

**NIH-University Graduate Partnership Request for Application**  
**National Institutes of Health (NIH)**  
**Comparative Biomedical Scientist Training Program (CBSTP)**

A National Cancer Institute-Administered Graduate Partnerships Program (GPP)

**Purpose:** The National Cancer Institute (NCI), Center for Cancer Research (CCR) Intramural Research Program (IRP) requests applications from university graduate education programs in veterinary medicine to participate as new or continuing collaborating partners in the NIH Comparative Biomedical Scientist Training Program (CBSTP). This distinctive NIH Graduate Partnerships Program (GPP) training initiative provides innovative interdisciplinary approaches to developing DVM/PhD clinician-scientists jointly at a university partner and within the NIH IRP, creating a fusion in comparative biomedical science linking animal health with human disease research. To continue this widely-respected initiative in comparative medicine and biomedical science education as a vital means to enhance the nation's health care workforce, the CCR intends to consider applications from new and existing university partners for the purpose of forming and continuing educational collaborations through an open and competitive application process. Invitation to apply is made herein based upon institutional submission, and CCR review, of a preliminary letter of interest in response to national solicitation for prospective partners between January 28, 2019 and March 28, 2019.

**Background:** The CBSTP, launched in 2003 as one of several NIH GPP programs (<https://www.training.nih.gov>), involves partnerships between universities and the IRP of one or more of the NCI, the National Heart, Lung and Blood Institute (NHLBI), the National Institute of Allergy and Infectious Diseases (NIAID), and the National Institute of Neurological Disorders and Stroke (NINDS). As a component of this program, the CBSTP provides access to outstanding university-based graduate training as well as NIH fellowship resources for career and professional development. An initial phase of CBSTP clinician-scientist training occurs at a partner university, where veterinary medical graduate education and specialty medical training are integrated into comprehensive post DVM graduate education. A second phase of the partnership curriculum includes continued training in comparative veterinary diagnostics, disease mechanism investigation, and research training within the NIH IRP laboratories. A variety of scientific pursuits in interdisciplinary human disease research are available in the CBSTP through the sponsoring NIH institutes.

This novel graduate training curriculum addresses the shared medical/physiological characteristics that exist between humans and animals. In addition, the intersections in disease causations and processes among species necessitate interdisciplinary and comparative understanding of biomedicine. The inherent comparative nature of veterinary medical education, which is derived through the investigation of diseases and patient care of multiple animal species, contributes to an understanding that is vital to improving human, animal and ecosystem health.

There are currently two pathways for trainees to enter the CBSTP training program: **Pathway A)** veterinarians pursuing fellowships for both specialty and research training in an integrated combined graduate Ph.D. research program, and **Pathway B)** veterinarians who primarily pursue graduate research training within the CBSTP, leading to the Ph.D., subsequent to having obtained specialty training under other (non-NIH) institutional support. In this request for applications (RFA), the CCR is seeking partners to jointly train students under pathway A). To date, all CBSTP trainees and graduates have specialized in veterinary pathology. Additional information regarding the current program is available at <http://nih-cbstp.nci.nih.gov>

**Rationale for Competitive Partnership Program Continuation:** Maintaining and building on the outstanding accomplishments of this innovative and distinctive program is a key priority. The success of the CBSTP has been realized through creation of an amalgam of high caliber university program partners, talented students, and NIH IRP participation. As the lead institution, the NCI, CCR believes that program success rests upon optimal university-NIH partnerships, and that recurring periodic review and reassessment of programmatic needs is essential for nourishing healthy and mutually beneficial educational programs. With this goal in mind, the NCI is holding an open application process to evaluate existing, and potential new, CBSTP GPP university partnerships. Future university partners will be selected based on the accompanying criteria for assessing research and educational collaborative potential. Training partnership arrangements will be subject to a periodic review and evaluation in the interest of maintaining robust and productive research and education collaborations.

**Application Evaluation Criteria:** Applicant responses indicating an interest to participate in partnership with CBSTP will be evaluated on the following criteria: **1)** The university's program and vision for integrated graduate partnership training between the two institutions, **2)** The quality of graduate research training program as detailed in the application, and **3)** Capacity to provide high quality diagnostic (or other proposed specialty) training experience as a component of graduate education in the pathway that combines specialty and research training (Pathway A). All applications will be evaluated and scored using the criteria and point system specified in Appendix I. The highest-ranking university applicants will be given preference for creating training partnerships, contingent upon ability to form trans-institutional agreement with the NIH. Following initial application review and before arriving at final determinations regarding selection of collaborating educational partners, the NCI anticipates undertaking a site visit process to further evaluate candidate university finalists. This will provide opportunity to exchange information between institutions and discuss the GPP Memorandum of Understanding (MOU) used to administer the program. The MOU provides for agreement to jointly recruit, select and train students, outlines the support between NIH and the university, and provides for policy regarding intellectual property issues. Details are subject to final agreement with partners. As is our current practice, the NCI anticipates the selection of multiple university partners for the CBSTP. Participation as a university partner does not assure any particular quota of sponsored partnership trainees by the NCI or the university.

**Program Outcomes to Date:** Trainee educational experience includes outstanding research accomplishments resulting in high impact publications, and recognition with numerous individual awards.

DVM/PhD, CBSTP graduates are highly sought after and hold a variety of academic and non-academic research positions that enhance the profession's contributions to education, biomedicine and public health. Academic positions held include tenured and tenure-track faculty at both veterinary and human medical schools. CBSTP graduates are also employed as research/discovery pathologists within contract research organizations, pharmaceutical companies, and US government research laboratories. Additional information is available in Appendix II and online.

## REQUEST FOR APPLICATIONS

### NIH Graduate Partnerships Program Comparative Biomedical Scientist Training Program

**APPLICATION DUE DATE: JUNE 30, 2019 BY MIDNIGHT (12:00 A.M.), EASTERN TIME**

**Send materials via email to: John Hickerson, Senior Program Analyst,  
ncimolpathol@mail.nih.gov**

**Overview:** Applications are being considered for university partnerships to train veterinary clinician-scientists at a PhD level in the University-NIH GPP under program pathway A (see above, background section). Preparation of veterinary clinician-scientists depends upon strong and comprehensive training in both clinical medicine and biomedical research. The general graduate educational model being used by this NIH GPP program is a curriculum comprised of postgraduate specialization integrated within graduate education in basic biomedical research training. The various phases of this inclusive curriculum are designed to provide the necessary fusion required in training future comparative biomedical investigators for the nation's healthcare workforce.

This RFA addresses components that are considered essential to assess program partners, using a two-part application. The initial section (Training Environment) is a series of narrative questions to explore the vision and substance of the university's program. The second part of the RFA (Mentors, Trainees and Accomplishments) is intended to summarize graduate specialty and research education at your institution in a format similar to that used by a wide array of NIH-sponsored training mechanisms. Note that the CBSTP program primarily trains veterinarians in diagnostic and investigative pathology. However, the overarching goal includes training clinician-scientists in the broadest sense. Thus, applicant responses may be focused to one (pathology), or more than one, discipline.

Sponsored and enrolled graduate veterinarians undertake combined diagnostic pathology training (or other suitable specialty) coupled with research training leading to a PhD and eligibility for specialty board certification as a function of a comprehensive university graduate education curriculum. Trainees typically spend up to the initial two years of the program at a partnership university completing PhD didactic graduate coursework including core experience in diagnostic pathology before transferring to NIH laboratories for PhD dissertation research. Students continue their enrollment as graduate students at the partner university while satisfying PhD dissertation research at NIH, which typically takes an additional 4+ years. For each trainee, the CBSTP will provide stipend, health insurance, tuition support and additional educational costs for degree program research. University partners benefit from NIH supported trainees through their joint training, tuition payments, NIH-sponsored student contributions to education and public service programs of the university, numerous means for interactions and potential for collaborations with NIH scientists. Additional information regarding the existing program is available at <http://nih-cbstp.nci.nih.gov/>

In this RFA, the pathology program refers to the university program that coordinates and administers graduate training in veterinary pathology. NCI acknowledges that most training programs are part of multidisciplinary veterinary departments. Therefore, the responses are anticipated to include elements of graduate/postdoctoral education in the context of a multidisciplinary graduate program department.

**In replying to the RFA, please consider the following information regarding applicant universities:**

In replying to the RFA, please consider the following information regarding applicant universities:

- 1) Demonstrates sufficient resources, personnel, case load and species diversity, and research activities to provide outstanding training environments appropriate to the program goals. Able to provide diagnostic training as a component of graduate education providing experience towards eligibility for board certification.
- 2) Are willing to actively participate in jointly recruiting highly qualified individuals. This may include announcements of partnership training opportunities through the university and other means. Ability to enroll trainees in university graduate school as candidates for the Ph.D. degree. Both the university and the NCI make independent decisions on all admissions, and subsequently coordinate informing applicants.
- 3) Curriculum flexibility allowing the completion of university-required didactic graduate course work and core clinical experience as graduate students, within the initial two-years of the training program support while at the university. Required didactic graduate course curricula sufficient to satisfy graduate degree requirements (exclusive of dissertation research credits) must be completed within a maximum of this two-year timeframe. Programs proposing training disciplines in addition to pathology can recommend curricular design modifications, to be discussed with NCI. However, NIH funding for the university phase of training is limited to two years on the university campus.
- 4) Following their initial enrollment at the university, supported students must relocate from the university to NIH during the fellowship, in order to complete research training within NIH laboratories. The NIH mentor assignments and required curriculum must be acceptable to the host university in satisfaction of its PhD degree requirements.
- 5) Partnership universities must be accredited and capable of granting graduate degree credit for research conducted at the NIH and be able to award doctoral degrees to candidates who have successfully completed the requirements as specified by the university and its faculty, as well as NIH mentors.
- 6) Commitment to supporting and educating CBSTP trainees with the NIH, while acknowledging NIH-supported fellows are considered as NIH employees in accordance with NIH fellowship policies.
- 7) The NCI/CBSTP seeks to negotiate acceptable arrangements for the payment of student stipend and other educational support including graduate tuition payments.
- 8) Payments for indirect overhead costs are not a feature of these collaborative agreements with the NIH intramural research program. Stipends, health insurance, tuition payments as well as research and other education costs are provided for students jointly trained.

- 9) Partnership agreements are subject to subsequent review by both parties for periodic updating. Either party may choose to discontinue the partnership upon providing written notification to the other in accordance with the Memorandum of Understanding. In such a case, both NIH and partner university shall continue their support for trainees that are already enrolled in the program in good academic standing to ensure the seamless progress and completion of degree requirements.

We welcome preliminary inquiries regarding the partnership application process.

## **Training Environment**

### **Create a vision for integrated training by the two institutions forming a graduate partnership.**

(the response to this section should be no longer than three pages single-spaced, except as noted below, using 0.5-inch margins and 11pt Arial font):

CCR's intent is to continue building strong partnerships supporting the development of critical integrative thinking and problem-solving investigational skills in diagnostic medicine, clinical investigation and basic research to advance the mechanistic understanding of disease, leading to future treatments and preventatives. In elaborating your educational program and vision for this training partnership, please provide information you feel will highlight strengths of your program. The future of the CBSTP partnership program may evolve to include veterinary clinician-scientist training in other disciplines in addition to its foundational program in pathology. Inclusiveness is likely to significantly benefit the biomedical research enterprise and veterinary medicine's role in health care more broadly. Universities may opt to propose pioneering joint NIH training in additional disciplines, in which case this section may be expanded to up to four pages in length. We recognize there are unique structures in residency education of multiple disciplines. Therefore, creativity, additional training time and collaborative funding needs would require mutual exploration for partnering in additional specialties.

Please use the following elements to help you construct your narrative response.

- How does your program facilitate acquisition of experience in: 1) integrating molecular mechanisms with pathophysiology, 2) comparative and laboratory animal pathology, 3) approaches in morphologic, biochemical, molecular and genetic disease investigation, and 4) the application of research and analytical methods, as well as 5) digital pathology, computer-assisted diagnostics and computational informatics?
- Specify how trainees may gain experience with investigational/laboratory analysis of material derived from experimental and spontaneous diseases. Do your trainees gain individual experience in the conduct of basic or clinical research investigation during residency? If so, specify clinical or basic research, and to what extent.
- The nature of pathology practice is changing. What is your vision of future practice and its role in research? Describe how your training program has/is evolved to reflect this?

- Briefly, summarize time spent in courses in your graduate curriculum. Highlight Ph.D. degree requirements to include total number of credits, typical credits per semester and number of required didactic course credits that would be necessary for individuals in a partnership.
- Describe how your department/program actively recruits trainees, and specifically how you would coordinate recruiting highly-qualified candidates for this NIH GPP partnership? Explain institutional programs and initiatives in place to ensure and enhance participation by under-represented minority population trainees.
- Our partnerships have included a lead faculty mentor who functioned as a director for the joint partnership program. Briefly indicate the scientific background, expertise, as well as administrative, mentorship, training experience, and administrative support if any, of the individual(s) who will administer the university portion of the program.
- Please indicate any additional information regarding your program that will highlight the value added to an NIH intramural research program partnership.

CONTINUE BELOW

## Mentors, Trainees and Accomplishments

### Data/Information on University Graduate Training Program

There are numerous ways to provide graduate education in biomedical research to train veterinary clinician-scientists. The NIH anticipates there will be some capacity to customize the training within any institution in order to accomplish the program goals and to permit learning on two campuses. Key indicators of suitable university training environments will include evidence of critical mass in terms of trainees and faculties, adequate funding and resource commitments, as well as a compelling track record of successful recruitment and graduation of diverse, high-caliber graduates.

**General instruction:** Use tables to summarize as needed. Include a narrative section for background information and responses that you are unable to tabulate or need further explanation. This may be in addition to the Training Environment narrative section of the application, but is limited to one page in support of data tables. Examples of completed tables are provided at <http://nih-cbstp.nci.nih.gov/>

#### Table 1. Faculty Members in Participating Department/ Program (Alphabetically by Faculty Member)

##### Instructions:

List each training faculty member with his/her degree(s), academic rank, specialty (anatomic pathology AP, clinical pathology CP), primary departmental affiliation and secondary appointments, and role in training/graduate education (1-4, see footnote). Indicate specialty certification, as applicable, and in what discipline.

Summarize the distribution of mentors by rank, highlight areas of emphasis/interests, and rationale for including participating faculty.

##### Rationale:

This information allows reviewers to assess the distribution of junior versus senior faculty and clinical versus basic scientists leading the training program, as well as their department affiliation. The data concisely summarize the scientific/clinical/teaching faculty.

Name/Degree(s)	Rank and AP or CP (As Applicable)	*Primary (& Secondary) Appointment(s)	**Role in Training Depart/ Program	Teaching, Research and Clinical Responsibilities (As Applicable)

\* Primary Appointment in the Department.

\*\* Contributes to diagnostic training (1), research training (2), and/or didactic education (3).

**Table 2. Grant and Contract Support of the Faculty Members in Participating Department/ Program (Alphabetically by Faculty Member)**

**Instructions:**

For each participating faculty member, list active and pending research grant and contract support from all sources (including Federal, non-Federal, and institutional research grants; and contract support) that will provide the context for research and other training experiences, including research training grants. If none, state "None." Include the source of support and grant number, role of the participating faculty member (Project Director/ Principal Investigator, co-PD/PI, etc.) the grant title, status, dates of the entire project period, and the current year annual direct costs. Explain alternative ways that research and research training may be supported in your institution.

**Rationale:**

This table provides evidence of the strength of the research environment, the availability of funds to support institutional research, and the appropriateness of the participating faculty members in terms of their active research support.

Faculty Member	Grant Title and Faculty Member Role on Project	Source of Support, Grant Number and Status	Project Period	Current Year Direct Costs Awarded

**Table 3A. All Current Postdoctoral Pathology Trainees in Participating Department/ Program (List Chronologically)**

**Instructions:**

List all current trainees (including residents) chronologically, grouped by year of entry into pathology training. Trainees should be listed anonymously by sequential numbers, rather than by name. For each trainee indicate: the training start date; prior academic degrees and years obtained; previous institution where degrees earned; type of diagnostic training being pursued/obtained (e.g., AP/CP (anatomic and/or clinical pathology)). Indicate the current trainees' training objectives at the time of this report by entering PhD, MS degrees and/or residency certificate. Indicate year of specialty board certification (if applicable). Indicate source of training support for current trainees.

**Rationale for the requested information in Tables 3A, 3B, and 3C:**

This series allows evaluation of trainee characteristics, origin in former institutions, time in training, training objectives, successful accomplishment of curricular milestones, sources of support. Such information is beneficial to assess the vitality of the educational experience and training environment.

Trainee Number	Training Start Date	Prior Professional Degree and Institution(s)	Type of Clinical Training (e.g., AP/CP)	Training Objective (At Time of Report) Ph.D./MS/ Certificate	Year of Certification (Boards, as applicable) (AP/CP)	Source of Support of Current Trainees

**Table 3B. All Former Postdoctoral Pathology Trainees in Participating Department/ Program (List Chronologically for Most Recent Five Years)**

**Instructions:**

List all former postdoctoral pathology trainees chronologically, grouped by year of entry into pathology training. Trainees should be listed anonymously by sequential numbers, rather than by name. Provide the inclusive start and finish dates (year) of training in the program; all prior academic degrees (year awarded) and former institutions. Indicate the certificate and or degree and year awarded by the program. Year of board certification should be listed. In the last column please indicate the current position title and the employing institution of trainees completing the program.

<b>Trainee Number</b>	<b>Inclusive Dates of Training</b>	<b>Prior Professional Degree and Institution(s)</b>	<b>Certificate and/ or Degree Completed and Year</b>	<b>Year of Certification (Boards) If Applicable AP/CP</b>	<b>Current Position of Past Trainees</b>

**Program Statistics**

This additional table provides an opportunity to make summary entries for program statistics. Include numbers of trainees for each category (PhD, MS, certificate). The right-hand most column includes entry for average total time in training following the DVM degree (enter in parentheses).

<b>Percentage of All Department Trainees who have exited Within Last 5 Years That Completed PhD/ MS/ or Certificate Only</b>	<b>Percentage of Pathology Trainees Within the Last 5 Years That Completed PhD/MS/ or Certificate Only</b>	<b>Average time to PhD While in Graduate School for All Students in the Last 5 Years (Avg. Total Time in Training Post DVM) (Not Including Leaves of Absence)</b>

**Table 3C. Trainee Board certification in Pathology (or other specialty) (Indicate Data for Most Recent Seven Years)**

**Instructions:**

For the most **recent 7 years** through 2017, please indicate the yearly success rate for your trainees in obtaining specialty board certification. Additionally, provide cumulative pass rate for the seven-year period of review. Finally, indicate the cumulative pass rate for all candidates on first attempt, for the period of review.

Year	Certifying Examination*	
	# Passed / # Attempted	
	AP	CP
2018		
2017		
2016		
2015		
2014		
2013		
2012		
Cumulative Pass / # Total Attempted		
Cumulative Total % Pass Rate		
Cumulative % Passing on first attempt		

Year	Phase I Examination (Applies 2015-2019) # Passed / # Attempted
2019	
2018	
2017	
2016	
2015	
Cumulative Pass / # Total Attempted	
Cumulative Total % Pass Rate	
Cumulative % Passing on first attempt	

Attempted is number of candidates who took any one or more sections of the exam; # passed is the number who became board certified. AP, anatomic pathology; CP, clinical pathology

*\* Prior to 2015 the comprehensive certifying exams in pathology were composed of single examinations comprised of 4 parts, with options for partial completion. Please answer accordingly.*

**Table 4. Clinical and Research Publications Completed by All Trainees and Graduates in Participating Department/ Program (Past Five Years, Published or In Press)**

**Instructions for Table 4:**

List all published papers of past and current trainees, related to work in the department, for the **past 5 years**. Boldface the trainee's name in the author list. Designate trainees who are in a thesis research graduate program with a dagger symbol (†), and trainees seeking pathology training with an asterisk (\*).

When citing articles that fall under the Public Access Policy that were authored or co-authored by the trainee and arising from NIH support, provide the NIH Manuscript Submission reference number (e.g., NIHMS97531) or the PubMed Central (PMC) reference number (e.g., PMCID234567). If the PMCID is not yet available because the Journal submits articles directly to PMC on behalf of their authors, indicate "PMC Journal - In Process." A list of these journals is posted at:

[http://publicaccess.nih.gov/submit\\_process\\_journals.htm](http://publicaccess.nih.gov/submit_process_journals.htm).

**Rationale:**

This information provides an indicator of trainee productivity, allows assessment of the quality of clinical and research contributions, priority of authorship; and the success of faculty members in facilitating trainee publication.

<b>Publication (Authors, Year, Title, Journal, PMCID)</b>

† Indicate trainees in a thesis research graduate program.

\* Designate trainees seeking pathology training.

**Program Statistics**

Trainee publications resulting in peer-reviewed original manuscripts. Please indicate the average number of original papers published by trainees, how many as first author, and how many trainees graduate/complete formal training without any first author publication.

	<b>Average Number of Papers Published by Trainees (# of papers / # of trainees)</b>	<b>Number of First Author Papers by Trainees</b>	<b>Number of Trainees Completing Program without any First Author Publication</b>
2015 - 2019			

**Table 5. Admissions and Completion Records for the Participating Department/ Program (During Past Three Years)**

**Instructions:**

For the participating department/programs, list the following information for each of the **past 3 years**: Number(s) of individuals, who have formally applied for training; have been accepted for admission; enrolled in designated year; then all trainees who completed the program; or left the program prior to formal completion.

Include all applicants who could be considered candidates for all types of training within the department and indicate in the appropriate column the number seeking diagnostic pathology training.

**Rationale:**

These data permit evaluation of the participating departments/programs' capabilities to recruit and retain trainees through the completion of their training. These data are useful in determining the selectivity of the admissions process, as well as the success of trainee recruitment and retention.

	<b>Calendar Year</b>	<b>Number of Applicants</b>	<b>Number of Applicants Accepted</b>	<b>Number of Applicants Enrolled</b>	<b>Number Seeking Pathology Training (AP/CP)</b>	<b>Trainees Completed Program Degree/ Certificate</b>	<b>Trainees Left Without Completing Program</b>
	2018						
	2017						
	2016						
<b>Total for past 3 years</b>							
<b>Averages</b>							

**Table 6. Summary Qualifications of Recent Applicants to Participating Department/ Program for Pathology Training (Past Three Years)**

**Instructions:**

Summarize the qualifications and application outcomes of recent applicants to your department/program for the most recent **past 3 years**, according to application year. Programs should provide data for each participating department/program. Include summary statistics: average GRE scores and average GPAs of all applicants; and total numbers of students interviewed, offered admission, and enrolled. Average GRE scores and average GPAs for students who were accepted, and for those who enrolled, would also be useful to include. Note any trends or other program impacting observations in summary.

**Rationale:**

The data provided in this table will permit an evaluation of the quality and depth of the applicant pool. These data are useful in providing some insight into the selectivity of the admissions process and the competitiveness of the program.

*Program Statistics: Total All Applicants per year for Three Years.*

<b>Year</b>	<b>Total Number of Applicants</b>	<b>Applicants Interviewed</b>	<b>Applicants Accepted</b>	<b>Applicants Enrolled</b>	<b>Average GRE (For Accepted Applicants)</b>	<b>Average GPA (For Accepted Applicants)</b>
2018						
2017						
2016						

## Appendix I

### Evaluation Criteria for Review of CBSTP GPP University Partner Applications

#### Overview:

Applications are requested to facilitate formation of collaborative graduate education partnerships between universities and the NIH Intramural Research Program to train veterinary clinician scientists. This process of forming intramural research collaborative partnerships does not mirror extramural grant procedures in all respects, however there are a number of analogous aspects with respect to reviewing the responses to this RFA.

Applicants are asked to provide a description of the training environment and vision for a graduate partnership, in the context of program design considerations highlighted in the RFA. Instructions encourage applicants not to be bound to addressing only these programmatic issues. Consider all statements about the training process, faculty, environment, general philosophy, track record of accomplishments, mentoring, and other strengths, as well as vision for a partnership in considering strengths and weaknesses for partnership collaborations. In program descriptions, national board examination achievement by trainees is one metric, however numerous other factors are considered significant in assessing overall trainee preparation in comparative biomedicine and diagnostic medicine. Such preparation should be considered along with statements about provision of the elements of training not specifically tested in national board examinations (to be provided to reviewers). Consider vision of training for future pathology practice statement.

To help facilitate the review of partnership program applications, reviewers will evaluate applications in two structured parts: applicant narratives and data tables, which are oriented along five review sections. The five review sections are: **Overall collaborative potential and partnership vision; Educational environment; Preceptors/Mentors; Trainees and Candidates; as well as Training Outcomes.** Scoring will be based on evaluations according to written summaries of strengths and weaknesses and reviewer assignment of ratings from 1-9 for each section (see scoring rubric guideline below). The goal is to evaluate information relevant to operating a training partnership and appraise program strengths. Components of training programs highlighted below (focused on those in pathology, but can be applicable to other disciplines generally) will provide guidelines to evaluate and define the relative strengths of a program. In general, criteria are considered guidelines to set benchmarks for point assignment. Less satisfactory fulfillment merits fewer points.

#### Guideline for scoring rubric:

Overall Impact or Criterion Strength	Score	Descriptor
High	1	Exceptional
	2	Outstanding
	3	Excellent
Medium	4	Very Good
	5	Good
	6	Satisfactory
Low	7	Fair
	8	Marginal
	9	Poor

## Criteria for Evaluation of Training Environment Narrative (Score 1-9)

Reviewers will consider narratives chiefly as the response to overall collaborative potential and partnership vision section. It is widely recognized that there are a variety of valid approaches to training. Since CBSTP partnerships rely upon combined diagnostics and research education, the program seeks to partner with universities that demonstrate strengths and vision in both clinical investigative/diagnostic and basic research curricula. It is further acknowledged that the initial phase of CBSTP training is predominantly provided through a university, while the subsequent phase, more greatly focusing on research training, is a partnership between the two institutions, albeit in the latter aspect predominantly provided by the NIH IRP.

In this context, reviewers will evaluate applications for evidence of how a university accomplishes its educational objectives including consideration of the degree to which:

- The program has a well-structured, disciplined, thoughtful approach to ensure effective training that includes diagnostic, clinical and research facilities and environments which are conducive to preparing trainees for successful careers as clinician scientists, diagnosticians and biomedical research scientists.
- The courses, where applicable, and research experiences provide opportunities for trainees to acquire state-of-the-art scientific knowledge, methods, and tools that are relevant to the goals of the training partnership. There is indication that the didactic requirements can be completed within the program design.
- The program articulates a vision of how the curriculum is changing to address demands of future practice.
- There is an integrated education from whole animal to molecular and genetic basis of diseases. Diversity of exposure (species mix, representative laboratory animals).
- There is an exposure to spontaneous diseases and induced-disease models, reflecting the breadth of clients and consultations in practice and in research. Extent of exposure.
- Clinical and/or basic investigative skill development is included in the training experience.
- There is an exposure (or capacity for) to data integration, quantitative analysis, as well as digital/computational pathology and informatics.
- Leadership, critical thinking, independence and other career development skills are fostered.
- The program provides elements of training not tested on national standardized and certifying examinations.
- Pathology trainees obtain experience outside of anatomic and clinical pathology (i.e., necropsy, histopathology and cytology; clinical chemistry, fluid analysis and hematology).

- The program provides exposure and experience in areas that it perceives not having a strength in.
- The program articulates the benefits that can be derived from an NIH partnership.
- The programmatic leadership has the scientific background, expertise, and administrative and training experience to provide strong leadership, management, and administration of the proposed research training partnership program.
- There is strong level of institutional commitment to the training program, including administrative and research training support to ensure the success of the program.
- There are institutional programs and initiatives in place to ensure and enhance participation by under-represented minority population trainees.

**Criteria for Evaluation of Mentors, Trainees and Accomplishments Section  
Data/Information on University Graduate Training Program**

**Preceptors/Mentors (score 1-9)**

AS CBSTP sponsored trainees are not trained in isolation from the department's other programs, reviewers will consider evidence of availability of adequate numbers of mentors to undertake diagnostic and research training and that there is a strong record of grant/contract/other funding to support a training program.

Tables 1 and 2 most closely align with these considerations.

The program is characterized by:

- Sufficient numbers of experienced faculty mentors involved in diagnostic training.
- Sufficient numbers of experienced faculty mentors involved in research training.
- Sufficient numbers of experienced faculty mentors involved in both diagnostic and research training.
- Faculty mentors that have appropriate expertise to provide strong mentoring to the number and type of research trainees.
- Appropriate ratio of clinical-track, assistant, associate and full professor (does the rank distribution of faculty suggests junior-heavy department?)
- Faculty members have record of extramurally funded research.
- Faculty mentors have adequate levels of grant and contract and other sources of training support to sustain the number and level of clinical and research trainees.
- Faculty mentors have records of successful publication and are actively mentoring trainees.
- The research areas and projects include interdisciplinary and comparative research, and have the potential to align with and stimulate collaboration with NIH institutes and investigators.

### **Trainees or Candidates (score 1-9)**

Reviewers will consider evidence of the competitiveness of the program in recruiting, training, and retaining high quality students nationally, and that there is support and practice to promote clinical trainees towards advanced degrees in research.

Tables 3A, 5 and 6 most closely align with these considerations.

- The training program has adequate number of pathology (and other clinical, if applicable) trainees.
- Adequate number of **pathology or other clinical trainees** are concurrently attaining advanced degrees (PhD or thesis MS) or plan to promote jointly.
- The program recruits well qualified trainees nationally.
- The program attracts a competitive applicant pool.
- The training program retains trainees through the completion of their training.
- There are diverse sources of funding for trainees suggesting a sustainable model of funding.
- There is an appropriate training faculty to trainee ratio (also refer to Table 1 for faculty numbers).

### **Training Outcome Record (score 1-9)**

Reviewers will consider evidence of the effectiveness of the program in clinical/diagnostic and research training and producing successful and impactful trainees in biomedical research.

Tables 3B, 3C, 4 and 5 most closely align with these considerations.

- Trainees complete the program successfully and in a reasonable period of time (typically within approximately six or fewer years for PhD and up to 4 years for MSc or residency training).
- Advanced degrees are encouraged and a significant number of trainees complete advanced degree.
- Most trainees successfully complete board certification and in a reasonable period of time.
- Trainees are productive in terms of research accomplishments and publication of research conducted during the training period.
- Trainees produce first author papers and predominantly publish research papers versus single case reports.
- Trainees are successful in achieving productive scientific careers as evidenced by successful competition for research/science positions in industry, academia, government or other research venues; there is strong evidence of impactful publications, and promotion to scientific leadership positions and or other measures of success.
- Trainees are making an impact on the profession in a variety of ways, including the biomedical research enterprise.
- The program has mechanisms in place for its evaluation and feedback is sought from stakeholders.
- Are health professionals sustaining roles in research in contrast to fulfilling predominantly clinical service and diagnostic roles?

### **Overall Assessment of Collaborative Potential (score 1-9)**

Provide an overall assessment score on the suitability/compatibility of the training program to forge a successful, quality training partnership, in consideration of the review criteria and applicant's response to request for application.

## Appendix II

### Comparative Biomedical Scientist Training Program (CBSTP) An NIH Graduate Partnerships Program (GPP)

#### Notable Features and Achievements

**Highlights of scientific and training opportunities:** The CBSTP provides unparalleled graduate training opportunities through a combination of outstanding university partner graduate programs and experience in world class biomedical laboratories within the various sponsoring NIH institutes. Furthermore, the CBSTPs inclusion as an NIH GPP provides access to excellent resources for career and professional development in a variety of workshops on writing, teaching, mentoring, oral presentations, and leadership, many of which are organized and provided by the NIH GPP and the NIH Office of Intramural Training and Education, as well as the NCI Center for Cancer Research Office of Training and Education. There are many outstanding graduate education and career development resources available through these resources. Some of these include a grant writing course followed by production of a model grant application, which fellows produce for their graduate guidance committees to critique. This experience is a requirement for all CBSTP trainees. Trainees have also found the GPP manuscript writing course invaluable. For information regarding CBSTP visit: <https://nih-cbstp.nci.nih.gov/> The NIH GPP website is <https://www.training.nih.gov/programs/gpp> and the CCR Office of Training and Education - <https://ccr.cancer.gov/training/office-of-training-and-education>

**Current CBSTP trainees:** Ten veterinarians are currently in the program as of July 2019. Five are conducting dissertation research within NIH, while five are at a partnership university conducting pre-dissertation research, pathology training, and didactic graduate course work. One of our current trainees is a board-certified Diplomate of The American College of Veterinary Pathologists. Four other trainees have passed the ACVP Phase 1 examination. The matriculated from eight veterinary colleges. For more information regarding our current trainees, visit: [https://nih-cbstp.nci.nih.gov/current\\_trainees/index.asp](https://nih-cbstp.nci.nih.gov/current_trainees/index.asp)

**CBSTP Alumni:** The program has graduated 20 fellows. DVM/PhD, CBSTP graduates of the program are highly sought after and hold a variety of academic and non-academic research positions. Of the total 20 graduates, three are tenure-track assistant professors, three are tenured associate professors, two are clinical assistant/associate professor. Eleven are in research/discovery positions in government, academia, or pharmaceutical industry. Employers include: University of Michigan, Wake Forest University, University of California (Davis), Purdue University, North Carolina State University, NAMSA, Tox Path Specialists, Kansas State University, Ohio State University, NIEHS, CDC, Charles River Laboratories, Medimmune/Astra Zeneca, NIAID, St. Jude's Children's Research Hospital, FDA, and Novartis. One graduate is pursuing a research fellowship. Seventeen graduates are board certified Diplomates of the American College of Veterinary Pathologists. For more information regarding our alumni, visit: <https://nih-cbstp.nci.nih.gov/science-and-alumni/cbstp-alumni>

**Publications:** Trainees have published first author primary research papers in high impact and prestigious journals such as Blood, Oncogene, Cancer Research, Clinical Cancer Research, Antiviral Research, Proceedings of the National Academy of Sciences of the United States of America, Journal of Histochemistry and Cytochemistry, Transgenic Research, PLoS One, Journal of Virology, Journal of Pediatric Hematology/Oncology, Zebrafish, and American Journal of Pathology. Trainees have also published numerous case report and clinical papers in Veterinary Pathology, Journal of Veterinary Diagnostic Investigation, and other veterinary specialty journals. For more information and complete list of publications by our trainees, visit: <https://nih-cbstp.nci.nih.gov/science-and-alumni/science-and-publications>

**Awards and recognitions:** Trainees have been recognized with numerous awards including NIH Director's Award, NCI Director's Innovation Award, NIAID Director's Award, Sallie Rosen Kaplan Fellowship Awards, Young Investigator Awards, NIH Graduate Student Research Award, an NIH Fellows Award for Excellence, a W.W. Carlton Scholarship in Veterinary Pathology, an R.C. Dillman Award of Excellence in Anatomical and Clinical Pathology, Dennis Sikes Award in Experimental Pathology, 2017 and an AACR Scholar-in-Training Award for 2017, and an NCI Flex Award DCEG-CCR collaboration. Our trainees routinely and consistently present at national and international meetings and have received invitations for speakerships and scientific travel awards. For more information regarding awards/recognitions of our trainees, visit: <https://nih-cbstp.nci.nih.gov>

**Summer Internship Program (SIP):** Our internship program for veterinary medical students is part of the NIH-wide Summer Internship Program (SIP) in Biomedical Research, and provides selected veterinary medical students with the opportunity to receive hands-on scientific research experience. In addition to working in a laboratory, students also take advantage of other ongoing activities at NIH, such as attending seminars, facility tours and meeting with veterinarians and other scientists engaged in biomedical research. This year our SIP marks its 15th year and has sponsored 69 veterinary students representing 24 U.S. colleges of veterinary medicine and 2 Canadian colleges for research experience at the NIH. Information about summer internship opportunities and past veterinary student interns is available at the following link: <https://nih-cbstp.nci.nih.gov/prospective-trainees/summer-internship>

**CBSTP highlights and professional engagements:** In addition to administering and coordinating graduate research training and SIP, CBSTP has been actively engaged in promoting and highlighting the vital role of veterinary medicine and comparative biomedicine to improving human, animal and ecosystem health. In this regard, program Director Dr. Mark Simpson and the staff at the Molecular Pathology Unit (MPU), have organized multiple symposia to highlight the research conducted by our pathology fellows. These symposia included renowned investigators, scientists and university professors from around the country to share their research findings and discuss animal models of human diseases as well as show the many different career paths for veterinary scientists. Additionally, these large meetings provided the opportunity for our program partners from both academia and the NIH to interact in-person and be informed of the research undertaken by our fellows within the various NIH institutes. For instance, recently the Molecular Pathology Unit and the CBSTP hosted the Nation's first Combined DVM/PhD and Comparative Biomedical Scientist Training Colloquium at the NIH on August 3, 2017. This colloquium was designed to develop community and networking opportunities for training coordinators and combined degree trainees to share practices, address concerns, and to discuss career advancement and funding. Furthermore, the contribution of CBSTP/MPU to the larger veterinary profession was exemplified organizing the 2017 National Veterinary Scholars Symposium on August 4 and 5, 2017, co-sponsored and co-organized by the Association of American Veterinary Medical Colleges, Washington, DC. The symposium was a remarkable success marked by a record 514 veterinary students from across the nation participating and presenting their summer research. Plenary presentations included topics in global health, neuroscience genetics of disease, comparative oncology, and conservation medicine.