Human Poisonings and the Yushchenko case

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Introduction

Human poisoning can be described as the administration of a noxious substance in small quantities resulting in adverse health effects. In most instances the recipient of the poison is not aware of such exposure although occasionally this may be so. Most poisons are accidental in the sense that steps would be taken to nullify both the timing and exposure or administration of the harmful substance before symptoms become evident[1]. Rarely poisons are administered intentionally to injure and even cause death. Classical agents used for intentional human poisons would be substances such as arsenic, sarin nerve gas, and ricin from the castor bean. In fact the former compound has been used as a human poison for centuries which, given at a prescribed dose, is tasteless, acts slowly and is easy to administer.

Dioxin or 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), dioxin-like compounds (DLCs), and other persistent organic pollutants (POPs) have not been traditionally used as human poisons. Reasons for this could be there relatively low acute toxicity combined with their slow expression of adverse effects. In fact the only incident in which dioxin was believed to be used as an deliberate poison was in the late 1990s[2]. This occurred in Vienna where five employees of a textile factory were affected ; two of these developed severe symptoms of dioxin poisoning along with chloracne and poor health. In the latter two cases, elevated exposure to 2,3,7,8-TCDD was demonstrated with blood lipid levels up to 150 :g/kg (ppb); five orders of magnitude (100 000 x) higher than the normal or background level of 2,3,7,8-TCDD found today in the tissues of most individuals from developed countries.

In September 2004 a poisoning incident[3,4] took place in the Ukraine involving a politician, Victor Yushchenko, who was contesting at that time the presidency. This report gives a chronology of that happening along with information about the symptoms of the poisoning as available.

Methods

Data on the September 2004 poisoning are taken mainly from the rather extensive and numerous accounts in the media[3-9] which attracted considerable worldwide interest and sympathy for the victim. For clinical, medical and legal reasons, it has not been possible for medical personnel who treated Yushchenko at the Rudolfinerhaus Clinic in Vienna to report on this matter. This restriction on information has resulted in somewhat incomplete picture of the overall event particularly for the reporting of the symptoms and their medical treatment. Further details about the identification of the causative agent and exposure measurement will be given in a following paper in this session.

Results

Chronology of Yushchenko Incident

The events describing the first signs of poisoning symptoms in September 2004 to the diagnosis of the causative agent in December 2004 and thereafter are given in table 1. There was a period of about three months between the appearance of the first symptoms and the definition of dioxin as the causative agent[5-7].

Symptoms and Treatment

The symptoms and their treatment are listed in table 2. It is interesting that the first indications of poisoning are headache, nausea, abdominal pain and tissue inflammation followed some weeks later by severe back pain, swollen face, eye nerve paralysis and the classical symptom of dioxin poisoning, chloracne.

Discussion

Due to the great rarity of this type of poisoning and its related symptoms, the nature of the causative agent is not easily evident to most medical and scientific investigators. Even when dioxin is identified as the poison, the course of treatment and behaviour are limited. The best known comparative poisoning is the one which occurred in Vienna[2]. In that instance the actual elimination of 2,3,7,8-TCDD from the body of the two most affected women was much quicker (half-lives of 1-2 years) than for normal or background exposure (7 to 10 years). The rate of elimination of dioxin in the Yushchenko case is uncertain. As far as is known, no serial blood samples have been collected from this patient in order to follow elimination by determination of their dioxin content. In the 1997-8 Vienna poisoning, increased body elimination was aided by dietary modification although the increase was not particularly large.

In the Yushchenko case, details on the symptoms are somewhat sketchy and limited particularly for the treatment aspects. For instance, the mode of administration of the dose of dioxin is not known although it is generally assumed to be oral through food ingestion. A central role in this case has been played by M. Zimpfer of the Rudolfinerhaus

Clinic, Vienna. He was involved early on in the diagnosis and treatment, and made the original report to the news media on the identity of the poison. What is definite is that the health of Yushchenko has improved since the first few months[8-9]. It is uncertain at this time how long his skin problems and any other medical condition will last and what, if any, will be the long term consequences of this elevated dosing with 2,3,7,8-TCDD. It is also recognized that the entire episode is the subject of an ongoing legal and political investigation which restricts the present discussion. Nevertheless, all of these parameters should be useful in addressing both the course and prognosis in the Yushchenko case as well as the important public health issue of low level long term exposure to dioxin-like compounds.

Acknowledgments

Foremost the strong character and perseverance of Victor Yushchenko must be acknowledged.

Table 1: Chronology of the Yushchenko Incident

Date	Happening
Sunday, Sept 5, 2004	Dinner with SBU (Ukrainian National Security); 3 hrs later symptoms of severe headache and nausea
Sept 6	symptoms worsen and extend to other parts of body
Sept 10	1st visit to Rudolfinerhaus clinic in Vienna, Austria; health serious
Sept 18	checks out of clinic in poor health; agent responsible for symptoms unknown
Oct 1	2nd visit to Vienna clinic due to severe back pain, chloracne and swollen face
Oct 8	returns to Kiev accompanied by medical personnel; morphine administered via epidural catheter for severe back pain
mid October	samples of hair, blood, and nails sent for testing to a toxicology group in the United States at the University of Virgina, G. Saathoff director
early November	no trace of biological weapons found by University of Virginia group in human samples sent to the U S
Nov 23	J. Henry, St. Mary's Hospital, London suggests in the media that skin symptoms could be dioxin poisoning
end November	A. Brouwer, BioDetection Systems, Amsterdam contacts Vienna clinic and on December 6th obtains blood sample collected in late November
Dec 10	Yushchenko visits Vienna clinic a third time for treatment; leaves Dec 13; U S team of toxicologists also present
Dec 10	BioDetection Systems finds high levels of dioxin in blood using CALUX bioassay; narrows nature of poison to one of up to 29 possible compounds
Dec 11	M. Zimpfer, Rudolfinerhaus, Vienna announces poisoning as dioxin origin
Dec 17	Brouwer confirms with GC-MS results from two independent laboratories that agent in blood is exclusively 2,3,7,8-TCDD
Jan 23, 2005	Despite health problems, Yushchenko inaugurated as Ukrainian president after success in the second national election on December 26, 2004
April 2005	Yushchenko visits the United States as president of the Ukraine

This hideous poisoning which severely compromised his health took place at a time of major stress and the rigours of a national election with its accompanying problems. To see him inaugurated in January 2005 at the end of such a difficult period is commendable. The input of Abraham Brouwer, BioDedection Systems, Amsterdam is also

appreciated. Arnold Schecter, University of Texas School of Public Health, Dallas, Texas is thanked for his support and ideas.

Table 2: Symptoms and Treatment of Yushchenko poisoning	
Date	**Signs or occurrence**
Sept 5, 2004	meal of crayfish, vegetable salad, cold meats and liquor; 3 hrs later first appearance of symptoms; severe headache and nausea
next day to week	acute abdominal pain; unable to walk
days following	1) pancreatitis, intestines swollen and ulcerated, greatly enlarged liver 2) gastrointestinal pain and increased white blood cell count
late September	1) chloracne as large lumps and cysts appears on ears, eyelids as well as other parts of skin 2) swollen face with grey/green skin discolouration 3) nerve paralysis on left side of face with discharge of tears and bloodshot left eye
late Sept, and early Oct	severe back pain requiring intravenous pain killer
	Treatment
September and following	1) intravenous fluid 2) restricted food intake 3) morphine for back pain via epidural

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