Poison centres as essential unit for poisoning prevention and sound chemicals management

Technical summary

World Health Organization

European Region

Abstract

This publication summarizes key information on poison centres: their role in management of poisonings, public health preparedness and response to emergency situations and implementation of International Health Regulations, contribution to sound chemicals management. Examples confirming importance and value of poison centres for health-care systems are included in the publication. This publication is primarily aimed at public-health and health-care professionals, toxicologists, and medical students.

WHO/EURO:2023-7573-47340-69478

Suggested citation: Poison centres as essential unit for poisoning prevention and sound chemicals management. Technical summary. Copenhagen: WHO Regional Office for Europe; 2023. Licence: CC BY-NC-SA 3.0 IGO.

Cataloguing-in-Publication (CIP) data. CIP data are available at http://apps.who.int/iris.

Design by: 4PLUS4
Cover photo: © WHO/Eric Leroux, © WHO/Tania Seburyamo, © WHO/Blink Media – Gilliane Soupe, © WHO/Gilles Reboux

Contents

Acknowledgements

The WHO Regional Office for Europe is grateful to co-authors Gillian Jackson, National Poisons Information Service, Royal Infirmary of Edinburgh, United Kingdom, and Mark Lawrence Zammit, Faculty of Medicine and Surgery, Department of Clinical Pharmacology and Therapeutics, Malta, for preparing this publication.

The Regional Office and the co-authors greatly appreciate contributions provided by:

- Ismayil Afandiyev, Head, Poison Centre, Baku, Azerbaijan;
- Nick Brooker, Principal Environmental Public Health Scientist, Health Security Agency, London, United Kingdom;
- Alexander Campbell, Manager (retired), National Poisons Information Service, Birmingham, United Kingdom;
- Laura Hondebrink, Senior Scientist, Poisons Information Centre, University Medical Centre, Utrecht, Netherlands (Kingdom of the);
- Romanek Katrin, Clinical Toxicologist, Clinic and Polyclinic for Internal Medicine II, Department of Clinical Toxicology and Poison Emergency Call, Munich, Germany;
- Ziad Kazzi, Assistant Medical Director, The Georgia Poison Center, Atlanta, United States;
- Davide Lonati, Poison Control Centre and National Toxicology Information Centre – Toxicology Unit, Pavia, Italy;
- Nancy Murphy, Medical Director, Atlantic Canada Poison Centre, Halifax, Canada;
- Mare Oder, Head of Poisoning Information Unit, Health Board, Tallinn, Estonia;
- Euan Sandilands, Director, National Poisons Information Service, Edinburgh, United Kingdom;
- Uwe Stedler, Senior Physician, University Medical Centre, Freiburg, Germany;
- Margaret Thompson, Medical Director, Ontario & Manitoba Poison Centres, Toronto, Canada;
- Gerard Abraham van Zoelen, Toxicologist, Poisons Information Centre, DVF of University Medical Centre, Utrecht, Netherlands;
- Richard Wooton, Team Leader, Canadian Surveillance System for Poison Information Initiative, Environmental Health Science and Research Bureau Health Canada, Ottawa, Canada.

This publication was prepared with financial support from the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection and the German Federal Ministry of Health.

Introduction

Poisoning is a significant global public health issue. A poison centre is a specialized unit advising on and assisting in the prevention, diagnosis and clinical management of acute and chronic poisoning. It thereby contributes to decreasing health burdens arising from impacts of hazardous chemicals in both emergencies and everyday life *(1)*, as demonstrated in many countries where poison centres are established. Within the WHO European Region, there are around 70 poison centres in 36 countries *(2)*. Poison centres are a source of specialized expertise on chemical, radiological[1] and biological substances, and their impact on human health.

Poison centres play an important role in implementation of the International Health Regulations *(2005)* (IHR), which require countries to set up systems and have relevant capacity for surveillance, detection and response to public health events caused by chemicals *(3)*. Much of this capacity can be located in adequately resourced poison centres *(4)*.

Poison centres have a long history (see Annex 1). The first poison information centre in the world was established in Chicago, United States of America, in 1953 *(5)*. This was followed by the founding in the Netherlands in 1960 of the first poison centre in Europe. The first clinical toxicology treatment centre was established in 1949 in Denmark because of the enormous increase in development of new chemical products and the corresponding increase in poisonings following the Second World War *(1)*.

Given the strong evidence of poison centres' contribution to prevention of diseases caused by chemicals, WHO aims to establish full coverage of the global population with poison centre services, and to support countries to facilitate achievement of this goal.

The public health impact of acute and chronic poisonings

Health impact

The negative health impacts of poisoning by chemical substances are vast and varied, as illustrated by global health statistics.

- In 2019, 0.5 million fatalities were attributed to illicit drug use, and 18 million years of healthy life were lost owing to drug use disorders *(6)*.
- In 2016, 106 683 deaths and the loss of 6.3 million years of healthy life were attributed to acute chemical poisoning *(1)*.
- Every year, 651 279 deaths are caused by hazardous substances at workplaces *(7)*, and more than 1 billion workers are exposed to hazardous substances, including pollutants, dusts, vapours and fumes *(8)*.
- Every year, 385 million cases of unintentional, acute poisonings occur; 44% of farmers worldwide are affected by pesticides *(8)*.

It should be noted that all these figures might be underestimated because they are based on available data from countries with system for poisoning surveillance, registration and reporting.

Without additional action (at the policy and technical levels) to improve prevention and effective treatment of poisoning, the numbers quoted above will increase, as a result of higher exposure to chemical substances and consequently higher risk. Among the many reasons are the increase in demand, production and sales of chemicals – in terms of both volume and numbers; new online trade options, which are challenging to control; and the lack of information on hazardous properties of new chemicals on the market *(9)*.

There is a need to strengthen health sector capacities to respond to these challenges, including establishing and/or strengthening poison centres.

1 In some countries, poison centre mandates can include management of emergency situations with involvement of radioactive substances and materials and biological emergencies, as well as outbreaks of unknown etiology.

Current and future exposure patterns

Increased range and volume of toxic products

Around 40 000–60 000 industrial chemicals are used in commerce globally, of which about 6000 account for almost all (99%) the total volume. It is projected that chemical production is set to triple by 2050. The number and volume of chemicals hazardous to human health will also increase following increases in production rates. Distribution of chemical products is also changing, with continuous increases in movement to developing countries *(9)*.

Around 6000 drugs are approved globally *(1)*, and the market is expected to reach US$ 1.5 trillion by 2023, at a growth rate of 4–5% *(10)*. In addition, over 730 new psychoactive substances have been reported to the early warning system of the European Union (EU) *(11)*.

Around 455 active substances in pesticides are approved in the EU *(12)*, and over 1000 pesticides are used around the world *(13)*. In addition, innumerable household, personal care and cosmetics products are available, with new products introduced on the market every year.

Natural toxins

Around 2000 poisonous plant species are known *(1)*, and 1200 species of venomous animals can harm human health. Annually, 4.5–5.4 million people are bitten by snakes; of these, 1.8–2.7 million develop clinical illnesses, and 81 000–138 000 die from complications *(14)*.

Chemical emergencies

Around 25 700 industrial accidents involving hazardous materials or dangerous goods from around the world have been documented during the past 90 years *(15)*. More than 65 000 deaths due to technological disasters were reported between 2009 and 2018, including among the most impactful:

- 3000 deaths from exposure to methyl isocyanate vapour (Bhopal, India, 1984);
- 19 deaths and 172 injuries following the explosion of a tanker carrying liquefied petroleum gas (eastern China, June 2020);
- 157 deaths, 6000 injuries and 300 000 people made homeless after an ammonium nitrate explosion (Beirut, Lebanon, August 2020);
- 13 deaths and 265 injuries when a container of highly pressurized chlorine gas fell from a crane onto a ship (Port of Aqaba, Jordan, June 2022);
- 49 deaths and 300 injuries when incorrectly labelled containers of hydrogen peroxide exploded (Bangladesh, June 2022).

Global challenges

Inequality

Populations in low- and middle-income countries (LMICs) are more affected by both hazardous exposures and poisonings.

Workers in LMICs are particularly exposed, as although some hazardous chemicals have been phased out, a number of toxic substances are still used globally *(8)*. Agricultural workers and children are those most affected. Children often suffer more severe effects than adults due to their physiological, behavioural and other characteristics *(14)*.

In total, 77% of suicides occur in LMICs, where pesticide poisoning is one of the most common modes of suicide *(16)*.

Comparing incidence of unintentional non-fatal acute pesticide poisoning in the farming population during 2008–2018, in France 7.26% of the population were affected compared to 81.75% of the population in Pakistan and 76% in Tanzania *(17)*.

Climate change

Climate change induced by anthropogenic warming of the earth's atmosphere is an existential threat to Europe and the world. The last 20 years have seen the number of major floods more than double, from 1389 to 3254 *(18)*.

There is a growing body of evidence that climate change has broad impacts on the distribution and toxicity of environmental contaminants *(19)*. Climate change also has profound impacts on biological invasions and migrations of species, including poisonous ones. For example, the Mediterranean Sea is being colonized by an invasion of venomous jellyfish and fish species *(20)*.

The role of poison centres in prevention of acute and chronic health disorders

Poison centres are essential units within health systems because they provide vital clinical and/or laboratory diagnostic and treatment activity (including but not limited to advice on antidote use). They can optimize the clinical procedures, treatments and specific medical procedures (such as via complex laboratory analysis and advice on antidotes) needed for treatment of poisoned patients.

Poison centres provide unique expertise, specific competence and capabilities. They represent a model of health management at low cost and high efficacy, offering a model for other acute and chronic intoxication and chemical exposure (occupational and environmental), which is increasing, avoiding unnecessary needs for emergency health care. They can also provide health data that facilitate early detection and timely warnings of health threats and justify specific prevention activities. Further, they support cooperation and collaboration at the international and national levels in the area of poisonings and poisoning agents.

As unique units dealing with various toxicological challenges that affect not only humans but also animals, the environment, occupational surroundings and food, poison centres are increasingly necessary in every country. They are a critical resource, helping countries to address difficult cases (such as rare intoxications and multiple and mass poisonings).

The main functions and tasks of a fully functional poison centre can be grouped into:

- management of poisonings – including prevention, detection, diagnosis and treatment;
- public health detection and management of chemical incidents and non-chemical emergencies and the IHR implementation;
- contribution to sound management of chemicals and prevention of noncommunicable diseases attributable to chemicals;
- specific functions including education, capacity-building, knowledge collection, research and addressing specific needs of the most vulnerable population groups.

Management of poisonings

- Poison centres provide advice 24 hours a day about exposure to chemical agents, including products, pharmaceuticals, drugs of abuse, natural toxins, pesticides, industrial chemicals, radiological materials and radioactive substances. Some poison centres (as in the Netherlands and the United Kingdom) only answer enquiries from health-care professionals, while those in some other countries also respond to information requests from the public (Box 1; see further examples in Annex 2).

Box 1.
High demand for information about poisonings and poisoning agents

Poison centres in the EU answer at least 600 000 calls a year from the general public and physicians (about 1700 calls per day). Roughly half of the cases are related to accidental exposure involving children *(21)*.

In Estonia, 3774 calls were responded to in 2022 *(22)*; in the United Kingdom, 43 227 enquiries from health-care professionals were responded to between April 2020 and March 2021 *(23)*; and specialists at the National Poison Information Centre in the Netherlands answered around 45 000 calls in 2022 *(24)*. In 2020, American poison centres answered enquiries about over 39 000 single-substance exposures, 186 618 single-product exposures to household cleaning substances and 35 182 exposures to fumes, gases and vapours *(25)*.

- Data collection; creation and support of databases; analysis, sharing and communicating of information (including online) are unique functions of poison centres (Box 2). The data most commonly collected are on:
  - › patients and enquiries
  - › poisonings and chemical agents that cause them
  - › hazards of chemicals and products
  - › availability and location of antidotes
  - › clinical toxicological information
  - › first aid information for the public
  - › clinical protocols.

Countries decide on the number and content of national databases needed for poison centre operation.

- Poison centres manage diagnosis and treatment of poisonings and development of clinical protocols (if clinical unit is in the poison centre structure). Protocols held locally within poison centres and/or hosted on poison information databases undergo regular review, based on a comprehensive search of published literature, which integrates information from related fields including occupational and environmental toxicology. These are combined with understanding gained from case-based experience, resulting in the development of complex clinical materials.

- Poison information centres have pioneered teleconsultation, and use of other telemedicine techniques such as audiovisual consultation with patients is becoming more common *(1)*. These techniques are particularly useful when no medical toxicologist is available at the location to assess the patient, or when a consultation with a specialist adviser – such as a snake-bite expert – is required.

Box 2.
Examples of poison centre databases

The TOXBASE database supported by the United Kingdom's National Poison Information Service contains information on approximately 21 000 products, along with generic advice on clinical management of poisoning. The database is accessed over 2 million times each year – mostly by staff in hospital emergency departments *(26)*. This resource can be made available free of charge to LMICs.

In the Netherlands, the poison centre database includes monographs and factsheets on systemic dose values (those at which (over)dose toxicity occurs). Availability of this information facilitates responses to health professional enquiries. The website received around 168 000 visits in 2022 *(24)*.

The 30 centres in the Brazilian Network of Poison Centres enter data from enquiries into a single database, DATATOX *(27)*. This supports professionals in poison centres and facilitates clinical and epidemiological studies and national assessment of the impacts of toxic agents on the health of the population. The National Health Surveillance Agency consults the database for information on exposures to specific products and pesticides.

Collection and analysis of information is needed to identify emerging agents in terms of poisonings. For example, in the United States the top five substance classes most frequently involved in all human exposures were analgesics (11.2%), household cleaning substances (7.49%), cosmetics/personal care products (5.88%), antidepressants (5.61%) and sedatives/hypnotics/antipsychotics (4.73%) in 2020–2021 *(28)*.

Public health management of chemical emergencies and IHR implementation

A poison information centre plays a pivotal role in management of chemical incidents and mass poisonings. The indicators of IHR implementation in relation to chemical events include the requirements that surveillance is in place for intoxication and poisonings and that adequately resourced poison centres are in place. The core capacities needed for chemical events can be grouped into four strategic areas: policy coordination and communication; event detection, verification and risk assessment; preparedness and emergency response; and capacity-building *(29)*.

Poison centres contribute to all stages of disaster management.

- To aid **prevention**, they share information, undertake assessments and map risks to detect new trends in poisonings and chemicals, providing awareness-raising and education, and sharing information with the public and professionals.

- To boost **preparedness**, they contribute to strategic planning of responses to emergencies, including development of standard operating procedures and treatment protocols; tracking of antidotes; education and training; and inventory tracking of essential medicines, personal protective equipment (PPE) and decontamination protocols.

- To support **detection and alerts**, they offer a 24/7 telephone service, ensuring access to toxicological laboratories and issuing real-time alerts and responses; and support early warning systems, toxicovigilance, toxicosurveillance and communication.

- To facilitate **response**, they contribute to rapid risk assessment, providing toxicological information, ensuring antidote provision, and offering advice on triage, secondary contamination and PPE (Box 3).

- To assist **recovery**, they identify affected people, support follow-up epidemiological studies, evaluate risks, restock medicines to ensure availability of antidotes and revise treatment protocols, if required.

Box 3.
Management of emergency situations

In March 2022, during a chlorine leak in London, United Kingdom, the country's poison centres ensured optimal patient care and prevented unnecessary overuse of valuable emergency department resources. Coincidently, on the same day, chlorine was released into a classroom in a school in Derby, United Kingdom, and consultant toxicologists remotely triaged 40 casualties on scene.

In 2020, American poison centres answered over 11 000 enquires relating to chemical/environmental incidents, including hazardous materials planning, safe disposal of chemicals and the potential toxicity of chemicals in the environment *(25)*.

A decision about the level of PPE to be worn by personnel responding to a chemical emergency and the required decontamination protocols will be determined by a rapid risk assessment of the situation, depending on each agency's existing protocols and procedures. Poison centres play an important role in rapid risk assessments, having developed contingency plans in the form of standard operating protocols for many chemicals of special interest. They develop and host recommendations for the use of PPE and decontamination protocols for use during chemical incidents.

Another of their vital roles is in poisoning prevention during non-chemical emergencies. The most recent example relates to the chemical impacts of fighting the COVID-19 pandemic (Box 4), which led to a dramatic increase of use of disinfectants and hand sanitizers, and consumption of drugs – including self-administered ones. The related increase in calls and numbers of poisonings was coped with very quickly in countries with poison centres.

Box 4.
The impact of COVID-19

The European Association of Poison Centres and Clinical Toxicologists (EAPCCT) led a collaboration to collate data from poison centres in 21 countries to examine the impacts of COVID-19 on workload. This showed an increase of 4.5% in call volumes – from an average of 228 794 in 2018/2019 to 239 170 in 2020. Proportions of calls about specific exposures also increased: calls about disinfectants rose from 1.9% to 5.2%, and about cleaning products from 4.4% to 5.7%. Information campaigns organized by poison centres effectively prevented further increases in cases *(30)*.

In the United States, poison centres reported 1 052 174 COVID-19-related contacts, with a peak of contacts/day at 12 163 on 16 March 2020. Throughout 2020, American poison centres answered 799 934 enquiries relating to COVID-19/viral diseases in the absence of exposure to a product. Exposure to cleaning and disinfectant agents (primarily bleaches) and hand sanitizers peaked in early 2020, followed by a peak in requests for information on chloroquine/hydroxychloroquine in June/July 2020 *(31)*.

Contribution to management of chemicals and prevention of noncommunicable diseases attributable to chemicals/ chronic poisonings

Based on information on poisonings and databases on hazardous products, safety datasheets and other relevant information on chemicals, their mixtures and hazardous products, and retrospective and prospective analysis of case data, poison centres take an advisory role on risk management measures, restrictions and prohibition of certain chemicals (Box 5).

Box 5.
Regulation of pesticides in the United Kingdom

Since 2004, the United Kingdom's National Poison Information Service (NPIS) has undertaken surveillance on exposures to pesticides that required health-care interventions. The data collected and the publications produced, over two decades, inform the national regulators of pesticides. The main messages are that a large proportion of acute pesticide exposures in the United Kingdom are reported in children *(32)*, and that poison centres can monitor pesticide exposures and advise on pesticides regulation, having the surveillance data *(33)*.

Specific functions

Education

Poison centres in many countries are at the forefront of poison prevention education campaigns. For example, in the United States, poison centres include "Mr. Yuk", a trademarked graphic image developed by the Pittsburgh Poison Centre *(34)* to educate children and adults about poison prevention. Centres around Europe – including in Belgium *(35)*, Finland *(36)* and Ireland *(37)* – provide a similar service.

Detecting and alerting – toxicovigilance

Toxicovigilance refers to the detection, identification and alerting of hazardous poisonings in real time, most commonly by poison centres specialists. Once a signal is detected, it forms the basis of a rapid risk assessment.

Toxicovigilance is the capacity to identify new emerging substances that may be of concern to public health. An established toxicovigilance system can create an alert about an increase in poisonings and chemical emergencies in real time, and include timely dissemination of public health information for assessment and public health response as necessary. This is usually in the form of an early warning system for detecting and identifying the hazard and a central alerting system.

Poison centres throughout the world already act as early warning and central alerting systems. Within a country, a poison centre is uniquely placed to link many government agencies, such as food safety and crime agencies, health and safety executives, departments for patient safety and ministries of agriculture, climate and public health (Box 6).

Box 6.
Examples of alerts sent to health professionals

All health-care professionals in the United Kingdom were warned about paediatric deaths from contaminated cough syrups in Gambia, using information from WHO Medical Product Alert No. 6/2022 *(38)*, which was sent using poison centre resources.

A European Monitoring Centre for Drugs and Drug Addiction alert was released regarding an outbreak of severe bleeding involving at least 70 people, which was linked to smoking synthetic cannabinoid products contaminated with brodifacoum (rat poison) *(39)*.

An Irish Department of Agriculture, Food and the Marine alert removed ViraPro hand sanitizer from the Biocidal Product Register because of public health concerns *(40)*.

The United Kingdom's NPIS alerted health-care professionals to cocaine contaminated with levamisole, which was causing acute liver failure in patients who had taken the drug at festivals in the United Kingdom in August 2022 *(41)*.

The National Health Surveillance Agency of Brazil is a body of the Ministry of Health, which coordinates the national health surveillance system *(42)*. The Agency alerts health professionals to issues of product safety. All health units that see cases are obliged to inform the National Information System for Notifiable Diseases *(43)* about poisonings caused by toxic chemicals, pesticides and heavy metals and others, as well as accidents related to venomous animals, according to Ordinance no. 1.271 of the Ministry of Health of 6 June 2014.

Detecting and alerting – toxicosurveillance

Toxicosurveillance differs from toxicovigilance; it refers to the systematic ongoing collection and analysis of data for public health purposes as outlined in the IHR. Toxicosurveillance is essential, as it provides an invaluable source of public health data (Box 7). Surveillance outputs can inform the development of policy and legislation, and prospectively demonstrate the effectiveness of legislation. Surveillance is used to monitor case data on substances of interest – usually substances that are already a known concern to public health, such as carbon monoxide or pesticides.

Box 7.
Real-time collection of data

Poison centres in the United States automatically upload data on poison exposures to the National Poison Data System on average every 9.5 minutes. This allows real-time detection of surveillance anomalies and events of public health significance. The data are monitored with anomaly detection software by both the American Association of Poison Control Centers and the Centers for Disease Control and Prevention. Data are also shared with key regulatory agencies such as the Food and Drug Administration, Drug Enforcement Agency, Consumer Product Safety Commission and Environmental Protection Agency *(44)*.

In some countries, poison information centres may be required to provide a broad range of information on toxic chemicals, including on risks to the environment and on safe levels in food and environmental media, as well as in the workplace.

Strategic planning and inventory tracking of essential antidotes

WHO publishes a model list of essential medicines, with the recommendation that they should be available in hospitals in which poisoning cases are treated *(45)*. By undertaking national stocking audits and liaising with stakeholders – such as, professional associations and procurement commissioners – poison centres are strategically involved in advising on the use and stocking of antidotes (Box 8). As incidents can occur anywhere, poison centres are also crucial in ensuring that arrangements for accessing supplies of antidotes are available when needed.

Box 8.
Improving antidote availability

A pilot project was launched in 2017 to improve the availability of antidotes in the WHO South-East Asia Region. Procurement and distribution were to be coordinated by the Ministry of Health of Thailand, and a facility to provide antidotes to countries in the case of emergencies was set up at the Ramathibodi Poison Centre in Bangkok *(46)*.

Box 9.
Examples of scientific research outcomes

Paracetamol can be taken in overdose. The antidote to paracetamol toxicity was developed by Professor Laurie F Prescott, Clinical Director of the then Scottish Poisons Information Bureau *(49)*.

The first finger-prick test allowing rapid and bedside diagnosis of methanol poisoning was developed by Dr Knut Erik Hovda and his team affiliated with the Norwegian National Unit for Chemical, Biological and Radio-Nuclear Event Medicine, Department of Acute Medicine, Oslo University Hospital, Norway *(50)*.

Professor D Nicholas Bateman, former Clinical Director of the NPIS, Edinburgh, United Kingdom, first described a reduction of adverse effects from intravenous acetylcysteine treatment by shortening treatment duration. This led to shorter modified protocols being introduced globally, reducing health-care costs and improving patient care *(51)*.

Provision of specific advice in cases of pregnancy and lactation

Some poison centres, such as the United Kingdom's UK Teratology Information Service *(47)* and Italy's Poison Control Centre and National Toxicological Information Centre *(48)* also provide specialized advice with regard to medicines use and clinical toxicology services in cases of pregnancy and lactation.

Veterinary poisons information

Many poison centres – for example, in Ireland, the Netherlands and the United States – also answer enquiries about animal poisonings, providing a service to veterinary workers nationally. Some countries have dedicated veterinary poisons information services for animal care professionals, and a dedicated triage helpline for pet owners that professionals and members of the public can choose to subscribe to. Such helplines are available in Australia, Germany, Ireland, the Netherlands and the United Kingdom.

Research

Every year, poison centres publish annual reports describing their activities. These include details about contributions made to the field of research and development (Box 9). Many poison centre workers are renowned and esteemed academics, who have made significant contributions to the field of clinical toxicology; these in turn have changed global policy and practices. In many cases, poison centre patient information data was invaluable to the process.

Reducing suicides – chemicals security

Decreased availability of dangerous high-risk chemicals can contribute to prevention of suicidal poisonings (Box 10). Decisions and evaluation of their effectiveness are based on intentional poisonings surveillance and statistics *(52,53)*.

Box 10.
Contribution to suicide prevention

A project in Sri Lanka supported policy-makers in identifying the most dangerous pesticides, introducing new bans and monitoring the impact of bans on suicide rates and agriculture. Sri Lanka's pesticide regulations have contributed to one of the greatest reductions in suicide rates ever seen in the world, with a fall of more than 70% since 1995. The Centre for Pesticide Suicide Prevention, based in Edinburgh, United Kingdom, is currently analysing secondary data on suicides, collected as part of two cluster randomized controlled trials in the north central region of Sri Lanka *(54)*.

International cooperation and coordination

Collaborations between poison centres across many countries are established and robust. These have long been fostered by sharing of intelligence on chemical incidents and public health responses to outbreaks, and by working together to develop policies and processes that benefit populations in terms of health and safety. Important achievements include:

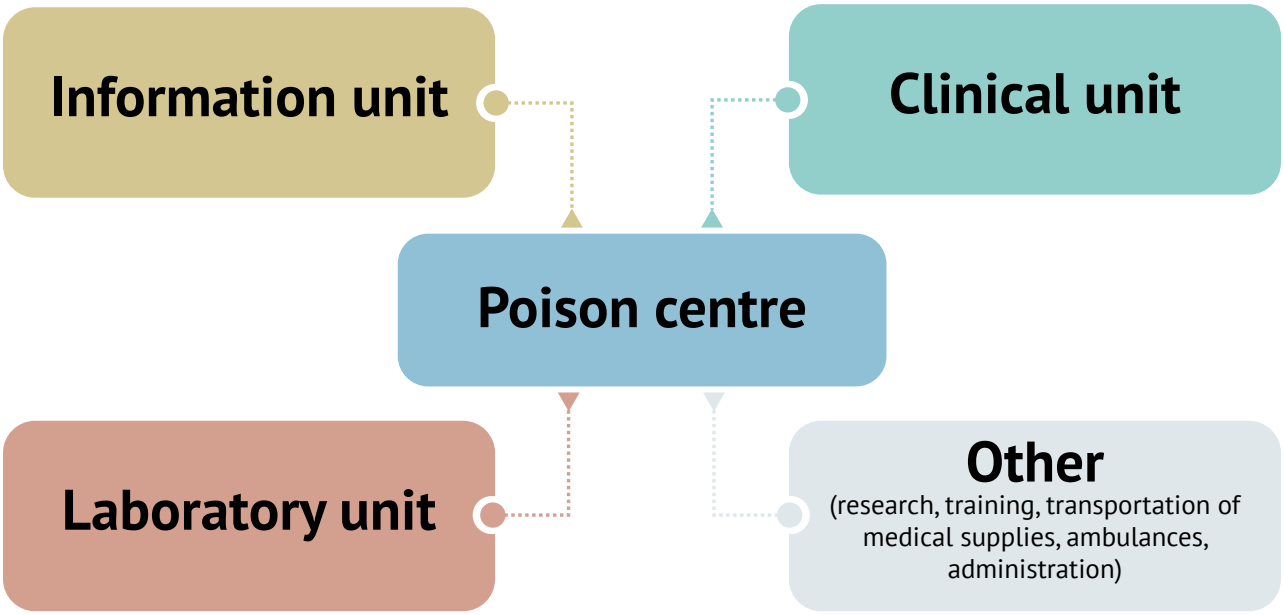
- summaries of information collected by poison centres at a global level, such as the WHO International Programme on Chemical Safety *(55)* and the International Labour Organization International Chemical Safety Cards *(56)*;
- creation of forums of experts such as:
  - › EAPCCT *(57)*;
  - › the Extracorporeal Treatments in Poisoning Workgroup (EXTRIP) *(58)*;
  - › EAPCCT and the American Academy of Clinical Toxicology on position statements on, for example, decontamination and antidote use;
  - › the Canadian Network for Public Health Intelligence *(59)*;
- provision of free access or access at reduced cost to poison information databases;
- harmonization of collection and reporting of information, such as via the European Chemicals Agency's European product categorization system *(60)*.

Structure of the poison centre

As a minimum, a poison centre is a toxicological information service operating 24 hours a day. The term "poisons/poisoning information centre" refers to an establishment that provides information and advice on poisonings and chemicals to health professionals and the public (depending on the poison centre's mandate) *(1)*.

A fully functioning poison centre includes also clinical and laboratory units equipped accordingly (Fig. 1).

Fig. 1. Structure of a poison centre



Policy framework

Establishment and strengthening poison centres contribute to achieving the Sustainable Development Goals (SDGs) *(61)* and to implementation of the IHR and other policies related to chemical emergencies and chemicals management.

- SDG target 3.9 is "by 2030 substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination".
- SDG target 3.4 is "by 2030 reduce by one third premature mortality from noncommunicable diseases through prevention and treatment and promote mental health and well-being".
- The IHR joint external evaluation tool *(4)* includes, as an indicator for chemical events, capabilities to detect, alert and respond to public health events caused by chemicals. The core capacities identified as necessary for countries to meet their IHR obligations include a poison information centre and access to toxicology laboratory services.
- The Strategic Approach to International Chemicals Management (SAICM) and its new policy framework for chemicals management beyond 2020 note that poison centre implementation is a priority target in chemical safety *(62)*.
- The establishment and strengthening of poison centres is also a priority action for governments in WHO's Chemicals road map *(63)*, approved by the Seventieth World Health Assembly in 2017. It outlines the need to reinforce the role of the health sector in reaching the goals of the SAICM.
- The compendium of possible actions to advance the implementation of the Ostrava Declaration on Environment and Health *(64)* encourages countries to ensure capacities to prevent and respond to acute exposure to hazardous chemicals and products, including strengthening the role of poison control centres.

The value of poison centres

Health-care benefits

Fully functional poison centres benefit health-care systems. They save resources as a result of reducing numbers of visits to emergency departments and reducing the length of stays in hospital beds (Box 11). They also reduce mortality from poisoning via phone advice that helps to identify cases in which urgent professional care is needed, leading to earlier admission to hospitals and timely treatment. Their operation can also lead to reduced needs for transportation of patients and doctors via provision of effective clinical toxicology services using telemedicine. A poison centre is a prime example of telemedicine. Its activities can be very cost-effective.

Box 11.
Poison centre consultations reducing hospital length of stay: examples

From 2010 to 2017, in Wisconsin, United States of America, 127 224 hospitalized poisoning cases were registered, of which 44 628 were included in a length-of-stay analysis. Poison centre consultation was associated with an 11.6-hour (95% CI: 10.4–13.0 hours) shorter mean length of stay overall, while data for children aged 0–6 years showed a larger reduction of 1.18 days *(65)*.

A retrospective review of patients admitted for poisoning to a single hospital in Brazil showed that patients stayed in hospital for 3.5 days less when the poison centre was consulted than when it was not consulted *(66)*.

Financial savings

Fully functional poison centres also offer financial benefits and represent value for money (Box 3). According to available evaluations, for every US$ 1 spent, more than US$ 13 were avoided in unnecessary health-care charges – including emergency room and physician visits, ambulance services and other medical treatments (giving a benefit-to-cost ratio of 13.39:1) *(67)*.

Data found a potential cumulative reduction of US$ 2078 charged per 10 patients in hospitals in Illinois, United States, among patients entering hospital with poison centre assistance. Statistics from 2010 confirmed that the length of hospitalization among poison centre-assisted patients was 0.58 days shorter than that among patients without poison centre assistance *(68)*.

In Israel, US$ 99 383 of potential health care savings can be made by preventing unnecessary referrals in cases of silica gel poisoning among children aged under 6 years, thanks to poison information centre advice. Silica gel poisoning is rarely symptomatic, but it is a source of unnecessary referrals to health care facilities. The cost evaluation includes emergency department visits (saving US$ 213 each) and community clinic tariffs (saving US$ 67 each) A total of 546 cases were recorded, with 91.4% in children under 6 years. The direct annual treatment cost of patients who referred themselves to health-care facilities without consulting a poison centre first (n = 60) was US$ 6507 (including emergency department and community clinic visit fees) *(69)*.

Establishment of a poison centre – recommended steps and resources

The structure, functions and operational modalities of poison centres vary from country to country depending on needs, population size, structure of the health system, existing resources and capacities. There is no universal single model that can be recommended, but the majority of existing models demonstrate the effectiveness of poison centre operation. A poison centre can be a specific institution within the health system or can be created on a functional basis, assigning different functions to institutions with relevant capacities under the coordination of a poison information centre.

Setting up a poison centre

Countries can decide to establish fully functional poison centres immediately if resources are available. In countries with limited resources, it is recommended that the following step-by-step approach is considered when a decision to set up a poison centre is made.

The first step is to establish a poison information centre to provide poisons information to all health-care facilities treating poisoned patients within the country. Minimum requirements include a telephone helpline, a patient information database to record case details (for surveillance and vigilance) and access to a poisons information database. Initially, engagement should be limited to health-care facilities – such as emergency departments and general practitioners. Thereafter, the service can be extended to members of the public as required.

The second step involves development of a dedicated clinical toxicology unit. A medical toxicologist will most likely be involved with treatment of poisoned patients within their health-care facility already, and can thus facilitate the development of a dedicated clinical unit. The unit must have access to biomedical laboratory analyses – including arterial blood gases, urea, electrolytes and creatinine, liver function tests, full blood count and coagulation. It should also have the ability to perform basic investigations, checking vital signs and electrocardiograms and other investigations, as appropriate. The clinical unit should provide the opportunity for clinicians around the area to be trained in clinical management of poisoned patients and antidote use.

The third step is establishment or appointment of an analytical and toxicological laboratory. Specialists in poisons information should be trained – ideally, they should have a medical or pharmacological background.

Essential tools

Poison information database

For poison information enquiries to be answered effectively (efficiently and accurately, reflecting current best practices), access to an up-to-date and accurate poisons information database is essential. This should include peer-reviewed information on a wide range of substances, including pharmaceuticals, plants, animals, fungi and chemicals. Available information on each

substance should include the mechanism of toxicity, the dose at which toxicity may occur, the features of toxicity and the best-practice clinical management for each poisoning (recommended investigations, suggested observation times and best treatment options). The specialist in poisons information will interpret this information in the context of knowing the full clinical presentation of the patient, and will advise accordingly.

Several online poisons information databases are internationally available – notably the United States' Poisindex, the United Kingdom's TOXBASE and New Zealand's TOXINZ. TOXBASE is also available offline via the TOXBASE application (for smartphones, on iOS and Android operating systems). AfriTox is another software system that helps doctors in southern Africa to diagnose and treat poisoning in adults or children. It contains information on more than 40 000 potential poisons and their treatment.

Holders of poisons information databases may provide access free of charge or at reduced cost to LMICs. High-income countries can negotiate subscription access directly with providers.

Patient information database

A patient information database is a basic and vital part of any poison centre. Establishing a reliable records management system compliant with relevant data protection legislation should be considered a priority.

Patient case data are vital for many essential poison centre roles, as they can be interrogated to provide information about:

- chemical management – surveillance;
- chemical management – vigilance (early warning system and central alerting system);
- compliance with record management and data protection policies;
- therapeutic and diagnostic practices;
- antidotes;
- the epidemiology of poisoning in each region.

Antidotes and antivenom knowledge/database

Poison centres can use their patient information database to establish demand for antidotes in the region. They can collate information on antidote stocking in health-care facilities in the region to ensure timely antidote provision for case of poisonings and to facilitate resource-saving storage of antidotes between and within health-care facilities. For example, Italy's Poison Control Centre and National Toxicological Information Centre *(48)* manages three operative national systems for antidote stockpiling – a system involving the national public hospitals network, a system related to chemical, biological and radio-nuclear emergencies and a system for pharmaceutical and chemical industries to provide prompt and easy access to antidotes in nearby hospitals or regions (avoiding expensive transport) *(70,71)*.

Clinical services

Acute poisonings are, in most instances, life-threatening emergencies for which expert management is often crucial. Management of such patients is also time critical. Poisoned patients should be managed in consultation with experts and specialists at a poison information centre, if necessary with the involvement of a medical toxicologist with expertise in diagnosis, chemical risk assessment, prognosis and management of exposure to a wide range of substances. To ensure the best clinical management of poisoned patients, all health-care professionals need to have ready access to high-quality poisons information and advice. All health-care professionals involved in the initial and further care of poisoned patients should have training in clinical toxicology – including paramedics, pharmacists, telephone triage nurses and physicians, emergency department and critical care nurses and physicians, paediatricians and anaesthetists *(1)*.

Laboratory services

Analytical toxicology laboratory services are an important component of a fully functional poison centre operation *(1)*; however, analytical toxicology can also be provided as a standalone service or by other types of laboratories. An analytical toxicology laboratory should be capable of undertaking analyses of both biological and nonbiological materials. To support management of poisoning, many laboratories offer other services, such as testing for drugs of abuse, specialized therapeutic drug monitoring, trace element analysis, biological monitoring of occupational or environmental

chemical exposure and forensic toxicology, in which similar equipment and expertise are used.

The main tasks of laboratory services are:

- emergency qualitative and/or quantitative assays for common poisons, especially when knowledge on concentrations in the biological matrix may influence treatment;
- complex analyses – for example, when the cause of illness is unknown;
- monitoring of the efficacy of treatment or elimination techniques (such as chelation therapy);
- analyses for biomonitoring of populations exposed to chemicals occupationally or environmentally, and environmental monitoring (such as soil, air, water);
- research into the toxicokinetics and mechanisms of toxicity of drugs and chemicals; and
- practical training of laboratory staff and providing training on interpretation of analytical data.

References[2]

1. Guidelines for establishing a poison centre. Geneva: World Health Organization; 2020 (https://apps.who.int/iris/handle/10665/338657).
2. World directory of poison centres, as of 28 February 2019. In: World Health Organization [website]. Geneva: World Health Organization; 2019 (https://apps.who.int/poisoncentres/).
3. International Health Regulations (2005), third edition. Geneva: World Health Organization; 2016 (https://apps.who.int/iris/handle/10665/246107).
4. Joint external evaluation tool: International Health Regulations (2005), third edition. Geneva: World Health Organization; 2022 (https://apps.who.int/iris/handle/10665/357087).
5. Scherz RG, Robertson WO. The history of poison control centers in the United States. Clin Toxicol. 1978;12(3):291–6. doi:10.3109/15563657809150481.
6. World drug report 2021. Vienna: United Nations Office on Drugs and Crime; 2021 (https://digitallibrary.un.org/record/3931425?ln=en).
7. World statistic. In: International Labour Organization [website]. Geneva: International Labour Organization; 2023 (https://www.ilo.org/moscow/areas-of-work/occupational-safety-and-health/WCMS_249278/lang--en/index.htm).
8. Exposure to hazardous chemicals at work and resulting health impacts: a global review. Geneva: International Labour Organization; 2021 (https://www.ilo.org/global/topics/safety-and-health-at-work/resources-library/publications/WCMS_811455/lang--en/index.htm).
9. Global chemicals outlook II: from legacies to innovative solutions – synthesis report. Nairobi: United Nations Environment Programme; 2019 (https://www.unep.org/resources/report/global-chemicals-outlook-ii-legacies-innovative-solutions).
10. Cvetkovska L. 38 Fundamental Pharmaceutical Statistics and Facts for 2021. Supplements101.net; 2021 (https://supplements101.net/pharmaceutical-statistics/).
11. EU drug markets report 2019. Lisbon: European Monitoring Centre for Drugs and Drug Addiction; 2019 (www.emcdda.europa.eu/publications/joint-publications/eu-drug-markets-report-2019).
12. Active substances, safeners and synergists (1482 matching records). In: EU pesticides database [online database]. Brussels: European Commission; 2023 (https://ec.europa.eu/food/plant/pesticides/eu-pesticides-database/start/screen/active-substances).
13. Pesticide residues in food [fact sheet]. In: World Health Organization [website]. Geneva: World Health Organization; 2022 (https://www.who.int/news-room/fact-sheets/detail/pesticide-residues-in-food).
14. Snakebite envenoming. In: World Health Organization [website]. Geneva: World Health Organization; 2023 (https://www.who.int/health-topics/snakebite).
15. FACTS: hazardous materials accidents knowledge base [online database]. Uddel: FACTS; 2020 (www.FACTSonline.nl).
16. Suicide [fact sheet]. In: World Health Organization [website]. Geneva: World Health Organization; 2021 (https://www.who.int/news-room/fact-sheets/detail/suicide).
17. Boedeker W, Watts M, Clausing P, Marquez E. The global distribution of acute unintentional pesticide poisoning: estimations based on a systematic review. BMC Public Health. 2020;7;20(1):1875. doi:10.1186/s12889-020-09939-0.
18. The human cost of disasters: an overview of the last 20 years (2000–2019). Geneva: United Nations Office for Disaster Risk Reduction; 2020 (https://www.undrr.org/publication/human-cost-disasters-overview-last-20-years-2000-2019).
19. Chemicals, wastes and climate change: interlinkages and potential for coordinated action. Nairobi: United Nations Environment Programme; 2021 (https://www.unep.org/resources/report/chemicals-wastes-and-climate-change-interlinkages-and-potential-coordinated-action).
20. Invasive species are changing the nature of the Mediterranean Sea. In: FAO [website]. Rome: Food and Agriculture Organization of the United Nations; 2022 (https://www.fao.org/fao-stories/article/en/c/1603640/).
21. Poison centres. In: European Commission [website]. Brussels: European Commission; 2023 (https://single-market-economy.ec.europa.eu/sectors/chemicals/poison-centres_en).
22. Statistika [Statistics] [website] (in Estonian). Tallinn: Health Board; 2023 (https://www.16662.ee/et/statistika).

2 All references accessed 23–24 March 2023.

23. National Poisons Information Service report 2020/21. Birmingham: National Poisons Information Service; 2021 (https://www.npis.org/Annual%20reports.html).

24. Jaaroverzichten [Annual overviews] [website] (in Dutch). Utrecht: National Poison Information Centre; 2023 (https://nvic.umcutrecht.nl/nl/jaaroverzichten).

25. Gummin DD, Mowry JB, Beuhler MC, Spyker DA, Bronstein AC, Rivers LJ et al. 2020 annual report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 38th annual report. Clin Toxicol (Phila). 2021;59(12):1282–501. doi: 10.1080/15563650.2021.1989785.

26. TOXBASE [online database]. Edinburgh: National Poisons Information Service; 2023 (https://www.toxbase.org/).

27. ABRACIT [website] (in Portuguese). Florianópolis: Brazilian Association of Toxicological Information and Assistance Centres and Clinical Toxicologists; 2020 (https://abracit.org.br/).

28. Gummin DD, Mowry JB, Beuhler MC, Spyker DA, Rivers LJ, Feldman R et al. 2021 annual report of the National Poison Data System© (NPDS) from America's Poison Centers: 39th annual report. Clin Toxicol (Phila). 2022;60(12):1381–643. doi:10.1080/15563650.2022.2132768.

29. International Health Regulations (2005) and chemical events. Geneva: World Health Organization; 2015 (https://apps.who.int/iris/handle/10665/249532).

30. Hondebrink L, Zammit M, Høgberg LCG, Hermanns-Clausen M, Lonati D, Faber K. Effect of the first wave of COVID-19 on poison control centre activities in 21 European countries: an EAPCCT initiative. Clin Toxicol (Phila). 2022;60(10):1145–55. doi:10.1080/15563650.2022.2113094.

31. Spyker DA, Bronstein AC, Weber JA. Making US poison centers a part of the solution to the COVID-19 pandemic. Clin Toxicol (Phila). 2022;60(1):102–14. doi:10.1080/15563650.2021.1933510.

32. Adams RD, Lupton D, Good AM, Bateman DN. UK childhood exposures to pesticides 2004-2007: a TOXBASE toxicovigilance study. Arch Dis Child. 2009;94(6):417–20. doi:10.1136/adc.2008.144972.

33. Perry L, Adams RD, Bennett AR, Lupton DJ, Jackson G, Good AM et al. National toxicovigilance for pesticide exposures resulting in health care contact – an example from the UK's National Poisons Information Service. Clin Toxicol (Phila). 2014;52(5):549–55. doi :10.3109/15563650.2014.908203.

34. Mr. Yuk. In: UPMC [website]. Pittsburgh, PA: University of Pittsburgh Medical Center; 2023 (https://www.chp.edu/injury-prevention/teachers-and-parents/poison-center/mr-yuk).

35. Centre Antipoisons Belge [Belgian Poison Centre] [website] (in French). Brussels: Belgian Poison Centre; 2023 (https://www.centreantipoisons.be/).

36. Myrkytystietokeskusas [Poison Information Centre] [website] (in Finnish). Helsinki: Poison Information Centre; 2023 (https://www.myrkytystietokeskus.fi).

37. National Poisons Information Centre [website]. Dublin: National Poisons Information Centre; 2023 (https://poisons.ie/).

38. Medical Product Alert No. 6/2022: Substandard (contaminated) paediatric medicines. In: World Health Organization [website]. Geneva: World Health Organization; 2022 (https://www.who.int/news/item/05-10-2022-medical-product-alert-n-6-2022-substandard-(contaminated)-paediatric-medicines).

39. New psychoactive substances: 25 years of early warning and response in Europe. Lisbon: European Monitoring Centre for Drugs and Drug Addiction; 2022 (https://www.emcdda.europa.eu/ews25_en).

40. Statement on withdrawal of approval of hand sanitiser product ViraPro. Dublin: Department of Agriculture, Food and the Marine; 2020 (https://www.gov.ie/en/press-release/ae08f-statement-on-withdrawal-of-approval-of-hand-sanitiser-product-virapro/).

41. PHILTRE annual report 2021/22. Cardiff: Public Health Wales; 2022 (https://www.wedinos.org/reports_publications.php).

42. Agência Nacional de Vigilância Sanitária [Brazilian National Health Surveillance Agency] [website] (in Portuguese). Brasília: Ministry of Health; 2020 (http://portal.anvisa.gov.br/).

43. Sistema de Informação de Agravos de Notificação [Notifiable Diseases Information System] [website] (in Portuguese). Brasília: Ministry of Health; 2023 (http://portalsinan.saude.gov.br/).

44. Arnold JK, Birger J, Nappe TM. Poison control in the United States. Treasure Island, Fl: StatPearls Publishing; 2023.

45. WHO Model Lists of Essential Medicines [website]. Geneva: World Health Organization; 2023 (https://www.who.int/groups/expert-committee-on-selection-and-use-of-essential-medicines/essential-medicines-lists).

46. Access to medical products in the South-East Asia Region 2019: review of progress. New Delhi: WHO Regional Office for South-East Asia; 2019 (https://apps.who.int/iris/handle/10665/326829).

47. UK Teratology Information Service [website]. Newcastle: NHS Regional Drug & Therapeutics Centre; 2021 (https://rdtc.nhs.uk/uk-teratology-information-service/).

48. Centro antiveleni e Centro Nazionale di Informazione Tossicologica [Poison Control Centre and National Toxicological Information Centre] [website] (in Italian). Pavia: Maugeri; 2023 (https://www.icsmaugeri.it/per-i-ricercatori/laboratori-ricerca/servizio-di-tossicologia-centro-antiveleni-e-centro-nazionale).

49. Forrest JA, Clements JA, Prescott LF. Clinical pharmacokinetics of paracetamol. Clin Pharmacokinet. 1982;7(2):93–107. doi:10.2165/00003088-198207020-00001.

50. Hovda KE, Lao YE, Gadeholt G, Jacobsen D. Formate test for bedside diagnosis of methanol poisoning. Basic Clin Pharmacol Toxicol. 2021;129(1):86–8. doi:10.1111/bcpt.13597.

51. Bateman DN, Dear JW, Thanacoody HK, Thomas SH, Eddleston M, Sandilands EA et al. Reduction of adverse effects from intravenous acetylcysteine treatment for paracetamol poisoning: a randomised controlled trial. Lancet. 2014;383(9918):697–704. doi:10.1016/S0140-6736(13)62062-0.

52. Safer access to pesticides for suicide prevention: experiences from community interventions. Geneva: World Health Organization; 2016 (https://apps.who.int/iris/handle/10665/246233).

53. Lee YY, Chisholm D, Eddleston M, Gunnell D, Fleischmann A, Konradsen F et al. The cost-effectiveness of banning highly hazardous pesticides to prevent suicides due to pesticide self-ingestion across 14 countries: an economic modelling study. Lancet Glob Health. 2021;9(3):e291–e300. doi:10.1016/S2214-109X(20)30493-9.

54. Sri Lanka. In: Centre for Pesticide Suicide Prevention [website]. Edinburgh: Centre for Pesticide Suicide Prevention; 2021 (https://centrepsp.org/sri-lanka/).

55. International Programme on Chemical Safety (IPCS). Geneva: World Health Organization; 1992 (https://apps.who.int/iris/handle/10665/170790).

56. International Chemical Safety Cards (ICSCs) [online database]. Geneva: International Labour Organization; 2023 (https://www.ilo.org/dyn/icsc/showcard.listCards3?p_lang=en).

57. European Association of Poisons Centres and Clinical Toxicologists (EAPCCT) [website]. Brussels: European Association of Poisons Centres and Clinical Toxicologists; 2022 (https://www.eapcct.org/).

58. EXTRIP [website]. Montreal: Extracorporeal Treatments in Poisoning Workgroup; 2023 (https://www.extrip-workgroup.org/).

59. Canadian Network for Public Health Intelligence [website]. Ottawa: Government of Canada; 2023 (https://www.cnphi-rcrsp.ca/cnphi/index.jsp).

60. New product categories for notifying poison centres. In: ECHA [website]. Helsinki: European Chemicals Agency; 2023 (https://poisoncentres.echa.europa.eu/).

61. Sustainable Development Goals [website]. New York: United Nations; 2023 (https://sdgs.un.org/goals).

62. Intersessional process single consolidated document [draft as corrected per Plenary discussion 3 March 2023]. Geneva: United Nations Environment Programme; 2023 (http://www.saicm.org/Beyond2020/IntersessionalProcess/FourthIntersessionalmeeting/tabid/8226/Default.aspx).

63. Chemicals road map. Geneva: World Health Organization; 2017 (https://apps.who.int/iris/handle/10665/273137).

64. Declaration of the Sixth Ministerial Conference on Environment and Health: Annex 1. Compendium of possible actions to advance the implementation of the Ostrava Declaration. Copenhagen: WHO Regional Office for Europe; 2017 (https://apps.who.int/iris/handle/10665/347249).

65. Farkas A, Kostic M, Huang CC, Gummin D. Poison center consultation reduces hospital length of stay. Clin Toxicol (Phila). 2022;60(7):863–8. doi:10.1080/15563650.2022.2039686.

66. Galvão TF, Silva MT, Silva CD, Barotto AM, Gavioli IL, Bucaretchi F et al. Impact of a poison control center on the length of hospital stay of poisoned patients: retrospective cohort. Sao Paulo Med J. 2011;129(1):23–9. doi:10.1590/s1516-31802011000100005.

67. Final Report on the value of the poison center system. Falls Church, VA: Lewin Group; 2012 (https://www.webpoisoncontrol.org/-/media/files/webpoisoncontrol/press-info/lewin-report-value-of-the-poison-center-system.pdf).

68. Friedman LS, Krajewski A, Vannoy E, Allegretti A, Wahl M. The association between U.S. Poison Center assistance and length of stay and hospital charges. Clin Toxicol (Phila). 2014;52(3)198–206. doi:10.3109/15563650.2014.892125.

69. Lavon O, Bentur Y. Silica gel: non-toxic ingestion with epidemiologic and economic implications. Isr Med Assoc J. 2015;17(10):604–6.

70. Buscaglia E, Petrolini VM, Costanzo V et al. Extraordinary mobilizations of antidotes from the National Stockpile to hospital emergency departments: an example of versatility and integration of national functions and systems. XXXVI International Congress of the EAPCCT, 24–27 May 2016, Madrid. Clinical Toxicology 2016. 54;4:388.

71. Locatelli CA, Buscaglia E, Petrolini VM, Lonati D, Vecchio S, Scaravaggi G. Antidoti 2018–2019: guida all'uso clinico e all'approvvigionamento [Antidotes 2018–2019: guide to clinical use and stockpiling] (in Italian). Pavia: Maugeri Clinical Scientific Institutes; 2020.

Annex 1

A history of poison centres – milestones

1870s A ward of 12 beds for the treatment of those with "incidental delirium" was established in Edinburgh, United Kingdom.

1949 The earliest poisonings treatment centre was established in Denmark for management of cases of acute poisoning in the Department of Psychiatry at Bispebjerg Hospital. Although the rationale for setting up the centre was to treat mostly intentional and accidental poisonings by surrogate alcohol, its establishment was important from the perspective of clinical toxicology development.

1950s The Regional Barbiturate Unit was set up in Oldchurch Hospital, Romford, United Kingdom.

1953 The first poison information centre in the world was established in Chicago, United States.

1958 The American Association of Poison Control Centers (now America's Poison Centers) was founded.

1957 Surveillance was first undertaken in poison centres in the United States with the establishment of the National Clearinghouse for Poison Control Centers.

1960 The first poison information centre was established in the Netherlands, and in 1962 it was linked to the Department of Reanimation in the Medical Faculty of the University of Utrecht.

1963 The first poison information centre was established in Edinburgh, Scotland, as part of an informal network of similar centres across the United Kingdom.

1963 The first German poison centre was established.

1983 TOXBASE was first made available in electronic format.

1985 The United States Poisindex database was published in electronic format (on CD-ROM) for the first time.

1999 TOXBASE moved online.

2022 Around 70 registered centres are established in 36 countries in the WHO European Region.

Annex 2

Summary of recent poison centre activities

In 2019, the United Kingdom's Veterinary Poisons Information Service answered 12 864 enquiries: 10 163 from animal care professionals and 2701 from pet owners.

In 2020, five Canadian poison centres answered 215 589 enquiries, including 186 739 human exposures. The population served is 38 million, giving an average of 567 enquiries per 100 000 population.

In 2020, 55 poisons centres in the United States answered 3.32 million enquiries logged via the National Poison Data System. These included 2.1 million human exposures, 66 745 animal exposures and 1.1 million information-only requests. The population served is 336.4 million, giving an average of 987 enquiries per 100 000 population.

In 2021, the Irish poison centre answered 11 145 telephone enquiries, and health-care professionals in emergency department and intensive care units generated 16 838 user sessions on the TOXBASE poisons information database. The population served is 5.0 million, giving an average of 560 enquiries/information requests per 100 000 population.

In 2021 the poison centre in the Netherlands answered 47 686 telephone enquiries from health-care professionals, who also generated 153 167 user sessions on the country's poisons information database. The population served is 17.5 million, giving an average of 1146 enquires/information requests per 100 000 population.

In 2021, the Swedish poison centre answered 96 568 telephone enquiries. The population served is 10.4 million, giving an average of 927 enquiries per 100 000 population.

In 2021, the Swiss poison centre answered 39 584 telephone enquiries. The population served is 8.7 million, giving an average of 455 enquiries per 100 000 population.

In 2021/22, 4 poison centres in the United Kingdom answered 39 083 patient-related telephone enquiries from health-care professionals, who also generated 754 866 user sessions on the TOXBASE poisons information database. The population served is 67.3 million giving an average of 1180 enquiries/information requests per 100 000 population.

The WHO Regional Office for Europe

The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

Member States

Albania
Andorra
Armenia
Austria
Azerbaijan
Belarus
Belgium
Bosnia and Herzegovina
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Georgia
Germany
Greece
Hungary
Iceland
Ireland
Israel
Italy
Kazakhstan
Kyrgyzstan
Latvia
Lithuania
Luxembourg
Malta
Monaco
Montenegro
Netherlands (Kingdom of the)
North Macedonia
Norway
Poland
Portugal
Republic of Moldova
Romania
Russian Federation
San Marino
Serbia
Slovakia
Slovenia
Spain
Sweden
Switzerland
Tajikistan
Türkiye
Turkmenistan
Ukraine
United Kingdom
Uzbekistan

WHO/EURO:2023-7573-47340-69478

WHO European Centre for Environment and Health
Platz der Vereinten Nationen 1
D-53113 Bonn
Germany
Tel.: +49 228 815 0400
Fax: +49 228 815 0440
Email: euroeceh@who.int
Website: www.who.int/europe