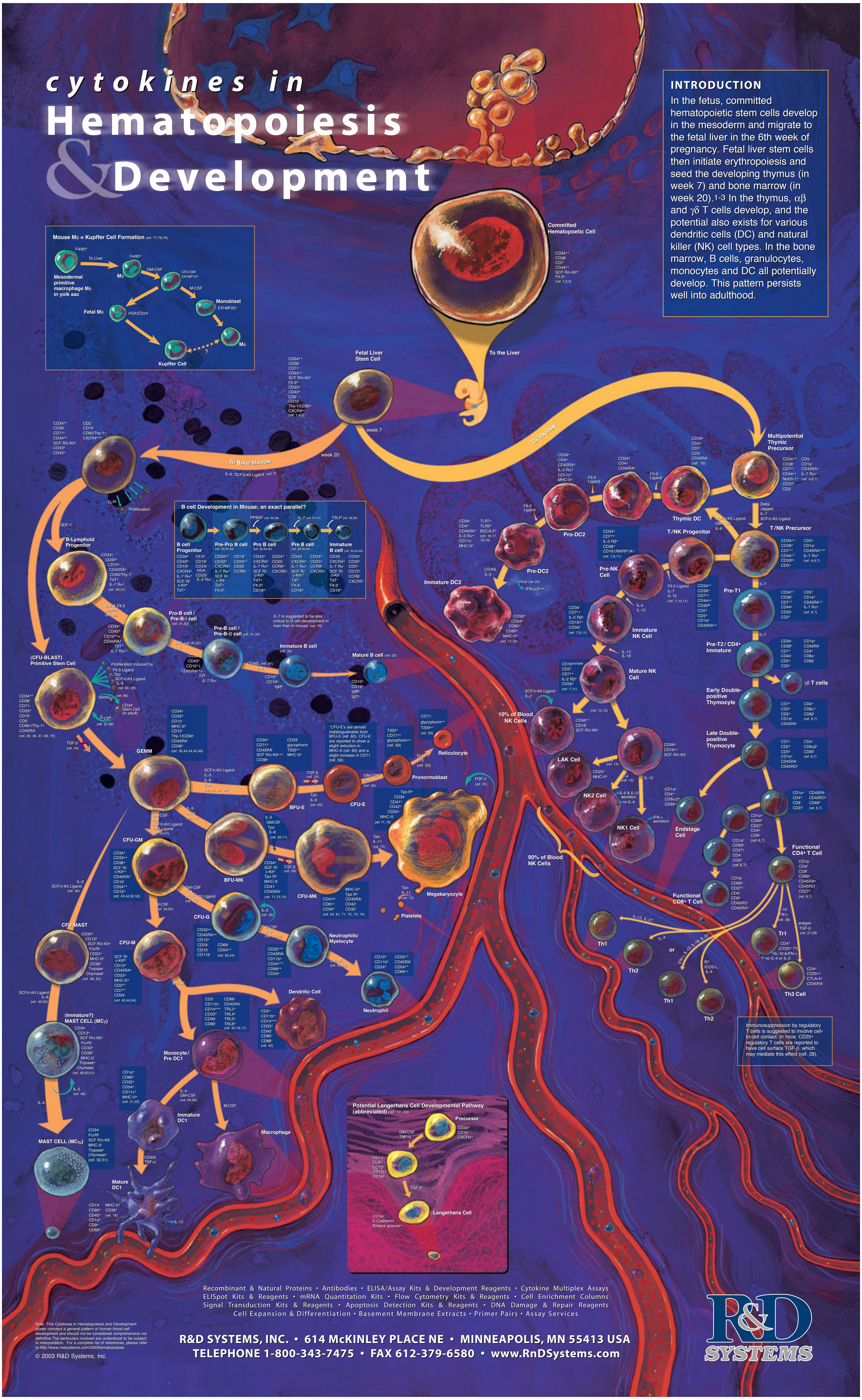
cytokines in
Hematopoiesis
& Development
INTRODUCTION
In the fetus, committed hematopoietic stem cells develop in the mesoderm and migrate to the fetal liver in the 6th week of pregnancy. Fetal liver stem cells then initiate erythropoiesis and seed the developing thymus (in week 7) and bone marrow (in week 20).1-3 In the thymus, αβ and γδ T cells develop, and the potential also exists for various dendritic cells (DC) and natural killer (NK) cell types. In the bone marrow, B cells, granulocytes, monocytes and DC all potentially develop. This pattern persists well into adulthood.
Committed Hematopoetic Cell
To the Liver
Fetal Liver Stem Cell
week 7
week 20
To Bone Marrow
To Thymus
Mouse Mφ = Kupffer Cell Formation
Mesodermal primitive macrophage Mφ in yolk sac
Fetal Mφ
Monoblast
Kupffer Cell
B cell Development in Mouse; an exact parallel?
B-Lymphoid Progenitor
Pro-B cell / Pre-B-I cell
Pre-B cell / Pre-B-II cell
Immature B cell
Mature B cell
(CFU-BLAST) Primitive Stem Cell
GEMM
BFU-E
CFU-E
Pronormoblast
Reticulocyte
BFU-MK
CFU-MK
Megakaryocyte
Platelets
CFU-GM
CFU-G
Neutrophilic Myelocyte
Neutrophil
CFU-M
Dendritic Cell
Monocyte / Pre DC1
Immature DC1
Macrophage
Mature DC1
CFU-MAST
(Immature?) MAST CELL
MAST CELL
Multipotential Thymic Precursor
Thymic DC
T/NK Progenitor
T/NK Precursor
Pro-DC2
Pre-DC2
Immature DC2
Pre-NK Cell
Immature NK Cell
Mature NK Cell
10% of Blood NK Cells
90% of Blood NK Cells
LAK Cell
NK2 Cell
NK1 Cell
Pre-T1
Pre-T2 / CD4+ Immature
γδ T cells
Early Double-positive Thymocyte
Late Double-positive Thymocyte
Endstage Cell
Functional CD8+ T Cell
Functional CD4+ T Cell
Th1
Th2
Th3 Cell
Tr1
Immunosuppression by regulatory T cells is suggested to involve cell-to-cell contact. In mice, CD25+ regulatory T cells are reported to have cell surface TGF-β, which may mediate this effect (ref. 29).
Potential Langerhans Cell Developmental Pathway (abbreviated)
Precursor
Langerhans Cell
Recombinant & Natural Proteins • Antibodies • ELISA/Assay Kits & Development Reagents • Cytokine Multiplex Assays
ELISpot Kits & Reagents • mRNA Quantitation Kits • Flow Cytometry Kits & Reagents • Cell Enrichment Columns
Signal Transduction Kits & Reagents • Apoptosis Detection Kits & Reagents • DNA Damage & Repair Reagents
Cell Expansion & Differentiation • Basement Membrane Extracts • Primer Pairs • Assay Services
Note: This Cytokines in Hematopoiesis and Development poster conveys a general pattern of human blood cell development and should not be considered comprehensive nor definitive. The particulars involved are understood to be subject to interpretation. For a complete list of references, please refer to http://www.rndsystems.com/2003hematopoiesis.
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