UK Health Security Agency

NPIS

National Poisons Information Service
Report 2021 to 2022

The National Poisons Information Service is commissioned by the UK Health Security Agency on behalf of the UK health departments

Contents

Foreword

Every day in the United Kingdom hundreds of people present to front-line NHS healthcare professionals because of concerns about exposure to drugs or chemicals. These exposures commonly involve unintentional contact with substances found in households or gardens and, although they occur in all age groups, they are particularly common in young children. Exposures also commonly occur as drug overdoses in the context of self-harm or as a result of drug misuse, with adolescents and younger adults disproportionately involved. Occupational exposures or involvement of natural toxins such as snake envenomation are less common.

The numbers of different substances that may be involved in human exposures are very large and include medicines, household and garden products, substances of misuse, industrial chemicals and plant or animal toxins. Most NHS healthcare professionals do not have the necessary knowledge and training to manage all of these potential exposures, so they need clinical support to provide appropriate care. This includes a source of high quality information about the health effects that might be expected from exposure to different drugs and chemicals, advice on appropriate patient care and the opportunity to discuss cases with a clinical expert.

The National Poisons Information Service (NPIS) is commissioned to provide this clinical support by the UK Health Security Agency (UKHSA), which acts on behalf of the English Department of Health and Social Care, the Scottish Government, the Welsh Government and the Northern Ireland Department of Health. Information and advice about thousands of drugs and chemicals are available via our internet database TOXBASE and the TOXBASE app, which are freely available to all UK healthcare professionals as well as colleagues in UKHSA and the Ministry of Defence. For complex cases our 24-hour telephone advice line is available, staffed by specialists in poisons information and supported by an on-call rota of consultant clinical toxicologists for advice on more serious or challenging cases. The NPIS also provides services to the Republic of Ireland, commissioned by Beaumont Hospital, Dublin, on behalf of the Irish Government. Services are provided by 4 NHS hospitals located in Birmingham, Cardiff, Edinburgh and Newcastle, which work together to deliver a fully-integrated national service.

The unborn child is particularly vulnerable to in-utero effects of drugs and chemicals, so the NPIS also delivers the UK Teratology Information Service (UKTIS), which is the designated UK source of expert advice regarding exposure to medicinal and illicit drugs as well as other chemicals during pregnancy. Information and advice about exposures to hundreds of drugs and chemicals are published openly on the internet, while NHS health professionals can access more detailed and fully-referenced information via TOXBASE, and obtain specialist advice by telephone during office hours.

The information and advice provided by the NPIS, including UKTIS, supports the high quality clinical management of patients with suspected poisoning. This improves the care of those at risk of serious complications, but also avoids unnecessary referrals, admissions and

treatments for those who are not at risk. The NPIS also performs research and education activities and collects and shares surveillance data that is important for public health and health security.

This annual report is published as a statement of the activity, accountability and governance of the NPIS during the reporting year.

Michael Eddleston
Chair, NPIS Clinical Standards Group

Raquel Duarte-Davidson
NPIS Commissioner, Radiation, Chemical and Environmental Hazards Directorate, UK Health Security Agency

Executive summary

Poisoning is an important public health issue and poisoning incidents as a percentage of all emergency department diagnoses continue to increase year on year. In England alone, there has been over 350,000 hospital presentations per year for the period 2018 to 2019 through to 2021 to 2022, where the primary or secondary diagnosis was poisoning (including overdose) (1)*. These episodes may involve accidental exposures, medication errors, self-harm or drug misuse. Many more patients are managed in the community, including by primary care and NHS patient advice services such as NHS 111, NHS 24 and NHS Direct. While the majority of episodes do not produce severe clinical effects, several thousand people die each year as a result of poisoning.

The NPIS is commissioned to provide 24-hour information and advice to NHS healthcare professionals across the UK to support the management of patients with suspected poisoning. This information is provided primarily via TOXBASE, an online database containing information on more than 17,000 agents. TOXBASE is also available as an app which users can access both on- and offline. A 24-hour telephone advice service, staffed by specialists in poisons information and supported by consultant clinical toxicologists, is also available for more complex cases if required. The availability of this expertise avoids unnecessary hospital referrals and admissions for patients at low risk of harm, while improving the quality of treatment and shortening hospital stay for those with clinical toxicity. UKTIS provides information and advice nationally about exposures to drugs and chemicals during pregnancy.

Activity

During 2021 to 2022 (changes from 2020 to 2021 in parentheses) there were:

NPIS

- 754,866 (-3.8%) TOXBASE user sessions from 7,807 different registered UK healthcare departments; hospital departments and the NHS patient advice services were the most frequent users

* A different coding structure was introduced into the Emergency Care Data Sets (ECDS) in 2020 to 2021. Data presented in this report for 2020 to 2021 and 2021 to 2022 reflects ECDS primary and secondary diagnosis codes combined so is comparable to the Comparison of A&E Diagnoses reported in the Hospital Episode Statistics for 2018 to 2019 and 2019 to 2020 (1).

- 2,599,241 (-2.9%) TOXBASE online page views
- 267,819 (-2.4%) app accesses from 25,821 TOXBASE app subscribers
- 39,083 (-1.9%) telephone enquiries received, of which 2,209 were referred to an NPIS consultant clinical toxicologist (-6.6%); the most frequent telephone enquirers were NHS telephone advice services and other healthcare professionals working in primary care
- 5,774 TOXBASE entries written or updated and 26,777 safety data sheets submitted to the NPIS Product Data Centre, bringing the total to more than 337,000

UKTIS

- 1.99 million (+7.9%) downloads of publicly available information about drugs in pregnancy provided by the ‘bumps’ website
- 21,117 (-6.3%) accesses by healthcare professionals to the detailed information on drugs and chemical exposures in pregnancy held on TOXBASE
- 1,199,357 (+34.1%) accesses to the openly available summaries on the UKTIS website; note that access data to publicly available websites is not directly comparable year to year because of a change to search engine algorithms
- 993 enquiries (+16.5%) about specific patients handled by the UKTIS telephone advice service

Quality

The NPIS has strict clinical governance procedures and our quality assurance exercises continue to demonstrate that all of the services provided have very high user satisfaction. The proportion of respondents scoring services as very good or excellent was 93.7% for TOXBASE online, 95% for the UKTIS telephone service, and 94% for the NPIS telephone poisons information service.

Surveillance

The NPIS continues to collect clinical information on important causes of poisoning from across the UK. This helps us improve our clinical advice for health professionals and provides valuable information for public health surveillance of poisoning. Examples of work carried out during 2021 to 2022 include work on poisoning with drugs of misuse, pesticides, carbon monoxide, dinitrophenol, and nitrous oxide as well as the use of the SNAP (Scottish and Newcastle Acetylcysteine Protocol) acetylcysteine regimen for paracetamol poisoning.

Introduction

In the UK, poisoning is a common reason for people to seek medical advice, present to emergency departments, or even require admission to hospital. Poisoning can be categorised according to type of exposure, substance involved and circumstances of exposure (for example intent). People may be exposed to substances that are not intended for human use, such as unintentional ingestion of a household product or exposures to potentially harmful environmental agents such as carbon monoxide. Inappropriate exposures to medicines and other drugs are also a common source of poisoning and might involve use by someone who was not prescribed the medicine or accidental or deliberate ingestion of excessive doses (an 'overdose'). Finally, drug misuse in the UK is an ever increasing problem and may involve licensed medicines or non medicinal substances.

Poisoning is an important public health issue in the UK, accounting for over 380,000 hospital presentations in 2019 to 2020, in England alone, where the primary or secondary diagnosis was poisoning (including overdose) (1), and many more consultations with primary care and NHS patient advice services such as NHS 111, NHS 24 and NHS Direct. Severe poisoning is also common and there were 4,561 registered deaths attributed to drug poisoning in England and Wales (2), 1,411 in Scotland (3) and 218 in Northern Ireland (4) in 2020.

The majority of episodes of poisoning in adults are caused by drug overdose in the context of self-harm, although drug misuse is an important cause of mortality. In children, accidental exposures are common, particularly involving substances found within the household. Many thousands of different substances may be involved, making it very difficult for NHS staff to keep up to date on risk assessment, diagnosis and management. The great majority of UK hospitals do not have specialist clinical toxicology services, therefore 24-hour access to high quality information and clinical advice concerning people with exposure to drugs and chemicals is essential for their safe and effective management.

The NPIS is a network of dedicated poisons units commissioned by the UKHSA on behalf of the UK health departments to provide poisons information to healthcare professionals. The role of the NPIS within the NHS is to support the appropriate triage, referral, assessment and treatment of patients with poisoning or where there is concern about possible health consequences from exposures. This is achieved by the provision of advice to emergency departments, GP practices and NHS advice services to aid the decision-making process as to whether patients require hospital admission or whether they can be safely managed at

home. Information and advice are provided in the first instance via TOXBASE®†, an online poisons information database, but there is also a 24-hour telephone advice line for provision of specific advice on individual cases. The information on TOXBASE is updated regularly using published literature, experience from NPIS telephone enquiry data, and direct clinical experience of NPIS-linked clinical departments.

A key component of the service provided by the NPIS is obtaining information on the effects and outcomes of cases of severe or unusual poisoning. This information assists in providing current and accurate advice and is continually used to update the information on TOXBASE.

Drug and chemical exposures during pregnancy can cause particular concern because these may affect the fetus as well as the mother. UKTIS, hosted by the NPIS, is a designated service providing advice to healthcare professionals and patients about potential effects on the unborn child. As well as providing information and advice, UKTIS collects new information on the potential adverse fetal effects of exposure to drugs and chemicals during pregnancy, including the therapeutic use of medicines.

The NPIS (including UKTIS) is funded primarily through government ‘grant-in-aid’ from UK health departments, with commissioning managed by UKHSA. The service also receives some contract income for providing services in other countries, as well as research income for specific projects. Providing a high quality responsive service to NHS users, including maintaining our essential and highly-used online platforms, remains an NPIS priority.

† TOXBASE® is a registered trademark of the UK National Poisons Information Service

National Poisons Information Service

The NPIS provides a 24-hour, 365 days a year, consultant-supported clinical toxicology advice service to assist healthcare workers in their diagnosis and management of poisoned patients, including those exposed in chemical incidents.

The 4 NPIS units are currently based within NHS teaching hospitals (2 in England and one each in Scotland and Wales). Birmingham, Cardiff and Newcastle participate in a 24-hour national telephone enquiry rota; the Edinburgh unit receives telephone enquiries during working hours only as its main focus is on the editing and production of TOXBASE.

The 4 units also take telephone calls about chemical exposures and operate an early warning alerting system providing advice resulting in the best possible patient care, ensuring efficient use of resources. The units liaise with the UKHSA Radiation, Chemical and Environmental Hazards Directorate (RCE) and Public Health Scotland (PHS) regarding real-time management of chemical incidents.

The service has consultant clinical toxicologist support available to advise on the management of more complex presentations and patients who are seriously unwell. This is provided by NHS consultant staff in the 4 NPIS units and colleagues from 2 other NHS Trusts (Guy's and St Thomas' NHS Foundation Trust and York Hospitals NHS Foundation Trust). These NPIS consultants also provide locally-funded specialist services in clinical toxicology in their own hospitals. The availability of this expertise is important for resilience and health security in the UK. Due to the NPIS receiving many enquiries about children and from emergency departments, UKHSA has commissioned additional support from consultants specialising in paediatrics and emergency medicine.

The primary source of information provided by the NPIS is its online database, TOXBASE, which is available without charge to all UK NHS healthcare units, including hospital departments, primary care practices and NHS patient advice services. TOXBASE is the National Institute for Health and Care Excellence (NICE) mandated, and Department of Health and Social Care recommended, initial source of poisons information for healthcare professionals in the UK. Ensuring that the information on TOXBASE is current and evidence-based is of paramount importance for patient safety and to maintain the confidence of healthcare professionals. It is essential that the great majority of enquiries are made via TOXBASE as NPIS telephone services do not have the capacity to absorb the substantial increase in telephone enquiries that would result from TOXBASE information becoming unavailable or outdated.

The TOXBASE app for mobile devices is also available without charge to UK NHS, UKHSA and Ministry of Defence (MOD) healthcare professionals and has the advantage of being available on personal mobile devices both online and offline.

While TOXBASE provides a wealth of information, it cannot provide all the answers for individual patients or complex cases and healthcare workers are encouraged to discuss such cases with the NPIS. To address this requirement, the NPIS provides a 24-hour telephone

information service for healthcare professionals using a single national telephone number (0344 892 0111). NPIS activity is reflected in TOXBASE user session data and accesses to individual entries as well as telephone enquiry numbers and consultant referrals.

Telephone enquiries are managed by specialists in poisons information (SPIs) who may have a scientific, nursing or pharmacy background and are qualified at least to degree level, with the majority also holding postgraduate qualifications in toxicology. In determining the severity of each clinical case, the SPIs use the World Health Organization (WHO)'s Poisoning Severity Score (PSS), developed by the International Programme on Chemical Safety, the European Commission and the European Association of Poisons Centres and Clinical Toxicologists (EAPCCT) (5). Enquiries about complex or severe cases, or where a review by an NPIS consultant might allow a patient either to be not admitted or sent home earlier, are referred on to NPIS consultants. Figure 1 illustrates how poisons enquiries are answered by the NPIS.

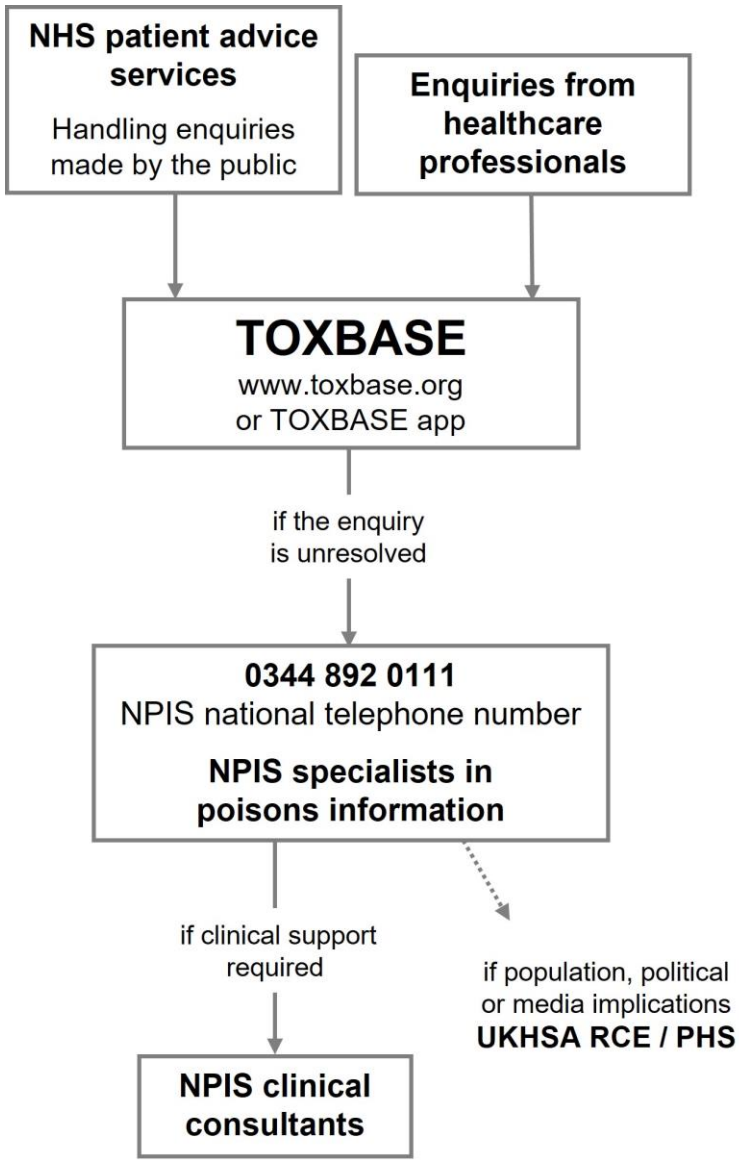
Enquiries via healthcare professionals, including the NHS patient advice services who handle poisons enquiries made by the public, should initially be made via TOXBASE. If an enquiry is unresolved using TOXBASE, then contact with NPIS should be made through the NPIS national telephone number 0344 892 0111. Calls to NPIS are handled by SPIs. Where necessary, if clinical advice is required, these specialists will refer calls to NPIS clinical toxicology consultants. If calls are received which have population, political or media implications, referral is made to UKHSA RCE or PHS as appropriate.

Audio recordings of all NPIS telephone enquiries are retained for governance purposes and clinical data are logged within a specially designed national database, the UK Poisons Information Database (UKPID). Data are uploaded to a central server, allowing access by other NPIS units that may be involved in managing a particular patient. This also allows easy collation of activity data and surveillance of the patterns of enquiries received. Details of all telephone enquiries made since 2007 are held within UKPID, making it an invaluable resource for studying the patterns of poisoning in the UK. To safeguard this data, and improve usability, development of an updated version of UKPID is ongoing.

In Northern Ireland, the Regional Medicines and Poison Information Service in Belfast provides a poisons information service during working hours while out-of-hours enquiries are referred to the NPIS. The NPIS is also contracted to provide poisons information for users in the Republic of Ireland through the provision of TOXBASE to major hospital emergency departments and to the National Poisons Information Centre (NPIC) in Dublin. The NPIS also provides direct out-of-hours telephone support to health professionals and the general public in Ireland.

Information on the potential toxicity to the unborn child from maternal exposure to drugs and chemicals in pregnancy is provided by UKTIS. Information is provided for healthcare professionals by telephone and TOXBASE, but summary advice is also openly available on the UKTIS website and public advice leaflets are held on the 'bumps' website.

Figure 1. How poisons enquiries are answered by the NPIS



The NPIS maintains a consistent approach, irrespective of the NPIS unit answering an enquiry, through a formal UK-wide strategic framework for training and governance, agreeing clinical advice and supporting the management of the service. Operating procedures are updated regularly and available to NPIS staff on a closed area of TOXBASE.

Commissioning issues are dealt with by the UKHSA NPIS Commissioning Group, while clinical issues, including clinical governance, are discussed by the NPIS Clinical Standards Group. Both of these groups meet at least quarterly and are attended by a representative of the commissioner, and a senior clinician and manager from each of the 4 units. Invitations are also extended to representatives of the NPIC in Dublin. Other senior NPIS staff are invited to attend as observers on a rotational basis.

There are regular teleconferences of the TOXBASE Editing Group to ensure consistent and nationally agreed database content. The NPIC in Dublin and the Northern Ireland Regional

Medicines and Poison Information Service also contribute to TOXBASE development and review. The UKPID User Group meets regularly to ensure the database remains an effective and reliable record of clinical enquiries to the NPIS.

To ensure a consistent and evidence-based approach to the clinical management of poisoning, all NPIS clinical and information staff are invited to attend continuing professional development (CPD) meetings. These educational meetings provide an opportunity for clinicians and SPIs to present updates on current topics, research and audit projects, and to discuss complex clinical cases and governance issues. These events occur several times a year, both virtually and face-to-face, and are hosted by all NPIS units in turn. Clinicians and SPIs are also encouraged to attend and present at international toxicology conferences such as the annual congress of the EAPCCT.

Cost benefit of NPIS

The NPIS provides timely reassurance and expertise in response to both routine and complex cases of poisonings. It is a well-used front line clinical service and an intrinsic component of the UK health security arrangements, fulfilling national and international requirements. Commissioning the NPIS uses significant resource and so it is important to justify these costs by the benefits provided by the service, such as avoidance of unnecessary hospital referrals and admissions, reduced lengths of stay, and improvements in the quality of treatment for those patients admitted. The NPIS has previously published research demonstrating its cost-effectiveness through reducing referrals to emergency department as a result of its advice (6).

NPIS activities

Overall service profile

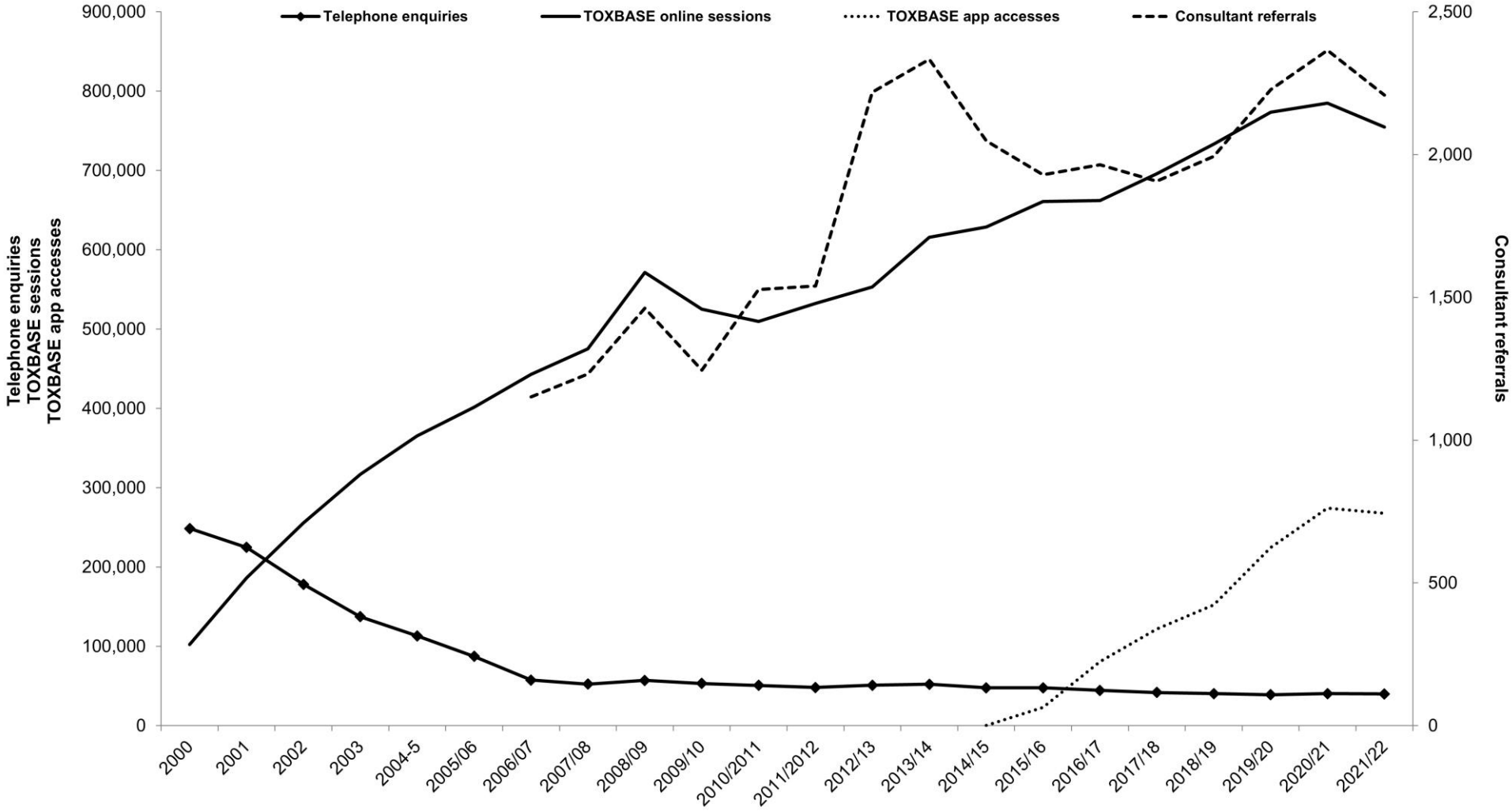
The overall activity of the NPIS in 2021 to 2022 is presented below. It is important to consider the service profile for 2021 to 2022 in the context of the very unusual years caused by the coronavirus (COVID-19) pandemic. Despite registrations for both TOXBASE online and the TOXBASE app continuing to increase in 2021 to 2022, this is the first time TOXBASE online activity has decreased year-on-year since 2010 to 2011 and only the third time a decrease in activity has occurred since TOXBASE went live on the internet in 1999. In addition, it is the first time a decrease in TOXBASE app accesses has been seen since the app's launch in 2015.

During 2021 to 2022 (changes from 2020 to 2021 in parentheses) there were:

- 7,807 (+9%) healthcare departments registered to use TOXBASE online
- 754,866 (-3.8%) TOXBASE online user sessions (defined as one login by a registered user where the user may access one or more pages several times, the average being 4)
- 2,599,241 (-2.9%) TOXBASE online page views
- 25,821 (+6.6%) individual TOXBASE app users
- 267,819 (-2.4%) TOXBASE app page accesses
- 39,083 (-1.9%) patient related telephone enquiries answered
- 2,209 (-6.6%) telephone enquiries referred to a consultant toxicologist
- 5,774 (+36.2%) TOXBASE entries written or updated

Figure 2 shows that the annual number of enquiries by all routes were lower than the previous year. Consultant referrals fell by 6.6%, TOXBASE online user sessions by 5.1%, TOXBASE app accesses by 3.7%, and telephone enquiries by 1.9%. The number of enquiries by all routes has risen steadily over the past 22 years; it is not anticipated that the lower numbers for 2021 to 2022 will alter the overall trend.

Figure 2. Number of TOXBASE online sessions, TOXBASE app accesses, telephone enquiries and consultant referrals between 2000 and 2021 to 2022



UK service profile

In 2021 to 2022, there were 676,509 TOXBASE online user sessions generated in the UK compared to 712,339 in 2020 to 2021 (-5.1%); 63% of all UK user sessions to TOXBASE online were generated by emergency departments. The majority of accesses to the TOXBASE app were from UK ambulance services (56.3%), and UK patient advice services were most likely to contact the NPIS national helpline number (39.1%). The total number of TOXBASE online user sessions, TOXBASE app accesses and patient related telephone enquiries generated by UK users of NPIS services are shown by workplace type in Table 1.

During 2021 to 2022 (changes from 2020 to 2021 in parentheses) there were:

- 35,830 (-5.1%) TOXBASE online UK user sessions, including 16,343 fewer sessions from telephone NHS advice services, 11,477 fewer sessions from hospital users, and 4,712 fewer sessions from primary care
- 9,243 (-3.7%) UK TOXBASE app accesses, including 6,506 fewer accesses from hospital users, 2,491 fewer accesses from ambulance service users, and 2,508 fewer accesses from primary care
- 2,262 more enquiries were received from NHS patient advice services and other miscellaneous user categories.
- 770 (-1.9%) telephone enquiries received, including 1,845 fewer enquiries from telephone triage services, and 581 fewer enquiries from GPs
- 709 more enquiries were received from hospital users

Whilst demand for NPIS services decreased slightly during the COVID-19 pandemic, the information sought by UK healthcare professionals did not differ from previous years. Table 2 lists the most common subjects of views/enquiries received across all routes of access to NPIS (TOXBASE online, TOXBASE app and phone calls) and it shows that UK healthcare professionals continued to need most help managing poisonings from analgesics and antidepressants. Indeed, accesses to the online paracetamol and ibuprofen entries on TOXBASE increased in 2021 to 2022 by 5.0% and 4.9%, respectively, when accesses to all other commonly viewed product pages decreased. There was also an increase in paracetamol and ibuprofen accesses via the app of 9.0% and 3.7%, respectively, compared to 2020 to 2021, despite an overall decrease in app accesses. This finding may reflect an increased reliance of the UK population on over-the-counter analgesics during the pandemic when access to GP and dentistry services was restricted, as this pattern is also seen in the telephone enquiry data, with enquiries to paracetamol and ibuprofen increasing by 14% and 25% compared to 2020 to 2021.

Table 1. Use of NPIS services by workplace type as of 31 March 2022 (UK only)

Workplace type	Number of TOXBASE online user sessions (% of total)
Emergency department	427,057 (63.1)
NHS patient advice services	124,125 (18.4)
Ambulance	68,627 (10.1)
Primary care	34,176 (5.1)
All others	22,524 (3.3)

Workplace type	Number of TOXBASE app page accesses (% of total)
Ambulance	91,156 (52.3)
Emergency department	32,027 (18.4)
Admissions / Assessment	11,351 (6.5)
General Practice	6,937 (3.9)
ITU / HDU	6,111 (3.5)
All others	26,789 (15.4)

Workplace type	Number of patient related telephone enquiries (% of total)
NHS patient advice services	15,264 (39.1)
Hospital	10,122 (25.9)
General Practice	6,248 (16.0)
Ambulance	3,918 (10.0)
Prison	1,163 (2.9)
All others	2,368 (6.1)

Table 2. Most commonly viewed product pages on TOXBASE online and the TOXBASE app, and the most common agents involved in telephone enquiries in 2021 to 2022 (UK only)

Rank	TOXBASE online	Number of page views
1	Paracetamol	191,410
2	Ibuprofen	52,356
3	Sertraline	37,691
4	Codeine	30,724
5	Diazepam	27,971
6	Quetiapine	24,422
7	Pregabalin	24,177
8	Propranolol	22,015
9	Mirtazapine	21,049
10	Amitriptyline	19,065

Rank	TOXBASE app	Number of accesses
1	Paracetamol	23,995
2	Sertraline	5,540
3	Ibuprofen	4,693
4	Amitriptyline	4,417
5	Diazepam	3,970
6	Quetiapine	3,729
7	Mirtazapine	3,473
8	Codeine	3,202
9	Pregabalin	2,968
10	Zopiclone	2,751

Rank	Telephone enquiries	Number of calls
1	Paracetamol	7,636
2	Ibuprofen	3,248
3	Codeine	2,103
4	Naproxen	933
5	Sertraline	924
6	Mirtazapine	720
7	Multivitamins	662
8	Diazepam	598
9	Quetiapine	585
10	Aspirin	583

In addition to TOXBASE product pages, additional pages providing guidance on antidote use are available to our users. In 2021 to 2022, via TOXBASE online, there were 46,054 accesses to antidote pages compared to 44,148 in 2020 to 2021, a 4.3% increase. There was no change between years in the list of most commonly accessed antidote pages. Of note, UK accesses to information on adder antivenom in 2021 to 2022 increased by 65% compared to 2020 to 2021.

Accesses to antidote pages via the TOXBASE app decreased substantially by 57.5% (5,365 down to 2,280) and, logically, so did accesses to all the most commonly accessed antidote pages. This year Prussian blue, calcium chloride and calcium gluconate were replaced by fomepizole, pralidoxime and methylene blue in the list of most commonly accessed antidote pages via the TOXBASE App. Table 3 lists the most commonly accessed antidote pages on TOXBASE online and the app.

Table 3. Most commonly accessed antidote pages on TOXBASE online and the TOXBASE app in 2021 to 2022 (UK only)

Rank	TOXBASE online	Number of page views
1	Acetylcysteine	33,675
2	Naloxone	1,095
3	Fomepizole	885
4	Flumazenil	650
5	Antivenom (adder)	594
6	Desferrioxamine	527
7	Procyclidine	437
8	Ethanol	294
9	Cyanide antidotes	205
10	Digoxin antibodies	186

Rank	TOXBASE app	Number of page accesses
1	Naloxone	321
2	Acetylcysteine	271
3	Atropine	182
4	Flumazenil	105
5	Glucagon	97
6	Methylene blue	74
7	Cyanide antidotes	69
8	Fomepizole	66
9	Ethanol	57
10	Pralidoxime	42

TOXBASE online in the UK

As of 31 March 2022, there were 7,537 healthcare departments registered to use TOXBASE online in the UK (+9% on 31 March 2021). In 2021 to 2022 there were over 2.26 million individual page accesses via TOXBASE online:

- 20,397 currently active product pages of which 11,983 (58.8%) different pages were viewed a total of 1,379,167 times
- 167 currently active antidote pages of which 147 (88.0%) different antidote pages were viewed a total of 46,054 times
- 2,459 currently active further information pages of which 1,684 (64.9%) different information pages were viewed a total of 835,580 times
- 1,009 common features and management pages
- 5,774 pages written or updated in 2021 to 2022

The most common product page and antidote accesses are detailed in Tables 2 and 3 above, respectively. Table 2 shows that paracetamol is the most frequently accessed product page. The paracetamol product page is one of the most complex on TOXBASE. A series of links are provided to allow users to navigate to the appropriate management advice they need, relative to the case they are treating. Table 4 shows which paracetamol management advice our users used. The data suggests that adults (and children aged 6-years and over) are most likely to present to healthcare facilities within 8 hours following an acute paracetamol ingestion (representing 36.6% of all accesses to the paracetamol product page), and that overdose following intravenous exposures rarely occurs (0.5%).

Our dosage calculator is regularly accessed by UK users (22.7% of all sessions include use of the calculator) as are our toxic dose tables - the toxic dose information pages for NSAIDs (26,342), opioid (23,336) and SSRIs (26,342) were most commonly accessed.

Table 4. Paracetamol management information pages accessed in 2021 to 2022 (UK only)

Paracetamol management information page	Number of page accesses (% of total)
Adults and children (≥6-years) if less than 8 hours since acute ingestion	68,867 (36.6%)
Adults and children (≥6-years) if 8 to 24 hours since acute ingestion	32,499 (17.3%)
Adults and children (≥6-years) if more than 24 hours since acute ingestion	13,283 (7.1%)
Children (<6-years) if less than 8 hours since acute ingestion	14,900 (7.9%)
Children (<6-years) if 8 to 24 hours since acute ingestion	9,031 (4.8%)
Children (<6-years) if more than 24 hours since acute ingestion	4,713 (2.5%)
All patients staggered overdose	27,371 (14.5%)
All patients therapeutic excess	16,649 (8.8%)
All patients intravenous overdose	861 (0.5%)

TOXBASE app for iOS and Android mobile devices

The TOXBASE app offers convenient mobile access to up to date poisons advice at the point of care. It is synchronised with online TOXBASE content and provides offline access when no internet connection is available, making it an invaluable resource for emergency responders. The app is available from the iOS app store and Google Play.

The design of the app is regularly updated to improve usability, and to ensure compatibility with the ever-changing market of mobile devices. Figure 3 shows examples of screenshots from the current app (the dosulepin entry on an Android device, and the features and management section of the primidone entry on an iPad).

The app provides NHS, UKHSA and MOD users with full and free TOXBASE access on validation of professional email addresses. For other users, a paid version of the app is available. Funding from the small fee charged contributes towards ongoing development and hosting costs.

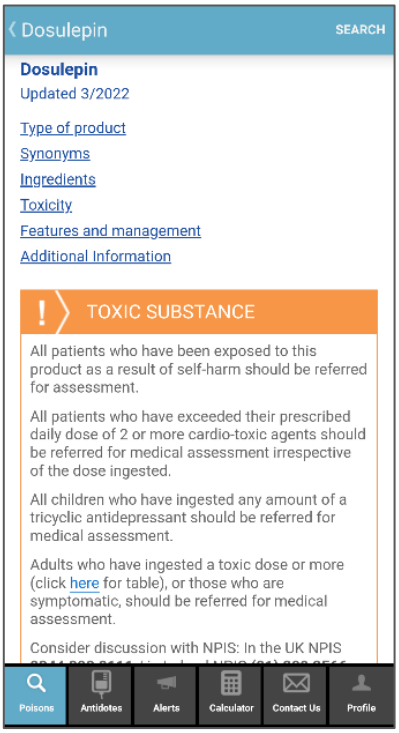
The number of subscribers changes daily as accounts are created, lapse and are renewed; on 31 March 2022 there were 25,821 current subscribers (24,935; 96.6% NHS/UKHSA/MOD and 886; 3.4% other). NPIS clinicians and SPIs have access to the app to support their NPIS

duties and to increase service resilience in case of interruptions to internet access. The most frequent UK workplace types are shown in Table 1 above; ambulance personnel were the most common.

During the 2021 to 2022 reporting year, app subscribers (excluding NPIS users) accessed 267,819 pages including 193,389 product entries and 74,430 antidote and information entries. Tables 2 and 3 above show the top UK product and antidote pages accessed on the app.

There was a 6.6% increase in the number of subscribers from the previous year and a 2.4% decrease in the number of pages accessed, as shown in Figure 4.

Figure 3. TOXBASE app screenshots



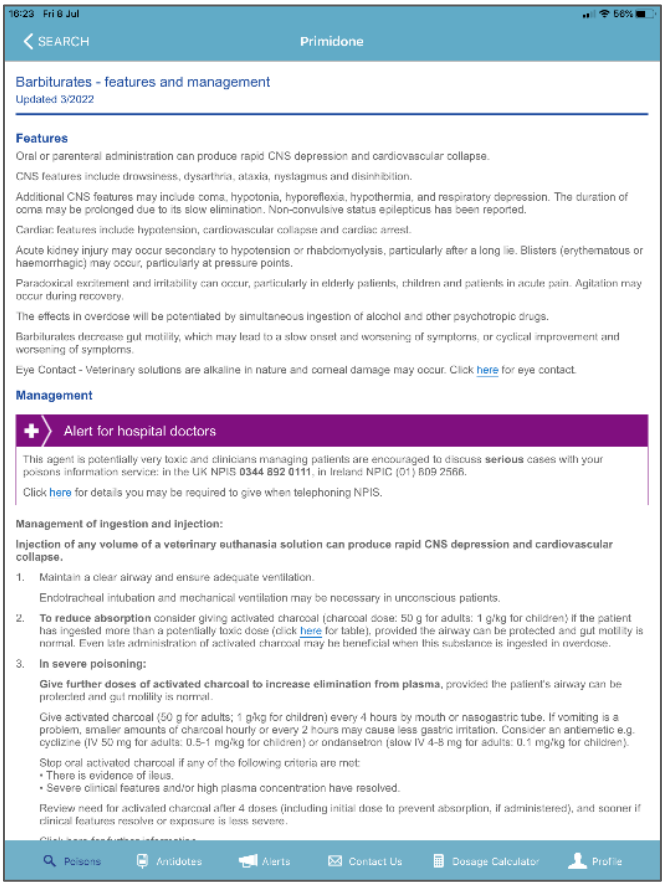
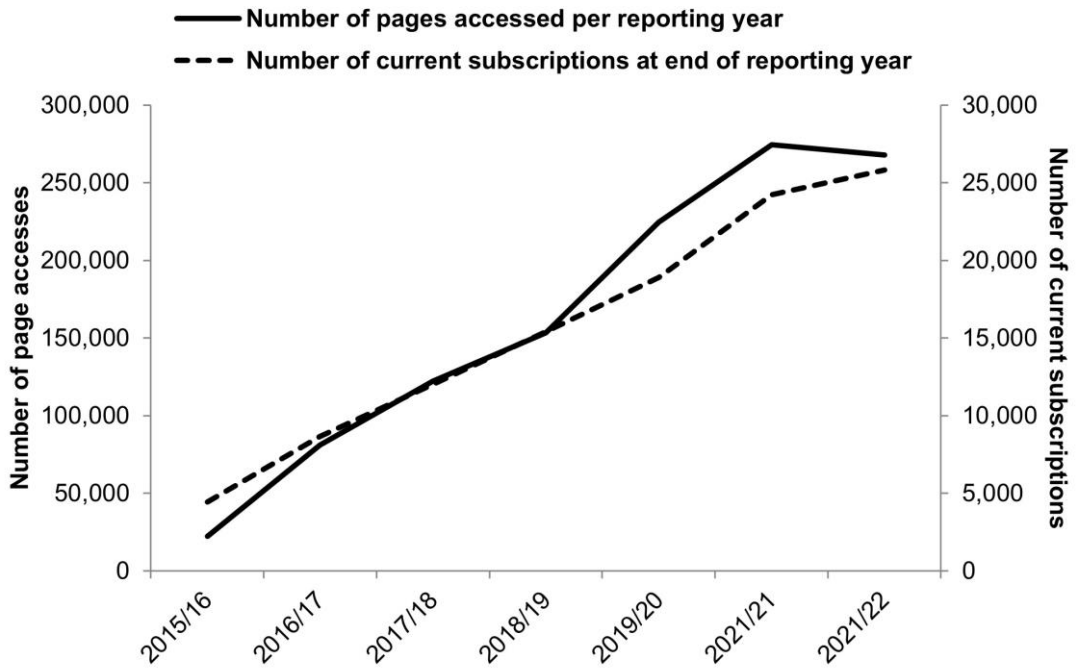


Figure 4. TOXBASE app subscriptions and pages accessed between 2015 to 2016 and 2021 to 2022



NPIS national telephone enquiry helpline

TOXBASE is the NICE mandated and Department of Health recommended initial source of poisons information for healthcare professionals in the UK. It is supported by the NPIS national telephone enquiry helpline, available for complicated enquiries due to multiple agents ingested, patient co-morbidities, or where the patient is severely unwell. The enquiry line provides 24/7 access to advice from SPIs and, when required, a network of UK consultant toxicologists.

In 2021 to 2022 there were 39,083 enquiries involving patients that required specialist input. There were more female than male patients (54% vs 46%, respectively). Figure 5 shows the age ranges of the patients involved; patients aged 9 years or less were most common, representing 26% (10,276) of all poisoned patients. Poisonings were predominantly accidental (15,682; 40%; Table 5), by ingestion (51,644; 89%; Table 6), and occurred at home (33,812; 86.5%; Table 7).

The national telephone enquiry helpline continues to be an invaluable resource for users and is vital to a functioning poisons information service in the UK. Providing urgent advice regarding the management of severely unwell patients at any time of the day, this is especially true during the early hours of the morning. During these hours (between midnight and 8 am) specialists answer a higher proportion of enquiries about moderate or severe poisoning compared to calls answered during the day (8 am to 4 pm [$z=14.16$; $p<0.001$]) or

evening (4 pm to midnight [z=13.64; p<0.001]). There is no difference between the proportion of moderate and severe calls received during the day compared to the evening (z=0.59; p=0.55) and the volume of enquiries received remains high well into late evening.

Figure 5. Age ranges of patients reported to NPIS during telephone enquiries in 2021 to 2022

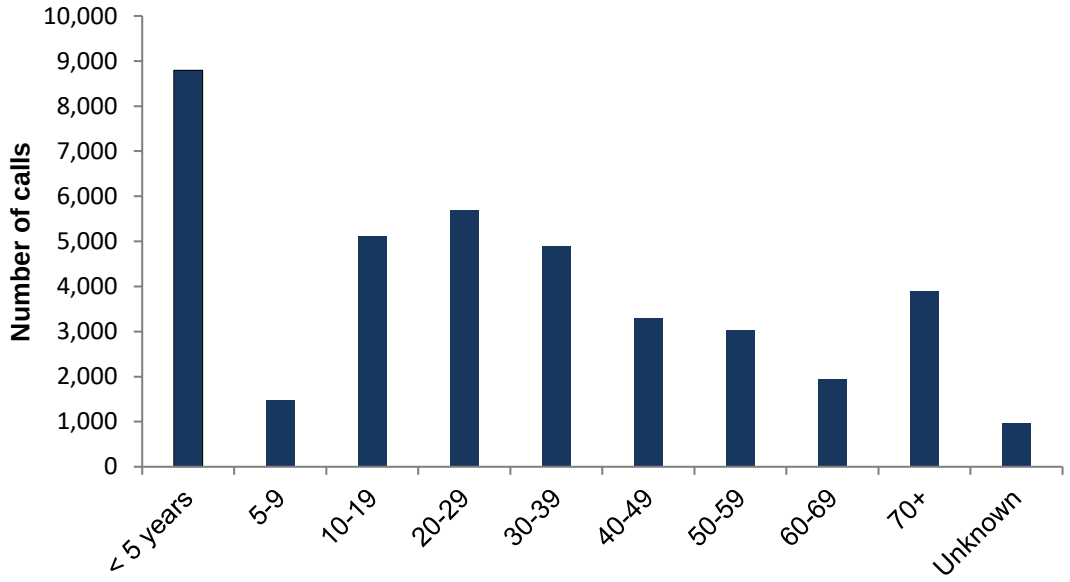


Table 5. Circumstances of poisonings reported to the NPIS during telephone enquiries in 2021 to 2022

Circumstance	Number (% of total)
Unintentional	15,682 (40.1)
Therapeutic error	9,806 (25.1)
Intentional (other)*	7,427 (19.0)
Intentional deliberate self-harm (new 1 January 2022)*	2,005 (5.1)
Unknown	954 (2.4)
Other	909 (2.3)
Intentional therapeutic excess (new 1 January 2022)*	843 (2.2)
Recreational misuse	692 (1.8)
Adverse reaction	355 (0.9)
Medical error (new 1 January 2022)*	283 (0.7)
General information	91 (0.2)
Malicious potential (new 1 January 2022)*	36 (0.1)

* the definitions of circumstance used by NPIS to classify poisoning cases were expanded in January 2022, compared to previous years, to facilitate more precise reporting

Table 6. Exposure route of poisonings reported to the NPIS during telephone enquiries in 2021 to 2022

Route of exposure	Number* (% of total)
Ingestion	51,644 (89.1)
Inhalation	2,285 (3.9)
Skin contact	1,287 (2.2)
Eye contact	945 (1.6)
Other	457 (0.8)
Subcutaneous	331 (0.6)
Intravenous	295 (0.5)
Insufflation	215 (0.4)
Intramuscular	164 (0.3)
Bite or sting	150 (0.3)
Needlestick	98 (0.2)
No exposure	68 (0.1)
Sublingual	10 (0.1)
Intrathecal	4 (0.1)

* the number of exposure routes exceeds the total number of enquiries because many patients are exposed via multiple routes during one episode of poisoning, for example ingestion and skin contact, or inhalation and eye contact

Table 7. Location of poisonings reported to the NPIS during telephone enquiries in 2021 to 2022

Location	Number (% of total)
Home/domestic	33,812 (86.5)
Prison	1,122 (2.9)
Nursing/care home	869 (2.2)
Work	799 (2.0)
Hospital	704 (1.8)
Public area	504 (1.3)
School	496 (1.3)
Unknown	423 (1.1)
Other	237 (0.6)
GP surgery	75 (0.2)
Agricultural workplace	42 (0.1)

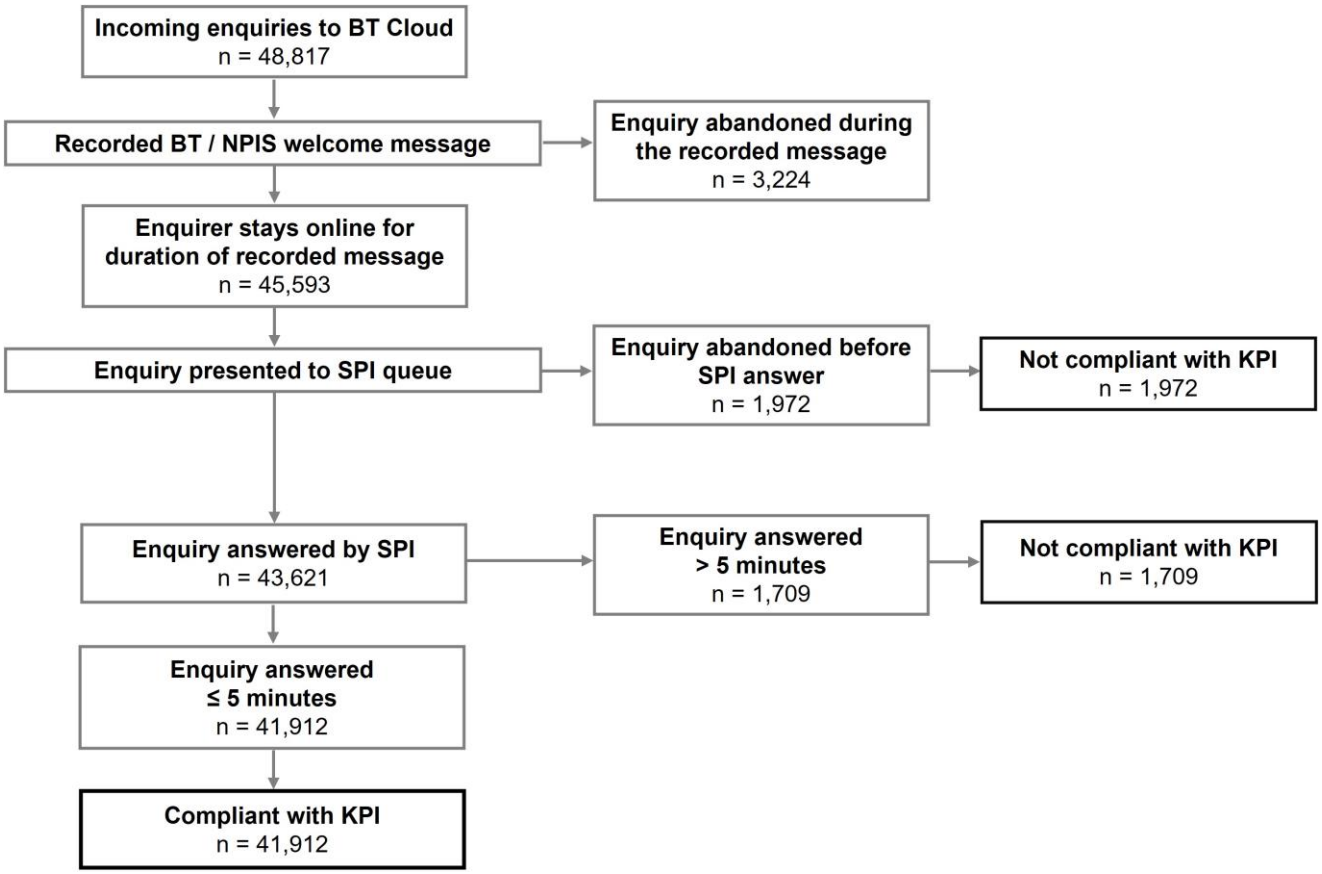
Telephone enquiry handling

The NPIS uses a bespoke BT Cloud Contact™ system to deliver telephone enquiries received from healthcare professionals across the UK via a single number (0344 892 0111) to SPIs in the 4 units. This system has several benefits including conference call functionality and a comprehensive reporting tool. The latter enables close monitoring of workload, wait times, dropped (abandoned) calls and call duration at national, individual unit and individual SPI level. It also allows assessment of compliance with the UKHSA stipulated key performance indicator (KPI) that 95% of telephone requests will be answered within 5 minutes of the call being made. Not all telephone enquiries received are recorded onto the enquiry logging system (UKPID). Examples of these enquiries include line tests, repeat calls made by healthcare professionals with additional case specific details and healthcare professionals contacting the NPIS to provide follow-up data on previously discussed cases.

Telephone enquiry data were assessed retrospectively for the period 1 April 2021 to 31 March 2022 using the BT Cloud data reporting tool and analysed using Microsoft Excel.

Figure 6 summarises the flow of telephone enquiries through the BT platform. 48,817 incoming enquiries were logged to BT Cloud. 3,224 enquiries were abandoned during the recorded BT/NPIS welcome message. 45,593 enquirers stayed on the line for the duration of the message. After the message, enquiries are presented to the SPI queue. 1,972 enquiries were abandoned before being answered by a SPI; these enquiries are considered not compliant with our KPI. 43,621 enquiries were answered by a SPI. Of these the delay to answering was greater than 5 minutes for 1,709 enquiries; these enquiries are also considered not compliant with our KPI. 41,912 enquiries were answered in 5 minutes or less. These calls are considered compliant with our KPI.

Figure 6. Summary of telephone enquiry flow through the BT platform in 2021 to 2022



The median wait time for a call presented to the SPI queue to be either answered or abandoned was 39 seconds (interquartile range [IQR] 29-63 seconds). Less than 1% (427) of enquirers waited longer than 10 minutes for their call to be answered. Of the 43,621 enquiries that were answered, the median talk time was 4.8 minutes (287 seconds, IQR 200-430 seconds) with 11.6% of answered enquiries lasting 10 minutes or more (5,038). The longest enquiry lasted one hour and 24 minutes. The proportion of enquiries that were abandoned before being answered by a SPI was low at 4.3% (1,972), the median wait time before abandonment was 59 seconds (IQR, 23 to 198 seconds). Seventy-five (3.8%) users waited in the SPI queue for more than 10 minutes before abandoning their call. There were 3,681 (8.1%) enquiries that were not answered within 5 minutes, the majority (2,176, 59.1%) of which were received between midday and 10 pm. These data demonstrate that the NPIS provides a robust service, answering 95.6% of all presented enquiries and the large majority (91.9%) within a wait time of 5 minutes or less. The service, however, is tasked to answer 95% of enquiries within 5 minutes which has not been possible in recent times due to resource constraints during busy periods which have caused delays in answering queries within the specified target time.

Consultant referrals

Daytime cover of the national telephone number is provided by SPIs in each NPIS unit, who are supported by consultants, academic clinical staff and/or specialist registrars, with appropriate supervision where needed.

The NPIS operates an out-of-hours national consultant clinical toxicology on-call rota for the UK and the Republic of Ireland. There are 16 consultant clinical toxicologists (13 from the 4 NPIS units and 3 from hospitals in York and London) contributing to out-of-hours cover (weekdays 18:00-09:00, weekends and public holidays). All are involved in the care of poisoned patients in their own local NHS hospitals. A nationally agreed protocol is used to determine when SPIs should refer enquiries to a consultant. The national consultant rota is managed from NPIS Edinburgh.

Units provide cross-cover in emergencies and occasionally support colleagues in other units. NPIS Edinburgh also provides consultant support for enquiries from Northern Ireland during the working week. Details of all telephone calls to the NPIS are logged on the UKPID database and sent to the relevant consultant for local or national audit and checking. In addition, consultants keep contemporaneous local records of advice given which are added to the records by the NPIS unit that took the original call.

There were 2,209 referrals to NPIS consultants in 2021 to 2022 which represents 5.7% of all telephone enquiries. Of these 1,160 (52.5%) were received during working hours and 1,049 (47.5%) out-of-hours. The median number of referrals per day was 6 (IQR 4). By far the most consultant referral calls - 2,046 (92.6%) - came from hospitals (Table 8), with calls from GPs/primary care (78; 3.5%) and NHS patient advice services (46; 2.1%) being the second and third most common sources respectively.

Table 9 shows the most common types of agents involved in referrals to consultants. The list reflects both agents that are commonly ingested and those associated with more complex poisoning where consultant input into patient care is often required. A referral to a consultant may also be made when a consultant review may avoid the patient being referred to hospital or allow earlier discharge than normal. Analysis of consultant referrals is used to improve the services offered by the NPIS, in particular TOXBASE. Issues highlighted by difficult or complex calls are discussed among NPIS staff at regular TOXBASE Editing Group meetings which enable necessary improvements to improve the advice provided on TOXBASE.

Table 8. NPIS consultant referrals from hospital by department in 2021 to 2022

Source	Number of referrals from hospital (% of total hospital referrals: 1,955)
Adult emergency departments	892 (40.4)
Intensive care units	472 (21.4)
Paediatrics	294 (13.3)
Other hospital units	137 (6.2)
Admission/assessment units	112 (5.1)
General medicine	85 (3.8)
Medicines information and pharmacy	28 (1.3)
Unspecified hospital units	26 (1.2)

Table 9. Agents commonly involved in NPIS consultant referrals in 2021 to 2022

Rank	Agent	Number of referrals (% of total referrals: 2,366)
1	Paracetamol (inc. combination products)	519 (23.5)
2	Drugs of misuse	152 (6.9)
3	Amlodipine	89 (4.1)
4	Ibuprofen	85 (3.8)
5	Ethylene glycol/methanol/antifreeze	74 (3.3)
6	Digoxin	73 (3.3)
7	Propranolol	70 (3.2)
8	Bites and stings	67 (3.1)
9	Venlafaxine	64 (2.9)
10	Mirtazapine	61 (2.8)

The NPIS national out-of-hours on-call consultant rota continues to work well. Frequent contact by email and telephone, together with regular educational meetings, helps to ensure consistency of advice and patient care. Information gleaned from analysis of the enquiries has assisted in identifying toxicological and methodological problems, improving the clarity of TOXBASE entries, and informing the need for research in a number of areas.

NPIS Product Data Centre

NPIS Birmingham is responsible for collecting and disseminating chemical safety information to other UK Poison Centres. The unit does this without dedicated resourcing and therefore on a best endeavours basis.

On 1 January 2021, Annex VIII of EU Classification, Labelling and Packaging Regulation (1272/2008) was implemented in Northern Ireland. This has meant that the UK is currently operating a dual system of chemical safety information submission.

Whether information is submitted in the harmonised European format for Northern Ireland, or the non-harmonised format for Great Britain, this is all securely held on the NPIS Product Data Centre, to which all NPIS staff have 24-hour access. This composition information is used to advise healthcare professionals contacting the NPIS for the acute management of poisoned patients as well as to update TOXBASE, enabling end-users to obtain specific advice on many common products.

In 2021 to 2022 a total of 26,777 (9,799 of which were made in the EU harmonised format) submissions were made to the NPIS, with the Product Data Centre now holding composition information on more than 337,000 products.

Operating a dual system for chemical safety submission has been challenging for NPIS at both an administrative and technical level. Issues have included providing clarity for stakeholders in industry so that they are aware of their obligations under this legislation. In addition, considerable time has been required to support industry to meet the technical challenges of submitting EU specified harmonised information directly to the NPIS national submission system. This has been particularly challenging as following EU Exit, the UK no longer has access to the centralised ECHA Poison Centre Notification Portal.

Electronic engagement

The NPIS has a long history of engaging with service users electronically, going back as far as the early 1980s when TOXBASE was first developed as a response to increasing numbers of poisons enquiries. TOXBASE was, at that time, revolutionary in information delivery for poisons information.

Forty years later the TOXBASE website and the TOXBASE app for Android and iOS remain a unique format for poisons information provision internationally.

UKTIS deliver information to healthcare professionals via the UKTIS website and provide lay information at the ‘bumps’ website.

The @TOXBASE Twitter account was launched in 2020. Utilising this social marketing tool has allowed the NPIS to connect and better engage with our user base, raising global awareness and signposting potential new users to our service.

The NPIS website is focused on providing information to our stakeholders. It holds information on the structure and function of the NPIS and details the range of services offered to healthcare professionals on all aspects of poisoning and links to affiliated organisations and relevant websites. Visitors to the website can download NPIS publications, including annual reports dating back to 2004. The website was created and is maintained by NPIS Birmingham with collaboration from the other units. Examples of research undertaken by the NPIS and presented at international toxicology conferences are also now accessible on the website. Members of the public are signposted to appropriate sources of emergency advice as well as provided with free access to leaflets and posters about poisoning in the home and garden. In addition, information specifically for industry who engage with NPIS has been made available on the website to clarify the requirements of both UK and EU specific legislation as a consequence of the UK's departure from the EU. Between April 2021 and March 2022 the site had 96,100 visitors, there were 107,000 page views, and the most popular pages viewed were written for healthcare and members of public. Visitors came predominantly from the UK, United States, China and Germany.

TOXBASE overseas

As of 31 March 2022, there were 256 departments registered for TOXBASE online and 1,017 TOXBASE app individual registered users from overseas.

In 2021 to 2022 there were 78,357 TOXBASE online user sessions from users in 55 different countries; Brazil, Ireland and Australia made the most use of TOXBASE. Overseas users made 232,417 accesses to 8,524 different product pages online; the most accessed products were paracetamol, clonazepam, and sertraline. TOXBASE app users, in 79 different countries, made 18,890 product page accesses to 1,915 different product pages; the most commonly accessed products via the app were paracetamol, quetiapine and ibuprofen, as shown in Table 10.

TOXBASE continues to be a well-regarded source of poisons information internationally and its international use has grown steadily. Paid subscriptions to TOXBASE online are available, though they represent only 25% of our overseas users. Paid subscriptions enable us to continue with our ethical subscription model which allows us to offer TOXBASE at no cost to poisons centres within low-income countries, improving resilience and capacity in poison centres and hospitals in these countries.

Table 10. Top product pages accessed by overseas users via TOXBASE online and the TOXBASE app in 2021 to 2022

Rank	Product page	Number of TOXBASE online accesses
1	Paracetamol	8,963
2	Clonazepam	4,591
3	Sertraline	3,969
4	Quetiapine	3,501
5	Amitriptyline	2,936
6	Fluoxetine	2,584
7	Ibuprofen	2,457
8	Escitalopram	2,276
9	Diazepam	2,267
10	Carbamazepine	2,102

Rank	Product page	Number of TOXBASE app accesses
1	Paracetamol	925
2	Quetiapine	364
3	Ibuprofen	237
4	Clonazepam	229
5	Sertraline	229
6	Amlodipine	224
7	Amitriptyline	202
8	Escitalopram	192
9	Olanzapine	185
10	Carbamazepine	178

UK Teratology Information Service

UKTIS is the designated UK source of expert advice regarding medication and chemical exposures in pregnancy for women and healthcare professionals. A small number of medicines should be avoided during pregnancy due to their teratogenic effects. However, many women need to take medicines in pregnancy to control chronic or acute health conditions to maintain their own health and that of their unborn baby. UKTIS critically appraises the available pregnancy safety data, which is often limited and of varying quality, to produce summary documents: monographs for healthcare workers and 'bumps' (Best Use of Medicines in Pregnancy Summary) patient information. UKTIS provides a telephone service for individual queries from healthcare providers regarding the risks and benefits of medication use in pregnancy. UKTIS also undertakes surveillance for teratogenic signal detection and is highly active in several national and international research activities in the area of reproductive toxicity.

Service activity

UKTIS provides detailed, fully referenced, systematic evidence reviews providing critical appraisal of the published data for almost 700 drug and chemical exposures for registered health professionals via TOXBASE, with abstracts of these documents openly available on the UKTIS website. The service also provides corresponding lay information at the 'bumps' website. This information is written and maintained by a small team of experienced scientists and an obstetric clinician. UKTIS online resources have become the preferred method of accessing pregnancy safety data by healthcare providers. The dedicated phone line for pregnancy related enquiries allows discussion with a scientific expert in teratology or, for more complex cases, a consultant teratologist/obstetrician.

In 2021 to 2022, UKTIS handled over 3 million information requests when considering telephone enquiries and online accesses together. Hits on information leaflets on both UKTIS and 'bumps' as well as the number of telephone enquiries were increased in 2021 to 2022 when compared to 2020 to 2021 (Table 11). The promotional campaign carried out by UKTIS as part of the IMI ConcePTION project, the COVID 19 Vaccination in Pregnancy national programme, and the Antivirals in Pregnancy Registry likely highlighted the service and increased the number of visitors to both the healthcare professional and patient facing websites. Further details of these activities are discussed below.

Table 11. Telephone enquiries, TOXBASE accesses for UKTIS reviews, UKTIS full systematic evidence reviews, and 'bumps' patient information leaflet downloads for the past 5 years

Year	Number of telephone enquiries (%)
2017 to 2018	1,689 (0.06)
2018 to 2019	1,432 (0.05)
2019 to 2020	1,153 (0.07)
2020 to 2021	852 (0.03)
2021 to 2022	993 (0.03)

Year	Number of TOXBASE accesses for UKTIS reviews (%)
2017 to 2018	38,461 (1.4)
2018 to 2019	34,729 (1.3)
2019 to 2020	29,264 (2.0)
2020 to 2021	31,078 (1.1)
2021 to 2022	29,117 (0.9)

Year	Number of UKTIS full systematic evidence reviews (%)
2017 to 2018	541,476 (20.0)
2018 to 2019	590,805 (21.4)
2019 to 2020	191,136 (13.1)
2020 to 2021	894,750 (32.2)
2021 to 2022	1,199,357 (37.6)

Year	Number of 'bumps' patient information leaflet downloads (%)
2017 to 2018	2,138,290 (79.0)
2018 to 2019	2,134,774 (77.3)
2019 to 2020	1,239,794 (84.8)
2020 to 2021	1,848,974 (66.6)
2021 to 2022	1,995,918 (61.4)

Year	Total information requests
2017 to 2018	2,719,916
2018 to 2019	2,761,740
2019 to 2020	1,461,347
2020 to 2021	2,775,654
2021 to 2022	3,185,385

UKTIS is a key stakeholder in collaborating with other UK organisations within the Medicines and Healthcare products Regulatory Agency (MHRA) Safer Medicines in Pregnancy and Breastfeeding Consortium and the MHRA Medicines in Women's Health Expert Advisory Group. In 2021 to 2022 UKTIS continued to support NHS Digital with the nhs.uk medicines A-Z pages, reviewing pregnancy and fertility content for 120 product pages.

In 2021 to 2022, UKTIS staff supported training events at UKMI, Drug Safety Research Unit, Gynaecological Visiting Society, and School of Pharmacy at Cardiff University and in providing webinars for the MacDonald UK Obstetric Medicine Society and the UK Maternal Cardiology Society. We also participated in webinars in relation to COVID-19 in pregnancy including national webinars run by the Royal College of Obstetricians and Gynaecologists and Royal College of Midwives.

Response to COVID-19

Treatment of COVID-19: standard and novel treatments

UKTIS has continued to support the national provision of COVID-19 related information to pregnant women and their healthcare providers. The service has provided an ongoing and consistent contribution to national decision-making on the use of novel COVID-19 treatments to treat infections in pregnant women during the ongoing pandemic. UKTIS has created accessible information on the new antiviral treatments for NHS Digital, and COVID-19 treatments for use in pregnancy, for the RECOVERY trial. Throughout 2021 to 2022, UKTIS provided timely updates of information on the safety of COVID-19 vaccinations in pregnancy for pregnant women and healthcare professionals, as it became available.

In February 2022, UKTIS was commissioned by the MHRA to set up the UK COVID-19 Antivirals Pregnancy Registry. UKTIS are currently seeking pregnant women who may have been exposed to antivirals for the treatment of COVID-19 to monitor the safety of these novel drugs.

COVID-19 vaccination

UKTIS has been involved in helping the UKHSA analyse COVID-19 vaccination data through monthly meetings with UKHSA and relevant public health representatives from the devolved nations. Our role has been to advise on how best to analyse national datasets and on the reporting of pregnancy outcomes.

Together with the UK Obstetric Surveillance Survey and the UKHSA Vaccines in Pregnancy group we have collected data from women receiving COVID-19 vaccination in pregnancy during the first 3 to 4 months of the vaccination programme (prior to data linkage). Information on the effects in early pregnancy have been analysed and submission of a paper investigating the miscarriage rates of those women receiving the Pfizer, Astra Zeneca and Moderna vaccinations in pregnancy is due to be submitted to BMJ Open imminently. A

publication investigating the risk of birth defects following first trimester in utero exposure to COVID-19 is also in preparation.

In March 2020, the head of UKTIS began working as a collaborator on a successful NIHR grant application for an 18-month project, starting in 2021, to assess the uptake, effectiveness and safety of COVID-19 vaccines including boosters in pregnant women, to provide easily understandable timely information for clinicians, pregnant women and policy makers.

Research and development

UKTIS provide input and direction on national and international platforms to improve pregnancy data collection, and the development of novel methods for signal detection. Collaborative work has continued with the European Network of Teratology Services, the National Congenital Anomaly Rare Disease Registration Service (NCARDRS) and the NHS Business Services Authority (NHSBSA).

UKTIS remain active in a 5-year European project, ConcePTION (imi-conception.eu), supported by the Innovative Medicines Initiative. The project aims to establish a research ecosystem to generate and disseminate reliable evidence-based information about the risks and benefits of medication use in pregnancy and breastfeeding. UKTIS is a key stakeholder of the project outputs and is also actively involved in several of the key work packages. UKTIS has led the development of a publication describing the core data elements required for the performance of pregnancy pharmacovigilance (PregPV) studies. The long-term aim is for approval and a recommended data standard for future PregPV studies. UKTIS has been a key contributor to the development of study protocols and statistical analysis plans utilising the CDE data standard to assess the safety of medications used to treat multiple sclerosis in pregnancy, and for the validation of gestational medication exposure and pregnancy outcome data collected from self-reporters. UKTIS has produced landscape analyses of current methods and practices and developed a toolkit and guidance for other PregPV centres to utilise for communication/promotion purposes. UKTIS is also involved with the development of a website for up to date information about drug use during pregnancy and lactation.

Future work

Currently work is underway to update the UKTIS website. The new site will offer improved user access to medicines in pregnancy related information. A new layout and a more comprehensive search functionality as well as easier access to full systematic evidence reviews will be available to healthcare professionals.

Clinical governance

Patient safety and the quality of the clinical services we provide remain the highest priorities within NPIS. We have described our approaches to clinical governance in detail in previous annual reports, including analysis of critical events and a comprehensive system of user feedback. This section includes details of critical events reviewed and user feedback received during 2021 to 2022.

Analysis of critical events

During 2021 to 2022 there were 9 events discussed nationally; 4 involved the advice provided on TOXBASE that related to guidance on the use of 2 antidotes (methylene blue and uridine triacetate) and 2 exposures (nitroxynil parenteral injections and a paracetamol ingestion).

It was noted that there was guidance on use of methylene blue available to health professionals via TOXBASE and that telephone advice was also available, including from a consultant; none of these sources were accessed for the case in question.

Adjustments were made to the uridine triacetate antidote entry (and all pyrimidine analogue entries) to improve clarity on the availability of uridine triacetate in the UK. Following an exposure to nitroxynil the TOXBASE entry was updated to reflect recent clinical evidence.

Two events related to the failure of the BT Cloud System, which NPIS use to answer telephone enquiries. For a limited period (one hour on 5 October 2021) our SPIs were unable to log on and so 12 enquiries went unanswered. The second event related to 41 telephone enquiries being incorrectly transferred to the mobile telephone number of a SPI who was off duty (27 September 2021). These 2 issues have been satisfactorily addressed with BT.

The number of SPIs in the NPIS has reduced over the last few years due to financial constraints which has made it increasingly difficult to staff rotas. This led to 2 critical events during 2021 to 2022. Regular reporting of near misses as well as critical incidents were agreed.

A critical event due to reduced SPI numbers occurred between 10 pm and 8 am on each of 4 nights (21 to 24 March 2022) when the NPIS were unable to staff 2 telephone enquiry lines, leading to one SPI operating a single phone line alone. This resulted in fewer enquiries being answered (79% of all enquiries compared to 96% of all enquiries when fully staffed), 32% more enquiries being abandoned, and a longer wait to answer for the enquirer (average of 3 minutes longer per enquiry). Critical processes did not take place, for example breaks were not taken, enquiries were not checked and there was no-one available to discuss potentially severe and distressing enquiries. A protocol detailing how emergency shortages in staffing should be addressed is being explored in case these situations recur.

Quality assurance exercises

Telephone information service user satisfaction

NPIS units have collected information on user satisfaction with their telephone enquiry service since 2002, aiming to establish overall service performance, user requirements / expectations and identify areas for improvement.

A random sample of telephone enquiries was selected using the same methodology for each unit. The sample size is intended to be at least 5% of telephone enquiries in each unit, with the exception of Edinburgh. The Edinburgh unit is required to survey a larger proportion (10%) to obtain an adequate sample size because it is not open 24-hours and therefore takes fewer telephone enquiries. The sample was taken between 1 April 2021 to 31 March 2022.

Survey results

During the 2021 to 2022 reporting year, 4,379 (11.6% of calls) questionnaires were sent out via email and 421 responses received, giving a response rate of 9.6% (similar to 2020 to 2021 during the COVID-19 pandemic, but lower than pre-COVID-19 numbers). The most common responder groups were NHS patient advice services operatives (38%), hospital doctors (27.3%) and GPs (15.9%).

A large proportion of those responding to the survey (71.3%) had checked TOXBASE prior to making their enquiry. The telephone enquiry had been made because TOXBASE did not provide sufficient detail to answer the query (51.8%), because of special circumstances or other reasons (22%) or because TOXBASE advised NPIS should be contacted (17.7%).

Reasons given for not accessing TOXBASE before telephoning the NPIS were preferring to speak to an advisor to obtain advice (58%), not having access to TOXBASE (33%) or having problems logging in (9%).

Users were asked to indicate their overall satisfaction with the service they received from NPIS using a scale of 1 to 5, with one indicating a very poor service and 5 an excellent service. The overall satisfaction with the telephone enquiry answering service remains very high, with over 96% grading the service a 4 or a 5 across all categories with the exception of call answering time which was 94%. It must be noted that all those respondents grading the service with 1 (strongly disagree) also left positive comments regarding the service.

Table 12 shows the overall quality scores for all units as percentage of respondents rating from 1 (strongly disagree) to 5 (strongly agree).

Table 12. Telephone information satisfaction scores in 2021 to 2022

Question	1 strongly disagree	2	3	4	5 strongly agree
Was your call answered promptly without delay?	2.6	0.5	2.9	17.3	76.7
Was the SPI that you spoke to polite and helpful?	2.4	0.2	0.2	3.6	93.6
Were you provided with appropriate information to answer your enquiry?	2.2	0.2	1.4	5.4	90.8
Did you have confidence in the information provided by the SPI?	2.2	0.2	0.4	4.3	92.9

One of the questions in the survey asked the user if the caller spoke to an NPIS consultant toxicologist when they telephoned the NPIS. Of the 421 responses, 80% stated they did not speak to an NPIS consultant toxicologist, 18.1% stated yes and 1.9% did not know. Of the respondents who stated that they spoke to a consultant toxicologist, upon review of the enquiry record, 30 (39.5%) did not actually speak to a consultant but to a SPI.

Of those respondents who spoke to a consultant toxicologist, 94.2% said they were provided with appropriate information to answer their enquiry at grade 4 or 5. Likewise, 92.6% had confidence in the information provided by the consultant.

TOXBASE

Formal QA is obtained from TOXBASE users using an online questionnaire. A selection of users are automatically asked to complete and submit one of a series of short QA forms during their online session. To combat user fatigue, differing forms are presented throughout the year. Invitations are generated every 5 to 15 database logins; this number is also varied throughout the year. A total of 1,095 returns were received during the 2021 to 2022 reporting year.

Users were asked to grade a series of statements on a Likert scale of 1 to 6 where 1=disagree completely, and 6=agree completely. TOXBASE user satisfaction scores are shown in Table 13. Satisfaction scores remain good.

Overall satisfaction with TOXBASE on a scale of 1 to 6 was indicated on 1,073 returns; 93.7% scored either 5 (good) or 6 (excellent).

Table 13. Summary of TOXBASE user satisfaction scores in 2021 to 2022

Satisfaction score is the percentage of respondents who agree ‘completely’ (6) or ‘a lot’ (5).

Number of responses	Question	Satisfaction score
389	“I had confidence in the information for my query”	94.1
389	“Logging on to the database was easy”	93.6
349	“Finding the information I required was easy”	91.1
357	“The information was sufficient for managing this case”	87.9

TOXBASE user feedback and service improvements

User feedback is an important component in the review process of TOXBASE entries. Feedback may be received from a variety of sources including TOXBASE QA forms, questionnaires linked to products of interest, responses to follow-up on cases of interest, or by email, letter or telephone. Users may raise queries or provide clinical data. Issues specific to entries are dealt with as they arise or may be collated for discussion at the TOXBASE Editing Group or Clinical Standards Group meetings.

Free text comments were provided on 205 TOXBASE quality assurance (QA) returns (18.7%), which can be grouped as shown in Table 14.

Table 14. Summary of free text comments on TOXBASE from quality assurance returns in 2021 to 2022

Type of comment	Number (% value) *
Positive comments and thanks	141 (68.8)
Suggestions	48 (23.4)
Comment related to other NPIS services	19 (9.3)
Specific issues	4 (1.9)
Negative comments	6 (3.9)
Information technology	5 (2.4)

* users often offered multiple comment types within one response

UKTIS

In 2021 to 2022, UKTIS sought feedback via paper questionnaire sent to a random sample of telephone enquirers with a poor response rate of 20 out of 350 (6%) questionnaires sent out being returned. The responses that were received indicated a high degree of satisfaction with the service, with 100% of responders reporting that enquiry staff were polite and helpful, the service was easy to contact, the enquiry was answered in an acceptable time frame, the information received was relevant and useful, and they had confidence in the reply. Of the 20 people who rated the service on a 6-point scale (1=poor and 6=excellent), 16 (80%) gave a rating of 6, 3 (15%) gave a rating of 5, and one (5%) gave a rating of 4.

Free text comments were positive, suggesting better promotion of the service and requests for more online patient information. The usefulness of the telephone service was highlighted particularly when healthcare professionals have complex pregnancy enquiries.

Education and training

Training for scientific staff

Each NPIS unit provides structured in-house training and assessment in both clinical and non-clinical (for example communication) skills to prepare scientific staff for dealing with healthcare professionals who contact our service for advice. Training is structured towards learning objectives covering all aspects of clinical toxicology, from the mechanisms of toxicity to the management of poisoned patients. These are clearly set out in a national training curriculum. Additionally, scientific staff may wish to undertake a postgraduate qualification in toxicology to further enhance their knowledge and expertise.

All NPIS staff are encouraged to participate in research and submit papers to peer reviewed journals and national and international meetings such as the British Toxicology Society and the EAPCCT.

Education and training

CPD for NPIS staff is an essential component of the clinical governance structure of the service. A national CPD programme equips both clinicians and scientific staff with the necessary knowledge and expertise to provide up to date, accurate, evidence-based and consistent advice on all aspects of poisoning.

It is the responsibility of the CPD lead, an NPIS consultant appointed by the unit directors every 3 years, to organise the rolling programme of meetings. An NPIS scientist is also appointed every 3 years, to ensure the needs of the scientific staff are well represented within the educational programme. The primary role of the CPD meetings is to ensure that clinicians and scientists remain up to date with the latest developments within clinical and academic toxicology. This includes education on new poisons, antidotes and other emerging treatment modalities.

The NPIS annual CPD programme since 2017 consists of 2-day meetings held twice each year, with all NPIS units hosting in turn, allowing staff greater opportunity for CPD along with the benefit of networking during an evening social event.

The CPD programme was impacted by the COVID-19 pandemic, however, resulting in the cancellation of physically attended events. In view of government mandated restrictions related to the COVID-19 pandemic, a new structure of delivering regular bimonthly CPD sessions virtually over an online video conferencing platform at minimal added financial cost was established. This platform has also allowed for secure storage of recorded presentations for future exclusive use of NPIS staff, further maximising educational benefit. Feedback has been very positive in response to these changes.

A series of 6 virtual CPD sessions were organised, including a new annual session showcasing external NPIS scientific contributions, in addition to a special Christmas CPD event with a guest international speaker.

Following easing of UK government restrictions, a hybrid face-to-face with virtual access 2-day CPD event (Box 1) was successfully held in September 2021. The intention is to continue a hybrid model of an annual face-to-face meeting with a social event component and regular virtual bimonthly sessions for NPIS staff for the foreseeable future.

Box 1. NPIS CPD event, hosted by NPIS Edinburgh

Day 1: Wednesday 22 September 2021

Fashionably late January blues – methaemoglobinaemia (Prof Sally Bradberry, NPIS Birmingham)

Methotrexate (Dr Aravindan Veiraiah, NPIS Edinburgh)

Methotrexate antidote experience/questions (Victoria Eagling, NPIS Edinburgh)

Nitrous oxide toxicity (Dr Mark Pucci, NPIS Birmingham)

Tricyclic antidepressants - UKPID, prescribing and mortality data (Mike Beddard, NPIS Cardiff)

Gardeners' world - plants, their uses in medicine and their impact on toxicology (Dr James Coulson, NPIS Cardiff)

Digoxin (Victoria Eagling, NPIS Edinburgh)

Toxicovigilance during COVID-19 (Nick Brooke UKHSA, Gill Cooper NPIS Cardiff and Elaine Donohoe NPIS Newcastle)

Day 2: Thursday 23 September 2021

Advanced nursing practice in toxicology (Karen Osinski, NPIS Edinburgh)

Next steps for carbon monoxide (Daniela Gentile, NPIS Edinburgh)

Update on SNAP and a simpler protocol? (Dr Ruben Thanacoody, NPIS Newcastle)

High dose NAC debate
Pro Argument (Prof Simon Thomas, NPIS Newcastle)
Con Argument (Prof James Dear, NPIS Edinburgh and Edinburgh University)

Scottish drug deaths - Clin Tox solutions? (Dr Aravindan Veiraiah, NPIS Edinburgh, Prof Michael Eddleston, NPIS Edinburgh and University of Edinburgh)

TOXlearning – a clinical toxicology e-learning resource

A clinical toxicology e-learning resource has been provided to NHS healthcare professionals across the UK by NPIS Edinburgh since 2005. The TOXlearning resource is available to all NHS staff, as well as UK medical, nursing and paramedic students, UKHSA staff, and UK and international TOXBASE subscribers.

The resource provides a useful and accessible training resource for those wishing to learn how to use TOXBASE effectively when handling enquiries about poisoning, and also learn more about the management of common overdoses. It is especially useful for NHS patient advice services staff when handling enquiries about poisoning, as well as training in the management of common overdoses.

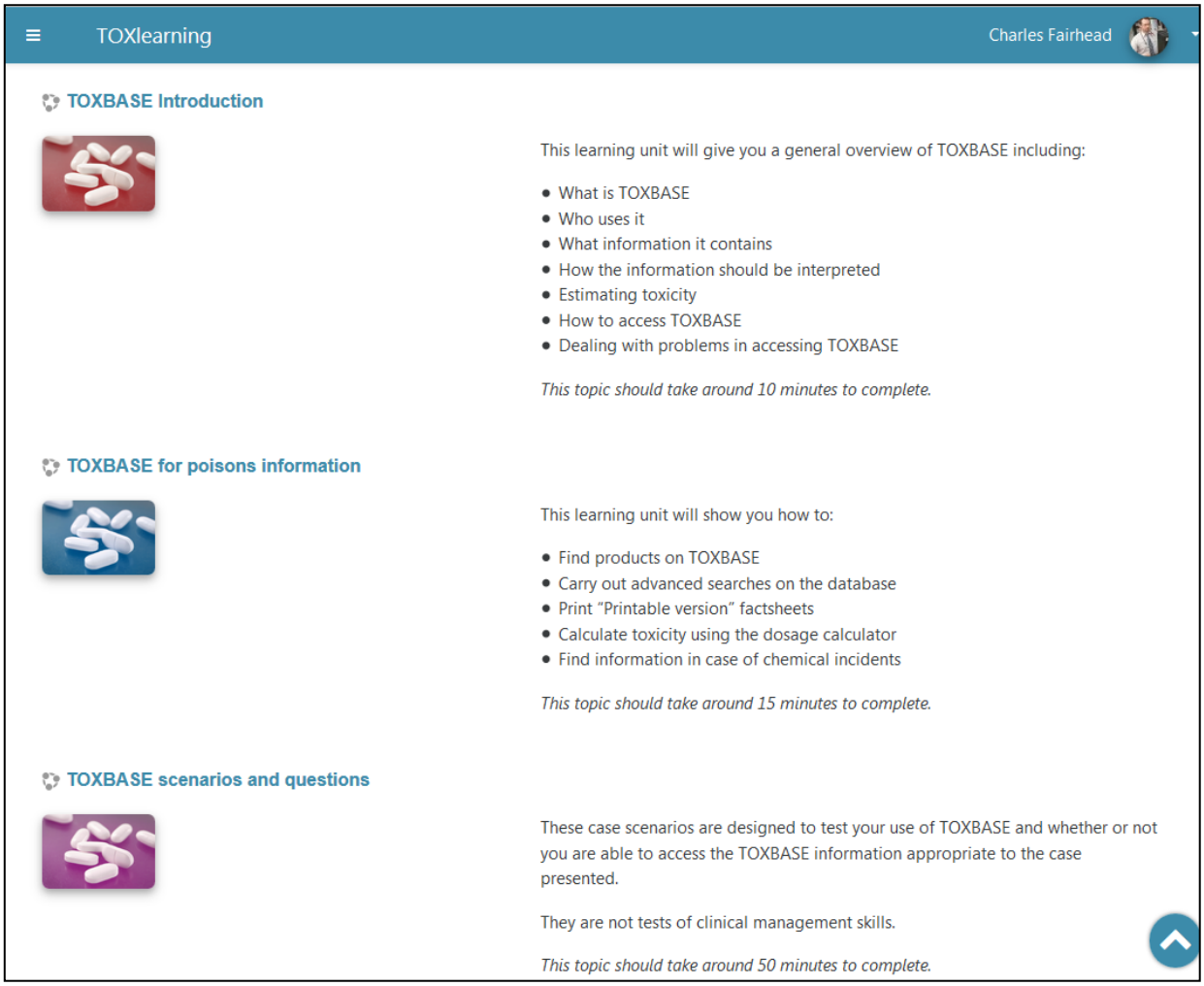
The NPIS recommends that TOXBASE users of all types and grades complete the 'Using TOXBASE' module. Box 2 shows the topics included within each module, and Figure 7 shows a screenshot of the 'Using TOXBASE' module from the resource. Registration and access are free; users can work through courses at their own pace, save their work, obtain their scores and print off their results for CPD files.

Box 2. TOXLearning modules

Module 1: Using TOXBASE
This module, which represents 75 minutes of learning, is designed to assist new and existing TOXBASE users to use the database more effectively.

Module 2: Clinical management of the poisoned patient
This module, which represents 180 minutes of learning, includes units on general aspects of poisoning, problematic poisons, common poisons and drugs of misuse.

Figure 7. Screenshot from TOXlearning



Areas of interest

Drugs of misuse

Introduction

The number of NPIS telephone enquiries and the volume of TOXBASE online and app accesses give an indirect indication of the drugs of misuse most commonly encountered by health professionals using our services. The data can be used to follow trends with time, including the emergence of new substances, and to characterise features of toxicity reported for different substances. These data are useful for monitoring and assessing toxicity relating to drugs of misuse and are shared periodically with responsible agencies including the Office for Health Improvement and Disparities, the UKHSA and the Advisory Council on the Misuse of Drugs (ACMD).

Methods

As in previous years, telephone enquiries are included in this analysis if the exposure is to a substance with no other purpose than drug misuse, or when the exposure has been classified as ‘recreational’ by the SPI answering the enquiry, irrespective of the substance involved and including medicinal drugs. This has the advantage of identifying substances not previously recognised as being involved in misuse.

The intent of the exposure is not available when using TOXBASE access data. Analysis of TOXBASE access data for prescription drugs does not allow insight into whether the access related to an exposure resulting from recreational drug misuse, self-harm or therapeutic error, and so on. For this reason accesses to TOXBASE pages that relate to licensed medications are omitted from cumulative data, with the exceptions of diazepam, methylphenidate, ketamine and methadone, which are under specific surveillance. Data are now included for TOXBASE app accesses.

Overall activity

Overall this year there has been a reduction in the absolute number of calls and TOXBASE online and app access in relation to drugs of misuse. Similarly the proportion of all NPIS calls and TOXBASE accesses that related to drugs of misuse has reduced. During the 2021 to 2022 reporting year, there were 691 telephone enquiries to the NPIS meeting the drug misuse criteria described above, a 30% decrease in absolute activity compared to 2020 to 2021. Of these 691 calls 80.1%, 8.8%, 4.9% and 4.6% were from England, Northern Ireland, Wales and Scotland respectively (1.6% were from outside the UK). These enquiries related to 248 different substances or products and accounted for 1.72% of all NPIS telephone enquiries, compared to 2.5% last year.

The reduction in telephone enquiries related to drugs of misuse this year continues the pattern of reduction in activity seen in previous years. The impact of COVID-19 during the year and the generally increasing use of TOXBASE in preference to telephoning the service, especially via the app, continue to be the most likely responsible factors. There were also 88,781 TOXBASE online accesses, an absolute decrease of 19.6% compared to last year. These related to 979 different substances or products and accounted for 6.4% of all TOXBASE online accesses, compared to 14.0% of TOXBASE activity last year. In previous years TOXBASE accesses related to drugs of misuse had been increasing.

There were 13,469 TOXBASE app accesses related to drug of misuse, a 22.8% reduction, accounting for 5.0% of all TOXBASE app accesses.

Activity related to individual drugs of misuse

The top substances of misuse involved in telephone enquiries and TOXBASE online and app accesses are shown in Table 15.

Table 15. Top drugs/substances of misuse involved in telephone enquiries and TOXBASE online and app accesses in 2021 to 2022 (% change from 2020 to 2021)

Rank	Telephone enquiries	Number
1	Cocaine	106 (-50.0)
2	Cannabis	89 (-41.8)
3	MDMA	51 (-26.1)
4	Diazepam	40 (-48.7)
5	Unknown drug of misuse*	38 (-11.6)
6	Ketamine	33 (-21.4)
7	Nitrous oxide	36 (-2.7)
8	Pregabalin	25 (-30.6)
9	Amfetamine	24 (-48.9)
9	Alprazolam	24 (-29.4)
9	Poppers	24 (60.0)

Rank	TOXBASE online accesses	Number
1	Diazepam**	27,994 (-23.3)
2	Cocaine	13,603 (-12.7)
3	Cannabis	6,153 (-18.5)
4	Methylphenidate**	5,573 (-10.5)
5	Heroin	4,260 (-19.0)
6	Ketamine	4,254 (-14.4)

Rank	TOXBASE online accesses	Number
7	MDMA	3,890 (-36.2)
8	Street benzodiazepines	2,904 (8.0)
9	SCRA***	2,569 (-16.0)
10	Methamfetamine	2,486 (-26.2)

Rank	TOXBASE app accesses	Number
1	Diazepam**	4,069 (n/a)
2	Cocaine	1,889 (n/a)
3	Ketamine	775 (n/a)
4	Heroin	728 (n/a)
5	Cannabis	722 (n/a)
6	Methylphenidate**	713 (n/a)
7	MDMA	568 (n/a)
8	SCRA***	547 (n/a)
9	GHB	392 (n/a)
10	Amfetamine	332 (n/a)

* ‘Unknown drug of misuse’ refers to calls where the clinician suspects that the person has taken a drug of misuse but not which one/s
** May include TOXBASE accesses relating to therapeutic use
*** SCRA is an abbreviation for synthetic cannabinoid receptor agonist

Patterns of NPIS activity for selected substances over time

Commentary

Figures 8 and 9 show NPIS activity related to selected substances of interest over the last 8 years. While activity for almost all substances has reduced substantially this year, classical drugs of misuse (diazepam, cocaine, cannabis, MDMA and heroin) continue to dominate NPIS telephone and TOXBASE activity. Notable exceptions are that telephone calls regarding alkyl nitrites (‘Poppers’) have increased this year, albeit at relatively low numbers, and TOXBASE accesses for ethylphenidate and street benzodiazepines have also increased in activity this year.

Substances of particular interest

Activity related to synthetic fentanyls remained low with only a single telephone enquiry (regarding isotonitazene), 207 TOXBASE online accesses (half for isotonitazene) and 83 TOXBASE app accesses (again isotonitazene accesses being most common). The NPIS did not receive any telephone enquiries in relation to the 13 novel benzodiazepines, defined by the ACMD report in April 2020. There were however a number of TOXBASE accesses online and via the app (Table 16).

Table 16. Novel benzodiazepine enquiries made via TOXBASE online and app in 2021 to 2022

Novel benzodiazepine	TOXBASE online accesses	TOXBASE app accesses
Alprazolam triazolobenzophenone derivative	36	14
Cinazepam	24	1
Tofisopam	19	2
Thionordiazepam	5	0
Norfludiazepam	4	1
Methylclonazepam	4	0
Flualprazolam	3	1
Cloniprazepam	1	6
Fluclotizolam	1	0

There were no telephone enquiries and only a small number of TOXBASE accesses in relation to the 4th generation SCRAs, while almost all activity was in relation to MDA-19.

Figure 8. TOXBASE accesses by year for selected substances between 2014 to 2015 and 2021 to 2022

Note: “Branded products” refers to drugs of misuse that are packaged and sold by a brand name rather than by the chemical name. Examples include ‘Black Mamba, Pandora’s Box or Herbal Haze’. Analytical reports typically show the presence of more than one SCRA, which may vary by batch.

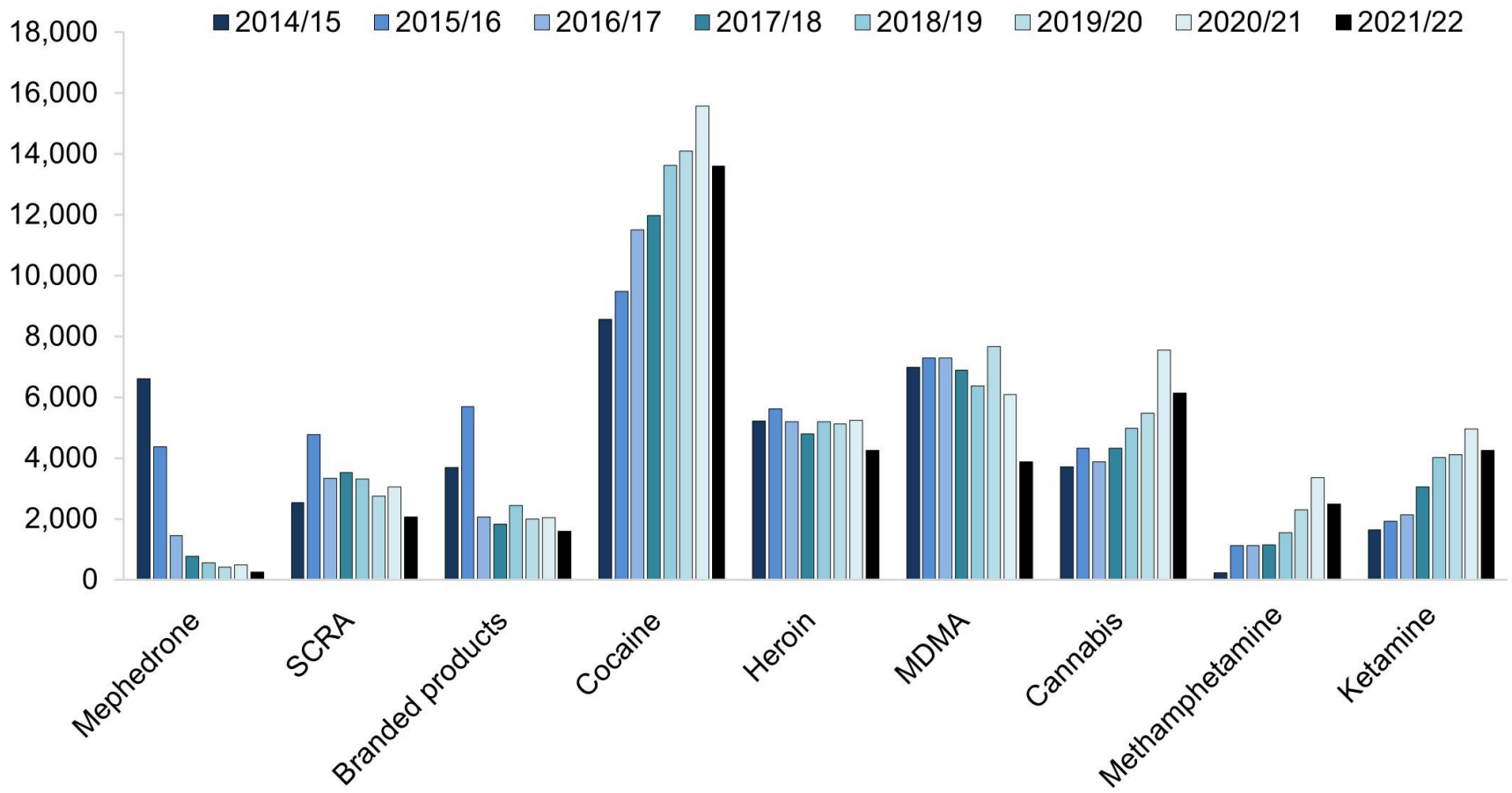
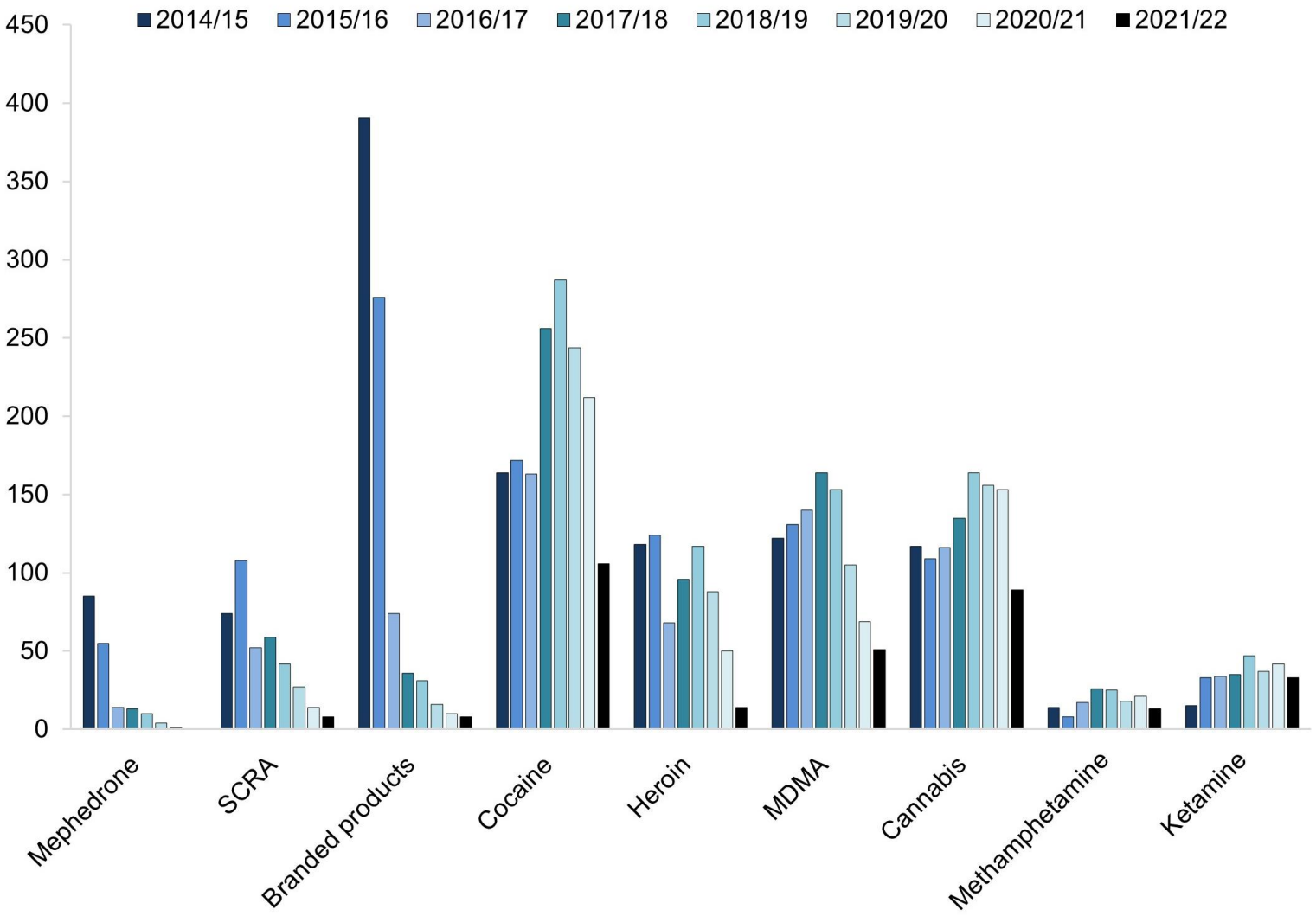


Figure 9. NPIS telephone enquiries by year for selected substances between 2014 to 2015 and 2021 to 2022



Pesticides

The NPIS pesticide surveillance system was established in 2004 under approval of the Pesticides Safety Directorate and funded by the UK Department for Environment, Food and Rural Affairs. The work was implemented to better describe the incidence and character of pesticide exposures in the UK that result in contact with health professionals (thereby selecting for more serious exposures). Surveillance data are collated and both quarterly and annual reports are submitted to the government's Expert Committee on Pesticides via the Chemicals Regulation Directorate of UK Health and Safety Executive (HSE).

Currently, 1,608 TOXBASE entries for pesticides and biocides are being tracked, a slight increase from the 1,602 tracked during 2020 to 2021. Incident information is obtained from follow-up of TOXBASE enquiries by an online or postal questionnaire, and from data collected during NPIS telephone enquiries.

During the year, there were 3,685 accesses to TOXBASE about pesticides of interest and information on 373 potential exposures was collected via the NPIS telephone enquiry service. The number of TOXBASE accesses [3,685 (2021 to 2022) vs 4,059 (2020 to 2021)] regarding pesticide poisoning fell by 9.2% between periods, with a larger 19.1% decrease in the number of calls (373 in 2021 to 2022 vs 461 in 2020 to 2021).

Overall, information was gathered on 607 potential exposures involving pesticides during 2021 to 2022. From these exposures, the number of cases identified for further analysis in 2021 to 2022 was 604.

The results presented below include both unintentional acute (493; 81.6%) and chronic cases (42; 7.0%) and cases of deliberate self-harm (69; 11.4%).

Of the 604 cases, 545 cases (90.2%) were graded as PSS 0 (not at all poisoned) or PSS 1 (mild). Fifteen cases (2.5%) were graded moderate (PSS 2) and 4 cases (0.7%) were graded severe (PSS 3). There were 2 fatalities reported (0.3%). One was caused by the deliberate self-injection of Gramoxone (20% paraquat) by an adult female; the other involved the accidental exposure of a child to aluminium phosphide.

Agents of interest

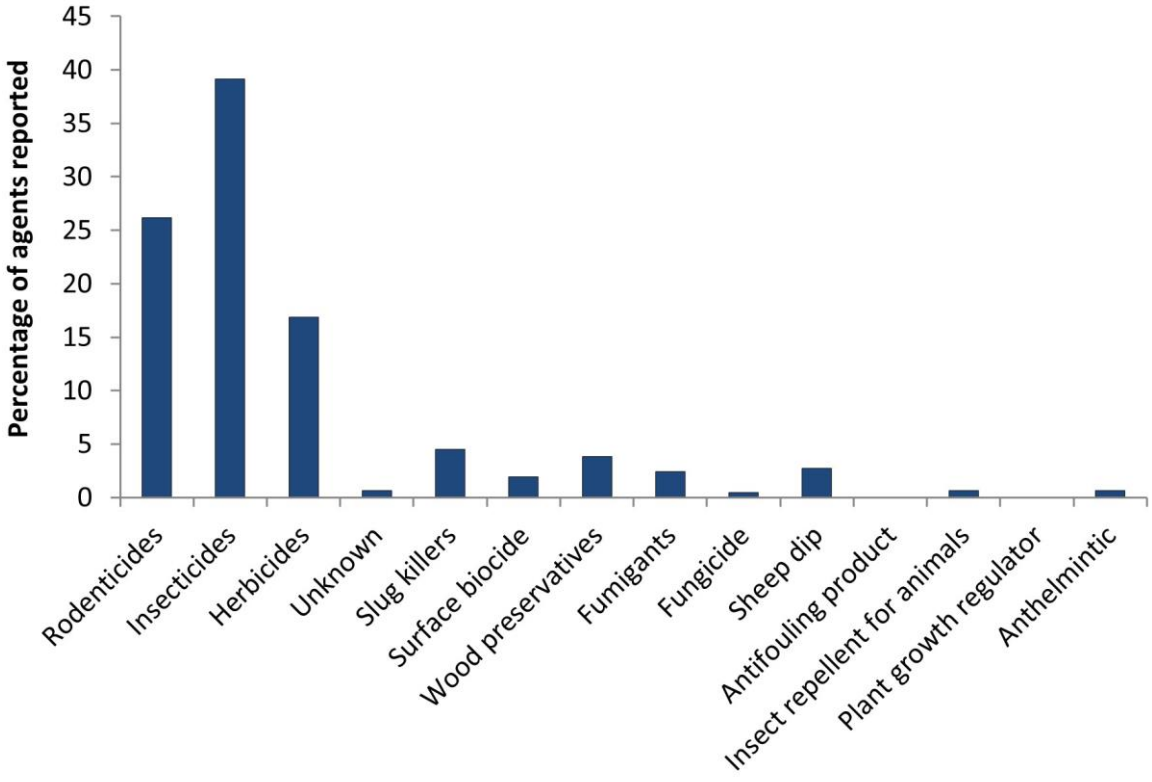
The agents most commonly involved in exposures are shown in Table 17. In addition, there were 86 cases involving unknown rodenticides.

In 2021 to 2022, patients potentially exposed to pesticide products comprised 350 adults (57.9% 13 years or older) and 299 children (49.5% 12 years or younger). There were 307 (50.8%) male patients and 280 (46.4%) female patients. There were 8 enquiries involving pregnant patients reported in 2021 to 2022 (7 in 2020 to 2021). All 8 exposures were acute, unintentional and graded PSS 0/PSS 1. The classes of product most commonly involved in exposures are shown in Figure 10. Permethrin and glyphosate remained the most commonly involved substances. Multiple/combination products were involved in some incidents.

Table 17. Pesticides most frequently (≥20) reported by respondents in suspected pesticide exposures during 2021 to 2022 compared with 2020 to 2021, ordered by rank in 2021 to 2022

Ingredient	2020 to 2021	2021 to 2022
Permethrin	70	51
Glyphosate	65	45
Phenols/cresols	32	35
Difenacoum	28	34
Cypermethrin	26	32
Bromadiolone	33	25
Tetramethrin	26	24

Figure 10. Pesticide exposures by class of product (as reported by respondent) in 2021 to 2022 (623 agents)



Carbon monoxide

Since June 2015, the NPIS has received funding from the Carbon Monoxide Research Trust (CO Research Trust; formerly known as the Gas Safety Trust) to analyse all enquiries relating to carbon monoxide (CO) exposure in the UK.

The epidemiology of CO poisoning is difficult to elucidate accurately due to complexities in identification, categorisation and reporting of exposures. Whilst exposures may be intentional (self-harm), we focused on accidental exposures which may be related to fires (where toxicity from additional agents such as cyanide and other products of combustion may contribute), or those that are non-fire related. Assessment of accidental non-fire related CO exposures was the primary objective of this study as these pose a serious public health challenge since patients may not be aware of the risks and subsequent symptoms of CO exposure. We recently published data from the first 4.5 years of the audit (7) and below provide data for the 2021 calendar year.

During the period 1 January 2021 to 31 December 2021, data were available for 639 patient-related CO exposures. One hundred and twenty one (18.9%) patients were male, while 185 (29.0%) were female (gender not specified for 333 (52.1%) patients). Exposures comprised 470 adults (≥13 years, 73.6%) and 91 children (≤12 years, 14.2%). Age was not specified in 78 exposures (12.2%). Fifteen exposures involved pregnant patients (2.4%).

The highest proportion of exposures resulted from faulty domestic boilers (205, 32.1%). Exposures were most commonly of low severity (450, 70.4%) and associated with no symptoms or mild symptoms only. During this period 3 (0.5%) fatalities were reported. Central nervous system symptoms were most prominently observed with headache reported with the highest frequency.

Whilst a raised carboxyhaemoglobin concentration (COHb%) is considered necessary to confirm an exposure, clinical interpretation is complex. It may be affected by patient-related factors such as smoking status, activity and co-morbidity, and environmental factors such as atmospheric CO concentration at the scene, exposure duration, time since exposure and administration of oxygen. In this cohort, blood COHb% concentrations were reported in 160 (25.0%) patients and ranged from 0.0% to 62.5% (median=2.9%). As many patients were not acutely unwell at the time of presentation, this may explain why an invasive blood COHb% was measured in only 25.0% of patients. We are continuing to collect and analyse data to assess whether there is a statistically significant correlation between measured COHb% and poisoning outcome.

These data demonstrate that the NPIS is uniquely placed to collect valuable epidemiological information on all aspects of CO poisoning (demographics, source, clinical features and poisoning outcome) from patients across the UK.

Dinitrophenol

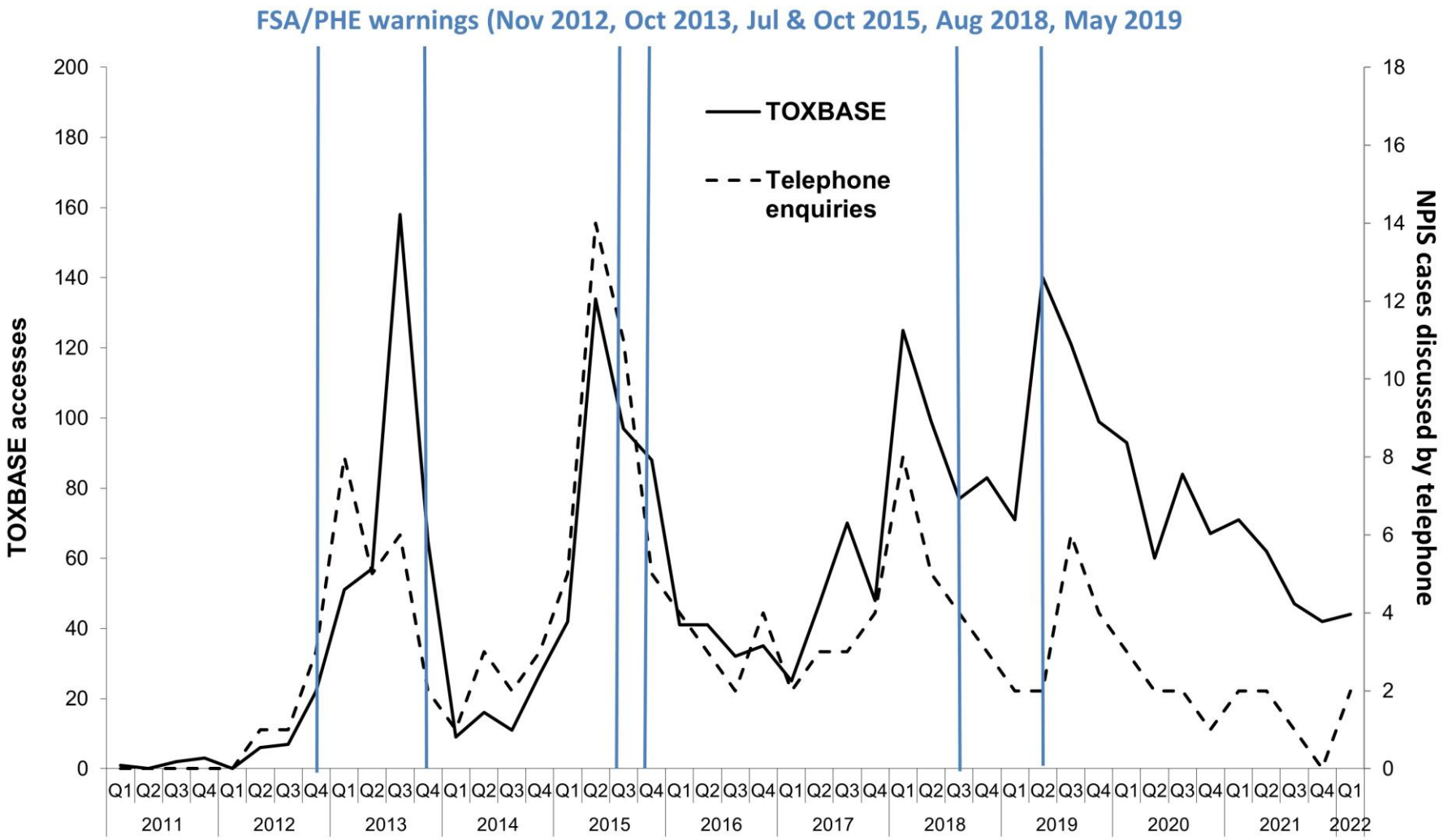
2,4-Dinitrophenol (DNP) is a toxic industrial chemical that blocks the normal mechanisms for storage of energy in the body, including fat, and is sometimes ingested by users to produce weight reduction, known as ‘fat burning’ or ‘body sculpting’. Unfortunately, DNP can cause serious health effects in humans including high fever, rapid heart rate, agitation, headache, diarrhoea, vomiting, convulsions, acidosis, muscular rigidity and multi-organ failure. These effects can be fatal in spite of intensive medical treatment.

The NPIS first reported an increase in enquiry numbers and deaths relating to DNP in 2013 and has since been monitoring and reporting these to UKHSA and the Food Standards Agency (FSA) on a quarterly basis and also in our annual reports. Various actions have been taken in response to the increase in enquiry numbers, including provision of warnings to the public and of information to healthcare professionals, as detailed in previous annual reports.

The information provided here has been obtained using the same methodology as described in previous annual reports. Quarterly numbers of DNP-related TOXBASE accesses and individual cases of systemic exposure reported in telephone enquiries since January 2011 are shown in Figure 11. During the 2021 to 2022 reporting year there were 5 cases of systemic DNP exposure referred to the NPIS. There were no fatalities. This compares to 14, 18 and 7 cases annually in the 3 previous reporting years. In total there have been 147 cases of DNP exposure discussed by phone with the NPIS since 2007, including 99 males and 48 females. Of these, 26 (18.3%) are known to have died (17 males and 9 females). The NPIS was made aware of one fatality related to an overdose of DNP during the 2021 to 2022 reporting year that was not discussed with NPIS. Together with at least 6 further fatal cases reported by the FSA or the Office of National Statistics that were not discussed with the NPIS at any stage in previous years, there have been at least 33 DNP-related deaths in the UK since 2007, including 25 since 1 January 2015.

The NPIS has recently been working with international partners to compare this UK experience with rates of DNP toxicity in other countries. Collaborative work in partnership with the WHO to obtain similar data from poisons centres in other countries indicates higher population-adjusted rates of DNP toxicity reported in the UK compared with other countries providing information, except for Sweden and Norway. Case fatality was high (11.9%, 95% CI 9.0-15.4) when mortality data was available. Systemic exposures to DNP, although uncommon, carry a high case fatality and occur more often in the UK than many other countries, in spite of the public health measures taken so far. However, the overall downward trend in the UK is reassuring and may reflect measures taken by NPIS and its government partners. The NPIS continues to encourage the responsible UK government agencies to consider further actions to restrict exposures to this highly toxic chemical.

Figure 11. Quarterly NPIS telephone enquiries and TOXBASE accesses relating DNP, January 2011 to March 2022



Scottish and Newcastle Acetylcysteine Protocol

Paracetamol is the most common medicine ingested in overdose in the UK, accounting for over 100,000 attendances to emergency departments annually. Around 60% require treatment with the antidote acetylcysteine. The original dosing regimen for intravenous acetylcysteine, developed by Prescott and colleagues in Edinburgh, was empirical and involved giving half the total dose of acetylcysteine (150 mg/kg) over 15 min with the remainder delivered over a further 20 h (50 mg/kg over 4 h then 100 mg/kg over 16 h). Although this regimen is effective, it has disadvantages: high rate of adverse reactions, complexity of the infusion regimen increasing the risk of medication error, and prolonged duration of treatment. In Canada, USA, Australia and subsequently in the UK in September 2012, a 21 h intravenous regimen was adopted consisting of a 1 h initial infusion; however, this did not lead to a significant reduction in acetylcysteine-related adverse effects.

Consultant clinical toxicologists from NPIS developed a shorter 12 h intravenous acetylcysteine regimen which is described in the Scottish and Newcastle Anti-emetic Pretreatment for Paracetamol Poisoning study, a randomised controlled trial conducted in 3 hospitals. The shorter regimen was shown to associated with a significant reduction in adverse reactions (8). They subsequently developed a Scottish and Newcastle Acetylcysteine Protocol (SNAP) protocol which was initially introduced with local clinical governance approvals in 3 hospitals with NPIS-affiliated consultant clinical toxicologists in Edinburgh, Newcastle and London. The SNAP protocol has similar clinical effectiveness to the licensed 21 h regimen in preventing acute liver injury (9). Further work has since been undertaken to demonstrate effectiveness in higher risk patients, such as those who present late after overdose or take large overdoses. Development and validation of a simple clinical decision rule allowing discharge of patients after the 12 h SNAP regimen has been completed and will allow up to 75% of patients treated after a paracetamol overdose to be discharged earlier.

The Royal College of Emergency Medicine issued a position statement in November 2021, endorsing the use of the SNAP protocol as the standard of care in emergency departments in the UK for treating paracetamol overdose (10). The adoption of the SNAP protocol nationally will have direct benefit to patients by reducing adverse effects and to the health service by reducing hospital length of stay. In view of these benefits, the off-label use of the SNAP protocol has been endorsed by NPIS for treatment of paracetamol overdose, following local clinical governance approval. To facilitate local implementation, details of the SNAP protocol are available to healthcare professionals on TOXBASE.

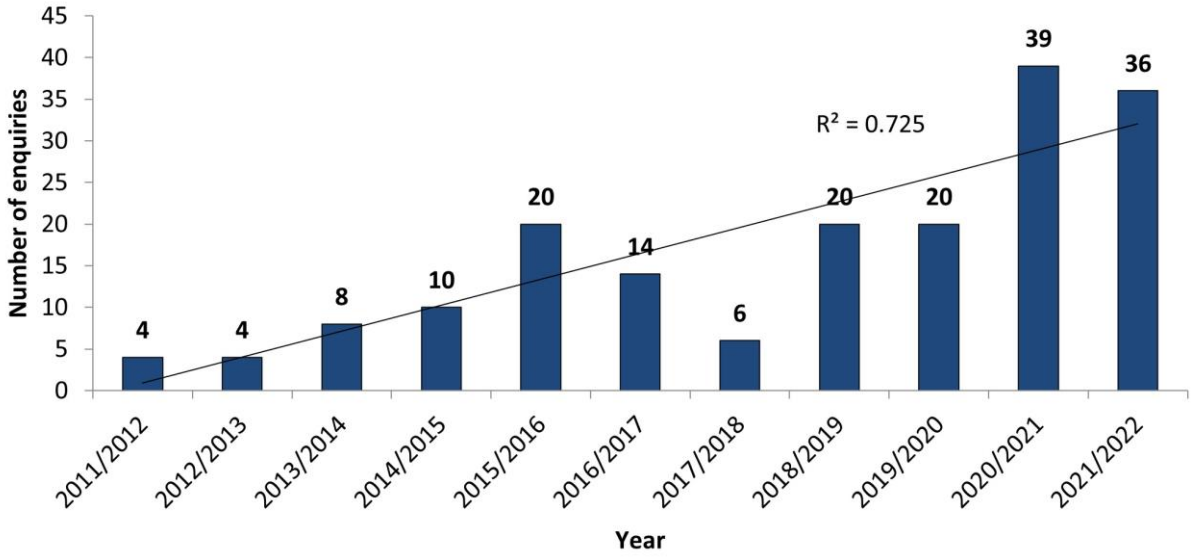
Nitrous oxide

The supply of nitrous oxide (N_2O) for recreational purposes has been illegal in the UK since the introduction of the Psychoactive Substances Act 2016; however, its recreational use remains common. N_2O irreversibly inactivates vitamin B12 resulting in functional B12 deficiency. Chronic recreational misuse predominantly results in neurological symptoms and can lead to subacute combined degeneration of the spinal cord. Vitamin B12 concentration is often normal when measured and does not serve as a good indicator of functional B12 status. Treatment focuses on adequate replacement of vitamin B12 although further evidence is needed for optimal treatment regimens.

Telephone enquiries to the NPIS relating to N_2O have increased steadily over the past ten years (Figure 12). In 2021 to 2022, the NPIS received 36 enquiries relating to recreational N_2O misuse representing a 257% increase since the 2011 to 2012 reporting year (but an 8% reduction since the previous year). Twenty-three (64%) patients were male and 12 female, with a mean overall age of 22.8 years (range 18 to 34 years). Consistent with a 10-year retrospective review of N_2O enquiries to the NPIS, most cases (86%) resulted in minor or moderate toxicity. Paraesthesia (33%) and hypoaesthesia (28%) were the 2 most prevalent features reported following misuse of N_2O. Measured vitamin B12 concentrations were only available in 3 cases and were within the normal reference range.

Public campaigns to increase awareness about the harms of N_2O misuse are required, particularly amongst young adults.

Figure 12. Telephone enquiries to the NPIS about nitrous oxide between 2011 to 2012 and 2021 to 2022



Retirement of Dr John Thompson

Dr John Thompson has had a long association with the NPIS while contributing greatly to toxicology in the UK and internationally. John graduated from the University of Sheffield in 1985 with degrees in both Medicine and Surgery, and Medical Physics and Clinical Engineering. After completing professorial house and then SHO jobs in Sheffield, he moved to the Nuffield Department of Medicine in Oxford. He subsequently undertook a research appointment near Salisbury running a small clinical trials unit where he developed his interest in Clinical Pharmacology and Toxicology, and forged links with the academic department of Clinical Pharmacology at Southampton University.

Subsequently, John moved to the West Midlands Poisons Unit in Birmingham where as a specialist registrar under the guidance of Professor Allister Vale, he worked on aspects of monitoring pesticide toxicity. It was already clear at that time that John had the capability, attention to detail and enthusiasm for toxicology that would remain throughout his career. He then completed his higher professional training in Salisbury and Southampton, being appointed research fellow and then Lecturer in Clinical Pharmacology at Southampton University, working with Professors Andy Renwick and Sir Charles George.

In 1998 John came to the Welsh National Poisons Unit in Cardiff as Consultant, and Cardiff University as Clinical Senior Lecturer, joining Professor Phil Routledge. This was an exciting opportunity and a chance for John to put his enthusiasm and capability to good use in helping develop clinical toxicology in the UK. John was involved right from the “get go” in 1998 as the first course organiser in producing materials and establishing the new distance learning postgraduate courses in Medical Toxicology at Cardiff University which are still running to this day. He was also responsible for the coordination of a wide range of undergraduate teaching at the university, and was theme lead for the teaching of Clinical Pharmacology and Prescribing for the undergraduate medical course there. He supported a wide range of undergraduate and postgraduate teaching at Cardiff University where he was a popular lecturer and colleague.

John developed his interest in chemical incident management as head of the Chemical Incident Management Support Unit and became Director of the poisons unit in Cardiff in 2002. He led the development of UKPID, collating, for the first time, national data from all 4 NPIS units in real-time, facilitating a new method of networked working between units. This has been a valuable source of data for poisons surveillance in the UK and remains in use today as the database of the NPIS, containing information on all poisons enquiries.

John has published widely in the field of toxicology, with many papers using data from the NPIS’s UKPID database. He has also undertaken primary research into “sheep dip ‘flu’”, transdermal drug absorption and the central effects of cannabinoids.

John’s national expertise has been recognised with appointments to several advisory committees including the Veterinary Products Committee, and as Deputy Chair of the Committee on Toxicity of Food, Consumer Products and the Environment. He has sat on advisory committees for Royal Colleges of Physicians and Pathologists, given evidence

before Parliament, and contributed to learned societies as Vice President (Clinical) of the British Pharmacological Society and as a board member of both the EAPCCT and British Toxicology Society, where he was Chair of the Human Toxicology Special Interest section for over ten years.

Internationally, John’s contribution has included participation in investigations into the alleged use of chemical weapons for the United Nations, investigations of epidemics of unknown aetiology suspected to be poisoning for the WHO, training in chemical incident emergency response, and invited talks at academic meetings.

Away from toxicology John’s first love is sailing - he is a keen and able yachtsman, and we hope that retirement will give him more time to pursue this hobby.

Dr John Thompson

Retirement of Professor Simon Thomas

Prof Simon Thomas trained at St Thomas' Hospital Medical School with academic awards notably in biochemistry. His house officer, SHO and registrar jobs were all in London Hospitals. He relocated to Newcastle as a Senior Registrar in Clinical Pharmacology and Therapeutics in March 1991 where he trained with Sir Michael Rawlins, Nick Bateman and Peter Blain and was a colleague of Robin Ferner. Simon was appointed to a consultant post in general medicine and clinical pharmacology in 1996. When Nick Bateman moved to join the Edinburgh poisons centre in 1998, Simon took over as the Medical Director of the Regional Drug and Therapeutics Centre, Director of the Regional Yellow Card Centre, the Director of the Newcastle Unit of the NPIS and Director of UKTIS (then the National Teratology Information Service).

Simon made an enormous contribution to Clinical Pharmacology and Clinical Toxicology locally, nationally and internationally. He developed and led the clinical toxicology service in Newcastle and, as a clinical pharmacologist with an interest in the safe use of medicines, he led the development of the UKTIS as a national advisory service on use of medicines in pregnancy. He strengthened the secondary hypertension clinic, and remained committed to the care of general medicine patients through both acute on-call and ward work. Simon chaired the Clinical Standards Group of the NPIS from 2005 until his retirement and was instrumental in developing NPIS as a highly regarded cost-effective national network of 4 poisons centres sharing common standards and performing both a front-line service to healthcare professionals and a public health function. He established the Advanced Fellowship in Clinical Toxicology to train the next generation of clinical toxicologists and has taught and mentored many of the consultant clinical toxicologists practising in the UK today.

Nationally, Simon has been a long-standing member of the MHRA Commission on Human Medicines, the MHRA Pharmacovigilance Expert Advisory Group, NICE Appraisal Committee A and European Medicines Agency expert panels.

He had diverse research interests ranging from hypertension research, adverse reactions including drug-induced QT prolongation and cardiac arrhythmias, and epidemiology of drugs of misuse, to chemical, biological, radiological and nuclear (CBRN) threats. During his career, Simon has been awarded research grants totalling over £12 million and collaborated widely across the UK and beyond. He was a member of the Department of Health/Health Protection Agency Chemical, Biological, Radiation and Nuclear Weapons Group from 2007 to 2012 and led the Health Protection Research Unit in chemical and radiation threats and hazards from 2014 to 2019. He set up and was the chief investigator for the IONA (Identification of Novel Psychoactive Substances) study and served on various committees at the ACMD.

As a world-renowned expert in clinical toxicology, Simon was a board member of the EAPCCT and chaired the Scientific Committee before being elected President. In that role he introduced a streamlined peer-review refereeing system for submitted abstracts, increasing the scientific value of the EAPCCT annual meetings. He supported the

establishment of Fellowship of the EAPCCT during his tenure as President and subsequently became a Fellow of EAPCCT himself as well as being elected a Fellow of the American Academy of Clinical Toxicology. He is a member of the British Toxicology Society and Asia Pacific Association of Medical Toxicologists. He has given very many invited lectures at international congresses including the renowned Louis Roche lecture at EAPCCT in 2015.

He is a prolific writer and has authored 2 books, 5 book chapters, 11 editorials, 36 review articles, 145 original papers, and over 300 abstracts and posters. He has been a long-standing editorial board member of the British Journal of Clinical Pharmacology, and Clinical Toxicology.

Throughout his long career he has shown great compassion for patients and their families, provided kindness and support to hundreds of staff and has characteristically been fair, calm and considered in his decision-making and communication.

The NPIS offers its congratulations to Simon on all he has achieved, thanks him for his service, and sends him best wishes for the future.

Professor Simon Thomas

Conclusions

Despite the challenges presented by COVID-19 pandemic, the NPIS and UKTIS have continued to provide information and advice to NHS health professionals about the management of patients with suspected poisoning and about drug and chemical exposures in women who are pregnant. Our excellent user feedback reflects the quality of the services provided and the continuing commitment and hard work of all our staff. The service has developed robust systems to ensure quality of information and advice during future periods when home working may be required.

Increasing use of TOXBASE and the TOXBASE app remain welcome, because these are highly cost-effective methods for the immediate delivery of written information and clinical advice. The growing use of ‘bumps’ as a publicly accessible source of advice about drugs and chemicals in pregnancy is also welcome, especially at a time when pregnant women may have found it more challenging to discuss their concerns directly with their doctor or midwife.

The NPIS, with UKHSA as its commissioner, has secured additional funding in the 2022 to 2023 financial year to ensure that the service is able to answer the phone calls of healthcare professionals managing patients who may be critically unwell within 5 minutes. This additional funding will ensure the stability of the service and the high quality of the support it is able to offer 24 hours per day, 365 days per year.

Recommendations

Outcome of recommendations for NPIS in 2021 to 2022

1. Continue to work with UKHSA, Department of Health and Social Care (DHSC) and other partners to identify further resources or reductions in services and expenditure to allow the NPIS and its constituent units to operate within a balanced budget.

The NPIS has continued to work with UKHSA to develop additional income streams where possible and to identify areas of cost savings. Budgets have been balanced by short-term income streams, but longer term solutions are needed to secure the service responsiveness and quality in the long term.

2. Continue to work with UKHSA, DHSC and other partners to ensure the NPIS is appropriately resourced to support receipt and management of material data sheets for chemicals sold in Northern Ireland and in Britain.

Discussions are ongoing with DHSC to clarify the role of the NPIS Product Data Centre in relation to the EU and Northern Ireland and to the UK's chemicals' policy.

3. Continue to monitor episodes of poisoning of public health importance, reporting to responsible government agencies as appropriate.

The NPIS has monitored episodes of poisoning relating to pesticides, carbon monoxide, drugs of misuse, nitrous oxide and dinitrophenol as detailed in this report. It has provided the information obtained to UKHSA and other government departments and public bodies such as HSE and ACMD.

Recommendations for NPIS in 2022 to 2023

1. Continue to work with UKHSA and other partners to provide the agreed level of staffing for each poisons unit whilst maximising resources available to allow the service to function effectively for its users.

2. Continue to work with UKHSA, DHSC and other partners to establish appropriate mechanisms to support receipt and management of material data sheets for chemicals sold in Northern Ireland and in Britain utilising the resources available.

3. Continue to monitor episodes of poisoning of public health importance, retrospectively and in real-time via our Early Warning System, reporting to responsible government agencies as appropriate and promoting the role of the UK NPIS in public health.

4. Continue to utilise UK NPIS data sets as the primary source of poisoning data in the UK to improve NPIS services.

5. Continue to organise high quality hybrid and online continuing professional development for NPIS staff to ensure users of the service are confident about the reliability and quality of the information provided.

6. Explore ways of increasing feedback to the service to ensure the views of users are heard and acted upon in improving TOXBASE and the telephone service.

7. Continue to improve poisons information provision in low-income countries worldwide via the provision of TOXBASE via the WHO.

APPENDIX A Senior NPIS staff

NPIS Consultants and Senior Staff

NPIS Birmingham

Professor S M Bradberry BSc MD FRCP FAACT FEAPCCT
Director, NPIS Birmingham and West Midlands Poisons Unit, City Hospital, Birmingham and Alcohol Lead, Sandwell and West Birmingham NHS Trust, Birmingham

Dr M E M O Elamin MBBS, DTM&H, PgCert ClinEd, MSc(Med Tox), FRCP
Consultant Physician and Clinical Toxicologist, NPIS Birmingham and West Midlands Poisons Unit, Birmingham City Hospital

Mr P S Jagpal BSc MSc
Service Manager, NPIS Birmingham

NPIS Cardiff

Mrs G L Alldridge MBE
Senior Information Services Manager, NPIS Cardiff

Professor J Coulson BSc MBBCh LLM MD DipMedTox DipTher GCGI MFPH MRSB FRCP FRCPE ERT
Professor in Clinical Pharmacology, Centre for Medical Education, Cardiff University and Honorary Consultant, Cardiff and Vale University Health Board

Dr L A Gray BA MBBCh MRCP
Medical Director, NPIS Cardiff; Consultant Physician in Clinical Pharmacology and Therapeutics, Cardiff and Vale University Health Board

Dr A Thomas MBChB FRCP DipMedTox, DipTher
Senior Lecturer in Clinical Pharmacology, Centre for Medical Education, Cardiff University and Honorary Consultant, Cardiff and Vale University Health Board

Dr J P Thompson BMedSci MBChB FRCP FBTS FEAPCCT FBPhS FAACT
Consultant, NPIS Cardiff; Honorary Senior Lecturer in Clinical Pharmacology, Centre for Medical Education, Cardiff University and Locum Consultant, Cardiff and Vale University Health Board

NPIS Edinburgh

Professor J W Dear PhD FRCPE
Professor of Clinical Pharmacology and Honorary Consultant Clinical Toxicologist, University of Edinburgh and NHS Lothian

Professor M Eddleston ScD FRCPE FRSE FEAPCCT FBPhS
Professor of Clinical Toxicology, University of Edinburgh; Consultant Clinical Toxicologist, NPIS Edinburgh and Royal Infirmary of Edinburgh; Director, Centre for Pesticide Suicide Prevention, University of Edinburgh

Dr G Jackson BSc DipMedTox PhD
Manager, NPIS Edinburgh

Dr E Morrison, MBChB(Hons), PhD BSc(Hons), MRCP
Consultant in Acute Medicine, Medicines Management and Toxicology, Royal Infirmary of Edinburgh

Dr E A Sandilands BSc MD FRCPE
Director, NPIS Edinburgh; Consultant Physician and Clinical Toxicologist, Royal Infirmary of Edinburgh; Honorary Clinical Senior Lecturer, University of Edinburgh

Dr A Veiraiah MB BS MRCP
Consultant in Acute Medicine and Toxicology, Royal Infirmary of Edinburgh

NPIS Newcastle (including UKTIS)

Mrs S Bradley BSc MSc
Information Services Manager, NPIS Newcastle

Dr S L Hill BSc MBBS FRCP
Consultant Physician and Clinical Toxicologist, Newcastle upon Tyne Hospitals NHS Foundation Trust; Honorary Clinical Senior Lecturer, Translational and Clinical Research Institute, Newcastle University

Dr K K Hodson MD MRCP(UK) MRCOG DipTher
Head of Teratology, UKTIS; Consultant in Obstetrics and Maternal Medicine, Newcastle upon Tyne Hospitals NHS Foundation Trust; Associate Clinical Lecturer, Translational and Clinical Research Institute, Newcastle University

Dr S Stephens BSc PhD
Assistant Head of UK Teratology Information Service, Newcastle upon Tyne Hospitals NHS Foundation Trust; Honorary Associate Fellow, Translational and Clinical Research Institute, Newcastle University

Dr H K R Thanacoody MD FRCP FRCPE
Director, NPIS Newcastle and UKTIS; Consultant Physician and Clinical Toxicologist, Newcastle upon Tyne Hospitals NHS Foundation Trust; Honorary Senior Clinical Lecturer, Translational and Clinical Research Institute, Newcastle University
Professor S H L Thomas BSc MD FRCP FRCPE FEAPCCT FAACT
Chair, NPIS Clinical Standards Group; Consultant Physician, Newcastle upon Tyne Hospitals NHS Foundation Trust; Professor of Clinical Pharmacology and Therapeutics, Newcastle University

Other consultants providing on-call support for the NPIS

Professor P I Dargan FRCPE FACMT FRCP ERT FAACT FEAPCCT FBPhS
Consultant Physician and Clinical Toxicologist, Clinical Director and Caldicott Guardian, Guy's and St Thomas' NHS Foundation Trust, London; Professor of Clinical Toxicology, King's College London, London

Dr W S Waring BMedSci MB PhD FRCPE FRCP FBPhS
Consultant Physician in Acute Medicine and Clinical Toxicology, York Teaching Hospitals NHS Foundation Trust; Honorary Senior Lecturer in Medicine, Hull York Medical School, York

Dr D M Wood MD FRCP FEAPCCT FACMT FAACT FBPhS
Consultant Physician and Clinical Toxicologist, Chair of Drugs and Therapeutics Committee and Trust Lead for Mortality Surveillance and Review, Co-Chair of Medication Safety Committee, Guy's and St Thomas' NHS Foundation Trust and King's Health Partners, London; Reader in Clinical Toxicology, King's College London, London

Consultants providing specialist support for the NPIS

Dr M Anderson BSc BMedSci BMBS MRCPCH
Consultant Paediatrician, Great North Children's Hospital, Newcastle upon Tyne Hospitals NHS Foundation Trust

Dr J M Wraight MBChB MSc FCEM DipMedTox
Consultant Emergency Physician with Toxicology, St John's Hospital, Livingston and Royal Infirmary of Edinburgh

National and international appointments of NPIS senior staff

NPIS staff have roles in supporting many important aspects of toxicology, both nationally and internationally. These include advisory roles to international and national bodies, including government, as well as academic activities. The range of their roles presented below provides a flavour of these activities and indicates the wider 'added value' of the NPIS.

NPIS Birmingham

Professor S M Bradberry
INTERNATIONAL SOCIETIES
Fellow: American Academy of Clinical Toxicology
Fellow: European Association of Poisons Centres and Clinical Toxicologists
Past President: Clinical and Translational Speciality Section, Society of Toxicology
UK ADVISORY COMMITTEES
Member: PHE Lead exposure in children surveillance system steering group
Member: Home Office, Office for security and counter terrorism. Chemical Expert Panel
ACADEMIC ACTIVITIES
Honorary Professor: School of Pharmacy, University of East Anglia
Honorary Professor: School of Biosciences, University of Birmingham
Joint Course Organiser: MSc (Toxicology), University of Birmingham
Educational and Clinical Supervisor: Sandwell and West Birmingham Hospitals NHS Trust

Dr M E M O Elamin
INTERNATIONAL SOCIETIES
Board Member (at Large): MENATOX (Middle East and North Africa Clinical Toxicology Association)
Member: Scientific Committee, MENATOX (Middle East and North Africa Clinical Toxicology Association)
ACADEMIC ACTIVITIES
Member: MRCP Part 1 and 2 Specialty Question Writing Group
Honorary Senior Clinical Lecturer: School of Biosciences, University of Birmingham
Honorary Clinical Lecturer: Warwick Medical School – Biomedical Sciences, Warwick University
Lecturer: NPIS/RCEM Clinical Toxicology Training Days

Mr P S Jagpal
INTERNATIONAL ACTIVITIES
External Expert for Rapid Risk Assessment: European Commission Scientific Committee on Health and Environmental Risks

NPIS Cardiff

Professor J Coulson
INTERNATIONAL ACTIVITIES
Consultancy in Clinical Toxicology to WHO
UK ADVISORY COMMITTEES
Member: Committee on Toxicity
Member: Herbal Medicines Advisory Committee, MHRA.
Co-opted member: Tramadol subcommittee to the Advisory Panel on Substance Misuse
NHS NATIONAL AND REGIONAL COMMITTEES
Chair: New Medicines Group
ACADEMIC ACTIVITIES
Honorary Professor of Clinical Pharmacology and Toxicology: Cardiff Metropolitan University
Visiting Professor of Clinical Pharmacology: University of South Wales

Dr L A Gray
NHS NATIONAL AND REGIONAL COMMITTEES
Chair: All Wales Prescribing Advisory Group (AWPAG) for All Wales Medicine Strategy Group
ACADEMIC ACTIVITIES
Medical Advisor: Diploma in Medical Toxicology, Cardiff University
Member: Prescribing Safety Assessment (PSA) Assessment Board, British Pharmacological Society
Medical Lead: Cardiff Update in Medical Toxicology

Dr A Thomas
NHS NATIONAL AND REGIONAL COMMITTEES
Medical Director: Yellow Card Centre Wales
Member: All Wales Medicines Strategy Group
ACADEMIC ACTIVITIES
PSA Lead: Cardiff University School of Medicine
Theme Lead: BDS Human Disease Course, Cardiff University
Member: Programme Management Committee, Certificate/Diploma/MSc in Medical Toxicology, Cardiff University
Member: Programme Management Committee, Certificate/Diploma in Therapeutics, Cardiff University
Member: Final Year Exam Executive, Cardiff University

Dr J P Thompson
INTERNATIONAL ACTIVITIES
Member: Advisory Board Hong Kong Poisons Centre
Consultant: WHO Collaborating Centre for Chemical Incidents
INTERNATIONAL SOCIETIES
Fellow: European Association of Poison Centres and Clinical Toxicologists
Fellow: American Academy of Clinical Toxicology

UK ADVISORY COMMITTEES
Senior Medical Officer: Yellow Card Centre (Wales)
NHS NATIONAL AND REGIONAL COMMITTEES
Member: Executive Committee, British Toxicology Society
Honorary Secretary: Joint Specialty Committee, Clinical Pharmacology and Therapeutics
Member: New Medicines Group, All-Wales Medicines Strategy Committee
Member: All-Wales Specialist Training Committee in Clinical Pharmacology
ACADEMIC ACTIVITIES
Honorary Senior Lecturer: Clinical Pharmacology, Cardiff University

NPIS Edinburgh

Professor J Dear
INTERNATIONAL ACTIVITIES
Member: Expert Advisory Group EU IMI TransBioLine Consortium, Critical Path Institute Acute Kidney Injury Working Group
INTERNATIONAL JOURNALS
Senior Editor: British Journal of Clinical Pharmacology
UK ADVISORY COMMITTEES
Member of Scottish Medicines Consortium
NHS NATIONAL AND REGIONAL COMMITTEES
Deputy Director: Yellow Card Centre, Scotland
Member: Lothian Formulary Committee

Professor M Eddleston
INTERNATIONAL ACTIVITIES
Member: WHO Expert Advisory Group for the FAO and WHO Joint Meeting on Pesticide Management
Advisor: World Health Organization/Department of Environment, Climate Change and Health
External Examiner: Postgraduate diploma in Pesticide Risk Management, University of Cape Town, South Africa
Board Member: South Asian Clinical Toxicology Research Collaboration, Peradeniya, Sri Lanka
INTERNATIONAL JOURNALS
Senior Editorial Board Member: Clinical Toxicology
UK ADVISORY COMMITTEES
Member: Expert Advisory Group on Antivenoms, UK Department of Health and Social Security
Member: Expert Committee on Pesticides, UK Health and Safety Executive
Member: Scottish Medicines Consortium
NHS NATIONAL AND REGIONAL COMMITTEES
Member: Area Drug and Therapeutics Committee, NHS Lothian

Dr G Jackson
INTERNATIONAL ACTIVITIES
External Expert: European Commission Scientific Committee on Health and Environmental Risks
UK ADVISORY COMMITTEES
Medical Sub Group Member: The All-Party Parliamentary Carbon Monoxide Group
NHS NATIONAL AND REGIONAL COMMITTEES
Member: National Safety Alerts Oversight Group

Dr E Morrison
UK ADVISORY COMMITTEES
Member: Scottish Medicines Consortium
Member: National Review Panel for PACS Tier 2, Healthcare Improvement Scotland
NHS NATIONAL AND REGIONAL COMMITTEES
Chair: NHS Lothian Area Drugs and Therapeutics Committee
Member: Individual Patient Treatment Request panel, NHS Lothian

Dr E A Sandilands
UK ADVISORY COMMITTEES
Associate Director of Training: Royal College of Physicians of Edinburgh
NHS NATIONAL AND REGIONAL COMMITTEES
ACADEMIC ACTIVITIES
MBChB Portfolio Lead: University of Edinburgh
MBChB Year 4 Clinical Placement Lead: University of Edinburgh
MSc Critical Care, Toxicology Lead: Royal College Physicians Edinburgh and University of Edinburgh

Dr A Veiraiah
NHS NATIONAL AND REGIONAL COMMITTEES
Medical Lead: SPSP Medicines
ACADEMIC ACTIVITIES
Faculty: Primary Care Improvement Programme, Healthcare Improvement Scotland

NPIS Newcastle (including UKTIS)

Dr S Hill
UK ADVISORY COMMITTEES
Member: New Psychoactive Substances sub group of the Advisory Council on the Misuse of Drugs
NHS NATIONAL AND REGIONAL COMMITTEES
Member: UK Focal Point Early Warning System on New Psychoactive Substances
Member and Curriculum Lead: Specialist Advisory Committee, Clinical Pharmacology and Therapeutics, Northern Deanery Representative
Member: MRCP Part 1 and 2 Specialty Question Writing Group
Member: British Pharmacological Society Clinical Committee

ACADEMIC ACTIVITIES
Module Lead: Drug Discovery and Development, Masters by Research in Translational Medicine, Newcastle University
Training Programme Director and SAC Representative: Clinical Pharmacology and Therapeutics, HEE North East
Member: Clinical Pharmacology and Therapeutics STC (HEE North East)
Educational Supervisor: PHE Funded Advanced Fellowship in Clinical Toxicology
Deputy Director of Medical Education (Undergraduate Lead): Newcastle Upon Tyne Hospitals NHS Foundation Trust
Co-Director: Newcastle Clinical Research Facility, Royal Victoria Infirmary, Newcastle upon Tyne

Dr K K Hodson
INTERNATIONAL SOCIETIES
Member: ENTIS (European Network of Teratology Information Services)
UK ADVISORY COMMITTEES
Member: MHRA Medicines for Women's Health Expert Advisory Committee
Member: RCOG COVID-19 Vaccination in Pregnancy Working Group
Member: British Rheumatological Society Guidelines for the management of rheumatological disease in pregnancy
Member: British Society of Haematology Guidelines for the management of metallic heart valves in pregnancy
NHS NATIONAL AND REGIONAL COMMITTEES
Executive Member: MacDonald UK Obstetric Medicine Society
Executive Member: UK Maternal Cardiac Society
Member: MHRA Safer Medicines in Pregnancy and Breastfeeding Consortium
ACADEMIC ACTIVITIES
Lead Consultant: Obstetric Medicine Training in NE England
Course Organiser: Obstetric Medicine Teaching Courses, Royal College of Obstetricians and Gynaecologists

Dr S Stephens
INTERNATIONAL ACTIVITIES
Secretary: European Network of Teratology Information Services (ENTIS)
INTERNATIONAL SOCIETIES
Secretary: European Network of Teratology Information Services (ENTIS)
UK ADVISORY COMMITTEES
Member: The Safer Medicines in Pregnancy and Breastfeeding Consortium, Medicines and Healthcare Products Regulatory Agency (MHRA)
ACADEMIC ACTIVITIES
Honorary Associate Fellow: Translational and Clinical Research Institute, Newcastle University

Dr H K R Thanacoody
INTERNATIONAL ACTIVITIES
Member: Acetaminophen/Paracetamol Clinical Toxicology Recommendations Collaboration
INTERNATIONAL JOURNALS
Executive Editor: British Journal of Clinical Pharmacology
UK ADVISORY COMMITTEES
Member: Pharmacovigilance Expert Advisory Group, Medicines and Healthcare products Regulatory Agency
ACADEMIC ACTIVITIES
Member: Joint Royal Colleges MRCP (Part 1) Exam Board
Module Leader: Experimental Medicine and Therapeutics, MRes in Translational Medicine, Newcastle University
Member: BSc Pharmacology Curriculum Committee, Newcastle University
Chief External Examiner: MBBS, Brighton and Sussex Medical School

Professor S H L Thomas
INTERNATIONAL SOCIETIES
Fellow and Past president: European Association of Poisons Centres and Clinical Toxicologists
Fellow: American Academy of Clinical Toxicology
INTERNATIONAL JOURNALS
Deputy Editor: Clinical Toxicology
UK ADVISORY COMMITTEES
Member: Advisory Council on the Misuse of Drugs
Member: Technical Committee, Advisory Council on the Misuse of Drugs
Chair: Advisory Council on the Misuse of Drugs Novel Psychoactive Substances Committee.
Member: Ministry of Defence Advisory Group on Military and Emergency Response Medicine
NHS NATIONAL AND REGIONAL COMMITTEES
Medical Director: Regional Drug and Therapeutics Centre, Newcastle
Member: Northern Treatment Advisory Group
Member: Northern Regional Medicines Optimisation Committee
Member: North of Tyne Area Prescribing Committee
Member: North of Tyne Area Prescribing Committee, Formulary Subcommittee
ACADEMIC ACTIVITIES
Regional Speciality Advisor (North East): Clinical Pharmacology and Therapeutics

Other consultants providing on-call support for the NPIS

Professor P I Dargan
INTERNATIONAL ACTIVITIES
Immediate Past Chair: European Association of Poison Centres and Clinical Toxicologists Scientific Committee
Board Member: European Association of Poison Centres and Clinical Toxicologists

Member: American College of Medical Toxicology International Committee
Abstract Reviewer: American Academy of Clinical Toxicology
Expert Adviser: World Health Organization and United Nations Office on Drugs and Crime
Member: GSK Global Analgesics Panel
Member: WHO/UN Global Alliance to Eliminate Lead from Paint
Member: WHO Global Burden of Disease Expert Panel
INTERNATIONAL JOURNALS
Senior Editorial Board Member: Clinical Toxicology
Editorial Board Member: Toxicologie Analytique et Clinique
UK ADVISORY COMMITTEES
Expert Adviser: Advisory Council on Misuse of Drugs
Co-chair: College of Emergency Medicine Antidote Guideline Group
ACADEMIC ACTIVITIES
Member: Faculty of Translational Medicine, Biomedical Research Centre (BRC) at Guy's and St Thomas' NHS Foundation Trust and King's College London
Member: London Ambulance Service Clinical Audit and Research Steering Group
Member: MRCP (UK) Scenario Editorial Committee
Examiner: MRCP (UK) Part 2 Clinical Examination (PACES)
Member: WHO Global Burden of Disease Expert Panel
PI: Janssen ENSEMBLE 2 COVID Vaccine Study
PI: Astra Zeneca AZD2816 COVID-19 Vaccine Study
PI: Moderna mRNA-1273-P305 COVID-19 Vaccine Study

Dr W S Waring
INTERNATIONAL JOURNALS
Associate Editor: Therapeutic Advances in Drug Safety
Editorial Board Member: European Journal of Clinical Pharmacology
Editorial Board Member: Expert Review of Clinical Pharmacology
Editorial Board Member: Recent Patents on Cardiovascular Drug Discovery
UK ADVISORY COMMITTEES
Member: Independent Review Panel for Borderline Products, Medicines and Healthcare products Regulatory Agency
NHS NATIONAL AND REGIONAL COMMITTEES
Regional Specialty Advisor: Clinical Pharmacology and Therapeutics
Member: Regional RCP Advisory Appointments Committee
CPT Representative: RCP Revalidation Specialty Advisory Group
ACADEMIC ACTIVITIES
Honorary Senior Lecturer: Hull York Medical School

Dr D M Wood
INTERNATIONAL ACTIVITIES
Member: American Academy of Clinical Toxicology Scientific Review Committee
Member: Clinical Toxicology Collaborative: Activated Charcoal Systematic Review
Member: Clinical Toxicology Collaborative: Paracetamol Systematic Review
Member: EXtracorporeal TReatments In Poisoning (EXTRIP) 2 workgroup

Expert Advisor: European Monitoring Centre for Drugs and Drug Addiction (EMCDDA)
Expert Advisor: United Nations Office on Drugs and Crime (UNODC)
Expert Advisor: World Health Organisation
INTERNATIONAL SOCIETIES
Member: Scientific Committee of European Association of Poisons Centres and Clinical Toxicologists (EAPCCT)
INTERNATIONAL JOURNALS
Editorial Board Member: Journal of Medical Toxicology
International Scientific Committee Member: Toxicologie Analytique et Clinique
UK ADVISORY COMMITTEES
Member: UK Advisory Council on the Misuse of Drugs (ACMD)
Member: ACMD Chemsex, Monitoring, Technical and Novel Psychoactive Working Groups
Member: COMed Working Group/All-Party Parliamentary CO Group (on behalf of the NPIS)
NHS NATIONAL AND REGIONAL COMMITTEES
Member: Department of Health Early Warning System
Member: Public Health England NPS Clinical Network
Member: Steering Group of the PHE RIDR project
Co-Vice Chair: South East London Integrated Medicines Optimisation Committee
Member: South East London Joint Formulary Committee (as Guy's and St Thomas' NHS Foundation Trust representative)
Case Reviewer: National Confidential Enquiry into Patient Outcome and Death Epilepsy Study
ACADEMIC ACTIVITIES
Joint Project Co-ordinator: European Drug Emergencies Network (Euro-DEN) Plus project
Lecturer: NPIS/RCEM Clinical Toxicology Training Days
Lecturer: NPIS Cardiff Update in Medical Toxicology course
Royal College of Physicians (RCP) representative: Royal College of Pathology (RCPath) Specialty Advisory Committee on Toxicology

APPENDIX B NPIS publications

57 contributions to the scientific literature were published in 2021 to 2022 by NPIS staff*

* NPIS staff are given in **bold** type, except where NPIS staff were part of a collaborative group

early online publication details for these publications were previously listed in the 2020 to 2021 NPIS report

Peer-reviewed papers

Alagappan A, Baruah R, Cockburn A, **Sandilands EA**. 'Paradoxical refractory hypotension following adrenaline infusion in a patient taking clozapine'. BMJ Case Reports 2021; volume 14, e243363

Bakkum MJ, Richir MC, Papaioannidou P, Likic R, Sanz EJ, Christiaens T, Costa JN, Mačiulaitis R, Dima L, Coleman J, Tichelaar J, van Agtmael MA; Education Working Group of the European Association for Clinical Pharmacology and Therapeutics (EACPT) and its affiliated Network of Teachers in Pharmacotherapy (NOTIP). 'EurOP2E - the European Open Platform for Prescribing Education, a consensus study among clinical pharmacology and therapeutics teachers'. European Journal of Clinical Pharmacology 2021: volume 77, pages 1209-1218

Bateman DN, **Dear JW**, **Eddleston M**, Vale JA. 'Comment on Fomepizole as an adjunct in acetylcysteine treated acetaminophen overdose patients: a case series'. Clinical Toxicology, published online 23 December 2021

Beaulieu J, Roberts DM, Gosselin S, Hoffman RS, Lavergne V, Hovda KE, Megarbane B, Lung D, **Thanacoody R**, Ghannoum M. 'Treating ethylene glycol poisoning with alcohol dehydrogenase inhibition, but without extracorporeal treatments: a systematic review'. Clinical Toxicology, published online 21 March 2022

Blanco G, Vidler D, Roper C, Wood DM, Dargan PI, Keating L, Macfarlane R, Emmett S, Johnson G. **Eddleston M**, **Hill SL**, **Thomas SHL**. 'Acute toxicity from the synthetic cathinone N-ethylpentylone (ephylone) in the United Kingdom'. Clinical Toxicology 2021: volume 59, pages 1270-1273

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About the National Poisons Information Service

The role of the NPIS is to advise NHS healthcare professionals on the diagnosis, treatment and care of poisoned patients across the United Kingdom. Poisoning is a common cause of hospital admission in the UK, with similar numbers of admissions to other common medical emergencies. NPIS advice ensures that healthcare professionals not only have access to up to date information about treating poisoned patients, but also information to safely manage appropriate cases of minor poisoning at home, thus reducing unnecessary use of NHS resources. The major workload of the NPIS is to advise hospital emergency departments, NHS telephone patient advice services (NHS 111, NHS 24 and NHS Direct) and also primary care services.

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NPIS Cardiff unit

University Hospital Llandough, Cardiff, hosted by Cardiff and Vale University Health Board
Director: Dr L A Gray BA MBBCh MRCP

NPIS Edinburgh unit

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NPIS Newcastle unit

Regional Drug and Therapeutics Centre, Newcastle, hosted by Newcastle upon Tyne Hospitals NHS Foundation Trust
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