

LEVELS IN FOODSTUFF, VEGETATION AND ANIMALS I

Dennis Paustenbach
Exponent, Menlo Park, California, USA

INTRODUCTION

Over the past fifteen years, it has become abundantly clear that the primary route of uptake of the dioxins and dioxin-like chemicals (e.g., the dioxins) by humans is the ingestion of foods. The United States EPA, for sample, has stated that at least 95% of the current body burden of these chemicals in non-occupationally exposed persons is due to the ingestion of dairy products, meats, fish and some other foods. This view is thought to be applicable to persons in virtually all countries. Every regulatory agency and scientific body throughout the world that has evaluated this issue has reached the same conclusion as EPA.

In recent years, scientists throughout the world have begun the process of sampling and analyzing foodstuffs and foods in an attempt to quantify the amounts of these chemicals in various foods. Originally, the studies were intended to identify those foods which contained the highest concentrations and then to determine how they became contaminated. Dozens of studies over the past decade were conducted and it is now generally accepted that the vast majority of these persistent chemicals enter the food chain through the aerial deposition of particles containing dioxins unto plants which are then eaten by grazing animals. Secondarily, some of the dioxins (as vapors) are adsorbed to the surfaces of the plants prior to their ingestion by cows, sheep, and goats. The primary source of the dioxin containing particles and volatilized dioxins is combustion.

More recently, the research has now gone down one of several different paths. First, most scientists are attempting to identify the differences in the concentration of the dioxins in various foods (other than products, meats and fish) and to identify whether different dioxins are appearing in different foods. Second, some are studying the same kinds of foods but from different countries in an attempt to see if that can shed some light on different sources of exposure across the globe. Third, others are trying to identify unusually high concentrations of the dioxins in certain foods in an attempt to see if sources other than airborne emissions from combustors are important. For example, the identification of high concentrations of these chemicals in catfish and chicken in the certain portions of the United States was responsible for prompting work which showed that ball clay which was added to feed contained very high concentrations of these chemicals. Similar research resulted in discovery of the contamination of food products in Belgium in the late 1990s. A fourth area of study is focused on special human populations who have diets that are far outside the norm of the general population. For example, for a number of years research was conducted to evaluate native populations near the arctic whose diets were primarily based on fish and products from the sea. Since some fish contain relatively high concentrations of the dioxins, this seemed a worthwhile area of investigation. Fifth, recent work is now focusing on whether it is possible to reduce the concentration of these persistent chemicals in various foods by intervening in some manner. For example, since much of the fish ingested in western societies is raised in controlled

settings (so-called, farm raised), perhaps there are production practices which could reduce the concentrations (such as changes in the feed or more frequent removal of the sediments in the ponds). Lastly, some recent work is trying to determine whether it is possible to identify so-called "indicator foods" which would allow a regulatory agency to characterize the concentration in "most foods". For example, is it reasonable to assume that if one measures the concentrations of butter from various sections of a country that one can predict the approximate contribution of dioxins from all dairy products and meats for a country (thus eliminating the need to sample ten or hundred-fold more products). This, and the other areas, offer an abundance of opportunities for researchers to better understand how dioxins enter the food chain, where and whether something "different" can be done about it. It is also clear from reviewing the related papers of the past 15 years, and those from this session, that a significant amount of additional sampling and analytical work needs to be conducted around the world if one wants to have a rather complete understanding of the source of uptake of these chemicals by humans.

The papers presented in this year session on foods represents an extension of work which has evolved over the past ten or more years. One of the striking features of this session is that the number of papers which address this topic has grown substantially over the years. For example, nearly 50 abstracts were submitted for consideration in this session. The range of area of study was also substantial. Some papers address the concentration of the dioxins in certain foods in certain countries, some address historical trends in the concentration in certain foods, others address the concentration in grazing animals over time, while others evaluate food additives. In light of the international efforts to minimize the concentrations of these persistent organic pollutants(POPs) in foods and other media, the importance of this area of research is likely to continue.