



Mahidol University
Faculty of Medicine Siriraj Hospital

**Training Curriculum for Certificate of Medical
Proficiency in Hematopathology**

Department of Pathology
Faculty of Medicine Siriraj Hospital
Mahidol University

(Revised on 29 September 2021 & 10 February 2022)

Training Curriculum for Certificate of Medical Proficiency in Hematopathology
Department of Pathology, Faculty of Medicine Siriraj Hospital,
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1. Program:

Training Curriculum for Certificate of Medical Proficiency in Hematopathology

2. Credentials:

Certificate of Medical Proficiency in Hematopathology

3. Awarding Body

3.1 Division of Hematopathology, Department of Pathology

3.2 Faculty of Medicine Siriraj Hospital

4. Duration of Training

1 year, from July 1 of the academic year to June 30 of the following year

5. Faculty

1. Prof. Dr. Sanya Sukpanichnant

- Fellow of Royal College of Pathologists of Thailand, FRCPath (Thailand)
- Research Fellow in Pathology (Hematopathology), Vanderbilt University Medical Center, USA (1990-1993)
- Diploma of the Thai Subspecialty Board of Hematopathology (corresponding fellow)

2. Associate. Prof. Dr. Tawatchai Pongpruttipan

- Fellow of Royal College of Pathologists of Thailand, FRCPath (Thailand)
- Observer in Hematopathology, Pittsburgh University Medical Center, USA (2010-2011)
- Diploma of the Thai Subspecialty Board of Hematopathology (corresponding fellow)

3. Dr. Tauangtham Anekpuritanang

- Fellow of Royal College of Pathologists of Thailand, FRCPath (Thailand)
- Certificate in Molecular Genetics Pathology, Oregon Health and Science University, Oregon, USA (2018-2021)
- Diploma of the Thai Subspecialty Board of Hematopathology (corresponding fellow)

6. Admission Requirements

- Applicant must have FRCPath (Thailand) **or** completed their training in Pathology from oversea
- Be virtuous and ethical person

7. Number of training position:

1 position per year

8. Program aims and objectives

Trainee, who completed the program, will be enhanced in diagnosing hematopathological cases including skills in interpretation of morphologic features, immunohistochemistry, fluorescent in situ hybridization (FISH), molecular analysis and flow cytometry.

9. Program Overview

9.1 Fundamental Courses

- 9.1.1 Basic Knowledge for specimen management
- 9.1.2 Basic Knowledge for immunohistochemistry
- 9.1.3 Basic Knowledge for flow cytometry
- 9.1.4 Basic Knowledge for cytogenetics and fluorescent in situ hybridization
- 9.1.5 Basic Knowledge for molecular study

9.2 Specialist Courses

- 9.2.1 Bone marrow pathology, non-neoplastic conditions
- 9.2.2 Lymph node and spleen pathology, non-neoplastic conditions
- 9.2.3 Myeloid neoplasms
- 9.2.4 Lymphoid neoplasms
- 9.2.5 Histiocytic neoplasms
- 9.2.6 Other hematopoietic and lymphoid conditions

9.3 Research Course (optional)

- 9.3.1 Research Methodology

10. Training and learning experiences methods

10.1 Scope of the training

Trainee will practice in gross examination, histologic examination and relevant special techniques. See appendix for logbook and entrustable professional activities (EPA).

10.2 Practical Experiences

Activities	Minimum/Year
Diagnostic hematopathology with hematopathologists	800 cases
Clinical observation of Division of Hematology (Internal medicine)	2 Weeks
Clinical observation of flow cytometry laboratory (Hematology)	2 Weeks
Clinical observation of flow cytometry laboratory (Pathology)	2 Weeks
Clinical observation of fluorescent in situ hybridization laboratory	1 Week
Clinical observation of molecular laboratory (hematology)	1 Week
Clinical observation of molecular laboratory (pathology)	1 Week
Clinical observation of chromosome laboratory	2 Weeks
Prepare and attend interdepartmental/interhospital conferences	8 Times
Prepare and attend journal club	8 Times
Acting as author or co-author in a research project in hematopathology	1 project (optional)

11. Assessments

11.1 Qualifications for assessee

- Pass the program requirement and have had practical experiences as minimum requirements
- The program committee consider those being good-virtuous, ethical and responsible hematopathologist

11.2 Assessment methods

Theoretical knowledge assessment

- Modified essay question (MEQ) and/or Multiple Choice (MCQ)
- Oral examination (passed/failed)

Professional skill assessment

- Histologic slide evaluation technique

11.3 Graduation Requirements

Must pass theoretical knowledge & professional skills

Theoretical knowledge

- MEQ and/or MCQ at least 60%
- Oral examination evaluated by the committee with at least 2 of 3 votes

Note: Three attempts of re-examination are allowed. Failure to pass the re-examination will result in repeating the course and do the examination again in the following year.

Professional skills

- Electronic logbook for diagnostic cases at least 120 cases that fulfill a list of must know-should know-nice to know diseases in hematopathology practices – see “Appendix 1”
- Entrustable Professional Activities (EPA) at least level 4 in each of the 5 EPA listed – see “Appendix 2”

12. Program Facilities

- Conference room, lecture room
- Audio/visual equipment
- Mahidol University Library
- Faculty Library including electronic resources and database provided by Faculty of Medicine Siriraj Hospital, Mahidol University
- Department library
- Department laboratory
- Department workroom
- Supporting staff

13. Language: English

14. Registration fee: Approximately 350,000 Thai baht

Please contact:

Prof. Dr. Sanya Sukpanichnant, Department of Pathology, Faculty of Medicine Siriraj Hospital, Mahidol University

E-mail: sanya.suk@mahidol.edu

APPENDIX

Summary of the training program

The Clinical Fellowship Training Program in Hematopathology has been established by Department of Pathology, Faculty of Medicine Siriraj Hospital, Mahidol University since 2016 academic year. It is not a well-known training program; only one fellow from Myanmar, Dr. Win Myat Oo, has been accepted for the training in 2018 and finished the training in 2019. During the one-year training, he and his mentor, Prof. Dr. Sanya Sukpanichnant, finished the research project and have later published an article on “Incidental malignant lymphoma and lymphoproliferative disorders in lymph node dissection specimens during tumor removal in various organs” in Siriraj Medical Journal in 2020. He is now an active hematopathologist at Department of Pathology, No (1) Defence Services General Hospital, Mingalardon 11021, Yangon. Recently, he and his colleague has published a case report on ALK-positive anaplastic large cell lymphoma in Asian Journal of Medicine and Health Sciences in 2021.

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During the one-year period, the training course provides an experience on real case handle and self-study learning from the archival materials. Every day, the trainee will learn repetitively how to gather information from careful morphologic evaluation and thoroughly correlate with clinical information, then decide to order any necessary special studies – histochemistry, immunostaining, flow cytometry, FISH, genetic studies, or other relevant laboratory investigations.

A list of must know-should know-nice to know diseases in hematopathology practices will be provided as a logbook (see “Appendix 1”) and the trainee should experience all of the must know entities, at least 75% of the should know entities, and at least 20% of nice to know entities. Importantly, during the training, an evaluation for entrustable professional activities (EPA) will be monitored to ascertain the training outcomes (see “Appendix 2”).

APPENDIX 1

A list of must know-should know-nice to know diseases in hematopathology practices

List of must know diseases (49 entries – all within the training period)

- 1) Aplastic anemia (AA)
- 2) Anemia of chronic disease
- 3) Nutritional anemia
- 4) Thalassemia and hemoglobinopathy
- 5) Acquired immune hemolytic anemia
- 6) Pure red cell aplasia (PRCA)
- 7) Human parvovirus B19 infection
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- 20) Burkitt lymphoma (BL)
- 21) Mantle cell lymphoma (MCL)
- 22) Follicular lymphoma (FL)/in situ follicular neoplasia/florid follicular hyperplasia/Progressive transformation of germinal centers (PTGCs)
- 23) Marginal zone lymphoma (MZL) of mucosa-associated lymphoid tissue (MALT), spleen, and nodal
- 24) Lymphoplasmacytic lymphoma (LPL) & Waldenstrom macroglobulinemia (WM)
- 25) Intravascular large B-cell lymphoma (IVL)
- 26) Extranodal NK/T-cell lymphoma, nasal type
- 27) Anaplastic large cell lymphoma (ALCL)
- 28) Angioimmunoblastic T-cell lymphoma (AITL)
- 29) Subcutaneous panniculitis-like T-cell lymphoma (SPTCL)
- 30) Peripheral T-cell lymphoma, not otherwise specified (PTCL, NOS)
- 31) T lymphoblastic lymphoma/leukemia (T-LBL)
- 32) Classical Hodgkin lymphoma (CHL)
- 33) Nodular lymphocyte predominant Hodgkin lymphoma (NLPHL)
- 34) Primary mediastinal large B-cell lymphoma & mediastinal gray zone lymphoma (unclassifiable B-cell lymphoma with features intermediate between DLBCL and CHL)
- 35) Mycosis fungoides (MF)/Sezary syndrome (SS)
- 36) Primary CNS lymphoma
- 37) Methotrexate-associated lymphoproliferative disorder (MTX-LPD)
- 38) EBV+ mucocutaneous ulcer
- 39) Plasmacytoma/Plasma cell myeloma (PCM, multiple myeloma)
- 40) Monoclonal gammopathy of undetermined significance (MGUS)
- 41) Minimal residual disease in leukemia, lymphoma & plasma cell myeloma
- 42) Tuberculosis (TB)

- 43) Necrotizing lymphadenitis
- 44) Langerhans cell histiocytosis (LCH)
- 45) Dermatopathic lymphadenopathy
- 46) Infectious mononucleosis
- 47) Hemophagocytic lymphohistiocytosis (HLH)/Hemophagocytic syndrome
- 48) Superior vena cava syndrome
- 49) Thymoma type B1

List of should know diseases (29 entries – 75% within the training period)

- 1) Acute leukemia with recurrent genetic abnormalities
- 2) Therapy-related myeloid neoplasm
- 3) Mixed phenotype acute leukemia (MPAL)
- 4) Chronic myelomonocytic leukemia (CMML)
- 5) Myeloproliferative neoplasm (MPN), unclassifiable
- 6) MDS/MPN
- 7) Systemic mastocytosis (SM)
- 8) Histiocytic sarcoma
- 9) Prolymphocytic leukemia
- 10) Hairy cell leukemia (HCL)
- 11) Lymphomatoid granulomatosis, EBV-associated large B-cell lymphoma, NOS & other aggressive B-cell lymphoma
- 12) Other indolent B-cell lymphoma
- 13) Other splenic lymphomas
- 14) Hepatosplenic T-cell lymphoma
- 15) Monomorphic epitheliotropic intestinal T-cell lymphoma
- 16) Primary cutaneous lymphoma or LPD other than mycosis fungoides
- 17) Primary cutaneous CD30+ lymphoproliferative disorders/Lymphomatoid papulosis (LYP)
- 18) Other immunodeficiency-associated lymphoproliferative disorders (LPD)
- 19) Posttransplant LPD (PTLD)
- 20) Castleman disease & related syndromes
- 21) IgG4-related disease
- 22) Rosai-Dorfman disease (RDD)
- 23) Acquired non-immune hemolytic anemia
- 24) Amyloidosis
- 25) Melioidosis
- 26) Dengue hemorrhagic fever/Dengue shock syndrome
- 27) Sarcoidosis
- 28) Leukemic infiltration/myeloid sarcoma
- 29) Serosus atrophy of marrow fat/Gelatinous transformation of marrow fat

List of nice-to-know diseases (19 entries – 20% within the training period)

- 1) Red blood cell membrane disorders & red blood cell defects
- 2) Paroxysmal nocturnal hemoglobinuria (PNH)
- 3) Congenital dyserythropoietic anemia (CDA)
- 4) Fanconi anemia
- 5) Thrombotic microangiopathy
- 6) Large cell lymphoma with *IRF4* rearrangement
- 7) Burkitt-like lymphoma with 11q aberration
- 8) T-cell large granular lymphocytic leukemia
- 9) Chronic lymphoproliferative disorder of NK cells
- 10) Aggressive NK cell leukemia

- 11) Enteropathy-associated T-cell lymphoma
- 12) Primary cutaneous gamma-delta T-cell lymphoma
- 13) Heavy chain diseases
- 14) Light chain deposition diseases
- 15) Autoimmune lymphoproliferative syndrome (ALS)
- 16) Interferon-gamma autoantibody
- 17) Hemochromatosis
- 18) Cat scratch disease
- 19) Toxoplasma lymphadenitis

APPENDIX 2

Entrustable Professional Activities (EPA)

In each entity, EPA can be generally divided into 5 levels. **The trainee is expected to reach at least EPA level 4 in any categories listed below.**

EPA level 1 (L1): enable to perform under close supervision

EPA level 2 (L2): enable to perform under guidance by supervisor

EPA level 3 (L3): enable to perform under help by supervisor, if needed

EPA level 4 (L4): enable to perform by oneself

EPA level 5 (L5): enable to perform by oneself and supervise the less experienced one

Entrustable professional activities (EPA)	Level
1. Handle hematopoietic and lymphoid tissue samples properly	L4
2. Provide diagnostic report for surgical pathology and cytology samples related to hematologic diseases	L4
3. Provide pathology support for interdisciplinary conferences related to hematologic diseases	L4
4. Review and provide hematopathology diagnosis consultations	L4
5. Optimize test utilization related to hematologic diseases	L4

1. EPA for “Handle hematopoietic and lymphoid tissue samples properly”

Level 1 (L1): Can explain how to handle and process specimen for hematopathology examination properly

Specimens in hematopathology services includes clotted marrow (marrow clot), bone marrow biopsy, core needle biopsy of enlarged lymph node, mass, or lesion in any organ, incisional or excisional biopsy, resection specimen, blood, marrow aspirate, or other body fluid. The trainee should know how to:

- Handle specimen properly for tissue processing, histologic sectioning, H&E staining, histochemistry, immunostaining, or FISH
- Handle specimen properly for cytologic preparation, Wright stain or Diff-Quik, Pap stain, cytochemistry, immunostaining, or FISH
- Handle fluid specimen properly for flow cytometry

Level 2 (L2): Specify ancillary test properly for immunostaining, flow cytometry, FISH, or molecular genetics

Level 3 (L3): Prioritize ancillary tests properly under supervision

Level 4 (L4): Prioritize ancillary tests properly by oneself

Level 5 (L5): Advise others for handling specimen properly

2. EPA for “Provide diagnostic report for surgical pathology and cytology samples related to hematologic diseases”

Consider in the following issue:

- 2.1 Interpretation of hematology testing
- 2.2 Morphologic interpretation and diagnosis
- 2.3 Interpretation of histochemistry and cytochemistry
- 2.4 Interpretation of immunohistochemistry (immunostaining)
- 2.5 Interpretation of in situ hybridization
- 2.6 Interpretation of flow cytometry
- 2.7 Reporting

2.1 EPA for “Interpretation of hematology testing”

Level 1 (L1): Explain the principle and pathophysiology of hematologic abnormalities

Level 2 (L2): Interpret the test results of hematologic abnormalities under the help provided by supervisor

Level 3 (L3): Interpret the test results of hematologic abnormalities by oneself

Level 4 (L4): Interpret the complex test results of hematologic abnormalities and realize the limitation of the test

Level 5 (L5): Provide consultation for the tests in hematologic abnormalities

2.2 EPA for “Morphologic interpretation and diagnosis”

Level 1 (L1): Demonstrate to have basic knowledge about blood, marrow, lymphoid tissues including morphology in order to specify the simple diagnosis under guidance by supervisor

Level 2 (L2): Apply the basic knowledge about blood, marrow, lymphoid tissues including morphology in order to specify the simple diagnosis by oneself

Level 3 (L3): Apply the basic knowledge about blood, marrow, lymphoid tissues including morphology in order to specify the complicated diagnosis under guidance by supervisor

Level 4 (L4): Apply the basic knowledge about blood, marrow, lymphoid tissues including morphology in order to specify the complicated diagnosis by oneself

Level 5 (L5): Provide consultation for morphologic evaluation in hematopathology

2.3 EPA for “Interpretation of histochemistry and cytochemistry”

Level 1 (L1): Explain the principles of histochemistry and cytochemistry used in hematopathology

Level 2 (L2): Interpret the staining for general abnormalities under guidance by supervisor

Level 3 (L3): Interpret the staining for general abnormalities by oneself and realize the limitation of the staining

Level 4 (L4): Interpret the staining for complex abnormalities by oneself and realize the limitation of the staining

Level 5 (L5): Provide consultation for interpretation of the stainings

2.4 EPA for “Interpretation of immunohistochemistry (immunostaining)”

Level 1 (L1): Explain the principles of immunostaining used in hematopathology

Level 2 (L2): Interpret the immunostaining for general abnormalities under guidance by supervisor

Level 3 (L3): Interpret the immunostaining for general abnormalities by oneself and realize the limitation of the technique

Level 4 (L4): Interpret the immunostaining for complex abnormalities by oneself and realize the limitation of the technique

Level 5 (L5): Provide consultation for interpretation of the immunostainings

2.5 EPA for “Interpretation of in situ hybridization”

Level 1 (L1): Explain the principles of in situ hybridization (ISH) used in hematopathology, including FISH for fusion genes and ISH for EBV-encoded small RNA (EBER) or mRNA for kappa or lambda light chain

Level 2 (L2): Interpret the ISH or FISH for general abnormalities under guidance by supervisor

Level 3 (L3): Interpret the ISH or FISH for general abnormalities by oneself and realize the limitation of the technique

Level 4 (L4): Interpret the ISH or FISH for complex abnormalities by oneself and realize the limitation of the technique

Level 5 (L5): Provide consultation for interpretation of the ISH or FISH

2.6 EPA for “Interpretation of flow cytometry”

Level 1 (L1): Explain the principles of flow cytometry used in hematopathology

Level 2 (L2): Interpret the flow cytometry for general abnormalities under guidance by supervisor

Level 3 (L3): Interpret the flow cytometry for general abnormalities by oneself and realize the limitation of flow cytometry

Level 4 (L4): Interpret the flow cytometry for complex abnormalities by oneself and realize the limitation of flow cytometry

Level 5 (L5): Provide consultation for interpretation of the flow cytometry

2.7 EPA for “Reporting”

Level 1 (L1): Specify key elements in hematopathology report and the appropriate turnaround time for suitable patient management as well as amendment or supplement of the signed-out pathology report properly

Key elements in hematopathology report include 1) pathology number, 2) patient’s name & hospital number, 3) detail of the specimen including collection site, 4) special stains or studies, 5) emergency track with notification and how to contact the responsible physician, 6) gross description of the specimen, 7) hematopathology diagnosis, 8) comment & note, 9) fellow, pathologist, and hematopathologist names (note: signed by the responsible pathologist only), and 10) amendment or supplement of the case.

Level 2 (L2): Provide pathology report within turnaround time in a simple case under guidance by supervisor as well as amendment or supplement report under guidance by supervisor

Level 3 (L3): Provide pathology report within turnaround time in a simple case by oneself as well as amendment or supplement report of a complicated case under guidance by supervisor

Level 4 (L4): Provide pathology report within turnaround time in a complicated case as well as amendment or supplement report of a complicated case by oneself

Level 5 (L5): Provide pathology report within turnaround time in a complicated case by oneself and demonstrate the uncertainty or problem in the case

3. EPA for “Provide pathology support for interdisciplinary conferences related to hematologic diseases”

Level 1 (L1): In simple case, summarize the next procedure for hematologic and hematopathologic studies together with relevant references that are useful for providing pathology support for interdisciplinary conferences related to hematologic diseases

Level 2 (L2): Provide pathology support under guidance by supervisor

Level 3 (L3): Provide pathology support in a simple case by oneself and in a complicated case under guidance by supervisor

Level 4 (L4): Provide pathology support in a complicated case by oneself

Level 5 (L5): Provide a holistic pathology support by oneself

4. EPA for “Review and provide hematopathology diagnosis consultations”

Level 1 (L1): Identify clinical problem leading to pathology review by oneself. Identify the cause or possibility in the original pathology report that leads to pathology review under the guidance by supervisor. Summarize the previous studies in the patient both pathology reports and other laboratory investigations as well as relevant references that are useful for the pathology review

Level 2 (L2): Review all the provided slides by oneself and plan for further investigations under guidance by supervisor and realize the mistake or limitation of the studies provided in the case

Level 3 (L3): Review all the provided slides, plan for further investigations, and realize the mistake or limitation of the studies provided in a simple case by oneself. But in a complicated case still needs guidance by supervisors.

Level 4 (L4): Review all the provided slides, plan for further investigations, and realize the mistake or limitation of the studies provided in a complicated case by oneself.

Level 5 (L5): Provide a holistic pathology review by oneself

5. EPA for “Optimize test utilization related to hematologic diseases”

Level 1 (L1): Identify the hematopathology practice in general and details of the workflow, including special stains, immunostaining, flow cytometry, genetic studies (cytogenetics and molecular genetic techniques)

Level 2 (L2): Explain the reasons for utilization of the tests by oneself

Level 3 (L3): Identify the chance to increase utilization of the test in pathology

Level 4 (L4): Initiate how to increase utilization of the tests

Level 5 (L5): Summarize the revision of test utilization and try to increase better test utilization



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- 26) Extranodal NK/T-cell lymphoma, nasal type
- 27) Anaplastic large cell lymphoma (ALCL)
- 28) Angioimmunoblastic T-cell lymphoma (AITL)
- 29) Subcutaneous panniculitis-like T-cell lymphoma (SPTCL)
- 30) Peripheral T-cell lymphoma, not otherwise specified (PTCL, NOS)
- 31) T lymphoblastic lymphoma/leukemia (T-LBL)
- 32) Classical Hodgkin lymphoma (CHL)
- 33) Nodular lymphocyte predominant Hodgkin lymphoma (NLPHL)
- 34) Primary mediastinal large B-cell lymphoma & mediastinal gray zone lymphoma (unclassifiable B-cell lymphoma with features intermediate between DLBCL and CHL)
- 35) Mycosis fungoides (MF)/Sezary syndrome (SS)
- 36) Primary CNS lymphoma
- 37) Methotrexate-associated lymphoproliferative disorder (MTX-LPD)
- 38) EBV+ mucocutaneous ulcer
- 39) Plasmacytoma/Plasma cell myeloma (PCM, multiple myeloma)
- 40) Monoclonal gammopathy of undetermined significance (MGUS)
- 41) Minimal residual disease in leukemia, lymphoma & plasma cell myeloma
- 42) Tuberculosis (TB)

- 43) Necrotizing lymphadenitis
- 44) Langerhans cell histiocytosis (LCH)
- 45) Dermatopathic lymphadenopathy
- 46) Infectious mononucleosis
- 47) Hemophagocytic lymphohistiocytosis (HLH)/Hemophagocytic syndrome
- 48) Superior vena cava syndrome
- 49) Thymoma type B1

List of should know diseases (29 entries – 75% within the training period)

- 1) Acute leukemia with recurrent genetic abnormalities
- 2) Therapy-related myeloid neoplasm
- 3) Mixed phenotype acute leukemia (MPAL)
- 4) Chronic myelomonocytic leukemia (CMML)
- 5) Myeloproliferative neoplasm (MPN), unclassifiable
- 6) MDS/MPN
- 7) Systemic mastocytosis (SM)
- 8) Histiocytic sarcoma
- 9) Prolymphocytic leukemia
- 10) Hairy cell leukemia (HCL)
- 11) Lymphomatoid granulomatosis, EBV-associated large B-cell lymphoma, NOS & other aggressive B-cell lymphoma
- 12) Other indolent B-cell lymphoma
- 13) Other splenic lymphomas
- 14) Hepatosplenic T-cell lymphoma
- 15) Monomorphic epitheliotropic intestinal T-cell lymphoma
- 16) Primary cutaneous lymphoma or LPD other than mycosis fungoides
- 17) Primary cutaneous CD30+ lymphoproliferative disorders/Lymphomatoid papulosis (LYP)
- 18) Other immunodeficiency-associated lymphoproliferative disorders (LPD)
- 19) Posttransplant LPD (PTLD)
- 20) Castleman disease & related syndromes
- 21) IgG4-related disease
- 22) Rosai-Dorfman disease (RDD)
- 23) Acquired non-immune hemolytic anemia
- 24) Amyloidosis
- 25) Melioidosis
- 26) Dengue hemorrhagic fever/Dengue shock syndrome
- 27) Sarcoidosis
- 28) Leukemic infiltration/myeloid sarcoma
- 29) Serosus atrophy of marrow fat/Gelatinous transformation of marrow fat

List of nice-to-know diseases (19 entries – 20% within the training period)

- 1) Red blood cell membrane disorders & red blood cell defects
- 2) Paroxysmal nocturnal hemoglobinuria (PNH)
- 3) Congenital dyserythropoietic anemia (CDA)
- 4) Fanconi anemia
- 5) Thrombotic microangiopathy
- 6) Large cell lymphoma with *IRF4* rearrangement
- 7) Burkitt-like lymphoma with 11q aberration
- 8) T-cell large granular lymphocytic leukemia
- 9) Chronic lymphoproliferative disorder of NK cells
- 10) Aggressive NK cell leukemia

- 11) Enteropathy-associated T-cell lymphoma
- 12) Primary cutaneous gamma-delta T-cell lymphoma
- 13) Heavy chain diseases
- 14) Light chain deposition diseases
- 15) Autoimmune lymphoproliferative syndrome (ALS)
- 16) Interferon-gamma autoantibody
- 17) Hemochromatosis
- 18) Cat scratch disease
- 19) Toxoplasma lymphadenitis

APPENDIX 2

Entrustable Professional Activities (EPA)

In each entity, EPA can be generally divided into 5 levels. **The trainee is expected to reach at least EPA level 4 in any categories listed below.**

EPA level 1 (L1): enable to perform under close supervision

EPA level 2 (L2): enable to perform under guidance by supervisor

EPA level 3 (L3): enable to perform under help by supervisor, if needed

EPA level 4 (L4): enable to perform by oneself

EPA level 5 (L5): enable to perform by oneself and supervise the less experienced one

Entrustable professional activities (EPA)	Level
1. Handle hematopoietic and lymphoid tissue samples properly	L4
2. Provide diagnostic report for surgical pathology and cytology samples related to hematologic diseases	L4
3. Provide pathology support for interdisciplinary conferences related to hematologic diseases	L4
4. Review and provide hematopathology diagnosis consultations	L4
5. Optimize test utilization related to hematologic diseases	L4

1. EPA for “Handle hematopoietic and lymphoid tissue samples properly”

Level 1 (L1): Can explain how to handle and process specimen for hematopathology examination properly

Specimens in hematopathology services includes clotted marrow (marrow clot), bone marrow biopsy, core needle biopsy of enlarged lymph node, mass, or lesion in any organ, incisional or excisional biopsy, resection specimen, blood, marrow aspirate, or other body fluid. The trainee should know how to:

- Handle specimen properly for tissue processing, histologic sectioning, H&E staining, histochemistry, immunostaining, or FISH
- Handle specimen properly for cytologic preparation, Wright stain or Diff-Quik, Pap stain, cytochemistry, immunostaining, or FISH
- Handle fluid specimen properly for flow cytometry

Level 2 (L2): Specify ancillary test properly for immunostaining, flow cytometry, FISH, or molecular genetics

Level 3 (L3): Prioritize ancillary tests properly under supervision

Level 4 (L4): Prioritize ancillary tests properly by oneself

Level 5 (L5): Advise others for handling specimen properly

2. EPA for “Provide diagnostic report for surgical pathology and cytology samples related to hematologic diseases”

Consider in the following issue:

- 2.1 Interpretation of hematology testing
- 2.2 Morphologic interpretation and diagnosis
- 2.3 Interpretation of histochemistry and cytochemistry
- 2.4 Interpretation of immunohistochemistry (immunostaining)
- 2.5 Interpretation of in situ hybridization
- 2.6 Interpretation of flow cytometry
- 2.7 Reporting

2.1 EPA for “Interpretation of hematology testing”

Level 1 (L1): Explain the principle and pathophysiology of hematologic abnormalities

Level 2 (L2): Interpret the test results of hematologic abnormalities under the help provided by supervisor

Level 3 (L3): Interpret the test results of hematologic abnormalities by oneself

Level 4 (L4): Interpret the complex test results of hematologic abnormalities and realize the limitation of the test

Level 5 (L5): Provide consultation for the tests in hematologic abnormalities

2.2 EPA for “Morphologic interpretation and diagnosis”

Level 1 (L1): Demonstrate to have basic knowledge about blood, marrow, lymphoid tissues including morphology in order to specify the simple diagnosis under guidance by supervisor

Level 2 (L2): Apply the basic knowledge about blood, marrow, lymphoid tissues including morphology in order to specify the simple diagnosis by oneself

Level 3 (L3): Apply the basic knowledge about blood, marrow, lymphoid tissues including morphology in order to specify the complicated diagnosis under guidance by supervisor

Level 4 (L4): Apply the basic knowledge about blood, marrow, lymphoid tissues including morphology in order to specify the complicated diagnosis by oneself

Level 5 (L5): Provide consultation for morphologic evaluation in hematopathology

2.3 EPA for “Interpretation of histochemistry and cytochemistry”

Level 1 (L1): Explain the principles of histochemistry and cytochemistry used in hematopathology

Level 2 (L2): Interpret the staining for general abnormalities under guidance by supervisor

Level 3 (L3): Interpret the staining for general abnormalities by oneself and realize the limitation of the staining

Level 4 (L4): Interpret the staining for complex abnormalities by oneself and realize the limitation of the staining

Level 5 (L5): Provide consultation for interpretation of the stainings

2.4 EPA for “Interpretation of immunohistochemistry (immunostaining)”

Level 1 (L1): Explain the principles of immunostaining used in hematopathology

Level 2 (L2): Interpret the immunostaining for general abnormalities under guidance by supervisor

Level 3 (L3): Interpret the immunostaining for general abnormalities by oneself and realize the limitation of the technique

Level 4 (L4): Interpret the immunostaining for complex abnormalities by oneself and realize the limitation of the technique

Level 5 (L5): Provide consultation for interpretation of the immunostainings

2.5 EPA for “Interpretation of in situ hybridization”

Level 1 (L1): Explain the principles of in situ hybridization (ISH) used in hematopathology, including FISH for fusion genes and ISH for EBV-encoded small RNA (EBER) or mRNA for kappa or lambda light chain

Level 2 (L2): Interpret the ISH or FISH for general abnormalities under guidance by supervisor

Level 3 (L3): Interpret the ISH or FISH for general abnormalities by oneself and realize the limitation of the technique

Level 4 (L4): Interpret the ISH or FISH for complex abnormalities by oneself and realize the limitation of the technique

Level 5 (L5): Provide consultation for interpretation of the ISH or FISH

2.6 EPA for “Interpretation of flow cytometry”

Level 1 (L1): Explain the principles of flow cytometry used in hematopathology

Level 2 (L2): Interpret the flow cytometry for general abnormalities under guidance by supervisor

Level 3 (L3): Interpret the flow cytometry for general abnormalities by oneself and realize the limitation of flow cytometry

Level 4 (L4): Interpret the flow cytometry for complex abnormalities by oneself and realize the limitation of flow cytometry

Level 5 (L5): Provide consultation for interpretation of the flow cytometry

2.7 EPA for “Reporting”

Level 1 (L1): Specify key elements in hematopathology report and the appropriate turnaround time for suitable patient management as well as amendment or supplement of the signed-out pathology report properly

Key elements in hematopathology report include 1) pathology number, 2) patient’s name & hospital number, 3) detail of the specimen including collection site, 4) special stains or studies, 5) emergency track with notification and how to contact the responsible physician, 6) gross description of the specimen, 7) hematopathology diagnosis, 8) comment & note, 9) fellow, pathologist, and hematopathologist names (note: signed by the responsible pathologist only), and 10) amendment or supplement of the case.

Level 2 (L2): Provide pathology report within turnaround time in a simple case under guidance by supervisor as well as amendment or supplement report under guidance by supervisor

Level 3 (L3): Provide pathology report within turnaround time in a simple case by oneself as well as amendment or supplement report of a complicated case under guidance by supervisor

Level 4 (L4): Provide pathology report within turnaround time in a complicated case as well as amendment or supplement report of a complicated case by oneself

Level 5 (L5): Provide pathology report within turnaround time in a complicated case by oneself and demonstrate the uncertainty or problem in the case

3. EPA for “Provide pathology support for interdisciplinary conferences related to hematologic diseases”

Level 1 (L1): In simple case, summarize the next procedure for hematologic and hematopathologic studies together with relevant references that are useful for providing pathology support for interdisciplinary conferences related to hematologic diseases

Level 2 (L2): Provide pathology support under guidance by supervisor

Level 3 (L3): Provide pathology support in a simple case by oneself and in a complicated case under guidance by supervisor

Level 4 (L4): Provide pathology support in a complicated case by oneself

Level 5 (L5): Provide a holistic pathology support by oneself

4. EPA for “Review and provide hematopathology diagnosis consultations”

Level 1 (L1): Identify clinical problem leading to pathology review by oneself. Identify the cause or possibility in the original pathology report that leads to pathology review under the guidance by supervisor. Summarize the previous studies in the patient both pathology reports and other laboratory investigations as well as relevant references that are useful for the pathology review

Level 2 (L2): Review all the provided slides by oneself and plan for further investigations under guidance by supervisor and realize the mistake or limitation of the studies provided in the case

Level 3 (L3): Review all the provided slides, plan for further investigations, and realize the mistake or limitation of the studies provided in a simple case by oneself. But in a complicated case still needs guidance by supervisors.

Level 4 (L4): Review all the provided slides, plan for further investigations, and realize the mistake or limitation of the studies provided in a complicated case by oneself.

Level 5 (L5): Provide a holistic pathology review by oneself

5. EPA for “Optimize test utilization related to hematologic diseases”

Level 1 (L1): Identify the hematopathology practice in general and details of the workflow, including special stains, immunostaining, flow cytometry, genetic studies (cytogenetics and molecular genetic techniques)

Level 2 (L2): Explain the reasons for utilization of the tests by oneself

Level 3 (L3): Identify the chance to increase utilization of the test in pathology

Level 4 (L4): Initiate how to increase utilization of the tests

Level 5 (L5): Summarize the revision of test utilization and try to increase better test utilization