

Contents

Genistein

Model Substance for Describing Endocrine Effects of Phytoestrogens

List of Abbreviations	IX
Summary	XI
Research Requirements.....	XVIII

1	Introduction	1
2	Identity of Genistein	5
3	Occurrence of Genistein	6
3.1	Natural Occurrence of Genistein	6
3.2	Exposure.....	16
3.2.1	Terrestrial Vertebrates and Invertebrates	16
3.2.2	Aquatic Vertebrates and Invertebrates	17

Ecology

4	Degradation and Bioaccumulation	18
5	Mammals	20
5.1	Feral Mammals	20
5.2	Farm Animals.....	20
5.3	Zoo Animals.....	25
6	Birds	26
6.1	Field Studies	26
6.2	Experimental <i>in vivo</i> Investigations.....	26
6.3	<i>Ex vivo</i> Investigations	27
6.4	<i>In vitro</i> Investigations	27
7	Reptiles	28
8	Amphibians	28
8.1	Field Studies	28
8.2	Experimental <i>in vivo</i> Investigations.....	28
8.3	<i>In vitro</i> Investigations	28

9	Fish	29
9.1	Field Studies	29
9.2	Experimental <i>in vivo</i> Investigations	30
9.3	<i>In vitro</i> Investigations	31
10	Invertebrates	35
10.1	Molluscs	35
10.2	Arthropods	36
10.3	Other Invertebrates	37
10.4	Protozoa	37
11	Biological Functions of Genistein	38
	Toxicology	42
12	Pharmacokinetics and Metabolism of Genistein	42
13	Mechanisms of Action and Effects of Genistein	48
13.1	Mechanisms, Test Procedures, Definitions	48
13.2	Estrogen-Like Effects of Genistein	52
13.2.1	<i>In vivo</i> Findings.....	52
13.2.2	<i>In vitro</i> Findings	60
13.3	Estrogen Receptor-Independent Effects of Genistein	63
13.3.1	<i>In vivo</i> Findings	64
13.3.2	<i>In vitro</i> Findings	64
13.3.3	Genotoxicity	67
14	Human Cases	68
14.1	Phytoestrogen Sources in Human Food.....	68
14.2	Human Exposure Through Food	72
14.3	Effects of Genistein on Human Health	76
14.3.1	Controlled Studies	76
14.3.2	Epidemiological Studies.....	78
15	Discussion of the Relevance for Humans	81
15.1	Pharmacokinetics and Metabolism	81
15.2	Mechanisms of Action	83
15.3	Exposure Situation.....	86
15.4	Possible Influences on Human Health.....	89
16	References	94