Contents

Preface viii **Abbreviations** *x*

Neonatal anaemia 38

1	The full blood count and blood film in healthy term and preterm neonates 1
	Introduction 1
	Brief outline of the ontogeny of haemopoiesis 1
	Properties of fetal haemopoietic stem and progenitor cells 2
	Red blood cell production and development in the fetus and neonate 5
	Erythropoietin production in the fetus and neonate 6
	Haemoglobin synthesis and red blood cell production in the fetus and newborn 6
	Red blood cell lifespan and the red blood cell membrane
	in the fetus and neonate 9
	Red blood cell metabolism in the fetus and neonate 10
	Iron metabolism in the fetus and neonate 11
	Normal values for red blood cell parameters in the fetus and neonate 12
	Leucocytes in the fetus and newborn 17
	Leucocyte production and function in the fetus and neonate 18
	Platelets and megakaryocytes in the fetus and neonate 23
	Developmental megakaryopoiesis and thrombopoiesis 23
	Platelet numbers in the neonate and fetus – normal values 24
	Neonatal platelet function 25
	Practical problems in interpreting neonatal blood counts and films 25
	Sample quality/artefacts 25
	Site of sampling 26
	Gestational age and postnatal age 27
	Pregnancy-associated complications and mode of delivery 28
	References 28
2	Red cell disorders: Anaemia, jaundice, polycythaemia and cyanosis 38

Definition and clinical significance of neonatal anaemia 38 Neonatal anaemia due to reduced red cell production 39 Neonatal anaemia due to increased red cell destruction 47

	Neonatal anaemia due to haemoglobinopathies and other microcytic anaemias Neonatal anaemia due to blood loss 76 Anaemia of prematurity 81 A simple diagnostic approach to neonatal anaemia 83 Neonatal polycythaemia 85 Haematological causes of cyanosis 86 Principles of red cell transfusion in neonates 86 Illustrative cases 88 Abbreviations used in the illustrative cases 110 References 110
3	Neonatal infection and leucocyte disorders 128 Leucocyte abnormalities in neonatal systemic disease 128 Increases in leucocyte numbers 128 Neonatal infection and its differential diagnosis: clues from the blood count and blood film 135 Storage disorders: diagnostic clues from the blood film 144 Neonatal neutropenia 145 Definition and causes of neutropenia 145 Immune neutropenia 148 Inherited congenital or neonatal neutropenia 150 Haematological features of neonates with Down syndrome 154 Congenital leukaemia 154 Leukaemia and preleukaemia in neonates with Down syndrome 160 Juvenile myelomonocytic leukaemia and Noonan syndrome myeloproliferative disorder 168 Illustrative cases 169 Abbreviations used in the illustrative cases 176 References 176
4	Disorders of platelets and coagulation, thrombosis and blood transfusion 190 Thrombocytopenia overview 190 Causes of neonatal thrombocytopenia: a practical classification based on age at onset 192 Fetal thrombocytopenia 194 Early-onset neonatal thrombocytopenia (presenting at <72 hours of age) 194 Late-onset neonatal thrombocytopenia (presenting at >72 hours of age) 196 Conditions leading to clinically significant thrombocytopenia in the neonate 197 Fetal/neonatal alloimmune thrombocytopenia 197 Neonatal thrombocytopenia due to maternal autoimmune disease 200 Thrombocytopenia due to congenital infections 201 Neonatal thrombocytopenia associated with chromosomal abnormalities 205 Inherited thrombocytopenia 206 Investigation of neonatal thrombocytopenia 215

67

Management of neonatal thrombocytopenia 215 Indications for platelet transfusion 216 Platelet function disorders 217 Inherited platelet function disorders with normal platelet counts presenting in the neonate 218 Thrombocytosis 218 Abnormalities of coagulation 220 Developmental haemostasis 220 Laboratory investigation of coagulation disorders in the neonate 220 Acquired coagulation abnormalities 221 Inherited coagulation disorders 223 Thrombosis 224 Screening tests for thrombophilia in neonates 224 Acquired thrombotic abnormalities 225 Inherited thrombotic abnormalities 225 General principles of neonatal platelet and plasma component transfusion 226 Platelet transfusion 226 Fresh frozen plasma 226 Cryoprecipitate 227 Prothrombin complex and recombinant factor VIIa 227 Illustrative cases 227 Abbreviations used in the illustrative cases 233

Index 254

References 234