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978-1-107-50383-0 — Multiparameter Flow Cytometry in the Diagnosis of Hematologic Malignancies

Edited by Anna Porwit, Marie Christine Béné

Frontmatter

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Edited by

Anna Porwit

Lund University, Sweden

Marie-Christine Béné

University of Nantes, France



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Contributors

Olof Axler

Lund University, Sweden

Giuseppe Basso

University of Padova, Italy

Barbara Buldini

University of Padova, Italy

Jacqueline Cloos

VU University Medical Center,
Amsterdam, The Netherlands

Ruth M. de Tute

Leeds University, UK

Jonathan R. Fromm

University of Washington, Seattle, Washington, USA

Angèle Kelder

VU University Medical Center,
Amsterdam, The Netherlands

Wolfgang Kern

MLL Munich Leukemia Laboratory,
Munich, Germany

Francis Lacombe

Bordeaux University, France

Arjan A. van de Loosdrecht

VU University Medical Center,
Amsterdam, The Netherlands

Gert J. Ossenkoppele

VU University Medical Center,
Amsterdam, The Netherlands

Roger G. Owen

Leeds University, UK

Andrew C. Rawstron

Leeds University, UK

Gerrit J. Schuurhuis

VU University Medical Center,
Amsterdam, The Netherlands

Lori Soma

University of Washington, Seattle, Washington, USA

Anne Tierens

University of Toronto, Canada

Theresia M. Westers

VU University Medical Center,
Amsterdam, The Netherlands

Brent L. Wood

University of Washington, Seattle, Washington, USA

Andrea Zangrando

University of Padova, Italy

Wendelien Zeijlemaker

VU University Medical Center,
Amsterdam, The Netherlands

Preface

Together with cytological examination, flow cytometry is often the first exploration step in patients with clinical symptoms suggesting haematological malignancy or with fortuitously discovered anomalies in a whole blood cell count. Depending on the healthcare organisation, flow cytometry results will stand alone and be discussed later during a diagnostic conference, or be integrated in a comprehensive set of investigations including bone marrow biopsy morphology, cytogenetics and sophisticated molecular studies.

Over the years, knowledge and skills have developed so that in many cases the subtleties of the sets of markers, as well as their expression or absence, have become familiar to clinicians expecting a diagnosis. Yet, the thousands of references in the literature, dealing with this specific part of laboratory haematology, provide a good idea of the puzzlement that may overwhelm any novice in the field.

Thinking about the outlines of this book, we placed ourselves in the position of a young laboratory haematologist or haematopathologist and wondered which questions would need an answer likely to be found in a single document. We then asked Expert Friends to work with us with this aim in mind. Moreover, we wanted to focus on the new 8- and 10-colour methodologies.

We decided to start with basic characteristics of the structure and functions of flow cytometers, trying to provide a clear explanation of what sometimes seems to be very complex. We also depicted the analysis tools available in current software to make the most of acquired data (Chapter 1).

We then collected pertinent information about the structure, function and expression of a large number of the antigens investigated in flow cytometry, all mentioned somewhere in this book, together with a brief history of the way they were characterised or discovered (Chapter 2).

Before tackling pathological issues, we thought that readers would appreciate some information about what to expect when flow cytometry is applied to normal samples of blood, bone marrow or lymphatic tissue (Chapter 3). We also listed a series of non-malignant conditions where the hypothesis of malignancy is plausible and must be ruled out (Chapter 4).

In Chapter 5, we present a collection of typical flow cytometry graphs characteristic for various categories of acute leukaemia.

From Chapters 6 to 13, the authors considered specific sets of diseases and their idiosyncratic flow cytometry features.

Finally, Chapter 14 provides a glimpse at what lays ahead, in the already foreseeable developments of the versatile and powerful technology of cell analysis.

We built this book, not only as a manual that may be read through while starting to work with flow cytometry diagnostics, but also as a reference document to consult when interested in any aspect of flow cytometry diagnostics of haematological malignancies.

We hope that, together with our co-authors, we have reached that goal.

Anna Porwit and Marie-Christine Béné

Abbreviations

7-AAD	7-aminoactinomycin D	ECD	Energy coupled dye (phycoerythrin-Texas red conjugate)
AIHA	Auto immune haemolytic anaemia	EDTA	Ethylene diamine tetraacetic acid
AITL	Angio-immunoblastic T-cell lymphoma	ETP-ALL	Early T-cell precursor acute lymphoblastic leukaemia
ALL	Acute lymphoblastic leukaemia	FCM	Flow cytometry
AML	Acute myeloid (or myeloblastic) leukaemia	FITC	Fluorescein isothiocyanate
APC	Allophycocyanin	FNA	Fine-needle aspirate
APL	Acute promyelocytic leukemia	FL	Follicular lymphoma
ATLL	Adult T-cell leukemia/lymphoma	FLAER	Fluorescein-labelled proaerolysin
BCP ALL	B-cell progenitor acute lymphoblastic leukaemia	FLT3-ITD	FMS-like tyrosine kinase-3 inversion tandem duplication mutation
BCR	B-cell receptor	FSC	Forward scatter
BCR-ABL	Breakpoint cluster region-abelson [t(9;22) also called Philadelphia chromosome]	HCL	Hairy cell leukaemia
BDCA	Blood-derived dendritic cell antigens	GFP	Green fluorescent protein
BF	Body fluid	GvL	Graft versus leukaemia
BM	Bone marrow	HIV	Human immunodeficiency virus
BPDCN	Blastic plasmacytoid dendritic cell neoplasm	HL	Hodgkin lymphoma
BR	Blast region	HLA-DR	Human leukocyte antigen – antigen D related
CALLA	Common acute lymphoblastic leukemia antigen	HSL	Hepatosplenic lymphoma
CART T-cell	Chimeric antigen receptor T-cell	HSCT	Haematopoietic stem cell transplantation
CBF	Core binding factor	HTLV-1	Human T-cell lymphotropic virus-1
CCR	Chemokine receptor	ICOS	Inducible costimulatory
CD	Cluster of differentiation	Ig	Immunoglobulin
ChIP	Chromatin immunoprecipitation	IL	Interleukin
CLL	Chronic lymphocytic leukemia	JAK	Janus kinase
CLPD	Chronic lymphoproliferative disorders	KIR	Killer immunoglobulin-like receptors
CML	Chronic myeloid leukaemia	KrO	Krome orange
CMML	Chronic myelomonocytic leukaemia	LAIP	Leukemia associated immunophenotype
CRLF2	Cytokine receptor-like factor	LCA	Leucocyte common antigen
Cy	Cyanin	LGL	Large granular lymphocyte
DAPI	4',6-diamidino-2-phenylindole	LSC	Leukemic stem cell
DC	Dendritic cell	Lin	Lineage
DLBCL	Diffuse large B-cell lymphoma	LPD	Lymphoproliferative disorder
DNA	Deoxyribonucleic acid	MAPK	Mitogen activated protein kinase

Abbreviations

MBL	Monoclonal B-cell lymphocytosis	PCR	Polymerase chain reaction
MCL	Mantle cell lymphoma	PD-1	Programmed death-1
MDS	Myelodysplastic syndrome	Percp	Peridinin chlorophyll-A protein
MF	Mycosis fungoides	PE R-	Phycoerythrin
MFI	Mean fluorescence intensity	PI	Propidium iodide
MHC	Major histocompatibility complex	PI3K	Phosphoinositide 3 kinase
MLL/KMT2A	Mixed lineage leukaemia/lysine methyl transferase 2A	PML-RARA	Promyelocytic leukemia/retinoic acid receptor A [t(15;17) translocation]
MRD	Minimal residual disease	PMT	Photomultiplier
m-TOR	mammalian transporter of rapamycin	RNA	Ribonucleic acid
MZL	Marginal zone lymphoma	RBC	Red blood cell
MPAL	Mixed phenotype acute leukemia	SC	Sézary cell
MRD	Minimal residual disease	SLL	Small lymphocytic lymphoma
NF	Nuclear factor-kappa B	SS	Sézary syndrome
NGS	Next generation sequencing	SSC	Side scatter
NK	Natural killer	STAT	Signal transducer and activator of transcription
NHL	Non-hodgkin lymphoma	TCR	T-cell receptor
NPM	Nucleophosmin	TdT	Terminal deoxynucleotidyl transferase
PB	Peripheral blood	TK	Tyrosine kinase
Pbl	Pacific blue	Tregs	Regulatory T-cells
PC	Plasma cell	WBC	White blood cell
PCA	Principal component analysis	WHO	World Health Organization
PCM	Plasma cell myeloma		