

ROADMAP FOR PHYSICIAN-SCIENTISTS IN PULMONARY BIOLOGY

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Step #1: Choosing a Fellowship

If you know you want an academic research career prior to fellowship, follow these steps.

- Calculate the number of weeks you would be conducting research with no daytime clinical commitments. This should be at least 50% of the total fellowship time, not counting vacation (i.e., 72 of 144 weeks for 3-year fellowship).
- Ask the program director about the track record of graduating fellows: Do they publish during and after fellowship? What percent moved on to academic positions in the last 5 years?
- Assess the levels of extramural funding (NIH CRISP database) and publications of faculty (Medline, PubMed, etc.).
- Is there an opportunity to do a fourth and/or fifth year of fellowship and, if so, what are the requirements? How many prior fellows who have wanted an additional research year have been able to do this? How many have not?
- Consider combined fellowship–MPH programs for clinical researchers.
- Consider combined fellowship-PhD programs for basic researchers.

Step #2: Targeting Your Fellowship

Organize your steps for developing a research project and follow a timeline relative to the start of the first research month.

Targets	Minimum	Good	Excellent
Identify research mentor	2 months	1 month	prior to starting
Develop written plan with hypothesis and specific aims (e.g., 1 page concept proposal)	3 months	2 months	1 month
Present detailed research plan seminar to division/external advisors and present a first draft of a grant proposal	6 months	4 months	3 months

Submit starter grant(s) (ALA fellowship; NRSA = F32)	12 months	6 months	3 months
Submit abstract to national meeting	fall 2 nd year	spring or summer 1 st year	fall 1 st year (with luck)
Present work at national meeting	spring 2 nd research year		spring 1 st research year
Analyze data, write manuscript, present research seminar	fall 3 rd year	fall 2 nd year	spring 1 st year
Consider starting small second project		spring 2 nd year	fall 2 nd year

Step #3: Positioning Yourself for a Faculty Position

Most experienced senior faculty believe it will require a minimum of 4 years of research time before you may be able to function and be competitive as an independent investigator. Hence it is very likely that you will need either an extended fellowship or an intermediate-step position (research associate, acting instructor, or instructor). Note that this is still less research training time than most PhDs who typically have two postdoctoral experiences following their thesis research. Different institutions have different titles with associated rules and implications for these intermediate steps.

During this period of time, it is very important that you achieve the following skill sets:

- Acquire a sufficiently broad set of technical skills so that you are not too limited by techniques.
- Refresh your basic science background in your area of focus.
- Expose yourself to at least several different mentors (all possibly relevant to a single project).
- Acquire formal instruction in grant and manuscript writing.
- Become comfortable with presenting your work and getting critical feedback.
- Submit several grants of increasing complexity.
- Write, submit, and revise as many manuscripts as possible.

Often it is wise to have two related projects ongoing – one more long-range and/or riskier, and another that is more certain to be productive (no matter the experimental result).

Do not get trapped into doing only long range, high-risk science. (But stay focused—that's why the projects are "related.")

It is highly recommended that you work with your mentors to plan for and submit a career development award that will help you transition to faculty status with protected time (NIH K08, NIH K23, ALA Clinician Scientist Award, Parker B. Francis Award, etc). This is an essential ticket to obtaining job offers from many top-of-the-line institutions. However, since some of these are mentored awards and are funded based as much or more upon the institution and mentor than upon you, do not assume that they are freely movable immediately after funding.

In some areas, such as pediatric pulmonology, there may be a sufficient dearth of academic investigators such that you are able to obtain a faculty position directly out of fellowship. Although this is attractive in terms of title, salary, and prestige, it does not obviate the needs listed above which require mentored training time and the considerations below. You will need to negotiate this with your new division chief.

Attend national meetings and have your mentors introduce you to other investigators in your field. Participate actively and appropriately in poster sessions and other forums. Remember, these may be your life-long colleagues and peers.

Step #4: Seeking a Faculty Position

If you are in a productive research situation as a fellow (good project, mentor, environment), do not rush into a faculty position and do not rush to move (i.e., try to do an extra year or two of fellowship). Consider the following:

- If finances are an issue, look at the NIH Loan Repayment Program. Also consider small amounts of moonlighting to supplement income rather than taking a full faculty position for more money.

- Many places are willing to negotiate a creative “Senior Instructor” type of position with a salary level between fellow and faculty in exchange for some clinical duties. Be careful in this process not to hurt your ultimate goals of research productivity and achieving grant support that will protect your time.
- Depending on the institution, the structure of its academic rank, and promotion and tenure policies, it usually is not wise to start the “tenure clock” ticking when you are not a funded, at least partially independent, investigator.
- Consider expanding your research project to involve a second principal mentor. This will help your research knowledge and skill set, giving you a more unique position, and in addition, enhance your perceived and actual independence. An ideal way to accomplish this is to develop a project that bridges interests of a faculty member in your primary department and a faculty member in a basic science department, but is a project that is slightly different from each of their primary foci of interest.
- With the present dearth of new physician-scientists interested in an academic career, many places, even without a position available, will consider creating a position for one of their own fellows who has excellent potential for a research career.

Should you stay where you are? If you are in a productive research situation and are relatively happy, you should think twice before changing locations at this early stage of your career. In addition to the obvious uncertainties of moving to a new location and the “down time” associated with creating a new productive research situation, you will also have to acclimate to a new clinical service.

If your preference is to move (due to family/spouse considerations, no position available, not a good research situation, etc.), what should you look for in an academic position?

- No more than 8 weeks on a time-intensive service (e.g., ICU) or no more than 12 weeks on a less time-intensive service for the first 3 years. In some circumstances, you can

volunteer to take a little less money for less service time/call nights.

- **Do not accept the position until you have a mentor.** This person should be well-funded, have a proven track record in mentoring junior faculty, and, if not in your division, have a good relationship with your division chief or department chair.
- Most places will offer a 3-year start-up package. This will include technician's salary and \$20,000-\$25,000 per year in supplies in addition to the major equipment you will need. It is suggested that you obtain this commitment in writing, specifying a minimum of 75% time for research, protected from clinical, teaching, and administrative work. Also, you should define what the expectations are after the 3-year "honeymoon" is over—what percentage of external salary and research support is expected of you and how much protected time will you have? To obtain this type of job offer, it typically requires your bringing a significant percentage of research support, including salary support, to your new position. In some disciplines, this may not be essential—but at the present, this is the exception.
- Obtain your job description and promises in writing with sign-off by the division chief and department chair. Remember that even written promises sometimes are altered of necessity due to changing circumstances, but then you will be in a much better bargaining position. Also, try for an agreement that any start-up dollars that are not needed early on can be rolled forward for up to 5 years (but be warned this may be difficult to get as a promise or in fact).

If you move to a faculty position at a new institution without completing the additional research training years, then you are "at risk." Therefore, you should try to negotiate a period of protected time longer than 3 years. Mentorship then becomes even more critical. It may be wise to work in the lab of a senior established investigator, but remember that you will need to establish independence and a promotion/tenure clock may be ticking. In this case, you may want to delay your "start-up package" for 1 to 2 years. During that time you will be getting the "lay of the land," continuing to work "hands-on" in the lab, be working with your mentor who will

provide the modest dollars needed for your own project which is intertwined initially with your mentor's, and be thinking about developing your own project after about 12 months on faculty.

Step #5: Serving Your Faculty Position

Years 1-3

Establish your lab and area of focus (e.g., identity) quickly. Meet relevant investigators and potential collaborators. Find ways to gain a local reputation in your area.

In the first year, meet with an experienced member of the medical school promotion and tenure committee in order to understand the local system and criteria for moving up.

Write your papers and remain focused on your research.

Stay away from clinical administrative tasks unless they are directly related to your primary area of interest.

Learn to say "no" nicely, emphasizing that your principal value to colleagues will come from your research success so that the institutional investment pays off. However, you need to be a reasonable team player and help out when unforeseen/unavoidable circumstances arise. If these have a significant negative short-term impact on your research, try to secure a quid pro quo (increased protected time in the future, etc). Be a good team player, but not a pushover who sacrifices your time too readily.

Keep doing your own hands-on work and be present in the research setting. Do not distance yourself by delegating your work.

Avoid working on a clinical project with a fellow during this time unless your role will be ancillary, well defined, related to your own laboratory/clinical research work, and the project has a high chance of resulting in a publication.

If you do not already have a starter-salary support grant (K08, K23, ALA, AHA, Parker B. Francis), obtaining this should be a very high priority. If you began a faculty position without

extra research time, your mentor should know when you are ready. You should have a developed project with some reasonable preliminary data and ideally at least one publication in the area of focus. If you don't already have one of these or more than 3 years of guaranteed protected time, then it is of critical importance to at least have submitted a salary support grant by 12-16 months into your faculty time. This will allow time for two review cycles within your first 3 years.

If you have starter career development support, do not rest on your laurels because time will go quickly. Use this precious time well. Expand your scientific knowledge base and interactions with basic scientists. Seek out supplementary research grants and other vehicles that will expand your operations and productivity (i.e., a second technician, joint mentorship of fellows).

If you take on long-range projects (transgenic production, epidemiologic outcome studies), be sure to balance them with some studies that are likely to have short-term productivity.

Obtain a graduate school appointment if it doesn't require devotion of too much teaching time.

Co-mentor junior trainees with a senior faculty member.

Years 3-5 and Beyond

Early-to-mid 4th year of a K award, you should submit an R01. This will allow time for two review cycles without necessitating a hiatus in funding. Consequently, you need to be productive prior to this time. However, don't put all your eggs in a single R01 basket. Apply for other grants that could help tide you and your research over if your R01 requires an additional cycle for funding.

Productivity during this time period is critical to continued funding and your career development. Write your manuscripts, begin studies likely to be published in more general scientific journals (e.g., *JBC*, *MCB*, *JCI*, *J Exp Med*).

Begin to take a more-active role in national and local professional organizations. Participate in a limited number of committees that are strategically related to your research interest.

Obtain a graduate school appointment if it doesn't require devotion of too much teaching time and if you haven't done so previously. Try to attract predoctoral students and postdoctoral PhDs to your lab.

If you are not happy with your institution, division, mentor, or living situation, this may be a reasonable time to consider changing institutions. Ideally you should have funding for at least 1 - 2 years that can be moved with you, as this will make you a much more attractive candidate. The best time to move is when you have a R01 grant. But be sure to understand the promotion and tenure system at any new institution before moving.

Once your principal research project is R01 funded:

- Begin to look for opportunities to fund a second project. Ideally this second funding would be offset 2-3 years so that the grants end at different times. Program Project and Specialized Clinical Center of Research grants are particularly good since they bring interactivity.
- Assume a greater mentoring role for trainees. Develop your portfolio in this area and transition from being a co-mentor to a solo mentor.
- Consider applying for a NIH K02 Award for additional protected time for training and expansion of your knowledge and skills.
- Investigate sabbaticals – these are underutilized.

Targeting Your Faculty Years 1-5

Target	Start Time
Write starter grant (K08, ALA, Parker B. Francis)	before faculty appointment or < 12-18 months
Obtain starter grant	before faculty appointment or <18-30 months
Work with your own mentor to	24-36 months

participate as a junior mentor to a fellow	
Write research project support grants (MOD, ALA RG, AHA RG)	12- 48 months
Submit RO01 grant	36-42 months
Submit multiple small “bridge” grants as R01 backup	36-60 months
Obtain R01 funding	60 months, but often delayed

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