but our ability to do this will be dependent upon the Nme positivity rate. **REFERENCES** 1. Hart, J., et al., *Obstetric and Neonatal Invasive Meningococcal Disease Caused by Neisseria meningitidis Serogroup W, Western Australia, Australia.* Emerg Infect Dis, 2024. **30**(2): p. 368-371.

Research Project Proposal 2025

Primary supervisor (name):	Prof Charlene Kahler
Contact details (phone; email; location)	0864572058 Charlene.Kahler@uwa.edu.au L block Marshall Center
Other supervisor/s if any (name):	Dr Van Thai
Contact details (phone; email; location)	Vanchi.thai@uwa.edu.au
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	
Contact details (phone; email; location)	
Project title:	**Understanding the role of the novel axillary protein, MisP, in signalling via the Two-component system, MisRS, in Neisseria meningitidis**
Project location:	Marshall Center, QE II Medical Center, L block
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	*Neisseria meningitidis* (Nme) is a resident bacteria of the human nasopharynx, which causes life-threatening invasive meningococcal disease (IMD). *N. meningitidis* expresses a lot of virulence determinants during invasive disease. One of the most important regulators is the two-component system (TCS), MisR-S. We have recently discovered that the signal for this TCS is oxidative and osmotic stress. Interestingly, this signalling cascade is reliant upon a periplasmic protein, MisP. When MisP is present, signalling through MisS occurs, but when MisP is absent, the signalling via MisS is completely shut down. MisP is entirely novel and we do not know how it works. A predicted structure of the protein suggests it may contain a disulphide bond. If true, then this bond would be important for the conformation of misP and would determine how it binds to MisS. In this project we will test the hypothesis that the disulphide bond is important for MisP to bind to MisS. The aims of the study will be: Aim 1: Mutate the cysteines in MisP to remove the disulphide bond and test whether this affects MisS signalling Aim 2: Create bait/prey fusions of MisS and MisP for the detection of an interaction between these proteins Methods:

	In the first aim, you will clone and mutation the MisP gene. This mutated gene will be re-introduced into a host strain with a reporter gene that detects MisS activity. In the second aim, you will design and create fusion proteins for expression in Neisseria. You will use western immunoblots to measure the expression of the fusion proteins. **REFERENCES** **Tzeng, Kahler, Zhang and Stephens. 2008.** MisR/MisS Two-Component Regulon in *Neisseria meningitidis.* Infect Immun. 2008 Feb; 76(2): 704–716.

Research Project Proposal 2025

Primary supervisor (name):	A/Prof Elaine Wong
Contact details (phone; email; location)	0864 570 563; elaine.wong@earscience.org.au; Floor 3, Ralph and Patricia Sarich Neuroscience Research Institute, 8 Verdun street, Nedlands, WA 6009
Other supervisor/s if any (name):	Dr Samuel McLenachan
Contact details (phone; email; location)	0893 810 777; samuel.mclenachan@lei.org.au; Floor 4, Harry Perkins Institute of Medical Research, 6 Verdun street, Nedlands, WA 6009
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	To be confirmed
Contact details (phone; email; location)	
Project title:	**Generation of 3D stem cell organoids from induced pluripotent stem cells for patient-specific ear development models**
Project location:	Ear Science Institute Australia, Floor 3, Ralph and Patricia Sarich Neuroscience Research Institute, 8 Verdun Street, Nedlands, WA 6009
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Hearing loss is a major public health problem affecting one in six people. In children, problems with hearing lead to delayed language development or speech impairment. In adults, loss of hearing and communication can lead to feelings of isolation and depression. Mainstay treatments include the use of hearing aids or cochlear implants, but these may be inadequate if hearing loss is profound or caused by extensive cochlear hair cell or neuron loss. These specialized cells, once lost or damaged, cannot regenerate and no treatment is available to cure hair cells or neuron loss in the inner ears. Our approach is to generate new sensory hair cells from human induced pluripotent stem cells (iPSC). Replacement of cochlear hair cells is a promising approach to reverse sensorineural deafness. This project will hold great potential for treatment of hearing loss to improve the quality of life for the hearing-impaired population. The differentiation of induced pluripotent stem cells to cell types of the inner ear is a new area, promising for regenerative studies, but still not developed enough for scalable, reliable and safe treatments. Another valuable contribution of pluripotent cells is in the generation of testing platforms for delivery, efficacy and safety of treatments. Many devices, materials and drug treatments have been compromised at late stages of development because of their poor targeting or ototoxic effects. Materials and drug testing are now performed mostly in animal models but are increasingly limited by ethical constraints and may be prone to error due to species differences. Demand for ototoxicity testing may be better satisfied with appropriate human organoid models, such as those recently generated from iPSC. Robust clinically-relevant protocols for

	human hair cell differentiation are still in development but there have been several advances in recent years towards safe and effective xeno-free methods. These largely recapitulate the regulation of signalling pathways (TGF, BMP, FGF, and Wnt) during development. In this project, we will identify the approaches to generate cochlear organoids with functional hair cells in implementing these models from normal and patient-specific iPSC and test for ototoxicity.

Research Project Proposal 2025

Primary supervisor (name):	Dr Sebastien Malinge
Contact details (phone; email; location)	The Kids Research Institute Australia – Cancer Centre Sebastien.malinge@thekids.org.au
Other supervisor/s if any (name):	Dr Jesse Armitage
Contact details (phone; email; location)	University of Western Australia The Kids Research Institute Australia – Cancer Centre Jesse.armitage@thekids.org.au
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
SBMS Coordinating supervisor (for non-SBMS supervisors)	Dr Bree Foley
Contact details (phone; email; location)	University of Western Australia Bree.foley@uwa.edu.au
Project title:	**Finding new cures for childhood leukaemia**
Project location:	University of Western Australia The Kids Research Institute Australia
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Leukaemia is the second cause of death by cancer for Australian children, mostly due to treatment-related toxicity and relapses. Our group is focused on finding new key vulnerabilities in the leukaemia cells to develop novel and less toxic targeted therapies, as well as better understand the microenvironment surrounding the leukaemia cells, to design new therapies: targeted chemo- and immunotherapies. To achieve this goal, we developed sophisticated and clinically relevant models of childhood leukaemia (unique cell lines, Patient-derived Xenografts and immune competent mouse models). In this project, we will assess the efficacy of novel targeted therapies using a wide range of technics (such as molecular and cellular biology, tissue culture, drug/response assays, flow cytometry, and animal work) and focus on 3 aims: - Aim 1: assess efficacy of new therapies in vitro (and in vivo), - Aim 2: dissect the molecular mechanisms of potent therapies, Ultimately, our goal is to discover new chemo- and immunotherapies with high potential to be translated into the clinic to improve prevention, diagnosis, long-term survival and quality of care for children with leukaemia.

Research Project Proposal 2025

Primary supervisor (name):	Dr Nina McCarthy
Contact details (phone; email; location)	nina.mccarthy@uwa.edu.au M Block QEII
Other supervisor/s if any (name):	TBC
Contact details (phone; email; location)	
Other supervisor/s if any (name):	
Contact details (phone; email; location)	
Project title:	**Structural equation modelling of the genetic overlap between language ability, schizophrenia and major depressive disorder.**
Project location:	M Block, QE2.
Project Description: Aims; Design; Techniques; Outcomes; References (optional):	Psychiatric disorders have high levels of genetic correlation with each other and share many pleiotropic genes (genes that have multiple distinct phenotypic effects). Many psychiatric disorders also share a common endophenotype - an 'intermediate' or 'sub' phenotype which is genetically correlated with the psychiatric disorder. Our group is working on a program of research, along with international collaborators, to investigate whether genetic overlap with shared endophenotypes explains the genetic correlation between pairs of psychiatric disorders, based on publicly available data from large GWAS studies. This is done using genomic structural equation modelling, a recently developed multivariate method, which can be used to probe the genetic structure of endophenotypes and their relationship to clinical disorders by estimating the joint genetic architecture of multiple complex traits. We hope that this work will improve our understanding of the aetiology of psychiatric disorders, and the relationships between them and their endophenotypes, which will eventually lead to improved diagnosis and treatments. In the shorter term, we hope that this work will help to tailor existing treatments; helping to inform when treatments should focus on symptoms specific to individual psychiatric disorders, and when they should be trans-diagnostic. The aim of this project will be to use genomic structural equation modelling to further investigate the reported genetic overlap between language ability, schizophrenia and major depressive disorder using publicly available data from the psychiatric genomics consortium and a recent GWAS of school performance.

Research Project Proposal 2025

Primary supervisor (name):	Dr Collin Chin
Contact details (phone; email; location)	0421 941 642 collin.chin@health.wa.gov.au Cell & Tissue Therapies WA, Level 2, North Block, Royal Perth Hospital, Perth WA 6000
Other supervisor/s if any (name):	Christian Tjiam
Contact details (phone; email; location)	christian.tjiam@thekids.org.au The Kids Research Institute Australia
Other supervisor/s if any (name):	Dr Dino Tan
Contact details (phone; email; location)	dino.tan@uwa.edu.au Institute for Respiratory Health, Level 5, Harry Perkins Institute for Medical Research Building, QQ Block, QEII Medical Centre, Nedlands WA 6009
Other supervisor/s if any (name):	A/Prof Kathy Fuller
Contact details (phone; email; location)	Kathy.fuller@uwa.edu.au Translational Cancer Pathology Laboratory (TCPL), University of Western Australia
Project title:	Investigating patterns of T cell exhaustion in patients treated with CAR-T and immune effector cell therapies.
Project location:	Translational Cancer Pathology Laboratory (TCPL), University of Western Australia

Project Description: Aims; Design; Techniques; Outcomes; References (optional):	**Background** Blood cancer is the second most deadly cancer in Australia and claims 16 lives daily. New treatments called immune effector cell (IEC) therapies are being used to fight blood cancers and can cure 1 in 2 patients who would have died with standard treatments. These treatments use the body's own defences to target and destroy cancer cells. One type of treatment, called chimeric antigen receptor T cell therapy (CAR-T), modifies a patient's own immune cells to recognise and attack cancer cells. Doctors take a patient's own blood, genetically modify the immune cells in a lab, and put them back in the body to fight off cancer. While these treatments have helped many patients, most still face challenges, like the cancer coming back or not responding to treatment. This can happen because the immune cells get tired. To make these treatments even better and save more lives, we need to understand how they affect the immune cells over time. **Aim:** This study aims to characterise the pattern of T cell exhaustion of immune effector cells using spectral flow cytometry. Specifically, we will investigate the different patterns of T cell exhaustion in patients treated with different types of cancer therapies including CAR-T. **Objectives** -To design and optimise a spectral flow cytometry panel evaluating patterns of T cell exhaustion using a Cytek NorthernLights® flow cytometer -To validate the spectral flow cytometry panel in patients with B-cell non-Hodgkin lymphoma treated with immune effector cell therapy **Techniques** PBMC isolation and cryopreservation; flow cytometry – panel design, optimisation and data analysis. **Significance/Outcomes** Understanding the different patterns of T cell exhaustion in patients treated with CAR-T and immune effector cell therapies may provide new insights into mechanisms of treatment failure. This knowledge could lead to the identification of novel therapeutic approaches to overcome T cell exhaustion and improving outcomes for patients with terminal blood cancers.