Contents

SUMMARY **1**
What Are Dietary Reference Intakes?, 2
Approach for Setting Dietary Reference Intakes, 6
Nutrient Functions and the Indicators Used to Estimate Requirements for Vitamin C, Vitamin E, Selenium, and the Carotenoids, 12
Criteria and Proposed Values for Tolerable Upper Intake Levels, 13
Using Dietary Reference Intakes, 14
Definition of a Dietary Antioxidant, 17
Evidence of Oxidative Stress and the Risk of Chronic Degenerative Disease, 17
Recommendations, 19

1 INTRODUCTION TO DIETARY REFERENCE INTAKES **21**
What Are Dietary Reference Intakes?, 21
Categories of Dietary Reference Intakes, 22
Parameters for Dietary Reference Intakes, 27
Summary, 33
References, 33

2 VITAMIN C, VITAMIN E, SELENIUM, AND β-CAROTENE AND OTHER CAROTENOIDS: OVERVIEW, ANTIOXIDANT DEFINITION, AND RELATIONSHIP TO CHRONIC DISEASE 35
Overview, 35
Definition and Criteria for a Dietary Antioxidant, 42
Oxidative Stress, Antioxidants, and Chronic Disease, 44
Conclusions, 51
References, 52

3 VITAMIN C, VITAMIN E, SELENIUM, AND β-CAROTENE AND OTHER CAROTENOIDS: METHODS 58
Methodological Considerations, 58
Estimates of Laboratory Values, 67
Nutrient Intake Estimates, 67
Dietary Intakes in the United States and Canada, 69
Summary, 71
References, 71

4 A MODEL FOR THE DEVELOPMENT OF TOLERABLE UPPER INTAKE LEVELS FOR NUTRIENTS 73
Background, 73
Model for Derivation of Tolerable Upper Intake Levels, 75
Risk Assessment and Food Safety, 75
Application of the Risk Assessment Model to Nutrients, 80
Steps in the Development of Tolerable Upper Intake Levels, 84
Intake Assessment, 92
Risk Characterization, 92
References, 94

5 VITAMIN C 95
Summary, 95
Background Information, 95
Selection of Indicators for Estimating the Requirement for Vitamin C, 101
Factors Affecting the Vitamin C Requirement, 128
Findings by Life Stage and Gender Group, 134
Intake of Vitamin C, 154

Tolerable Upper Intake Levels, 155
Research Recommendations for Vitamin C, 165
References, 167

6 VITAMIN E 186
Summary, 186
Background Information, 187
Selection of Indicators for Estimating the Requirement for α-Tocopherol, 203
Factors Affecting the Vitamin E Requirement, 224
Findings by Life Stage and Gender Group, 226
Intake of Vitamin E, 243
Tolerable Upper Intake Levels, 249
Research Recommendations for Vitamin E, 260
References, 262

7 SELENIUM 284
Summary, 284
Background Information, 284
Selection of Indicators for Estimating the Requirement for Selenium, 287
Factors Affecting the Selenium Requirement, 291
Findings by Life Stage and Gender Group, 292
Intake of Selenium, 308
Tolerable Upper Intake Levels, 311
Research Recommendations for Selenium, 318
References, 319

8 β-CAROTENE AND OTHER CAROTENOIDS 325
Summary, 325
Background Information, 326
Selection of Possible Indicators for Estimating the Requirement for β-Carotene and Other Carotenoids, 331
Factors Affecting Carotenoid Bioavailability, 354
Findings by Life Stage and Gender Group, 358
Intake of Carotenoids, 360
Tolerable Upper Intake Levels, 366
Research Recommendations for β-Carotene and Other Carotenoids, 371
References, 372

9 USES OF DIETARY REFERENCE INTAKES **383**
Overview, 383
Assessing Nutrient Intakes of Individuals, 384
Assessing Nutrient Intakes of Groups, 387
Planning Nutrient Intakes of Individuals, 392
Planning Nutrient Intakes of Groups, 392
Nutrient-Specific Considerations, 393
Summary, 399
References, 399

10 A RESEARCH AGENDA **401**
Approach, 401
Major Knowledge Gaps, 402
The Research Agenda, 406

APPENDIXES
A Origin and Framework of the Development of Dietary Reference Intakes, 409
B Acknowledgments, 413
C Dietary Intake Data from the Third National Health and Nutrition Examination Survey (NHANES III), 1988–1994, 416
D Dietary Intake Data from the Continuing Survey of Food Intakes by Individuals (CSFII), 1994–1996, 432
E Canadian Dietary Intake Data, 1993, 1995, 438
F Serum Values from the Third National Health and Nutrition Examination Survey (NHANES III), 1988–1994, 440
G Options for Dealing with Uncertainties, 458
H Glossary and Acronyms, 463
I Biographical Sketches of Panel and Subcommittee Members, 469

INDEX **483**

SUMMARY TABLE, Dietary Reference Intakes: Recommended Intakes for Individuals, **507**

DRI

DIETARY REFERENCE INTAKES

FOR

Vitamin C,

Vitamin E,

Selenium, and

Carotenoids