UNIVERSITY OF ALBERTA
FACULTY OF MEDICINE & DENTISTRY
Department of Laboratory Medicine & Pathology

Alberta Health Services

CLINICAL FELLOWSHIP PROGRAM IN MOLECULAR GENETIC PATHOLOGY

The Department of Pathology and Laboratory Medicine
University of Alberta, Faculty of Medicine and Dentistry and
Alberta Health Services

Guidelines and Objectives
January, 2019

Supervisor for Molecular Genetic Pathology:

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CLINICAL FELLOWSHIP IN MOLECULAR GENETIC PATHOLOGY

INTRODUCTION and BACKGROUND

The fellowship is designed to provide comprehensive training in all aspects of molecular genetic pathology, with a focus in molecular oncology. A unique rotation schedule will be structured according to the fellow's needs and objectives, to provide broad or focused exposure to the fields of molecular oncology, molecular genetics, molecular hematopathology, molecular immunology, molecular microbiology, cytogenetics, biochemical genetics and cancer genomics. The program provides training in clinical application of a broad variety of molecular techniques including DNA and RNA extraction, qualitative and quantitative PCR methods, gel and capillary electrophoresis, sanger and next generation sequencing techniques, fluorescence in situ hybridization, fluorescence microscopy, nanostring technology for genomic profiling and basic bioinformatics etc. The fellowship training emphasizes principles and application of various molecular techniques in the clinical and pathologic context of disease and in accordance with published recommended guidelines on best practice. The program facilitates the use of various bioinformatics tools to help elucidate and interprete genetic and genomic data.
External rotations will be available in molecular diagnostic, cytogenetics and biochemical genetics laboratories and medical genetics clinic. The fellow will be based primarily in the molecular pathology laboratory but will have interactions with all subspecialty groups, affiliated with molecular pathology as outlined in the molecular pathology advisory committee. The fellow will participate in clinical consultative and teaching activities within the molecular pathology service, primarily supervised by Dr Iyare Izevbaye. Other participating staff and faculty members will assist in the supervision of the fellow. The molecular pathology division offers molecular diagnostic services to the clinical oncology practice at the Cross Cancer institute, the hematology and hematopathology division at the UAH, and UAH surgical pathology subspecialties and including lung, gastrointestinal, neuropathology, dermatology, soft tissue and lymphoma services. We serve as a reference laboratory for the Edmonton Zone, Northwest Territories and Saskatchewan.

Diagnostic objectives

1. To analyze molecular genetic and genomic assays and issue a clinical interpretation with diagnostic, prognostic or predictive information for clinicians and pathologist.

2. To understand and trouble shoot molecular assays and recommend corrective action.

3. To determine appropriateness and adequacy of specimen for different molecular platforms

4. To provide clinical consultative services for pathologist and oncologist in various clinical scenarios applicable to molecular testing.

5. To understand the principles of total quality and laboratory management

Educational objectives

1. To participate in academic half day molecular lectures and journal clubs
2. To teach resident and medical student advanced concepts in molecular pathology and genetics/genomics
3. To have a grasp and understanding of the molecular basis of disease, to be update on the current peer review literature and text books in molecular pathology and genetics/genomics.
4. To obtain a passing grade in the end of rotation exams.

Research objectives

1. Research: Prepare and submit at least one peer review paper or two case reports on a topic mutually selected by the student and primary preceptor

2. Present a poster at a regional or international conference.

3. Participation and presentation at Discovery, Research and Innovation (DRIvE) meeting in Lab Medicine, University of Albertal.

PROGRAM CURRICULUM

The Molecular genetic pathology Fellowship program curriculum will include:

- Molecular anatomic pathology
- Molecular hematopathology
- Molecular genetics/HLA
- Cytogenetics
- Biochemical genetics
- Medical genetics

Mandatory and Elective Rotations:

Mandatory:

1. 6 months rotation in molecular pathology/hematopathology
2. 2 months in molecular genetics (MDL) and HLA lab
3. 1 month in the cytogenetics,
4. 2 weeks in the medical genetics clinic

Elective:

1. 1 month biochemical genetics
2. 2 weeks in molecular microbiology/virology

Seminars, Rounds and Teaching Sessions

Didactic lectures on molecular pathology are given during the academic half days for pathology residents. Small group tutorials occur on clinical signout rotations. The fellow is encouraged to attend related subspecialty rounds and teaching sessions in which molecular holds a prominent role including the weekly Joint hematology rounds, molecular pathology and genetic network meetings, and residents' presentations.

Clinical/On Call Experience

During the laboratory rotations the fellow will rotate through laboratory benches to gain experience in wet work. The fellow will be involved in the specimen screening, tumor enrichment for macrodissection of FFPE, assay interpretation and case signout.

Quality Management

The fellow will adhere to all Alberta Health Services quality assurance and quality control processes, procedures and policies. The fellow will participate in all aspects of laboratory quality management including the use of quality control, quality monitoring and assurance, assay validation, proficiency testing, customer satisfaction surveys, equipment maintenance and corrective actions etc. The fellow will be required to attend at least two GLS quality council meeting in the year.

Research and Development

The fellow will be required to optimization and validate at least one clinical molecular assay during the one year program. Opportunities for basic and translational research will be available and the fellow is expected to prepare and submit at least one manuscript for publication by the end of his rotation.

SPECIALTY TRAINING REQUIREMENTS

Eligible candidates must have completed residency training in Anatomic, General Pathology or Hematologic Pathology through a recognized program.

DURATION AND LOCATION

Six to twelve months of approved training in molecular genetic pathology. The fellow will be primarily located at Molecular Pathology Laboratory with elective rotations in the molecular diagnostic, cytogenetic and biochemical genetic laboratory.

EVALUATION

A pre and post test will be administered at the start and finish of the program.
A formal quarterly written evaluation will be provided and discussed with the fellow to ensure that steady progress towards training objectives are being met.
The successful completion of the fellowship will be evaluated by the molecular pathology fellowship committee based on the last two quarters of written evaluations. The fellow is responsible for demonstrating the completion of all fellowship requirements and showing the competence to practice molecular pathology in an ethical and professional manner.

RESOURCES AND PERSONNEL

Space and Workload: A work area and microscope and computer station will be available for the fellow

Funding: According to the Edmonton Zone Department fellowship allocation from University of Alberta and Alberta health Services

Salary scale: at the PGY 5 level

Primary Faculty responsible for Molecular Genetic Pathology Fellow :

Dr Iyare Izevbaye MD PhD

Faculty Members of Molecular Pathology Advisory Committee at the UAH sites:

Dr. Adrian Box (Anatomic and Molecular Pathology), Dr Cheryl Mather (Anatomic and Molecular Pathology); Dr Remegio Maglantay Jr (Anatomic and Molecular Patholopgy), Dr Soufiane El-Hallani (Anatomic and Molecular Pathology) Judith Hugh (Breast), Dr. Consolato Sergi (Pediatric) Dr Frank van Landeghem (Neuropathology) Dr Raymond Lai (Lymphoma) Dr Julinor Bacani (Gastrointestinal) Dr Mireille Kattar (Microbiology) Dr Juan Moreno (Genitourinary, Gastrointestinal) Dr Jean Deschenes (Gastrointestinal and lymphoma)

ACCREDITATION AND CERTIFICATION

Upon successful completion the fellow will be issued a certificate from the office of Post Graduate Medical Education, Faculty of Medicine, University of Alberta, affirming that 12 months of subspecialty training have been successfully completed.
(For more information see https://www.ualberta.ca/https://cloudfront.ualberta.ca/-/media/medicine/pgme/policy-guidelines-other/clinical-fellowship-policy.pdf)

ELIGIBILITY

1. Applicants must possess a **medical degree (MD or equivalent**) and must have completed residency training in pathology (General, Anatomic, Clinical, Hematologic pathology, Neuropathology etc).
2. Funding is competitive and not guaranteed. Applicants who are eligible for Canadian certification in pathology by the Royal College of Physicians and Surgeon of Canada (RCPSC) or by the College of Physicians and Surgeons of Alberta (CPSA) will be considered for internal funding by the department. Applicants who are ineligible for Canadian certification (by the RCPSC or CPSA) in a field of pathology may still be considered for admission into the program. However such candidates are required to secure external support from external sponsoring agents.e.g. relevant ministry in their home country.
3. Note that this is a clinical fellowship and not a research post-doctoral fellowship. The fellowship is geared towards subspecialty training for trained pathologists.
4. Vist the link below for application form/requirements
(https://cloudfront.ualberta.ca/-/media/medicine/departments/laboratory-medicine-and-pathology/programs/clinical-fellowship-training-application-form.pdf)

RECOMMENDED READING and EDUCATION RESOURCES

Recommended Reading

Textbook

1. Molecular Pathology in Clinical Practice ed Debra Leonard Springer 2007

2. Diagnostic Molecular Pathology in Practice: A Case-Based Approach by Iris Schrijver 2012

3. Molecular Surgical Pathology, edited by Liang Cheng and John Eble, 2012; ISBN-10: 1461448999

4. Principles of Molecular Diagnostics and Personalized Cancer Medicine by Dongfeng Tan and Henry T. Lynch MD (Jan 9 2013)

5. Quick Compendium Molecular Pathology by Daniel D Mais and Mary Nordberg ASCP Press

6. Quick Compendium Companion for Molecular Pathology George Leonard, Frank Zuehl and Daniel D Mais

7. Human Molecular Genetics 4th edition ed Strachan T and Read A Garland Science 2010

8. Nussbaum et al (ed) 2007 Thompson and Thompson Genetics in Medicine, Saunders Elsevier, 7th edition

9. Molecular Surgical Pathology by Liang Cheng and John Eble, 2012

10. Stanford Open Curriculum in Genomic Medicine
https://www.youtube.com/playlist?list=PLfTljtR5bxMcTg8hgQp9sA4YQwicpSAQv

Inherited Diseases

1. Nussbaum et al (ed) 2007 Thompson and Thompson Genetics in Medicine, Suanders Elsevier, 7th edition
2. Braun AT, Farrell PM, Ferec C, Audrezet MP, Laxova A, Li Z, Kosorok MR, Rosenberg MA, Gershan WM. Cystic fibrosis mutations and genotype-pulmonary phenotype analysis. *J Cyst Fibros*. 2006; 5:33–41
Callum J Bell et al Carrier Testing for Severe Childhood Recessive diseases by NGS Sci Transl Med 3, 5ra4 (2011)
3. www.genereviews.org
4. Lindor NM et al Concise Handbook of Familial Cancer Susceptibility Syndromes. 2nd edition Journal of the NCI Monographs No.38 2008

Molecular Microbiology

David Persing (ed) Molecular Microbiology: Diagnostic Principles and Practice 2nd edition 2011

Journal Publications

Quality and Test Method Validation

1. Jennings L et al 2009 Recommended Principles and Practices for validating clinical molecular Pathology tests Arch Path Lab Med Vol 133 May 2009
2. Berte LM Laboratory Quality Management: A Roadmap Clin Lab Med 27 (2007) 771–790
3. Cankovic M et al The Henry Ford Production system: LEAN Process Redesign Improves Services in the Molecular Diagnostic Laboratory Journal of Mol Diagn 2009,11:390-399
4. Chen B et al Good Laboratory Practices for Molecular Genetic Testing for Heritable Diseases and Conditions. Morbidity and Mortality Weekly Report 2009 Vol 58 No RR-6

Molecular Oncology

1. Geiersback KB and Samowitz WS Microsatellite instability and Colorectal cancer Arch Pathol Lab Med 2011; 135:1269-1277
2. Molecular Pathology of Non-small cell Lung cancer: A practical guide. Molecular Diagnostic Consultation: Am J Clin Pathol 2012; 138:332-346
3. Yip et al Molecular Diagnostic Testing in Malignant Gliomas: A practical update on predictive Markers J Neuropathol Exp Neurol 2007; 67(1)1-15

4. Sepulveda AR CpG Methylation Analysis – current status of clinical assays and potential applications in molecular diagnostics J of Molecular Diagnostics 11(4):266-278
5. NCCN Task Force Report: Update on the Management of Patients with GIST Demetri G et al 2010 Journal of the National Comprehensive Cancer Network vol 8 supplement 2 S1-S45
6. Hunt J et al Micro dissection Techniques for Molecular testing in surgical path Arch Path Lab Med 2004; 128:1372-1378
7. Hewitt S et al Tissue Handling and Specimen Preparation in Surgical Path Arch Path Lab Med 2008 vol 132:1929-1935
8. Renshaw AA UroVysion, Urine cytology and the CAP Arch Path Lab Med 2010; 134:1106-1107
9. Basolo F et al Correlation between the BRAF V600E and tumor invasiveness in PTC smaller than 20mm J Clin Endocrinol Metab 2010 959):4197-4205
10. Nikiforov Y et al Molecular testing for mutations in improving the FNA Diagnosis of Thyroid nodules J clin Endocrinol Metab 2009,94(6):2092-2098
11. Molecular testing guideline for selection of lung cancer patients for EGFR and ALK TKIs: Guideline form the CAP, IASLC and AMP
12. KRAS Mutation: Comparison of Testing Methods and Tissue Sampling Techniques in Colon Cancer: Journal of Molecular Diagnostics, Vol. 12, No. 1, January 2
13. Eduardo Di az-Rubio et al Role of Kras Status in Patients with Metastatic Colorectal Cancer Receiving First-Line Chemotherapy plus Bevacizumab: A TTD Group Cooperative Study PLOS October 20012 Vol 7(10) e47345
14. Xing Mingzhao Clinical Aspects of Braf Mutation in Thyroid Cancer Hot Thyroidol. 10/10;1-13
15. Xing Mingzhao Molecular pathogenesis and mechanisms of thyroid cancer. Nature Review cancer 2013 vol 13(3):184-99

Molecular Hematopathology

1. White et al. Establishment of the first WHO internation genetic reference panel for quantitation of BCR-ABL mRNA Blood 2010 116:e111-117
2. Cross et al Standardized definitions of molecular response to CML. Leukemia (2012) 26, 2172-2175
3. Baccarani et al CML: An update of concepts and management recommendations of ELN Journal of Clinical Oncology 2009; 27(25)6041-6051
4. Branford et al Desirable performance characteristics for BCR-ABL measurement on an IS reporting scale to allow consistent interpretation of individual patient response and comparison of response rates between clinical trials Blood 2008 112:3330-3338
5. King et al A comparative analysis of molecular genetic and conventional cytogenetic detection of diagnostically important translocation in more than 400 cases of AL, highlighting the frequency of false negative conventional cytogenetic Am J Clin Pathol 2011;135:921-928
6. Patel et al Prognostic Relevance of integrated genetic profiling in AML the New England Journal of Medicine 2012 366(12):1079-89
7. Alizadeh AA et al Distinct types of DLBCL identified by gene expression profiling Nature 2000 403:503-511
8. Lenx G et al Stromal gene signatures in B cell lymphomas. NEJM 359(22):2313-23