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Non-Intentionally Added Substances in PET-Bottled Mineral Water

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Preface

This book deals with polyethylene terephthalate (PET) bottled water, whose global market size is expected to reach around USD 350 billion by 2021, following 10% year-on-year growth. Our goal is to define and formulate a comprehensive analysis of risk associated with drinking PET-bottled water.

In recent years, concerns are rising about the safety of PET foods packaging due to the possible migration of chemical compounds from PET to the water contained into the bottle, which may pose health risk to consumers. These chemicals are called ‘NIAS’, acronym of non-intentionally added substances, and they are supposed to have potential estrogenic and/or anti-androgenic activities and to be cancerogenic or toxic to humans. Our approach is to report data from the international scientific literature examining what happens when the polymer undergoes specific conditions, such as exposure to ultraviolet light/high temperature, ageing or humidity.

The introductory chapter highlights the relationship between water and health. Taking into consideration the recommended daily water intake, the importance of good hydration is argued. The second chapter deals with the global bottled market. The demand for bottled water is witnessing significant growth due to organoleptic and health-related reasons. Concerns about tap water risks may contribute to bottled water consumption. In particular, demographic and socio-economic variables as well as information provided by the mass media are argued as factors related to the consumers’ attitudes towards bottled drinking waters. Furthermore, European Union (EU) and United States of America (U.S.) legislation on bottled waters is examined. The third chapter deals with the fundamentals of PET chemistry and the elementary PET-bottled manufacturing steps. It is a guide to the reader for the comprehension of what NIAS are and how they can migrate from the wall of PET bottle to the water inside it. For this reason, special emphasis is given to the additives used during the synthesis of the polymer. In addition, specific EU and U.S. regulations on plastic materials and articles intended to come into contact with foodstuffs are examined. Finally, the last chapter describes NIAS as a result of the interactions between different ingredients in the packaging materials, as well as the degradation processes and the impurities present in the raw materials used for their production. Phthalates, aldehydes and volatile organic compounds (VOC) are

examined. Although some of them may be cancerogenic or toxic to humans, it is likely that in the majority of cases, due to their very low levels, these substances will not be of any health concern.

We are conscious that the book is not exhaustive of all the current topics related to PET and NIAS. Nonetheless, because with the approach described we attempt to answer questions not only of ‘how’ NIAS migrate but also ‘why’ they migrate from PET into the bottled water, we hope that this book can be a useful compendium of data that are currently in literature.

We acknowledge with pleasure the colleagues who helped us in our efforts. Foremost, we thank Doctor Stefano Melada who reviewed the entire manuscript and provided invaluable help and advice on the content of the book. We further acknowledge the constructive discussions and suggestions offered. We would also thank Carmelo Parisi, currently a student at the Liceo Scientifico Stanislao Cannizzaro, Palermo, Italy, for some of realised figures in this book. We also thank Prof. Salvatore Parisi (Al-Balqa Applied University, Jordan) for his thorough editing of the manuscript, which contributed greatly to the final quality of the book.

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