

# Metabolism at a Glance, 4th Edition

J. G. Salway

ISBN: 978-0-470-67471-0

February 2017

Wiley-Blackwell

144 Pages

## **TABLE OF CONTENTS**

Preface ix

Acknowledgements x

### **Part 1 Energy metabolism**

1 Introduction to metabolic pathways 2

2 Biosynthesis of ATP I: ATP, the molecule that powers metabolism 4

3 Biosynthesis of ATP II: mitochondrial respiratory chain 6

4 Oxidation of cytosolic NADH: the malate/aspartate shuttle and glycerol phosphate shuttle 8

5 Metabolism of glucose to provide energy 10

6 Metabolism of one molecule of glucose yields 31 (or should it be 38?) molecules of ATP 12

7 Anaerobic metabolism of glucose and glycogen to yield energy as ATP 14

8 2,3-Bisphosphoglycerate (2,3-BPG) and the red blood cell 16

9 Metabolism of triacylglycerol to provide energy as ATP 18

### **Part 2 Carbohydrate metabolism**

10 Metabolism of glucose to glycogen 20

11 Glycogen metabolism I 22

12 Glycogen metabolism II 24

13 Glycogen metabolism III: regulation of glycogen breakdown (glycogenolysis) 26

14 Glycogen metabolism IV: regulation of glycogen synthesis (glycogenesis) 28

15 Pentose phosphate pathway: the production of NADPH and reduced glutathione 30

16 Regulation of glycolysis: overview exemplified by glycolysis in cardiac muscle 32

17 Glycolysis in skeletal muscle: biochemistry of sport and exercise 34

18 Regulation of gluconeogenesis 36

19 Regulation of Krebs cycle 38

20 Mammals cannot synthesize glucose from fatty acids 40

21 Supermouse: overexpression of cytosolic PEPCK in skeletal muscle causes super-athletic performance 42

22 Sorbitol, galactitol, glucuronate and xylitol 44

23 Fructose metabolism 46

24 Ethanol metabolism 48

### **Part 3 Fat metabolism**

25 Pyruvate/malate cycle and the production of NADPH 50

26 Metabolism of glucose to fat (triacylglycerol) 52

27 Metabolism of glucose to fatty acids and triacylglycerol 54

28 Glycolysis and the pentose phosphate pathway collaborate in liver to make fat 56

29 Esterification of fatty acids to triacylglycerol in liver and white adipose tissue 58

30 Mobilization of fatty acids from adipose tissue I: regulation of lipolysis 60

31 Mobilization of fatty acids from adipose tissue II: triacylglycerol/fatty acid cycle 62

32 Glyceroneogenesis 64

33 Metabolism of protein to fat after feeding 66

34 Elongation and desaturation of fatty acids 68

35 Fatty acid oxidation and the carnitine shuttle 70

36 Ketone bodies 72

37 Ketone body utilization 74

38  $\beta$ -Oxidation of unsaturated fatty acids 76

39 Peroxisomal  $\beta$ -oxidation 78

40  $\alpha$ - and  $\beta$ -oxidation 80

41 co-Oxidation 82

### **Part 4 Steroid metabolism**

42 Cholesterol 84

43 Steroid hormones and bile salts 86

### **Part 5 Amino acid metabolism**

44 Biosynthesis of the non-essential amino acids 88

45 Catabolism of amino acids I 90

46 Catabolism of amino acids II 92

47 Metabolism of amino acids to glucose in starvation and during the period immediately after refeeding 94

48 Disorders of amino acid metabolism 96

49 Phenylalanine and tyrosine metabolism 98

50 Tryptophan metabolism: the biosynthesis of NAD<sup>+</sup>, serotonin and melatonin 100

51 Ornithine cycle for the production of urea: the 'urea cycle' 102

### **Part 6 Metabolic channelling**

52 Metabolic channelling I: enzymes are organized to enable channelling of metabolic intermediates 104

53 Metabolic channelling II: fatty acid synthase 106

### **Part 7 Purines, pyrimidines and porphyrins**

54 Amino acid metabolism, folate metabolism and the '1-carbon pool' I: purine biosynthesis 108

55 Amino acid metabolism, folate metabolism and the '1-carbon pool' II: pyrimidine biosynthesis 110

56 Krebs uric acid cycle for the disposal of nitrogenous waste 112

57 Porphyrin metabolism, haem and the bile pigments 114

### **Part 8 Integration of metabolic pathways and diabetes**

58 Metabolic pathways in fasting liver and their disorder in Reye's syndrome 116

59 Diabetes I: metabolic changes in diabetes 118

60 Diabetes II: types I and II diabetes, MODY and pancreatic p-cell metabolism 120

61 Diabetes III: type 2 diabetes and dysfunctional liver metabolism 122

Index 125