
MOLECULAR MICROBIOLOGY 631

SEMESTER 1, 2012

UNIT DETAILS

Unit Index No:	310172 v.1
Credit points:	25 credit points are available on successful completion of this unit.
Pre-requisite units:	Entry to course or appropriate undergraduate qualification.
Tuition pattern:	2 hours lectures weekly 6 hours tutorials Self-paced study program
Unit coordinator:	David E Townsend
Address:	School of Biomedical Sciences Curtin University of Technology GPO Box U1987 PERTH WA 6845
Email:	d.townsend@curtin.edu.au
Phone:	(08) 9266 7423. The phone is connected to a Voice Answering system that will prompt you to leave a message when I am unable to take your call. Clearly state your name, contact number and suggested time to ring back. If possible give a brief description of your inquiry so that I can prepare a response or obtain the information you need.
Fax:	(08) 9266 2342
Office:	308.227

UNIT STATUS

This is a **core unit** for students enrolled in the Master of Biomedical Science course. Students who fail this unit on more than two occasions may be terminated from the course.

REQUIREMENTS TO COMPLETE THE UNIT

PREREQUISITE SKILLS

The content covered in Molecular Microbiology 631 assumes that you:

- Have good written and verbal communication skills.
- Can effectively source, access and use library resources (printed and electronic).
- Are familiar with the use of a computer.

TECHNOLOGY

It is helpful, but not essential, that you have access to:

- A computer with an Internet connection. Remote access to Curtin's computer network is available for your home computer or you can access the computing facilities on campus.
- Email, telephone or a fax machine to contact your tutor and other students studying the same unit.

UNIT OUTCOMES

LEARNING OUTCOMES (CONTENT KNOWLEDGE)

On successful completion of this unit you should be able to:

- Detail the principles and applications of selected molecular techniques used to investigate pathogenesis of infectious diseases.
- Evaluate and select the most appropriate molecular methods for the analysis of infectious diseases.
- Discuss advances made by molecular analyses in the understanding of selected infectious diseases and how this may contribute to better methods for surveillance, prevention and control.
- Research a selected topic and present the findings as a seminar to an audience of peers.
- Critically appraise selected examples of scientific publications relevant to infectious diseases.

PROFESSIONAL SKILL OUTCOMES

On successful completion of this unit you will have completed tasks that will have developed the following skills:

- Demonstrate self-directed learning and professional development
- Use of written, verbal and electronic media.
- Accessing, analyzing and critically evaluating relevant information.
- Organizational skills to study, research, revise and review unit materials.
- Organisational skills to prepare for assessments.
- Revision and discussion of unit materials as part of a tutorial group.
- Prepare an oral presentation using a software package like Microsoft's PowerPoint and present an engaging and informative talk to your peers.

SYLLABUS

There is mounting evidence for the re-emergence of infectious disease as a major threat to human health particularly as more pathogens become resistant to current antimicrobial chemotherapy. A selection of microbial diseases will be examined at the molecular level to illustrate the mechanisms of pathogenesis and infection cycles and provide new insights and solutions for their surveillance, prevention and control. Cutting-edge molecular techniques for investigating microbial pathogenesis will be analyzed and compared including real-time PCR, signature-tagged mutagenesis, IVET, micro-array, genomics and proteomics.

TEACHING TIMETABLE

Lectures 1-12	Friday	9.00 - 11.00 am	307.102
Lectures 13-22	Wednesday	8.00 - 10.00 am	405.206
Tutorials	Tuesday (Group A)	8.00 - 10.00 am	108.111
Weeks 10-12	Thursday (Group B)	8.00 - 10.00 am	400.219

LECTURE PROGRAM

Week	Date	Lecture	Topic	Lecturer
1	2/3	1, 2	General introduction to virology: definitions, basic biology, structure, cultivation, purification, identification, taxonomy and assays.	David Townsend
2	9/3	3, 4	Molecular biology of virus life cycles: comparison of DNA and RNA viruses, classification schemes of viruses.	Brian Brestovac
3	16/3	5	Virus detection; "Elementary my dear Watson"	Brian Brestovac
3	16/3	6	Papilloma virus; a new vaccine to prevent cervical cancer	Brian Brestovac
4	23/3	7	Influenza virus; a leopard changes its spots	Brian Brestovac
4	23/3	8	Herpes Simplex virus; are you back again?	Brian Brestovac
5	30/3	9	Rotaviruses; a major cause of infant mortality	Dale Morgan
5	30/3	10	Emerging viral diseases; where did you come from?	Brian Brestovac
6, 7	Good Friday and week free			
8	18/4	13, 14	Introduction to bacterial pathogenesis	David Townsend
8	20/4	11	Prions – an infectious protein!	Brian Brestovac
8	20/4	12	Antiviral chemotherapy and vaccines; don't shoot yourself!	Brian Brestovac
9	Anzac Day holiday			
10	2/5	15	Molecular signaling in a symbiotic relationship – <i>Rhizobium</i> and the root nodules of legumes	Elizabeth Watkin
10	2/5	16	Bacterial signaling pathways – quorum sensing	Elizabeth Watkin
11	9/5	17	Prokaryotic secretory systems and the release of virulence factors	David Townsend
11	9/5	18	Prokaryotic-eukaryotic cell communication	David Townsend
12	16/5	19, 20	Introduction to molecular techniques for analysis of microbial pathogens	David Townsend
13	23/5	21, 22	Examples of bacterial diseases: <i>Vibrio cholera</i> as a model for bacterial diarrhoea and <i>Yersinia pestis</i> as a model for toxin delivery and extreme	David Townsend

		virulence.	
--	--	------------	--

TUTORIAL PROGRAM

Students will prepare a seminar presentation on one of the following topics. A key reference paper is provided for each topic. Use this reference as a **starting point** for reviewing the literature on this subject. You may need to consult other papers to obtain a full understanding of the topic. Also prepare a summary of the presentation on a single sheet of A4 paper and include 5-8 short answer questions (multiple choice, one word answer etc) that highlight the main points of the topic.

Topic		Reference
1.	Treatment of HIV infection – latest protocols	Tsibris AMN and Hirsch MS. 2010. “Antiretroviral Therapy in the Clinic.” J Virology 84 (11): 5458–64.
2.	What is the significance of Herpesviruses integrating into human chromosome?	Morissette G and Flamand L. 2010. “Herpesviruses and Chromosomal Integration.” J Virology 84 (23): 12100–9.
3.	Are there better vaccines for human papilloma vaccines?	Campo MS and Roden RBS. 2010. “Papillomavirus Prophylactic Vaccines: Established Successes, New Approaches.” J Virology 84 (3): 1214–20.
4.	How does a virus cross over to infect other species?	Graham RL and Baric RS. 2010. “Recombination, Reservoirs, and the Modular Spike: Mechanisms of Coronavirus Cross-Species Transmission.” J Virology 84 (7): 3134–46.
5.	How does a virus infect neighboring cells?	Mothes W, Sherer NM, Jin J, and Zhong P. 2010. “Virus Cell-to-Cell Transmission.” J Virology 84 (17): 8360–8.
6.	Global regulators of <i>Staph aureus</i> and the expression of virulence factors.	Bronner S, Monteil H and Prévost G. 2004. “Regulation of virulence determinants in <i>Staphylococcus aureus</i> : complexity and applications”. FEMS Microbiology Reviews. 28 (2): 183-200.
7.	Cell communication in biofilms.	Jayaraman A et al, 2008. “Bacterial Quorum Sensing: Signals, Circuits, and Implications for Biofilms and Disease”. Annual. Rev. Biomed. Eng. 10 :145–67.
8.	How can we develop a cost-effective cholera vaccine?	Rhie GE <i>et al.</i> 2008. “Construction of cholera toxin B subunit-producing <i>Vibrio cholerae</i> strains using the Mariner-FRT transposon delivery system” FEMS Immunology and Medical Microbiology 52 (1): 23-8.
9.	Type IV secretory system of <i>Helicobacter pylori</i> .	Backert et al. 2008. “Role of type IV secretion in <i>Helicobacter pylori</i> pathogenesis”. Cellular Microbiology 10 (8): 1573–81.
10.	<i>Helicobacter pylori</i> as a causative agent of gastric cancer.	Polk DB and Peek RM. 2010. “ <i>Helicobacter pylori</i> : gastric cancer and beyond”. Nat. Rev. Cancer. 10 (6):403-414

11.	The role of tyrosine kinase during intracellular invasion by <i>Shigella</i> .	Van Nhieu GT <i>et al.</i> 2005. "Tyrosine kinase signaling and type III effectors orchestrating <i>Shigella</i> invasion". <i>Current Opinion in Microbiology</i> , 8 :16-20.
12.	Acquisition of iron by bacteria from host tissues and cells.	Skaar, EP. 2010. "The Battle for Iron between Bacterial Pathogens and their Vertebrate Hosts". <i>PLoS Pathogens</i> 6 (8).

Submit the summary to the tutor **one week before** the tutorial date so that photocopies can be made and distributed to the rest of the tutorial group. Prepare a talk on the topic using Microsoft PowerPoint. The text should have a minimum size of 24 picas, use a plain font such as Arial and ensure good contrast against the slide background. Save your presentation to a floppy disk, thumb drive or email it to me (It is most advisable to have a dry run on Curtin's projector to make sure your files are compatible with our equipment). Plan the talk to last for 15-20 min and be prepared to answer questions for 10 min. If you are having any problems using the software please contact your lecturer for guidance.

The lecture material provides the theoretical background for the tutorials so you are not expected to repeat information already dealt with in the lectures. These tutorial topics have been chosen because they illustrate some particularly interesting aspects of molecular microbiology. You must decide which aspect is interesting to you and then present this in a manner that is informative and stimulates your audience.

Here are some guides for your presentation.

1. Start your talk with an "attention grabber". A statement that highlights the most exciting aspect of your topic.
2. Use a simple font like Arial at a minimum size of 24 picas.
3. Avoid a long list of facts and data! Slides with a mass of information and small text are impossible to follow and boring – your audience can read faster than you can talk. Tantalise the audience with short phrases, points etc. Keep your slides simple and uncluttered – clarity is the key.
4. Be very careful of diagrams and tables etc. Make sure they are easy to read and uncluttered. If you cut and paste them from another document the resolution is often very poor and it may be better to redraw them with PowerPoint's drawing tools.
5. Be very careful of illustrations and photographs. They may be subject to copyright and require acknowledgement within the presentation. Make sure all labels can be easily read by your audience.
6. Avoid complicated technical information that is more suited to an audience of experts in this field. Your audience is intelligent and well-informed but not expert in this field.
7. Somebody reading a set of prepared notes is boring! Use your Power Point slides as your prompts for the talk. Address your talk to the audience. Look at them! Look as if you are interested in the topic. Your audience will take their cue from your facial expression and the tone of your voice.
8. Carefully consider the sequence of slides – it should be logical. Do not jump back and forth between slides – repeat a slide if the information must be used later in the presentation but also consider altering the sequence to avoid repetition.

9. Consider the transition between slides – there must be a logical flow from one slide to the next. Avoid overly complex slide transitions – data “flying” all over the screen or slides that “zoom” off screen accompanied by the sound of a jet engine just becomes a distraction.
10. Make use of images, graphs etc wherever possible – “a picture is worth a thousand words”. When an image is presented make sure it is labeled with the information you wish to highlight and be prepared to turn to the image and point out the salient facts – do not expect the audience to interpret the image for you.
11. Finish the talk with a summary of the most important points – there should be a “take home message” for the audience.
12. The summary should also be in point form with good use of headings and in the same order as your talk. Your audience should be able to use this document to jog their memory of the talk several weeks after the presentation.
13. Questions should examine the main points of the talk. They should be worded in such a fashion that they can be incorporated into an exam without reference to the tutorial. Students should be quite clear about what is being examined. This is much more difficult to achieve than it would appear!

Note that the material and questions presented in tutorials will be assessed in the final objective test.

Marks will be deducted for work submitted after the required date. Both students are expected to make an equal contribution to the preparation and presentation of the topic.

ASSIGNMENTS

You are required to research two topics by consulting textbooks and scientific literature. You are provided with recent references to use as a starting point in your search of the literature.

Topic 1.

Title: The use of oligonucleotides as antiviral drugs.

References: Lopez-Fraga M et al. 2008. RNA Interference-Based Therapeutics: New Strategies to Fight Infectious Disease. *Infectious Disorders – Drug Targets* 8: 262-273.

Stone JK et al. 2008. A Morpholino Oligomer Targeting Highly Conserved Internal Ribosome Entry Site Sequence Is Able to Inhibit Multiple Species of Picornavirus. *Antimicrobial Agents and Chemotherapy* 52(6): 1970-1981.

Topic 2.

Title: The survival of *Neisseria gonorrhoeae* as an intracellular pathogen.

References: Seib KL. 2006. Defenses against Oxidative Stress in *Neisseria gonorrhoeae*: a System Tailored for a Challenging Environment. *Microbiology and Molecular Biology Reviews*, 70 (2): 344–361.

ASSESSMENT

Mid-semester exam : Short-answer questions from lectures 1-12 Essay based on topic 1 Friday 27 th April at 12-2 pm in 308.250	20% 20%
Tutorial presentation: Submitted by the due date. Late submissions will incur a loss of marks.	20%
Final exam: Short-answer questions from lectures 13-24 Essay based on topic 2 Exam week at date, time and venue to be arranged	20% 20%
Total	100%

OBJECTIVE TESTS

The questions for the objective tests will be taken from the questions provided at the end of each lecture.

- Objective test 1 examines lectures 1-12
- Objective test 2 examines lectures 13-22 and the questions provided by students for each of the tutorial topics

Students not able to attend at the prescribed times will require prior approval to sit the exam on another date or a medical certificate.

TUTORIAL ASSESSMENT

Overall assessment for the tutorial program is based on the following;

Summary:	5%
PowerPoint presentation:	3%
Talk:	10%
Questions:	2%
Total	20%

TEXTBOOKS

Textbooks for this subject are very expensive. If students desire to purchase a textbook then the following is recommended but this will need to be ordered by each student from the Curtin Bookshop and may have to be prepaid. I suggest that initially students should attempt to use one of the reference texts listed below.

- *Fundamentals of Molecular Virology*. Acheson NH, John Wiley & Sons Inc, 2007
- *Prescott's Principles of Microbiology*. 1st edition. Willey JM, Sherwood LM and Woolverton CJ. McGraw-Hill Higher Education, New York 2009.

REFERENCES

General references for information on basic microbiology

- *Foundations in Microbiology*. 6th edition. Talaro KP, McGraw-Hill Higher Education, New York 2008.
- *Microbiology: An Introduction*. 9th edition. Tortora GJ, Finke BR and Case CL, Pearson International Edition, Benjamin/Cummings Publishing, 2007.
- *Microbial Life*. 2nd edition. Staley JT, Gunsalus RP, Lory S and Perry JJ. Sinauer Associates Inc, 2007

Reference texts on virology

- *Virology*. Carter JB and Saunders VA, Wiley, 2007
- *Human Virology*. 3rd edition. Collier L and Oxford J, Oxford University Press, 2006
- *Basic Virology*. 2nd edition. Wagner EK and Hewlett MJ, Blackwell Publishing, 2004.
- *Principles of Virology*. Flint SJ, Enquist LW, Krug RM, Racaniello VR and Skalka AM, ASM Press, Washington DC, 2000.
- *Principles of Molecular Virology*, 3rd edition. Cann AJ, Academic Press, 2001.

References for bacterial pathogenesis

- Bacterial Disease Mechanisms. An Introduction to Cellular Microbiology. Wilson M, McNab R & Henderson B. (2002) Cambridge University Press, ISBN: 0 521 79689X
- Bacterial Pathogenesis. A Molecular Approach. Salyers AA & Whitt DD (2002) ASM Press. ISBN: 1-55581-171-X
- Mechanisms of Microbial Diseases (3rd edition) Schaechter M, Engelberg N, Eisenstein B & Medoff G (1998), Williams and Wilkins Press, ISBN: 0-683-07605-1
- Molecular Diagnosis of Infectious Diseases (2nd edition) Decker J & Reischl U (2004), Human Press, ISBN: 1-58829-221-5

PLAGIARISM POLICY

Students need to be aware of the University's policy on plagiarism. It is not acceptable to simply copy the words of other students or authors when completing exercises and assignments in this unit. This constitutes plagiarism and is regarded as academic malpractice. The penalties for plagiarism can be very severe and may include termination from your course of study. All direct quotes must be correctly attributed to the author and should be kept to a minimum. Also, you should include a list of references to acknowledge the source(s) of information used to produce any written work. Refer to the Plagiarism Policy included in your Transition package for full details.

SUPPLEMENTARY EXAMINATIONS

Supplementary examinations are awarded only at the discretion of the Board of Examiners. The aim of a supplementary examination is to allow the student to correct **minor** problems /deficiencies in the initial assessment and **not** to gain extra study time or correct major problems. The number of supplementary examinations awarded will be kept to a minimum for any one examination period and course of study.

Supplementary examinations, if awarded, will be indicated on the official Curtin examination result statement posted to all students and will also be listed on the School (or Departmental) noticeboard 24 hours after the Board of Examiners meeting. It is **your** responsibility to check your status. A student who does not sit for a scheduled supplementary examination has no claim to a further examination. If you are awarded a supplementary examination it is imperative that you confirm the time and venue for the exam.

DEFERRED ASSESSMENT

Deferment of an examination is not automatic. Students may be permitted by the relevant Board of Examiners to defer an examination or other assessment where circumstances outside their control have arisen. However, a student's overall performance may be taken into account in granting permission to defer an examination.

Applications for deferment on health grounds or as a result of extenuating circumstances must be submitted not later than seven (7) days after the end of the relevant examination period or assessment date during the semester. **Detailed** medical certificates should be attached to the application where appropriate.

The prescribed application form may be obtained either from Admission and Student Records or your Course Administrator. Completed forms **must** be submitted to the Course Administrator. This includes applications for deferred assessment for units in your course of study conducted by **other** Schools.

MOBILE PHONES

As a courtesy to both lecturers and other students, if you have a mobile phone, please ensure that it is **TURNED OFF** during lecture, tutorial and practical sessions. Students who do not comply with this request can be asked to leave the class.

ACCESS TO UNIT COORDINATOR

The following is a list of methods by which you can contact me about any aspect of the course material or personal problems that affect your attendance or performance in the course. They are not listed in any order of priority.

- I will be available in my office for student queries on most Wednesdays 12-2 pm. If you would like to see me at another time please make an appointment.
- Please make use of the office phone, it has an answering service attached that allows detailed messages to be recorded, so leave your name, contact phone number, times that you can be contacted and some idea about the nature of your query.
- I have provided my email address above but please do not expect detailed responses to questions; my typing is too slow!
- Raise queries about any aspect of the course during the laboratory sessions.

Unit coordinator:	David E Townsend
Address:	School of Biomedical Sciences Curtin University of Technology GPO Box U1987 PERTH WA 6845
Email:	d.townsend@curtin.edu.au
Phone:	(08) 9266 7423. The phone is connected to a Voice Answering system that will prompt you to leave a message when I am unable to take your call. Clearly state your name, contact number and suggested time to ring back. If possible give a brief description of your inquiry so that I can prepare a response or obtain the information you need.
Fax:	(08) 9266 2342
Office:	308.227

FINAL NOTE

Molecular Microbiology 631 has been designed to study the molecular biology of viruses and pathogenesis of bacterial infections at considerable depth. You will be required to use knowledge gained in other units of molecular biology and microbiology so I encourage you to look widely for answers to questions and solutions to problems. At this level of study it is not sufficient to rely on textbooks for information, you must consult recent scientific literature. The assessment is clearly set out and simple. There will be no surprise tests or quizzes so you can relax and enjoy the subject matter. Feel free to raise any topic during the course of the semester; there is ample opportunity to explore other subjects.

Welcome and best wishes for your studies in 2012

David Townsend