

Reviewer report for the Master Programme in Infection Biology, Uppsala University, 2021

Introduction

This report summarises the conclusions and recommendations for the Master Programme in Infection Biology (MIB2M) from the review panel within the 11 quality aspects defined by Uppsala university.

The self evaluation with its appendices was used as a background for the review. It was complemented by interviews with the programme director, programme coordinator, director of study, most of the course leaders, and representatives of alumni and different student groups during a site visit in Uppsala on November 22nd, 2021. We had additional Zoom meetings within the review panel, both before and after the site visit.

The members of the review panel were:

- **Antonio Barragan**, Professor, Department of Molecular Biosciences, Stockholm University.
- **Daniel Öberg-Arendt**, Ph.D., Service Business Manager, Mercodia.
- **Erik Fries**, Professor Emeritus, Department of Medical Biochemistry and Microbiology, Uppsala University.
- **Jan Andersson**, Associate Professor, Department of Cell and Molecular Biology, Uppsala University (chairman).
- **Jesper Boman**, Ph.D. student, Department of Ecology and Genetics, Uppsala University (student representative).
- **Marianne Jansson**, Associate Professor, Department of Laboratory Medicine, Lund University.

Summary

With the Covid-19 pandemic it has become apparent that infection biology competence is strongly needed in our society. We believe that MIB2M is well suited to meet this demand. The students that graduate from the programme have a broad knowledge in infection biology and interrelated areas, for example global medicine, antibiotic resistance and zoonoses. Its strength builds on the fact that there is a nationally unique concentration of academic entities and governmental agencies with expertise in infection biology and interrelated areas within the Uppsala area.

However, we have found it difficult to assess whether the students who have passed the programme have actually fulfilled all set goals. This is a central quality aspect which needs to be carefully analysed by MIB2M.

MIB2M enrolls students with diverse academic backgrounds. Although this is part of the strength of the programme, it also provides challenges. We think that the programme outline during the first semester could be more flexible in order for the teachers to be able to meet all students on an appropriate level.

We have identified 3MK014 (Infection Biology in a Global Perspective) and 3MK015 (Advanced Scientific Research and Methodology) as particularly valuable courses. They foster the development of the general competences required in a master degree, which are usually less well covered in traditional courses. To our regret we note that some students chose not to take these courses, especially the methodology course.

Recommendations

- We recommend that MIB2M analyses in more detail to what extent the programme goals are fulfilled by the outlined courses. This work requires that it is ensured that all course goals are being examined in an appropriate manner and should lead to a clear progression through the programme.
- We recommend that MIB2M investigates how the different needs of students with diverse knowledge backgrounds can be met in a more efficient way. For example, we suggest that the first semester could be more flexible with different course options depending on the academic background of the student.
- We recommend that MIB2M considers making the scientific methodology course (3MK015) compulsory.
- We recommend increasing the involvement of infection biology actors/bodies from outside academia, which there are aplenty of in the Uppsala region. Such effort could assist the students with networking.
- We recommend that MIB2M develops and maintains routines for quality assurance. The system with course reports needs to be reestablished and there is a need for regular meetings to discuss quality issues between the programme and representatives of teachers and students.

Evaluation of the elective courses (3BL350-3BL353)

One of our tasks was to evaluate the elective courses (3BL350-3BL351 Research Training in Medical Biochemistry and Microbiology and 3BL352-3BL353 Project Work in Medical Biochemistry and Microbiology). The courses are briefly discussed in the self evaluation and the course syllabi and instructions are included in the supplementary material. Unfortunately, no course reports or evaluations were included. It is also unknown to us how many students actually take these courses and how they are used in relation to the regular courses and the degree project. Therefore, we have not been able to evaluate the quality of these courses regarding each of the eleven aspects. We can state, however, that the written instructions for the students and their supervisors are commendably detailed.

Extended comments for each of the 11 aspects from Uppsala University's Model for Review of Study Programmes

In this section we discuss the strengths and weaknesses that we observed for each of the eleven aspects. We also give recommendations on how the quality of the programme could be further improved.

1. That the study programmes achieve the objectives of the Higher Education Act and Higher Education Ordinance (Qualifications Ordinance) and programme-specific objectives, i.e., that actual learning outcomes correspond to expected learning outcomes

The course goals for each course in MIB2M have been mapped to the programme goals (the objectives of the Higher Education Act and Higher Education Ordinance and the programme-specific objectives stated in the MIB2M syllabus) by the course leaders. It is unclear to us how this mapping was done and if an "x" in the table in appendix 4.7 indicates that the specific programme goal is covered by a specific course goal that is part of the examination in the course. For example, programme-specific goal 4.4 states that the student should "be able to evaluate both local and global infectious biological issues based on ethical, economic and sustainability perspectives". This programme goal is indicated to be covered in five courses. Yet, only a single course mentions "economy" within the content, and none as a goal. These kinds of inconsistencies make it difficult for us to evaluate to what degree the programme goals are covered by the individual courses in the programme.

In question 25 of the alumni questionnaire, the respondents were asked to indicate to what extent MIB2M contributed to the development of a set of skills and knowledge, which should give some indication of the fulfilment of the programme goals. The responses suggest that the students do fulfil many of the programme goals. Still, the responses to some of the questions are a bit worrying because they indicate a lower level of fulfilment, e.g. "e. Explain to non-specialists", "i. Independently plan and prioritise work tasks", "j. Discuss and defend your point of view", "k. Make ethical judgements", "r. Communicating with private sector/companies". However, we do notice that the response rate for the alumni questionnaire is rather low and that the graduation years are diverse.

The students need 60 hp of programme courses for the degree project. That means that they can replace two 15 hp programme courses with any other courses and still get their degree. Two courses that seem to contribute substantially to the fulfilment of

the programme goals are in period 1 and 2, year 2 (3MK014 Infection Biology in a Global Perspective and 3MK015 Advanced Scientific Research and Methodology). We think that some of the programme goals could be difficult to fulfil for a student that replaces one or both of these courses.

We appreciate that the teachers present and discuss the course goals with the students. Indeed, in most of the course evaluations the students indicate that the goals for the courses are clear. The course leaders appear to design their examinations to cover the course goals. However, according to the students we interviewed, the grading criteria for e.g. seminars and oral presentations are sometimes vague.

Recommendations:

- We recommend that the course syllabus is aligned with the actual course content for every single course and that every goal is assessed in a suitable way. Then every course goal should be mapped to one or more programme goals. In this way programme goals with weak coverage can be identified and appropriate action can be made.
- We recommend that the syllabus for MIB2M is reviewed and maybe revised in a way that ensures that every student reaches the programme goals. Courses that are needed to reach specific programme goals should be mandatory.
- We commend that teachers communicate the course goals and grading criteria to the students. We recommend that the programme surveys the grading criteria for examinations of course activities (seminars, presentations, etc) for all courses. If grading criteria are currently lacking or unclear they should be developed and communicated to all involved teachers, presented for the students and applied.

2. That the content and teaching activities are founded on a scientific basis and proven experience

The link between teaching and scientific basis and research was clearly demonstrated in both contents and forms of education. First, IMBIM has Infection Biology as one of its research profiles, with active researchers in this area. Second, for areas not directly covered by the department's own research, teachers and researchers have been affiliated to IMBIM part-time to teach (for example parasitology). Third, invited external lecturers from the Uppsala area (SVA, SLU, Akademiska Hospital and other UU institutions) cover specific areas (for example, clinical infection biology & diagnosis). A majority of the teachers have

assistant/associate professor (“docentur”) or higher qualification levels. The close connection to research was confirmed in interviews with teachers and students.

Laboratory practicals were described by teachers as oriented towards a relevant scientific problem or question. In several courses, case-based and problem-based learning are applied and combined with workshops, seminars and discussions around scientific literature. A majority of students indicated they are trained in problem-solving strategies and critical thinking (Studentbarometer 2018, fig. 21). During the final Master Degree project (30 or 45 hp), students are integrated in a research group. A scientific methodology course (3MK015 Advanced Scientific Research and Methodology) is provided as “a link between moving from a guided student towards a self-guided researcher/specialist” (programme self-evaluation document).

Ethical aspects in research are specifically brought up in one of the course modules and are to be evaluated in the Master Degree project plan.

In summary, there is undoubtedly a scientific base and proven experience for the theoretical and practical components of MIB2M. The teaching includes diversity in well-established pedagogic methods and approaches. There is a progression in subjects and subject difficulty within the programme. However, given the diverse background of the students, this progression needs to be assured also in relation to bachelor programmes at Uppsala University.

Recommendations

- We commend the integrated laboratory sessions in courses (for example bacteriology and virology) and recommend that programme and course leadership consider the possibility of expanding those in other courses (mycology/parasitology/immunology).
- We commend the use of the scientific methodology course (3MK015) and recommend that MIB2M considers evaluating alternatives to integrate this course in the compulsory courses offered, in its current or other form.
- We recommend that the progression from bachelor to master courses is discussed with teachers and students.

3. That teaching focuses on the learning of students/doctoral students

Except for the master project, only the first course is mandatory, giving a great degree of flexibility for the students to create their own career path. Furthermore,

student-activating activities, such as peer-feedback at seminars and presentations, are used throughout the programme.

In the evaluation of the first course, several students complained about the pedagogical quality of the immunology module. They were also dissatisfied with immunology and bacteriology modules being examined on the same occasion. Furthermore, students with a bachelor degree from the Biomedical programme at UU, felt that the course was essentially a repetition of what they had already studied.

In the evaluations of the second and the third course several students complained that some external lecturers had poor pedagogical skills. However, according to the self-evaluation these problems should be remedied by a reorganisation of the courses and the hiring of a new teacher. Furthermore, some students found that information about the expected format of reports and presentations were lacking.

Recommendations

- We recommend that the cause of the complaints regarding the immunology module should be investigated and taken care of by the course leader and that the immunology and bacteriology modules should be examined separately.
- We recommend that students with sufficient prior knowledge in microbiology, immunology or virology are offered an alternative course, possibly an elective web-based course.
- We recommend that the programme introduces a workshop or document on how to present and write a scientific paper and a lab report.
- We commend that course evaluations have been performed with reasonably high response rates (around 50%) and with many constructive comments, and recommend that the system with written course reports describing what actions have been made is reestablished. All teachers should be included in feedback.

4. That the achievement of intended learning outcomes is assessed using appropriate methods and in compliance with the legislation, and that progression is ensured

During the MIB2M programme a variety of different learning activities and outcomes are examined using different means, including written exams, participation in seminars and laboratory activities, as well as written assignments and laboratory reports. Written exams, including a mix of essay-, short- and multiple-choice questions, are digital, which ensure fair unbiased evaluations. However, it is not clear

how some of the overarching, and subject independent, learning goals included in several courses, for example presentation skills, are assessed and graded.

All examiners are tenured faculty, whereas seminar tutors also include PhD students and postdocs, who have varying levels of pedagogic training. The master theses are all judged/examined by one and the same examiner, providing continuity and overview.

Types of assessments, exams and other examinations of learning outcomes, as well as criteria and grading of the master thesis, are described to the students when they are admitted to the programme. The students are also informed that they have to reach all learning goals, even if they do particularly well on specific topics. Still, some goals appear to be assessed jointly in single written exams.

As stated in the self-assessment, the aim of the first semesters is to give courses in a specific order, for the purpose of giving a clear progression, building on topics that goes from micro- to macroscale. However, according to information from course evaluations, and views brought up during the site-visit by student representatives, some of the initial courses include partial repetitions of previous courses. This feedback was mainly given by students that entered MIB2M after finishing their biomedicine bachelor studies at UU. In contrast, students entering the programme with other backgrounds appeared to have difficulty during the first semester. Thus, heterogeneity in prior knowledge of students admitted to the programme, comes with challenges for the course leaders to optimally design the teaching during the first semester courses. Alumni reports also indicate that some of the first semester courses have not been challenging enough, and have not contributed to creativity and critical thinking as would be expected during a Master programme.

As for progression related to interprofessional learning, external teachers from different areas are invited to teach on MIB2M, still students wished for more contacts outside academia.

As indicated in the self-evaluation and during the site-visit, the numbers of suspected cases of fraud and plagiarism have increased during digital off-campus examinations, which have been enforced during the Covid pandemic. Thus, MIB2M, will return to on-campus examinations as soon as possible, for the purpose of ensuring fair written examinations. All written assignments, including project reports, are also checked for plagiarism.

Recommendations

- We commend the range of different means of the programme to examine learning outcomes, which contributes to the overall assessment of the students.
- We recommend that the pedagogic skills to give feedback and grading of seminar leaders, with different pedagogic background, are secured.
- We recommend that the methods for assessing overarching, subject independent, learning goals are developed further in order to assure creative and critical thinking of the students.
- We recommend that the first semester, which includes an overlap with previous courses during the bachelor programme, and where other students have difficulties to reach learning outcomes, should be reorganized. The first semester could be more flexible. Students with knowledge gaps could take the basic courses whereas students already fulfilling the learning outcomes of the first semester courses could be offered elective courses. This would ensure progression for all students and sustain high quality of the following courses.
- We recommend that training for a career outside academia is developed.

5. That staff involved in the study programme possess current subject area and teaching and learning in higher education/discipline-based skills, and that there is sufficient teaching capacity

A majority of teachers are active researchers within the field of infection biology and have qualifications equivalent or higher than research assistant/associate professor ("docentur"). The nationally unique concentration to the Uppsala area of academic entities and governmental agencies should provide an outstanding possibility to cover teaching within relevant areas of infection biology and interrelated areas, for example global medicine, antibiotic resistance and zoonoses.

The participation of PhD-students and postdocs to specific elements of teaching and teaching assistance requires close definitions of roles and mentoring by qualified teachers, in line with intended learning outcomes.

Recommendation

- We recommend that the responsibilities of teaching-assistant PhD-students and teachers are clarified. Possibly, through a short didactic course for course assistants/PhD-students.

6. That internationalisation, international perspectives and sustainability are promoted

Infection biology has obvious international and global aspects as a topic. The student group in MIB2M are from diverse cultural backgrounds from all over the world. In addition, the teaching staff is international. This provides excellent international experiences for the students in the programme. However, it is a bit unclear how structured this internationalisation is within courses. For example, how does MIB2M make sure that the mixed student groups within courses take advantage of their different cultural and academic backgrounds?

MIB2M includes the course 3MK014 Infection Biology in a Global Perspective. The course is given in collaboration with researchers in Bangladesh, Vietnam and India and normally includes a field trip to Bangladesh. This is a splendid example on how international perspectives can be incorporated into an educational programme.

The professional training module in the beginning of the programme gives the students an introduction to sustainability and the global perspective course in year two provides hands-on insights into sustainability issues. It is less clear if there is a progression in the development of the competencies for sustainable development within the infection biology courses in year 1.

Recommendations

- We recommend that MIB2M evaluates how internationalisation could be more actively promoted. For example by giving instructions and supervision that take the cultural and international aspects into account when mixed groups are formed within courses.
- We commend that the Global Perspective course (3MK014) includes clear components of internationalisation and sustainability. We recommend that the sustainability aspects perhaps could be made more apparent in all courses where they are relevant. The relevance could be assessed by relating the course content to the 17 Sustainable Development Goals (Global goals) from 2015. There is research about key competences for sustainability which should be taken into account in order to strengthen this aspect of MIB2M further (see for example Brundiers, K., et al., 2021, Sustainability Science 16: 13-29).

7. That a gender equality perspective is integrated into the study programme

We conclude that MIB2M deals with the gender issue in an appropriate way. In their first semester, the students attend a compulsory lecture series in which gender, cultural and language differences are discussed. Throughout the programme the students work in teams of mixed gender and cultural backgrounds. Furthermore, the majority (70%) of the students are female - reflecting the gender composition of the applicants - as are about half the teachers.

8. That the study programme meets individuals' and society's needs for learning and professional knowledge and prepares students for future careers

Uppsala has a unique constellation of different competences within the field of infection biology and global medicine, SVA (parasitology), Läkemedelsverket, etc.. This presents a plethora of opportunities for MIB2M, teachers and students. In line with that, the programme covers the areas of Infection Biology basic areas (bacteriology, virology, mycology, parasitology and prions) well. According to an alumni survey, most of the students have found employment within the first 6 months of graduation and almost all have a position related to infectious biology.

The course in advanced methodology (3MK015) is a great initiative. It seems like an eye opener for many students and also much appreciated for potential future employment. What are the possibilities to make the course Advanced Methodology mandatory and offer earlier in the programme? Alternatively, it could be run in parallel with the other courses or offered once per semester, i.e. presenting the students with several opportunities to select it.

Recommendations

- We recommend the organisers to increase the reach out towards the plethora of governmental agencies and authorities that MIB2M has at its doorstep due to being localised in Uppsala. Any interaction is likely to benefit the programme.
- We recommend MIB2M to continue developing the Infection Biology network through different channels, for example LinkedIn, which presents a way for the programme and associated students to follow alumni through their professional development highlighting career possibilities, potential mentors, *etc.*

- We recommend introducing the students to an entrepreneurial way of thinking early in the programme. Academics, on all levels, are seldom knowledgeable about what it takes to secure intellectual property. It is advisable to bring the subject up again towards the end of MIB2M when the students have a firmer grasp of research.

9. That students/doctoral students have influence on the planning, implementation and follow up of the study programme

MIB2M has a structure in place for course evaluation meetings between student representatives, main teachers and programme coordinator. Alumni recommended improvements of the programme while they were students which subsequently were implemented, showing that MIB2M has both received and acted on feedback from the students.

According to the student panel, course representatives were in some cases not elected. Some of the interviewed students said that they were not informed that they needed such. Consequently, it is unclear to what degree course evaluation meetings occur. Overall the students wanted more efficient communication with programme leaders.

Students also raised the point that communication with the program leaders could be improved.

Recommendations

- We recommend that MIB2M tries to foster a greater involvement of students by repeatedly encouraging them to take part in both written course evaluations and course evaluation meetings. This responsibility is ideally shared between both programme- and course leaders. One way to increase the involvement of students in their studies could be through increasing the use of formative mid-course evaluations.
- We recommend that the course leader should discuss the students' complaints with the student representatives (if possible) and the course leader's concluding remarks should be documented in a course report. We appreciate that the programme has raised this point in the self-evaluation and are taking action on improving the work with course reports.

10. That an appropriate study environment is available to all students/doctoral students

We commend the programme for the adequate teaching premises. They provide well the logistics around lectures, practicals and student self- and group studies.

In several master programmes, feedback from students has been that there is a need that students that have weak practical experience to start with, are presented with an opportunity to perform practical exercises. When the subject was discussed with the teachers, several logistical hurdles were presented. Among them, the students in need of this support are mostly from non-European countries. Those students often have difficulties (VISA etc.) to arrive in time for the start of the programme, which is the time when such opportunities could be presented.

Recommendations

- We recommend MIB2M, potentially jointly with other programmes, to provide opportunities for students with poor practical experience for an introduction to the most basic laboratory techniques (e.g. TekNat provides this to interested students from all their master programmes). The difficulty in providing such services, such as limited resources, could be overcome by a joint effort. Such an effort would provide great support to otherwise theoretically very strong and motivated students and possibly allow practicals to be run more smoothly. Such events also allow for (early) networking between programmes. This could potentially alleviate some of the stress such students carry the first half year at Uppsala.
- We recommend that the programme gives more support in the area of integration. Individual international students transmitted a feeling of sometimes being left out and believe more networking events are needed. Some additional examples of improvements could be: Folders on depression are in Swedish, few events etc. If someone is not assigned to work on these kinds of issues, it would be great for the sake of integration if someone is.

11. That continuous follow-up and improvement of the study programme is carried out

Most teachers involved in MIB2M belong to the Department of Medical Biochemistry and Microbiology which facilitates an active communication between the teachers and the programme regarding quality issues. It appears that most of these discussions are informal. Although it is a clear strength that many problems can be fixed without bureaucracy, it may be a risk that complex problems are left unfixed.

Another concern is that informal communication may exclude students from the programme development, especially those who are less familiar with the university system.

Revisions of MIB2M have been performed every third year since it started. It is unclear to what extent these revisions have been based on input from students, alumni and future employers, and if these groups have been included in the process of development. It is also unclear to what extent the programme includes key performance indicators, such as completion rate of students with different backgrounds, or analyses of the fulfilment of programme goals (aspect 1) in their continuous follow-up and larger revisions.

The organisation for course evaluations, course meetings with students and course reports do not seem to be well functioning currently (see aspect 9).

Recommendations

- We commend that teachers involved in the program have active informal discussions about quality issues. We recommend that these discussions are complemented with formal routines for quality assurance. This could for example be regular meetings to discuss quality issues and programme development between the programme and representatives of teachers and students.
- We commend that teachers in individual courses contribute to the development of MIB2M. We recommend that the programme also includes students and, if possible, alumni and working life representatives in future revisions of the programme.

Uppsala, 2022-01-28, on behalf of the whole review panel