Biomedical Sciences

The web of life

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Jessica Macindoe BiomedSc(Hons) Student

Biomedical Sciences is the degree that links the papers relevant to an understanding of the scientific basis of health and disease in humans. You can combine papers from two or more disciplines into one of six exciting and innovative majors – the ‘web’ that underpins modern biological and medical research. The degree aims to equip graduates with the skills required to meet the constantly changing boundaries of modern biosciences.
Biomedical Sciences at Otago

The University of Otago is acknowledged as a world leader in biomedical sciences. The diverse departments that contribute papers to this degree are able to provide training across the whole spectrum of biomedical sciences – there is no narrow focus or restricted choice here! A common first-year emphasis that BiomedSc students are well-grounded in the basic sciences that underpin the later years of the degree. A BiomedSc degree at Otago allows you to benefit from the University of Otago’s research excellence and unique campus lifestyle.

Why study Biomedical Sciences?

Biomedical sciences is the interdisciplinary approach to sciences. It has great name recognition and is a very marketable degree. These interdisciplinarity strengths allow BiomedSc graduates to quickly adapt to diverse workplace demands – from developing nutritional sports powders to investigating the pathology of Hepatitis C. Our students are fast gaining a reputation for excellence and are sought after for PhD studies, so this is a good option if you are interested in a research career. A BiomedSc also provides an excellent grounding for those students who wish to apply for graduate entry to health professional programmes such as medicine, dentistry, pharmacy, or physiotherapy.

Background required

The BiomedSc degree has a common first year. All students must take seven papers, including six compulsory papers: BIOC 192, CELS 191, CHEM 191, HUBS 191, HUBS 192, and PHSI 191. There are no particular requirements for entry to these first-year papers, although a school background in biology, chemistry, and physics is strongly recommended.

Most BiomedSc students enrol in the Health Sciences First Year (HSFY) programme, which includes the paper called Foundations of Epidemiology. However this paper can be replaced with another paper from any degree schedule.

In order to progress to the second year of the BiomedSc degree, students must pass all seven papers (totaling 126 points).

What majors are available?

Currently there are six majors available in the BiomedSc degree:

- Drugs and Human Health (DRHH)
- Functional Human Biology (FUHB)
- Infection and Immunity (INIM)
- Molecular Basis of Health and Disease (MBHD)
- Nutrition and Metabolism in Human Health (NMHH)
- Reproduction, Genetics and Development (REGD)

Drugs and Human Health

The use and abuse of drugs plays a major role in human health. Drug use is increasing with the ageing of the population and with its increasing affluence. As drug use increases, the search for new agents has widened from traditional sources such as plants and animals, to new sources utilising new technologies in pharmacology, biochemistry, and immunology. This major gives an overview of the role of drugs in human health.

Functional Human Biology

Ultimately, human health depends on the normal functioning of the cells, tissues, and organ systems of the body. Understanding of disease in turn rests upon knowledge of the pathological processes on these systems. This major provides an overview of the mechanisms of functioning of all systems of the human body and explores specific areas in depth, with a research-informed focus.

Infection and Immunity

The study of microbes responsible for infectious diseases and their control is an important area in biomedical sciences. Important infectious or microbial diseases in New Zealand include invasive meningococcal disease, tuberculosis, rheumatic heart disease, and AIDS. Topics include the characteristics and properties of pathogenic microbes, antibiotic resistance, and immunology (and its relevance to the prevention and control of microbial and other diseases, such as cancer).

Molecular Basis of Health and Disease

This major explores the molecular basis of human metabolism and investigates the biochemical aspects of cellular communication related to human health and disease. Some of the topics covered include pathways of cell growth, survival and death, protein interactions in cell signalling pathways, dysregulation of metabolism, the expression of disease phenotypes, and protein-based drug design.

Nutrition and Metabolism in Human Health

This major covers the physiology and biochemistry of nutrition, dietary assessment, and nutrition and its relevance to human health. Topics covered include protein and amino acid requirements and nutritional issues, assessment of nutrient status, energy requirements and balance, and the role of lipids and carbohydrates in metabolic disorders.

Reproduction, Genetics, and Development

This major focuses on understanding the interplay between genes and structure in reproductive and developmental processes. Topics covered include the biology of reproductive systems, formation of embryos, genetic control of developmental processes, transgenic plants and animals, and a range of anatomical and molecular genetic techniques.

What is the difference between a BiomedSc and a BSc?

All the papers in the BiomedSc degree are also available in the BSc programme – the main difference is the way the degrees are structured. All BiomedSc students have six papers in common in their first year, and must pass 126 points (or seven papers) before continuing into their second year. In the third year of study, a BSc student must take four papers in their chosen discipline, whereas a BiomedSc student must combine two or three papers in one discipline with one or two papers from another discipline. So a BSc is discipline-focused whereas a BiomedSc is interdisciplinary. In addition, the BiomedSc degree is focussed on human health and disease.

Can I change degrees or majors?

Yes! As the papers are the same in both degrees it is possible to change from one degree to the other at the end of second year, providing you have met the appropriate prerequisites for your chosen major. In fact, we like you to keep your options open as long as possible!

Career opportunities

As a graduate of Otago’s BiomedSc degree you will have a wide variety of career options, both in New Zealand and overseas. You might choose to apply for graduate entry to medicine or other health professional programmes, or to continue research-based training in one of Otago’s internationally acclaimed biomedical departments. Your working life might begin with an innovative biotechnology company or with a more established company in the pharmaceutical, biomedical, or agricultural sectors. Alternatively, you might be employed by a research institute, university, government agency, or local authority, and use the scientific skills you have learned during your studies to provide policy, technical, or diagnostic advice.

Many of our graduates are professional scientists in a wide variety of different fields. Some are studying medicine, dentistry, optometry, and forensics. Some have opted for a research career – first completing a postgraduate BiomedSc(Hons) degree and then continuing with PhD studies. BiomedSc graduates are also working as research scientists, teaching fellows, research assistants, science technicians, and product managers.

BiomedSc(Hons)

The Bachelor of Biomedical Science with Honours (BiomedSc(Hons)) degree is a one-year, postgraduate programme. With its focus on hands-on biomedical research, it is widely regarded as an excellent choice for students wishing to continue on to PhD studies. Applicants must have completed the requirements for a BiomedSc degree (or equivalent qualification) with an average grade of at least B+ for the required 300-level papers, and must have taken papers worth at least 126 points at 200-level or above in their third year of study.

For questions about Biomedical Sciences

otago.ac.nz/biomedsci
Drugs and Human Health
Jessica Macindoe
BBiomedSc(Hons) Student
Jessica Macindoe learned about the BBiomedSc programme from a University of Otago careers officer, and it seemed like a natural fit.

“I loved it! I particularly liked how you could take such a variety of subjects even within the one major. During my undergrad degree, I studied a combination of biochemistry, physiology, pharmacology, and genetics – so I really felt like I could get a feel for what I enjoyed the most.”

Jessica also explains how she developed a number of valuable skills during her studies, including researching, coordinating team projects, and “hugely developing my public speaking ability.”

Jessica further developed her research skills when she took on one of Otago’s summer studentships, during the summer break at the end of her third year.

“That was what really convinced me that I wanted to do an honours year,” she says. “I definitely recommend the summer studentships to all students who are interested in doing some research at any stage in their life – it was a great experience and I learnt a great deal.”

Now, as a postgraduate student, Jessica’s noticed a big difference between the BSc(Hons) and BBiomedSc(Hons) programmes. “My BBiomedSc honours year is far more research heavy, so I don’t have to take nearly as many fourth-year papers as a BSc honours student would – and instead can dedicate more time to my research project,” she says.

Jessica’s research involves using electrophysiological techniques to assess the efficacy of a drug that may be a possible neuroprotective agent.

Functional Human Biology
Cade Bedford
BBiomedSc(Hons) Student
Unlike many other students, Cade Bedford didn’t enter the Biomedical Sciences programme straight from secondary school. He initially enrolled to study engineering in Christchurch, but soon learned that it wasn’t for him. Seeking something new, he enrolled in his first human biology paper.

“I really enjoyed the paper so started looking for what degrees involve human biology. I thought I could start with biomedical science, then if I enjoyed it, I could continue into biomedical engineering.”

Fortunately, after moving south to Dunedin, Otago’s “strong reputation for medicine and medical science” didn’t disappoint.

“With biomedical science you get to try multiple health science disciplines,” Cade explains. “It’s a holistic approach to the health sciences, where you learn about more than one component of health and disease.”

“I started university thinking there was an answer to everything. I learned very quickly that this wasn’t the case. I learnt to critically assess information and question everything. This applies to all aspects of life: to learn more and develop you should question your preconceived views, beliefs, and thoughts.”

Having finished his BBiomedSc last year, Cade is now a postgraduate BBiomedSc(Hons) student. He’s considering continuing on to do master’s study next year, or else travelling and getting started in a research career. He says that his functional human biology studies have equipped him well for this.

“If I want to find a job within the research industry, I have practical lab skills. It’s a hands-on degree.”

Infection and Immunity
Farah Al Barwani
PhD Student
Farah Al Barwani is a long way from her home in the Sultanate of Oman, but she plans on staying in Dunedin for a while longer yet.

Farah did most of her schooling in Oman, except for Year 11, which she spent studying in Christchurch. While she was in Christchurch she kept hearing about how great Otago was, so she made plans to come to Otago for her university study.

“My favourite subjects at school were chemistry and math because they just made sense to me,” says Farah. She continued with these subjects when she came to Otago for the Foundation Year.

After completing Foundation Year, the idea of doing research in the health sciences drew Farah to the BBiomedSc degree. “I wanted to do immunology based research, and the infection and immunity degree was perfect for me,” she explains.

For Farah, the practical aspect of her learning was really enjoyable. “I loved doing experiments, especially when the experiments worked.”

The practical side of the programme encouraged Farah to continue with an honours degree.

Farah has now enrolled in PhD study. “I have a long road ahead of me, but I love being back in the lab doing experiments again,” she says.

Once her PhD is completed, Farah is definite about her next plan – she wants to return to Oman and teach the next generation of students.
Molecular Basis of Health and Disease

Henry Beetham
PhD Student

During his undergraduate studies, Henry Beetham took a variety of papers spread across the fields of biochemistry, pharmacology, and genetics. The BBiomedSc degree, majoring in the molecular basis of health and disease, enabled him to incorporate all of these papers into his degree.

“I can’t think of how it could have turned out better,” Henry says, giving three examples of why he enjoyed the programme.

“I was able to enrol in a variety of papers, which enabled a degree tailored to my interests. The BBiomedSc honours programme was a heavy research-based degree, which enabled a large amount of hands-on work and responsibility. And I was able to be part of multiple departments’ presentations and social activities.”

After finishing his BBiomedSc degree with first class honours, Henry joined the University of Otago’s Cancer Genetics Lab (part of the Centre for Translational Cancer Research), as a PhD student.

His work at the Lab involves finding new drugs that only kill cancer cells, as opposed to existing cancer drugs which also cause damage to normal tissue (leading to unwanted side-effects and limiting the drugs’ overall effectiveness).

“In the long-term, Henry expects what he discovers will “lead to better chemotherapy treatment of cancer patients, with fewer side-effects than current standard chemotherapy drugs.”

Nutrition and Metabolism in Human Health

Peta Campion
BBiomedSc Student

Peta Campion was originally drawn to Otago for its Health Sciences First Year programme. This gave her the opportunity to take a wide variety of Health Sciences papers, while also meeting the first-year requirements for many different Health Sciences programmes – including the BBiomedSc degree.

During Health Sciences First Year Peta discovered she was particularly interested in nutrition and anatomy, as well as some of the other Health Sciences “so studying biomedical sciences was definitely the best option.”

Peta enrolled as a BBiomedSc student majoring in nutrition and metabolism in human health.

“The practical labs have been a great learning experience,” she says, “particularly in the anatomy labs where I did dissection work.”

“I was very lucky to have the opportunity to do this,” she adds.

Peta also points out “the variety of papers offered in the biomedical sciences programme means that each semester was interesting, and being with a group of like-minded people made lectures and lab sessions much more enjoyable.”

Now Peta’s in the final year of her three-year BBiomedSc degree. She hopes that the people, practical, and research skills she’s gained will allow her to “help people make healthy nutrition and lifestyle choices in the future.”

To do this she plans to apply for the University of Otago’s Master of Dietetics (MDiet) programme next year, which will enable her to become a qualified dietician.

Reproduction, Genetics and Development

Mackenzie Lovegrove
BBiomedSc(Hons) Student

It wasn’t just the “vibrant and fun” scarfie lifestyle that attracted Mackenzie Lovegrove to Otago, but also “the great atmosphere, the amazing buildings, and resources like the anatomy museum, and the fact I could easily get to classes and into town by walking,” she says.

Mackenzie realised that she’d made the right choice once she began her BBiomedSc studies, majoring in reproduction, genetics and development.

“Biomed was a great option,” Mackenzie explains. “The majors were a blend of subjects that fitted well together, and allowed me to study across disciplines.”

“I was lucky enough to have amazing lecturers, interesting classes… as well as having access to resources that helped my learning hugely. It allowed me not only to study the genetics of development, but to couple that knowledge with the anatomy that went with it. It gave me an overview of my field that was invaluable.”

Something else she found invaluable was the amount of hands-on lab work she got to do. This made her even more interested in a research career, so after completing her BBiomedSc degree Mackenzie joined the Department of Biochemistry as a postgraduate student.

Based in the Department’s Laboratory for Evolution and Development, she is researching how the environment regulates large scale changes in gene expression. Mackenzie says this has “been both challenging and highly rewarding so far.”

Mackenzie plans to “complete a PhD either in Otago, or overseas, and live and travel around Europe as a postdoc. Then have a career as a research scientist and academic.”

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