

1. **Introduction.** We thank the reviewers for their comments and constructive feedback on our new T32 application in Translational and Molecular Sciences. In this introduction section, we provide responses to noted weaknesses, and summarize how the application has been revised in response; all significant revisions are underlined.

Comments from Resume and Summary of Discussion:

i) “Graduates of the 1-year HHMI program list many publications....publishing may be overemphasized to the detriment of developing in-depth research projects..” We have revised our analysis to include additional students who have graduated since the initial submission, and to only include publications that are peer-reviewed original data based articles (method articles, reviews, editorials and conference proceedings have been excluded). For the 16 graduates and 4 students who are defending their thesis in the next semester, the mean number of publications is 4.2 ± 2.1 (STDEV) with a mean impact factor of 5.2 ± 2.4 (STDEV). Moreover, trainees were first author on 38% of these publications (with a mean of 1.6 first author publications per student, minimum-maximum range being 1-3). We agree with the reviewer that in depth projects are the goal of any effective training program and the successful submission of manuscripts describing the student's studies we feel, is an effective metric of both quality and impact of their research. This philosophy is further underscored by the collective and successful training experiences of the participating faculty.

ii) A significant percentage of Med into Grad students have been awarded fellowships, but their subsequent career success is not clear... To date, 16 HMG students have graduated with their PhD and 2 with MS. Of the 16 PhD graduates, 11 (69%) are pursuing post-doctoral research, 2 (12.5%) are researchers in industry including 1 as a vice president of research of the company, 2 (12.5%) are university or college faculty with teaching as their primary job, and 1 (6.3%) is a stay at home mother. Thus of the PhD graduates ~80% went into research as their immediate next career step.

Critique 1:

Overall Impact

iii) It is difficult to evaluate the research accomplishments....as to whether they are making significant discoveries, and whether they are being successful for next career steps.. see point i) above.

Training program and environment

iv) It is difficult to understand how taking time away from what would normally be research intensive years to have extra TMS courses would be beneficial for graduate school progress... This is an interesting point that we have discussed in depth and have carefully monitored the students progress. The proposed program reflects the requirements of translational medicine, and we have carefully designed courses which can be effectively integrated into the laboratory thesis work. We note that for current HMG students, despite the extra course load, they matriculate in 5.2y vs 5.9y for JHS students; matriculation is clearly not hampered. Also, feedback from students who have taken these courses indicate that in addition to improved knowledge, the courses have motivated them in their translation research projects. In this new application, the didactic courses HMG702, 704, 705 (year 2) and HMG 704, 707 (year 3) are similar to the existing HMG courses and provide critical information with drug discovery paradigms and approaches, experiences with patient interactions and testimonials, and active involvement in regulatory and oversight processes for clinical trial research projects. The majority of the time taken from 'bench time' would be during the clinical internship. We designed this course to be flexible so that it would minimally disrupt the main lab-based component of the trainee's research project, and anticipate that the experience gained will lead to synergy with didactic and lab-based training, which in turn will motivate and accelerate the students' progress towards his/her degree.

Training program director/PI

v) 3/4 of Dr. Patel's NIH grants are up for renewal in 2013... Dr Patel has acquired new NIH UO1 grant through 2018. The NCE grants are in different stages of re-submission and / or peer-review.

Training record

vi) It is difficult to tell what the genesis of the 7 papers/ med into grad studentt... See response to i) above

vii) It is hard to understand the 5 and 5.9Y matriculation calculation if only 3% of students finish in 5y (Table 7A). Only the Med into Grad students finish in 5y? As mentioned above, our intent was to highlight the

fact that despite HMG students taking additional HMG-specific courses, the extra curricula did not hamper their time to degree relative to non-HMG students. We anticipate that a similar outcome will be observed with TMS program trainees. We are also discussing with the JHS leadership how the structuring of our program results in both higher productivity and shorter time to graduation so that it can be more broadly applied.

viii) Unclear what the success rate is for the next career step. See response to point ii) above

Recruitment and retention plan to enhance diversity

ix)text says med into grad program was 15% (for URM recruitment), but this varies year to year and numbers are small....this suggests that the minority retention efforts are not effective. We apologize for the confusion between data provided in Table 7A and Table 10. Table 7A reports data from 2009-current, whereas Table 10 reports data from 2005-current (both include all GBS students). From table 7A, since 2009 we have enrolled 51 total students (all TGE) from URM, with disabilities or from disadvantaged backgrounds, compared to 423 non-diversity students (of which 347 are TGE). Only 4 or (7.8%) of diversity students have left without completing their PhD, relative to 45 or 10.6% (or 36, 10.4% for TGE pool) of non-diversity students. Table 10 shows that since 2005, out of the 127 total diversity students enrolled, 29 (22.8%) have left without completion of their studies. A further look at these data show that this relatively poor retention rate from Table 10 is due to students enrolled between 2005-2008, for which attrition was 32.4% relative to 9.4% for students enrolled since 2009. These data demonstrate improvements over the last 5y at the institutional level in diversity student retention as outlined in section 4 (Recruitment and retention of diverse populations). With respect to trainees in our Med into Grad program only, of the 10 TGE trainees enrolled since 2006 (65 total enrollees, representing a mean 16% URM enrollment), all have graduated or still in the program (excluding one death during). In summary, our diversity student recruitment and retention efforts have yielded positive outcomes especially over the last 5y.

Training in the RCR

x) The reviewer noted that the RCR training was not acceptable.. A detailed description of the revised RCR training plan is included in section 5.

Critique 2:

Training program and environment

xi) ..lacking was a clear description of what the training program does to ensure students have appropriate quantitative graduate training... All students are required to take GBS 755: Biometry / Biostatistics (Appendix 6) as described in section 3.3a

xii) Training faculty are senior heavy... We have added new senior and junior-mid-level faculty in the revised application. 4 faculty have left and 6 new faculty have been added. Of the 42 preceptors, 34 are professors, 6 associate professors, 1 assistant professor and 1 manager (equivalent to Assoc. Professor). Of the new additions, Drs Jennifer and David Pollock are new investigators at UAB who bring a wealth of training experience. In addition, we have added Drs Tse (Assistant Prof), Dr. Floyd and Dr. Ross (Assoc Prof), and Dr Noah (manager) from Southern Research Institute, who recently (in 2014) graduated his first PhD student (also a Med into Grad trainee).

xiii) Heavy enrollment in GBS compared to other 3 programs (BME, biostatistics and nutrition sciences) begs the question whether they supply a meaningful benefit... While GBS will provide the predominant number of students, students from other programs will also be performing interdisciplinary translational research projects. The selection of programs also reflects the diverse backgrounds of the faculty and the integrative nature of translational research. Finally, we note our goal is to improve the translational research landscape across our biomedical research campus and not just in the traditional SOM affiliated programs. To further underscore this sentiment, we note that the Department of Biomedical Engineering has recently been approved to be a joint department between the Schools of Engineering and Medicine. We anticipate this will further improve the pipeline of trainees eligible for the proposed TMS program.

Training program director/PI

xiv) Dr Patel has a modest training record.. Since the initial submission, Dr Patel has graduated an additional student (May 2014), and 2 in the last 2 years, with a total of 5 students over the last 10y. We also

highlight Dr Patel's experience in graduate education; in addition to running the HMG program he also directs the Molecular and Cellular Pathology Graduate Program (since 2008) and co-directs the Pathobiology and Molecular Medicine GBS theme (since 2010).

Preceptors / Mentors

xv) Multiple errors in tables...no discussion of who supports trainee if faculty fall in between funding... we apologize for these errors. All tables have been checked to ensure they report accurately funded and pending grants, whether faculty is PI or Co-PI and total annual direct costs and average annual direct cost per faculty are included in section 3.2.b. Upon joining a lab, the mentor and his/her department agree to assume responsibility for students stipend. This is also articulated in the student displacement policy stated in the GBS handbook. We also note that UAB SOM recently developed a bridge-funding program school-wide, and similar programs are available to faculty via department / division specific programs. This information has been included at the end of section 3.7.

Training Record

xvi) Average number of publications per trainee...was not indicated... this information from table 6A is now discussed in section 3.2.a.

xvii) Several faculty fail to list degree of their past trainee..... this information has been clarified and included in revised Table 5a and summarized in section 3.2a

Critique 3:

xviii) TSM leadership will not be involved in qualifying exams...thus there is no assurance that capabilities in translational research and clinical collaborations will carry weight.... the TMS program will require a physician or physician-scientist familiar with the area of research to serve on the trainee's committee; this is currently the case with the HMG program and ensures that translational research training and experiences are integrated with students project and progress. In addition, per the reviewer's suggestion, we will also require that Dr Patel or Ambalavanan serve as a non-voting member of the dissertation committee, unless the trainees research project would directly benefit from either of the PI's research or clinical expertise, in which case, a voting member position would be recommended. In the event that both Dr Patel and Ambalavanan are unable to participate in every committee meeting, a member of the Trainee selection and curriculum committee will serve. This is now stated in section 3.4 and 3.4h.

xix) Little detail is provided regarding how the success of the program is meeting its objectives will be assessed... Objectives are now outlined in revised section 2.1e, and how these will be evaluated in section 3.6. This will include ongoing evaluation of trainees and faculty during the program. In addition, exit and 1 year follow-up evaluations will be performed to assess impact of TMS training on next and future career steps.

xx) Though portrayed as a strength, average of 7 papers per student raises the question of whether trainees are encouraged to ask significant questions during their thesis research.... See response to i) above.

xxi) The challenge in maintaining a cohesive program especially beyond the 2y period with students matriculating in multiple departments.. Indeed, this has been a real challenge experienced in our HMG program to date. In order to maintain a sense of cohesion, we have implemented various enrichment activities that are not time consuming and which occur both during the 2y TMS program and beyond for the duration the student is at UAB. These enrichment activities are designed to ensure TMS students to meet and participate as a group in experiences that broaden their knowledge base. These include research days that will expose each student to other TMS trainees and their research project, forums that discuss scientific publishing, career opportunities in translational medicine in academia and industry, entrepreneurship to name but a few. These enrichment activities together with attendance requirements are discussed in detail in section 3.4g.

Additional revisions

In collaboration with our CTSA, we have performed an analysis of interactions between TMS faculty to assess the coverage of scientific areas, the network of collaborations at the level of informal discussion to co-authored papers and funded grants. This data is included in revised section 3.2c and underscores the breadth and depth of experience offered by TMS mentors to potential trainees.