
Contents

List of Tables	i
List of Figures	iii
List of Abbreviations	iv
Abstract	v
Zusammenfassung	vii
1 Introduction	1
1.1 The gastrointestinal system	1
1.2 Hepatic xenobiotic metabolism	3
1.3 Zinc and iron oxide nanoparticles	4
1.3.1 Occurrence of zinc oxide nanoparticles	5
1.3.2 Zinc metabolism	5
1.3.3 Toxicity of zinc oxide nanoparticles	6
1.3.4 Occurrence of iron oxide nanoparticles	7
1.3.5 Iron metabolism	8
1.3.6 Toxicity of iron oxide nanoparticles	9
1.3.7 Characterization of nanoparticles	11
1.3.8 Human exposure to nanoparticles	12
1.4 Risk assessment and regulation	13
2 Objective	15
3 Overview of original publications	17
4 Summarizing discussion	19
5 Future perspective	27

6 Publications	42
6.1 <i>In vitro</i> digestion of ZnO NPs	42
6.1.1 Abstract	43
6.1.2 Introduction	43
6.1.3 Experimental section	45
6.1.4 Results	50
6.1.5 Discussion	56
6.1.6 Conclusion	61
6.1.7 Description of Supplementary Material	66
6.2 Characterization of E172	67
6.2.1 Abstract	68
6.2.2 Introduction	68
6.2.3 Materials and methods	70
6.2.4 Results	75
6.2.5 Discussion	81
6.2.6 Conclusion	85
6.2.7 Description of Supplementary Material	90
6.3 Impact of IONs on xenobiotic metabolism	91
6.3.1 Abstract	92
6.3.2 Introduction	92
6.3.3 Materials and methods	94
6.3.4 Results	97
6.3.5 Discussion	102
6.3.6 Conclusion	107
6.3.7 Description of Supplementary Material	112
A Supplementary Material	113
A.1 <i>In vitro</i> digestion of ZnO NPs	115
A.2 Characterization of E172	135
A.3 Impact of IONs on xenobiotic metabolism	141
Congress Contributions	152

Funding 153

Acknowledgements 154