INTERNET

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Introduction

The internet as we know it today in the twenty-first century is far removed from its original conceptual idea. Historically the internet originated in the late 1960s and early 1970s when it was developed by the USA during the Cold War. Its original purpose was as a means of communication between key institutions within the USA following a nuclear attack. Considering the computer software and hardware available at the time of its original development, it was a pure text-based system. It was not, in fact, until the early 1990s when the graphical interface of the worldwide web (www) was developed that the internet as we know it today was born. The development of the graphical interface led to interest from the general public and the expansion of use of the internet. Prior to this it had not been readily available to most of the population. The increase in demand for use of the internet also coincided with a new generation of computers and appropriate software; the personal computer moved into our lives both within the work and home environment and more recently on to our handheld palmtops and mobile phones. Thus, following 1992, its role within the provision of medical services became apparent and since then the system as a provider of information and communication between health professionals, amongst the general population, and in the commercial sector has expanded exponentially.

Terminology

For the purposes of this article there are three types of system, which may be available to the forensic practitioner either singly or in combination. They are defined within the internet hyperdictionary as follows:

1. The internet/www: this term refers to a computer network consisting of a worldwide network of computer networks that use the TCP/IP (Transmission Control Protocol/Internet Protocol) network protocols to facilitate data transmission and exchange.
2. An intranet: this is a restricted computer network or private network created using worldwide software. It is any network within an organization that provides access to that of the internet but is not necessarily connected to the internet. The commonest examples of this are organizations such as the UK National Health Service (NHS) that provides one or more www servers on a TCP/IP network for distribution of information within the NHS.
3. An extranet: this is the extension of a company's intranet out on to the internet, for example, to allow selected customers, suppliers, and mobile workers to access the company's private data and applications via the www. This is in contrast to, and usually in addition to, the company's public website, which is accessible to everyone. The difference can be somewhat blurred but generally an extranet implies real-time access through a firewall of some kind. Such facilities require careful attention to security but are becoming an increasingly important means of delivering services and communicating efficiently.

Thus, by gaining access to one or more of these networks the forensic practitioner can start to make use of the full potential of the computer-based communications.

The Internet and Forensic Practitioners

Nowadays it would be unusual for a forensic practitioner not to have access to the internet, an intranet, or an extranet. This could be via a personal computer either at the workplace or at home, on a palmtop, laptop, or notebook computer, or via a mobile phone. The question is, however, why would a forensic practitioner consider or wish to access the internet for work rather than purely for leisure purposes? The remainder of this article will discuss possible uses of the internet in forensic practice.

Communication

The mainstay system of communication for the internet is e-mail. The ability to send text and images

anywhere in the world via the internet has undoubtedly been one of the most significant modern human developments. With the development of secure password-protected encrypted systems, confidential documents can now be sent and delivered within a matter of minutes to colleges across the world. This could include statements for court or cases for urgent opinions. However, e-mail is not without problems, and to date has not replaced more traditional forms of document carriage. The recipient does not know that the author of the e-mail is who it says. Although the IP address of the computer from which it was sent can be checked and traced, the person who actually typed it can be challenged. This is a particular problem within the world of internet pedophilia where the pedophile "grooms" the victim by making the child think he or she is talking to another child. The ability to send multiple copies of the same letter all at the same time to multiple recipients is open to abuse, for example within an office environment and may lead to individuals reading other people's correspondence. The mail may not bear a true signature and the size of the images or text may be restricted by firewalls or the recipient's server. As these are electronic communications they can contain viruses that can be rapidly disseminated throughout the world, which in turn may have catastrophic results on computer systems of individuals, companies, or institutions.

Other forms of communication also exist within the internet. Webcams and video conferencing allow the transmission of still and real-time images with or without voice between the host and recipient. This could be within an office or home environment or at a scene of crime or modern forensic mortuary. The presence of the senior investigating police officer at the scene of crime or mortuary may become a thing of the past as he or she can be updated or watch procedures occurring at distant sites from the comfort of the incident room.

Journals

At the time of writing we are at a crossroads in the history of medical and scientific journals. Medical journals are the traditional accepted way of disseminating new knowledge within forensic practice. This could be in the form of editorials, peer-reviewed articles, case reports, letters, or rapid communications. Journals are dedicated to specific areas of forensic practice and may or may not be associated with national or international associations. Traditionally access to them is either through personal subscription or via a library. The internet, however, has changed access to journals as we know them forever.

The use of the internet allows the forensic practitioner three different means of accessing information via journals:

1. Journal subscription. Journals can still be received in their entire hard-copy format that, depending on the journal, may contain color or black-and-white images and text. However, these days most journals can also be received via the internet. Those holding personal or institutional subscriptions will, via passwords, be able to access their journals online, although some journals choose to have free access to all. As they are in an electronic format there is no longer restriction on the length of the article or the use of color photographs as the cost of printing, production, and circulation is removed. Access to archived back issues of journals removes the necessity to visit library facilities or to store hard copies of journals within offices in forensic institutions. Many journals now publish articles on the internet prior to hard-copy publication, leading to more rapid dissemination of peer-reviewed information.
2. Abstracts. Most journals publish abstracts of their articles on the internet and they are free to be accessed by anyone. This allows wider dissemination of information amongst the scientific community, although access to the full journal article may be restricted by the journal owner and access only granted on a "fee-for-paper" basis unless you subscribe to the journal. The abstracts and citations are also held by a number of global electronic indexing facilities such as PubMed or Medline, allowing rapid searching for articles by use of keywords, journals, or authors' details: this allows rapid accumulations of information related to cases through an electronic medium. Thus practitioners can rapidly research cases that they have not encountered before or review the known knowledge in a case where the defense may be putting forward an alternative scenario/causation.
3. ETOCs. ETOC stands for "electronic table of contents." A significant number of journals are now available to be accessed through the internet using the ETOC system. This system is free of charge and allows users to specify by a keyword their area of expertise or interest. The system then identifies all available journals that are accessible through the internet in the chosen field and then, whenever one of the identified journals is published, forwards to the user via e-mail the table of contents of the journal. Each article within the contents table may then be hyperlinked to the abstract, journal, or paper. In this way users can gain access to the content tables and articles of

large numbers of journals without subscribing to them or visiting the library. These are often in areas which may be peripheral to their main field of expertise and yet may contain articles that are relevant to them from time to time. Thus the forensic practitioner has a wider access to information throughout the world on a day-to-day basis.

Education

Sitting in a classroom and being spoon-fed information and facts is a thing of the past thanks to the internet. Many institutions throughout the world now offer postgraduate education via distance learning. The use of systems such as Blackboard allows students to undertake learning distant from the institution where they are registered to study. By logging into the password-protected area of the tutor's web-page students are given coursework such as essays, reading lists, lectures, or tutorials at set times through the course just as if they were attending the institution. Thus the forensic practitioner can undertake under- or postgraduate courses at universities anywhere in the world.

Many universities and institutions now have their libraries and collections accessible through the internet. It is this global access to information or the ability to contact and discuss case material with peers throughout the world that brings the entire world's knowledge of a subject to the fingertips of the forensic practitioner.

Peer Review

Many areas of forensic practice require reports or material to be peer-reviewed before statements are released for use in court. Example areas include forensic science and forensic pathology within the UK, where it is becoming the norm that statements to be used in the prosecution of individuals are not released to the courts without all work being checked by a peer. Traditionally this requires the second person to go through all hard-copy paperwork, slides, laboratory work, or images of the original practitioner. If this takes place within a host institution where both individuals work, then access to this material may be easy, although if the peer review is to occur by a person working distant from the original practitioner then the transportation of large quantities of sensitive material may be impractical or preclude this process. The question as to whether peer review should be undertaken by colleagues within the same work environment or by independent individuals has not been satisfactorily answered to date. As more and more work, of all types, is stored in electronic format, including paper documents, laboratory reports, photographs, video streaming, and histological slides, then the use of the internet means that all of this information can be accessed and peer-reviewed via computer by a peer working at a distant site. The report can be checked online, electronically signed, and sent to the courts having been independently reviewed by the peer without the need to use traditional means of document carriage. However, some bodies (e.g. legal firms) may not accept documents transmitted via e-mail.

Quality Assurance Schemes

Internal and external quality assurance (EQA) schemes can be developed by use of the internet. For example, in the case of forensic pathology, these tend to be distant learning packages (DLPs) rather than EQA, as the subject remains, to date, opinion-based rather than evidence-based. Things will change. One has to be very careful how one sets up an internet-based EQA as any image or text-based system must allow users to be able to demonstrate their knowledge rather than using multiple-choice-type answers which could lead users to fail if insufficient information is available to them to interpret the question or several possible answers are available. This is why DLP is currently preferred.

Where the internet does come into its own is that a practitioner can opt to participate in multiple EQAs or DLPs in different parts of the world by online access: this may be required for continuous professional development (CPD) and revalidation to practice. Electronic submission of answers, certificates, or questionnaires to a professional body to acquire CPD credits is extremely easy using the internet.

Commercial

The commercial element of the internet can be seen as a benefit or a drawback depending on which side of the fence you are on. If you enter a keyword into an internet search engine you will usually be overloaded with "hits," most of which will be individuals or companies offering commercial services in that field. This may be what you are looking for, for example if you need to source someone to represent you in a case or seek the services of an "expert" within a given forensic field. Trying to find someone specialized in a highly selective field of expertise has undoubtedly been simplified by the internet. It has become as simple as using a telephone directory and, unlike a paper-based telephone directory, it will even have a map of where to drop off the material for the opinion. However, if you are seeking general information on a subject but then have to wade through hundreds or thousands of commercial adverts, it is at times a time-consuming task.

Societies, Associations, and Professional Bodies

To practice a forensic practitioner must be in a position to keep up-to-date with current and new knowledge within his/her field of chosen expertise. One way of doing this is to be a member of one or more of the range of national and international societies and associations related to forensic, science, or medical practice. It would be unusual for these groups not to have a web-based facility these days. These are used to inform potential members of the benefits of membership and help give an insight into the given field. They will have contact details of members, notice boards, and chat rooms for dissemination of information, journal reviews, similar site links and, in some cases, draft policy documents or national guidelines will be circulated for consideration, opinion, and views via member-only areas of the sites. They will advertise the contents of their forthcoming meetings with links provided to allow online abstract submission, hotel and venue details and booking forms, as well as flight and accommodation information. Thus they have become mini travel agents for the society/association. They may also carry job advertisements, recruitment drives, or best-practice advice for practitioners.

Many professional bodies are now making use of extranets, for example, the police, security services, forensic pathologists, scientists, and the courts. In the case of forensic pathology original notes, images, histology, and video can be downloaded to secure national storage centers for the purpose of security, data collection, research, and peer review. Court documents can be generated, reviewed and dispatched from anywhere in the world as long as there is a telephone connection into which to plug your laptop. Rapid, confidential secure communication with all entries being logged for disclosure and tracking purposes ensures consistency between practitioners within any field of forensics.

Meetings

Scientific meetings may be advertised on stand-alone sites or, more commonly, in association with the above group sites. In the old days if you couldn't make the meeting, especially if it was in a foreign country, then you may have missed out considerably on the activities within your profession. However, these days many more organized or large associations/societies will include facilities for distant online discussion at the meetings as well as video conferencing to allow absent colleagues to view or participate in the meeting. Those at the meeting can keep in contact with their place of work by cybercafé-type computer facilities within the conference venue.

Summary

As the internet continues to expand, diversify, and develop, the forensic practitioner will be able to gain access to a world of knowledge and communication that could only have been dreamed about by those who came before us. This is a brief summary of some of these opportunities.

See Also

Computer Crime and Digital Evidence

Toxicology

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Introduction

The internet has become a colossal online library, where required information can be obtained by the touch of a button. The emergence of search engines, such as Google, AltaVista, Yahoo, etc., has added immensely to its utility. Information on every conceivable subject is available on the internet today. Toxicology is no exception. Professionals and laymen alike can use the internet to retrieve much valuable information regarding toxicology.

Using the Search Tools on the Net

Search Engines

There are special search engines meant specifically for toxicologists, e.g., ChemFinder (http://chemfinder.camsoft.com/). By entering a CAS registry number in the search box, ChemFinder will provide information by searching hundreds of chemical-related sites. This free search engine is provided by CambridgeSoft, a commercial firm which sells software and chemical information resources.

Web Directories

Another useful way to search for meaningful toxicology websites is to use web directories. These are collections of web pages of a similar theme arranged in a hierarchical system and, in some cases, even annotated.

Yahoo! (http://www.yahoo.com/) maintains a large directory of toxicology sites, in a hierarchical order. A search by the author in late 2003 showed 42 toxicology sites maintained in six categories, such as, environmental toxicology, forensics, institutes, journals, organizations, and schools, departments, and programs. Other useful directories are Open Directory Project (ODP) (http://www.dmoz.org/), Galaxy (http://galaxy.einet.net/), LookSmart (http://www.looksmart.com/), Snap (http://www.snap.com/), About.com (http://home.about.com/index.htm), Lycos (http://www.lycos.com/), eBlast (http://www.britannica.com/), Magellan Internet Guide (http://www.mckinley.com/magellan/), The Argus Clearing House (http://www.clearinghouse.net/), Buble Link (http://bubl.ac.uk/link/), Infomine (http://infomine.ucr. edu/Main.html), Librarians' Index to the Internet (http://lii.org/), and 192 Directory (http://www.192directory.co.uk/).

Toxicology Data Network (Toxnet®)

One of the biggest needs of toxicologists today is a broad database on toxicology, which can be searched easily to retrieve relevant and appropriate information. Toxnet® (http://toxnet.nlm.nih.gov) is such a database. Started in 1985, it is an integrated system of several different databases organized into four groups. It is maintained by the Toxicology and Environmental Health Information Program (TEHIP) in the Division of Specialized Information Services (SIS) of the National Library of Medicine (NLM). The four groups of databases within Toxnet® are: (1) databases providing toxicological data, such as GENE-TOX, (2) bibliographic information, such as Toxline®, (3) chemical releases to the environment, such as Toxics Release Inventory (TRI), and (4) nomenclature information on chemicals, such as NCI-3D. The Toxnet "Multiple databases" option allows for simultaneous searching of HSDB, IRIS, CCRIS, and GENE-TOX. Toxnet® databases are accessible free of charge. More information is available at http://tehip@teh.nlm.nih.gov or (http://sis.nlm.nih.gov/). Factsheets on these databases are available online as well as by request to http://publicinfo@nlm.nih.gov. **Table 1** summarizes the various Toxnet® databases classified according to groups. The Toxnet® training manual can be downloaded free of cost from http://www.sis.nlm.nih.gov/Tox/ToxLecture.html. Both pdf (portable document format; 9.9 MB) and ppt (PowerPoint presentation; 4.2 MB) files are available.

Other Online Databases

Toxnet® is undoubtedly one of the largest databases on the internet related to toxicology. However, there are other databases on the net that can be used profitably.

Elsevier Science runs ScienceDirect® at www.sciencedirect.com, which offers users browse and

Table 1 Toxnet® databases

No	*Database*	*Type*	*Short description*
1	HSDB®	Data	Hazardous substances databank. Human and animal toxicology data on over 5000 potentially hazardous chemicals
2	IRIS	Data	Integrated risk information system. Toxicological data on more than 500 chemicals that are primarily chemicals in commerce that are of regulatory interest
3	CCRIS	Data	Chemical carcinogenesis research information system
4	GENE-TOX	Data	Genetic toxicology database from the US Environmental Protection Agency
5	Tox Town	Data	An interactive guide to commonly encountered toxic substances, people's health, and the environment
6	Haz-Map	Data	An occupational toxicology database designed primarily for health and safety professionals
7	EMIC	Data	Environmental mutagen information center
8	TOXLINE®	Literature	Literature on biochemical, pharmacological, physiological, and toxicological effects of drugs and other chemicals
9	DART/ETIC	Literature	Developmental and reproductive toxicology and environmental teratology information center
10	TRI	Chemical release	Toxic release inventories from EPA for various years
11	CHEMIDPLUS	Chemical information	Chemical names, synonyms, structures, regulatory list information, and links to other databases
12	HSD structures	Chemical information	Two-dimensional chemical structures of chemicals in HSDB
13	NCI-3D	Chemical information	Two- and three-dimensional chemical structures from National Cancer Institute

Modified from Young RR (2002) Genetic toxicology: web resources. *Toxicology* 173: 103–121.

search functionality based on Lexis®-Nexis technology®. ScienceDirect® provides seamless access to abstracts from more than 10 000 journals, including the Elsevier Science family of products, BIOSIS Previews®, Ei Compendex®, Beilstein, INSPEC®, and EMBASE. Access to abstracts is free but payment is required for access to full text.

Elsevier Science also runs a comprehensive scientific search engine, Scirus (http://www.scirus.com). Scirus covers more than 60 million scientific pages from free and fee-for-access-controlled scientific information sources. It searches both web and membership sources, concentrating on those with scientific content. Sources include Neuroscion, BioMed Central, MEDLINE, BioMedNet, Beilstein on ChemWeb, Patients, and ScienceDirect®. The EMBASE service is available at http://embase.com. It provides access to the Excerpta Medica database.

Environmental Toxicology

Environmental toxicology is the study of the ecological effects of anthropogenic substances (e.g., pesticides) released into the environment. A number of websites are devoted to this topic. One of the largest sites devoted to this is ECOTOX (http://www.epa.gov/ecotox). It is a large database comprising more than 320 000 individual effect records abstracted from 17 195 peer-reviewed publications representing over 7800 chemicals and 5300 aquatic and terrestrial species. The database is updated quarterly. ECOTOX database is available in its entirety at http://www.epa.gov/ecotox/data_download/data_download.htm.

Environmental Defense Scorecard (http://www.scorecard.org/) collects data from more than 300 state and federal databases to profile environmental pollution problems and the health effects of toxic chemicals. It provides information on 6800 chemicals released by manufacturing companies.

ECOSAR, a Windows-based application, developed by the US Environmental Protection Agency (EPA), Office of Pesticide Pollution and Toxics (OPPTS), Office of Pollution Prevention and Toxics (OPPT), can be used in estimating the toxicity of single chemicals to primarily aquatic organisms. The program uses quantitative structure–activity relationships (QSARs). It can be downloaded from the web free of cost as part of the EPI Suite™ (v3.11) (http://www.epa.gov/oppt/exposure/docs/episuitedl.htm).

ERED (Environmental residue-effects database) at http://www.wes.army.mil/el/ered/ is a database of test results, where both tissue contaminant concentration and observed toxic responses are reported. The database includes ecotoxicology literature published from 1964 to 1998. Currently, it has over 3400 records abstracted from over 700 publications, covering more than 200 compounds and 180 aquatic species.

The Agency for Toxic Substances and Disease Registry (ATSDR) produces "toxicological profiles" for hazardous substances found at National Priorities List (NPL) sites. These hazardous substances are ranked based on frequency of occurrence at NPL sites, toxicity, and potential for human exposure. Toxicological profiles are developed from a priority list of 275 substances. ATSDR also prepares toxicological profiles for the Department of Defense (DOD) and the Department of Energy (DOE) on substances related to federal sites. At the time of writing, more than 250 toxicological profiles of various chemicals had been published. More information (including complete toxicological profiles) can be obtained at the ATSDR site at http://www.atsdr.cdc.gov/.

Three self-guided tutorials on toxicology, mainly covering environmental toxicology are available for all at http://www.sis.nlm.nih.gov/Tox/ToxTutor.html.

Food Toxicology

Food toxicity deals with adverse reactions developed by the consumption of food. The toxicity observed may be due to food additives, pesticide residues, environmental contaminants, food allergens, or natural toxins. Since most of these are being dealt with in separate articles, only internet resources related to food additives and toxicity resulting from them are described here.

All humans are consumers of food, and it is their natural instinct to know what chemicals are added to it to enhance its flavor, color, or shelf life. Some food additives are considered to be "generally recognized as safe" (GRAS) while others are more strictly regulated. All countries have their own regulatory agencies that exercise control over food additives. In the USA, the FDA has primary responsibility for the regulation and approval of food additives.

The FDA's Center for Food Safety and Applied Nutrition has a comprehensive website at http://www.cfsan. fda.gov/~lrd/foodadd.html. It provides consumer information at (http://www.cfsan.fda.gov/~dms/opa-bckg.html) and includes information on such food additives as monosodium glutamate. Members of the food industry can also get useful information from the FDA site. A list of technical documents is available at http://www.cfsan.fda.gov/~dms/opa-tech.html. It contains information on a wide variety of subjects, such as guidelines for submitting food additive petitions, petition status, inspection results, notification programs, and threshold of regulation exemptions. The site also contains a valuable

database at http://www.cfsan.fda.gov/~dms/opa-indt.html. This database gives information about a number of "indirect" additives used in food contact substances such as adhesives and components of coatings, paper and paperboard components, polymers, and adjuvants and production aids. These are generally substances that come into contact with food as part of packaging or processing equipment, but are not intended to be added directly to food.

However, the data that may be of more immediate concern to toxicologists are available from the Everything Added to Food in the United States (EAFUS) food additive database. This database comprises of chemical and toxicological information on over 2000 substances directly added to food, including substances regulated by the FDA as direct, "secondary" direct, and color additives, and GRAS and prior-sanctioned substances.

There are a number of other organizations providing information on food toxicology. These are the UK Institute of Food Science and Technology (http://www.ifst.org/ifstfaq3.htm) and the International Food Information Council Foundation (http://ific.org/mediaguide/). These two sites contain a vast variety of consumer-friendly educational materials on food additives.

Genetic Toxicology

The biggest online database on genetic toxicology is undoubtedly GENETOX, a part of Toxnet® discussed already. An important area in genetic toxicology concerns the regulatory guidelines that apply to hazard assessment of new drugs. Harmonized guidelines have been developed for preclinical genotoxicity testing of drugs before they are used in humans. Almost all drugs in development must be tested by a battery of genetic toxicology tests that include a bacterial reverse mutation assay, an *in vivo* rodent bone marrow micronucleus assay, and either an *in vitro* mammalian cell gene mutation assay or an *in vitro* mammalian cell chromosome aberration assay. The complete guidelines are available at http://www.ifpma.org/ich5s.html. Good laboratory practice (GLP) are available at http://www.fda.gov/ora/compliance–ref/bimo/default.htm.

Various websites related to professional genetic toxicology societies and journals related to genetic toxicology are discussed in sections dealing with toxicology societies, and online toxicology journals.

Drug Toxicity

Information on drug toxicity is used primarily by three categories of consumers: (1) patients who want to be aware of possible side-effects of drugs they are taking, (2) physicians, who need to be aware of various drug interactions and their toxicities, which could help in better treatment and provide more viable alternatives for treatment, and (3) R&D scientists who are in the process of developing newer drugs. They need to know the toxic potentials of various new molecules in the development process. Various softwares are now available online, which can do this job easily.

There are information resources on the web today catering to everyone. Consumers can access a very useful resource R_x list (http://www.rxlist.com/) for information on side-effects and drug interactions for more than 1300 products. The site provides an A–Z listing of these drugs and their toxicities at http://www.rxlist.com/cgi/generic/brand.htm. Recent additions to R_x List monographs are given in a separate table. A neat search box is provided through which the consumer can search for toxicity of any drug. Another good site for the consumers is provided by The Institute for Safe Medication Practice (http://www.ismp.org). It is a non-profit organization involved in reporting medication errors and adverse events associated with drugs. The aim is to prevent future similar occurrences.

For physicians, key information on drug–drug interactions can be accessed through a number of sites such as www.drkoop.com and the drug-checker system, http://www.pharmacytimes.com. The former is a very user-friendly site and can profitably be used by nontechnical persons as well. A search box is provided over the top-left, where one can enter the name of the drug to read about its toxicity.

Perhaps the biggest beneficiaries of the internet in the field of drug toxicity are the R&D scientists, who can use a number of online applications to predict toxicity of newer molecules. These are sometimes referred to as "new chemical entities" or NCEs and "new molecular entities" or NMEs. One of the key steps in the development of a new drug molecule is the evaluation of its so-called "ADME/tox" profile (absorption, distribution, metabolism, excretion, toxicity). Previously done by actual experimentation entailing high costs, this can now be done easily and much more economically by simulation software, most of which is available online. These softwares generally make use of the structure–activity relationship (SAR). SAR is a computer-based technique that allows chemical testing based solely on a chemical's molecular structure. It is one component of the more comprehensive QSAR, which is capable of quantifying the type of relationship identified. Although quite complicated in their working, essentially most of these software compare the chemical structures of

NCEs and NMEs with those whose toxicity is already known. A prediction on toxicity of the new molecules is based on the similarity between the two structures. A number of QSAR-based software programs are available online. One is Accelrys' TOPKAT (available at http://www.accelrys.com/products/topkat/). *dsNavigator*, a suite of internet-based applications for adverse event compilation and reporting is available at http://www.biopharm.com/prod5dsNav.html and http://www.drugsafety.com. Other similar software are Hazard Expert available from Compudrug at http://www.compudrug.com, M-CASE and Casetox available from Multicase Inc. at http://www.multicase.com, *C2.ADME* from Accelrys at http://www.accelrys.com/cerius2/c2adme.html and *MetabolExpert* available from CompuDrug at http://www.compudrug.com.

ToxScope is a new virtual decision-making software that provides access to 150 000 chemical structures and expert statistical analysis of complex data to speed the process and cut the high costs of drug discovery. The ToxScope databases encompass acute toxicity, hepatotoxicity, mutagenicity, and carcinogenicity. It is made available by LeadScope Inc, in collaboration with ddplatform LLC. More information about this software is available at http://www.hpcwire.com/dsstar/01/0612/103161.html.

"Registry of toxic effects of chemical substances" (RTECS) at http://www.ccohs.ca/products/databases/rtecs.html is a database that provides toxicological information with citations on over 150 000 chemical substances. Among other data, the detailed profiles also include toxicological data and reviews. Six types of toxicity data are included in the file: (1) primary irritation, (2) mutagenic effects, (3) reproductive effects, (4) tumorigenic effects, (5) acute toxicity, and (6) other multiple dose toxicity. It was first published on 28 June 1971. Known as "toxic substances list" at that time, it included toxicological data for ~5000 chemicals.

Pesticide Toxicology

Pesticides released into the environment are a major concern today. There are a number of websites specifically devoted to pesticide toxicology. A useful site about pesticides in a nontechnical language is the EXTOXNET (http://ace.orst.edu/info/extoxnet/). EXTOXNET is a cooperative effort of University of California–Davis, Oregon State University, Michigan State University, Cornell University, and the University of Idaho. Primary files are maintained and archived at Oregon State University. The EXTOXNET database is divided into several parts. Specific information on pesticides is provided in what they call PIPs (pesticide information profiles). It is available at http://ace.orst.edu/info/extoxnet/pips.html. Toxicology information briefs (TIBs) contain a discussion of certain concepts in toxicology and environmental chemistry. TIBs are available at http://ace.orst.edu/info/extoxnet/tibs/tibs.html. Other topic areas include toxicology issues of concern (TICs), fact sheets, news about toxicology issues, newsletters, resources for toxicology information, and technical information. The PIPs page also has an alphabetical listing of all the cataloged active ingredients.

Other useful resources are EPA biopesticides (http://www.epa.gov/pesticides/biopesticides/), EPA office of pesticide programs (http://www.epa.gov/pesticides), EPA OP insecticide tolerance reassessment (http://www.epa.gov/pesticide/op), and EPA pesticide reregistration status (http://www.epa.gov/pesticides/reregistration/status.htm).

Developmental and Reproductive Toxicity

Developmental and reproductive toxicity studies deal with risks faced by the fetus, when the pregnant mother is exposed to poisons and toxic agents. Several websites are now devoted to developmental toxicity. The Center for the Evaluation of Risks to Human Reproduction (CERHR) has its website at http://cerhr.niehs.nih.gov. It was established by the NTP/NIEHS (National Toxicology Program/National Institute of Environmental Health Sciences) in 1998 to provide scientific assessments of the potential for environmental agents to cause adverse effects on human reproduction and development. It reviews the developmental toxicity of several chemicals. The reports are available at its website.

A web-based resource on developmental toxicology (http://www.devtox.org/index.htm) has been developed by German agencies and the WHO Collaborating Center for Developmental Toxicology under the auspices of the Harmonization Project. This online resource contains harmonized terminology (nomenclature) for developmental toxicology along with images of anomalies to aid classification, and associated background documents.

Reprotox® (http://reprotox.org/) is a computerized database that was developed by A. R. Scialli (an obstetrician with expertise in clinical teratology) and associates at the Reproductive Toraicology Center in Bethesda, MA, for use by scientists, healthcare professionals, and governmental agencies. It is a component of the Reprorisk System® of Micromedex, Inc. (http://www.micromedex.com) and is available via the internet by subscription only. This database provides up-to-date information on reproductive

toxicity data related to a number of chemicals and environmental agents, including medications and recreational drugs.

FETAX (Frog Embryo Teratogenic Assay – *Xenopus*) is a developmental toxicity test conducted on the South African clawed frog *Xenopus laevis*. Information about this and other similar tests is available at http://usacehr.detrick.army.mil/aeam/Methods/Dev_Frog/default.asp.

Veterinary Toxicology

The first animal poison control center in the world was the ASPCA Animal Poison Control Center (http://www.napcc.aspca.org/).

The American Board of Veterinary Toxicology (ABVT) is at http://abvt.org. The ABVT consists of a group of trained veterinarians whose aim is to educate the public, professional veterinarians, and veterinary medical students about toxicologic hazards to pets, livestock, and wildlife. The American Association of Veterinary Laboratory Diagnosticians is at www.aavld.org. If offers links to veterinary diagnostic laboratories in the US that offer extensive veterinary toxicologic testing.

The food animal residue avoidance database (FARAD) at http://www.farad.org/ is a computer-based decision support system. It has been designed to provide livestock producers, extension specialists, and veterinarians with practical information on how to avoid drug, pesticide, and environmental contaminant residue problems. Information can be obtained from this site by both producers and veterinarians.

Details about the Veterinary Toxicology Residency Program are available at www.cvm.uiuc.edu/vb/toxres/. This program is run by the University of Illinois College of Veterinary Medicine. The College maintains an outdoor garden specifically for toxic plants (http://www.library.uiuc.edu/vex/vetdocs/toxic.htm). This gives residents, veterinary students, and practitioners opportunities to identify plants poisonous to livestock, companion animals, and human beings at all stages of growth and maturation over the growing season. "Plants causing sudden death" (http://www.ivis.org/special_books/Knight/chap1/chapter_frm.asp?LA=1) is a full-text document describing plant species that can cause sudden death in animals.

Nitrate and nitrite poisoning in livestock (http://www.agric.nsw.gov.au/reader/an-health/a0967.htm) is a resource provided by the New South Wales Department of Agriculture, Australia, in July 2003 as part of its "Agfact" series. Written by Dr Sarah Robson (a veterinary officer), this site provides information on nitrate and nitrite poisoning in livestock.

Zootoxins deal with toxins produced by animals. One useful website on this subject is sponsored by the Department of Environmental Health and Safety at Oklahoma State University at http://www.pp.okstate.edu/ehs/links/poison.htm.

There is a discussion group on veterinary toxicology. It is called VetTox. For details, one can contact the moderator Dr. Merl Raisbeck at http://raisbeck@uwyo.edu.

Toxicology Associations and Societies

Many toxicological societies now have their own websites. These websites give information about their aims and objectives, constitution, memorandum of association, memberships, annual meetings, professional and academic activities, subscription fees, etc. It would not be possible to give the names and URLs of all professional toxicological societies, because there are several. **Table 2** lists a few representative societies. Many of these societies have their own links pages, through which the visitor will be able to visit further societies and associations.

Online Toxicology Journals

A number of toxicology journals are now available online. Full-text access requires membership in many cases, while a few are available free online. The *Journal of Analytical Toxicology* (http://www.jatox.com) provides abstracts free of cost, but full text is available for a fee.

The European Journal of Genetic Toxicology (http://www.swan.ac.uk/cget/ejgt1.htm) is an online journal published by the European Environmental Mutagen Society (EEMS). It is an international multidisciplinary journal aimed at bringing together research and overviews of research and regulatory activities into the mechanisms of action and consequences of exposure of living organisms to genotoxic chemicals and radiations.

The International Journal of Toxicology (http://landaus.com/toxicology/journal.htm) publishes refereed papers covering the entire field of toxicology, including research in risk assessment, general toxicology, carcinogenicity, safety evaluation, reproductive and genetic toxicology, epidemiology and clinical toxicology, mechanisms of toxicity, new approaches to toxicological testing, and alternatives to animal testing. Reviews and major symposia in the field are included.

Inhalation Toxicology (http://www.tandf.co.uk/journals/titles/08958378.html) is a peer-reviewed monthly publication providing a key forum for

Table 2 Some representative professional toxicology associations and societies with their URLs

No.	*Society*	*URL*
1	American Academy of Clinical Toxicology	http://www.clintox.org/
2	American Association of Poison Control Centers	http://www.aapcc.org/
3	American Board of Forensic Toxicology	http://www.abft.org/
4	American Board of Toxicology	http://www.abtox.org
5	American Board of Veterinary Toxicology	http://www.abvt.org/
6	American College of Medical Toxicology	http://www.acmt.net/
7	American College of Toxicology	http://www.actox.org/
8	Argentine Toxicologial Association (Asociación Toxicológica Argentina) (in Spanish)	http://www.ataonline.org.ar
9	ASIATOX (Asian Society of Toxicology)	http://yes.snu.ac.kr/asiatox/
10	Association for Development, Study and Advice in Toxicology (Association pour le Développement, l'Etude et le Conseil en Toxicologie)	http://www.lptc.u-bordeaux.fr/pages-perso/adectox/Adec_Homepage_en.htm
11	Association for Research in Toxicology (Association pour la Recherche en Toxicologie) (in French)	http://www.aret.asso.fr/
12	Association of Government Toxicologist	http://www.agovtox.org/
13	Australasian Society of Clinical and Experimental Pharmacologists and Toxicologists	http://www.ascept.org/
14	Behavioral Toxicology Society	http://www.behavioraltoxicology.org/
15	British Toxicology Society	http://www.thebts.org/
16	California Association of Toxicologists	http://www.cal-tox.org/
17	Canadian Society of Toxicology	http://meds.queensu.ca/stcweb/
18	Estonian Society of Toxicology (Eesti Toksikoloogia Selts) (in Estonian, with some English)	http://www.estsoctox.ee/
19	European Association of Poison Centres and Clinical Toxicologists	http://www.eapcct.org/
20	EUROTOX-Association of European Toxicologists and European Societies of Toxicology	http://www.eurotox.com/
21	Finnish Society of Toxicology	http://www.uta.fi/fst/
22	French Society of Genetic Toxicology (Société Française de Toxicologie Génétique) (in French and English)	http://www.sftg.org/
23	French Society of Toxicology	http://www.ccr.jussieu.fr/sft/index.htm
24	Genetic and Environmental Toxicology Association of Northern California	http://www.ems-us.org/geta/index.html
25	German Society for Experimental and Clinical Pharmacology and Toxicology (Deutsche Gesellschaft für experimentelle und klinische Pharmakologie und Toxikologie) (in German)	http://www.dgpt-online.de/
26	International Association of Forensic Toxicologists	http://www.tiaft.org/
27	International Society of Regulatory Toxicology and Pharmacology	http://www.isrtp.org/
28	International Union of Toxicology (IUTOX)	http://www.iutox.org/
29	Irish Society of Toxicology	http://www.toxicologyireland.com/
30	Italian Society of Toxicology	http://users.unimi.it/~spharm/sit/SIThome.html
31	London Toxicology Group (LTG)	http://ramindy.sghms.ac.uk/~ltg/links.htm
32	Netherlands Society of Toxicology (Nederlandse Vereniging voor Toxicologie) (in Dutch)	http://www.toxicologie.nl/
33	Norwegian Society of Pharmacology and Toxicology	http://www.farmakoterapi.uio.no/nsft/
34	Society of Clinical Toxicology (Société de Toxicologie Clinique) (in French)	http://www.toxicologie-clinique.org/
35	Society of Environmental Toxicology and Chemistry	http://www.setac.org/
36	Society of Forensic Toxicologists	http://www.soft-tox.org/
37	Society of Toxicologic Pathologists	http://www.toxpath.org/
38	Society of Toxicology	http://www.toxicology.org/
39	Swedish Society of Toxicology	http://www.imm.ki.se/sft/
40	The Genetic Toxicology Association	http://www.ems-us.org/gta/index.html
41	Turkish Society of Toxicology	http://www.turktox.org.tr
42	Ukrainian Toxicology Society	http://www.medved.kiev.ua/utox/info_en.htm

Modified and updated from Kehrer JP and Mirsalis J (2001) Professional toxicology societies: web based resources. *Toxicology* 157: 67–76.

the latest accomplishments and advancements in concepts, approaches, and procedures presently being used to evaluate the health risk associated with airborne chemicals.

Archives of Environmental Contamination and Toxicology (http://link.springer.de/link/service/journals/00244/) is published by Springer-Verlag and contains peer-reviewed papers on environmental toxicology. More information about this journal is available at http://link.springer.de/link/service/journals/00244/about.html.

The *International Journal of Drug Testing* (http://www. criminology.fsu.edu/journal) is an online peer-reviewed journal edited by Mieczkowski. Another journal is *Anil Aggrawal's Internet Journal of Forensic Medicine and Toxicology* at http://www.geradts.com/~anil/index.html. This biannual journal was started on February 25, 2000, and has an international board of editors. There are currently 25 professionals on the editorial board, including at least one forensic professional from each of the six continents. The journal publishes original papers, theses, book reviews and dissertations in full and also has a regular undergraduate and postgraduate section.

Some representative toxicology journals available online are given in **Table 3**. In addition to these, http://www.freemedicaljournals.com/ provides a list of about seven free online toxicology journals, including three in French and more information can be obtained by browsing.

Toxicology Books and Atlases on the Internet

A number of free toxicology books are available on the internet for download and more information can be obtained by browsing http://freebooks4doctors. com/. More information on free e-books can be obtained by browsing http://www.bizzydays.com/freeebooks.htm. However, this site has books on other subjects as well, including nonmedical subjects; browsing for a while is needed to get the required book.

A number of sites allow one to download books on payment basis. One such site is OVID (gateway.ovid.com), which has a number of toxicology books in its database (including books like, *The 5-Minute Toxicology Consult* and *The 5-Minute Emergency Medicine Consult*). These books can be downloaded for a small fee. PROQUEST (http://www.umi.com/proquest) is another online database, which also allows downloading of a number of books. Both OVID and PROQUEST also allow downloading of journal articles, from several forensic and toxicology journals, such as *American Journal of Forensic Medicine and Pathology.*

A number of poisonous plants atlases are available on the internet free of cost. Most useful among them are *Poisonous Plants of North Carolina* by Dr. Alice B. Russell and colleagues of the Department of Horticultural Science (http://www.ces.ncsu.edu/depts/hort/consumer/poison/images/), high-resolution engravings of poisonous plants by the Southwest School of Botanical Medicine (http://www.kmxq.com/hrbmoore/Illustrations/Illust.html), pictures provided by University of Pennsylvania School of Veterinary Medicine (http://cal.vet.upenn.edu/poison/), *Poisonous Plants of Pennsylvania* (http://caltest.nbc.upenn.edu/poison/Brett/AgBook/AgHome.htm) and "Poisonous plants" home page of Cornell University (http://www.ansci.cornell.edu/plants/). There is also an interesting poisonous animals atlas dealing mainly with poisonous frogs at http://www.colonet.com/frogs/. Best Toxicology Books at http://www.geradts.com/~anil/btb/index.html reviews only toxicology books.

Online Toxicology News

There was a methyl isocyanate (MIC) gas leak in Bhopal, India on 2 December, 1984 in which 2000 people died. Papers in India were agog with news regarding this disaster. It was a significant news related to toxicology, but not many people around the world got to know about it. In the rest of the world, the event got a very small coverage in the national papers or a few seconds on TV and radio, if at all. If anyone missed the news, the information was lost. Certainly it was very difficult for anyone to get this news in detail, after, say, one month. There was no internet at that time. In such a scenario, researchers (in other countries) doing research in MIC could very easily be deprived of this significant event.

With the development of the internet, the situation has completely changed. There are an estimated 10 000 daily newspapers, and several more general-interest magazines around the world. Now search for, e.g., MIC disaster, can be done easily not only for the current but also for the previous years by *electronic library systems*. One of the best electronic libraries is the eLibrary tracker (http://ask.elibrary.com/). Sponsored by Electric Library. It searches each day for any topic needed and emails the latest headlines automatically. 1stHeadlines (http://www.1stHeadlines.com) indexes 415 newspapers, broadcast and online sources, and Moreover.com (http://w.moreover.com/) (please note there is just one "w" in the address, not "www") indexes articles from about 1500 sources. Proquest mentioned above also allows readers to access a number

Table 3 Some representative toxicology journals available on the internet

No.	Journal	URL (at the time of writing)
1	*Adverse Drug Reactions and Toxicological Reviews*	http://www.adis.com/page.asp?ObjectID = 154
2	*Anil Aggrawal's Internet Journal of Forensic Medicine and Toxicology*	http://www.geradts.com/~anil/index.html
3	*Annual Review of Pharmacology and Toxicology*	http://pharmtox.annualreviews.org/
4	*Archives of Environmental Contamination and Toxicology*	http://link.springer-ny.com/link/service/journals/00244/
5	*Archives of Toxicology*	http://link.springer.de/link/service/journals/00204/
6	*Best Toxicology Books*	http://www.geradts.com/~anil/btb/index.html
7	*Bulletin of Environmental Contamination and Toxicology*	http://link.springer.de/link/service/journals/00128/
8	*Cell Biology and Toxicology*	http://kapis.www.wkap.nl/journalhome.htm/0742-2091
9	*Chemical Research in Toxicology*	http://pubs.acs.org/journals/crtoec/index.html
10	*Comments on Toxicology*	http://www.tandf.co.uk/journals/titles/08865140.html
11	*Critical Reviews in Toxicology*	http://www.crcjournals.com/ejournals/issues/issue_archive.asp?section = 1053
12	*Current Advances in Toxicology*	http://www.elsevier.com/inca/publications/store/7/3/9/
13	*Drug and Chemical Toxicology*	http://www.dekker.com/servlet/product/productid/DCT
14	*Ecotoxicology*	http://www.kluweronline.com/issn/0963-9292
15	*Ecotoxicology and Environmental Safety*	http://www.elsevier.com/locate/issn/0147-6513
16	*Environmental Toxicology and Pharmacology*	http://www.elsevier.com/inca/publications/store/5/2/3/0/2/4/
17	*European Journal of Genetic Toxicology*	http://www.swan.ac.uk/cget/ejgt1.htm
18	*Experimental and Toxicologic Pathology*	http://www.urbanfischer.de/journals/exptoxpath/et_patho.htm
19	*Food Additives and Contaminants*	http://www.tandf.co.uk/journals/titles/0265203x.html
20	*Human and Experimental Toxicology*	http://www.arnoldpublishers.com/journals/pages/exp_tox/aut.htr
21	*Immunopharmacology and Immunotoxicology*	http://www.dekker.com/servlet/product/productid/IPH
22	*In Vitro and Molecular Toxicology*	http://www.liebertpub.com/ivt/default1.asp
23	*Inhalation Toxicology*	http://www.tandf.co.uk/journals/titles/08958378.html
24	*International Journal of Drug Testing*	http://www.criminology.fsu.edu/journal
25	*International Journal of Toxicology*	http://landaus.com/toxicology/journal.htm
26	*Journal of Analytical Toxicology*	http://www.jatox.com/
27	*Journal of Applied Toxicology*	http://www.interscience.wiley.com/jpages/0260-437X/
28	*Journal of Biochemical and Molecular Toxicology*	http://www.interscience.wiley.com/jpages/1095-6670/
29	*Journal of Environmental Pathology, Toxicology and Oncology*	http://www.begellhouse.com/journals/0ff459a57a4c08d0.html
30	*Journal of Toxicology – Cutaneous and Ocular Toxicology*	http://www.dekker.com/servlet/product/productid/CUS
31	*Journal of Toxicology and Environmental Health Part A*	http://www.tandf.co.uk/journals/titles/15287394.html
32	*Pharmacology and Toxicology*	http://www.munksgaard.dk/tidsskrifter.nsf/a3b40ef0ca9b8d86c1256a160050049f/c6c5ae8d31463c59c1256a1c004870e9?OpenDocument
33	*Regulatory Toxicology and Pharmacology*	http://www.elsevier.com/locate/issn/0273-2300
34	*Reviews in Toxicology*	http://www.iospress.nl/site/html/13826980.html
35	*Toxicologic Pathology*	http://www.tandf.co.uk/journals/titles/01926233.html
36	*Toxicological and Environmental Chemistry*	http://www.tandf.co.uk/journals/titles/02772248.html
37	*Toxicological Sciences*	http://toxsci.oupjournals.org/
38	*Toxicology*	http://www.elsevier.com/inca/publications/store/5/0/5/5/1/8/
39	*Toxicology and Applied Pharmacology*	http://www.tandf.co.uk/journals/titles/10937404.html
40	*Toxicology and Industrial Health*	http://www.arnoldpublishers.com/journals/pages/tox_ind/07482337.htm
41	*Toxicology in Vitro*	http://www.elsevier.com/inca/publications/store/8/0/0
42	*Toxicology Letters*	http://www.elsevier.com/inca/publications/store/5/0/5/5/1/9/
43	*Toxicology Mechanisms and Methods*	http://www.tandf.co.uk/journals/titles/15376516.html
44	*Toxicon*	http://www.elsevier.com/inca/publications/store/2/5/9/
45	*Xenobiotica*	http://www.tandf.co.uk/journals/tf/00498254.html

of newspapers for toxicology news. The Newspaper Association of America (http://www.naa.org) lists 1150 US papers and 200 non-US papers. Editor and Publisher magazine (http://www.editorandpublisher.-com/ editorandpublisher/index.jsp) has 4600 newspapers worldwide, which can be searched online.

Online Theses and Dissertations

An interesting recent development is the availability of a number of theses and dissertations submitted to various universities online. They are known as electronic theses and dissertations (ETDs). To know more about ETDs, it is useful to browse a site entitled *About Electronic Theses and Dissertations* (http://etext.lib.virginia.edu/ETD/about/). Ranging on all subjects, many ETDs deal with toxicology.

Toxicology Sites for the Layman

Although a majority of sites mentioned above are meant primarily for professional toxicologists, there are a number of other sites meant specifically for the layman. One of the most popular is *Anil Aggrawal's Forensic Toxicology page* (http://www.geradts.com/~anil/index.html). This site is in the form of a discussion between an expert forensic pathologist and a very curious 15-year-old youngster Tarun. Most of the time the pathologist is in the postmortem room just about to begin the postmortem examination on the dead body of a person, who is suspected of having died from poisoning. Tarun sees the body and starts asking questions of the pathologist. As the pathologist keeps dissecting the body, he keeps answering Tarun's questions, discussing with him the signs, symptoms, pathological findings, etc., of poisons. By the time the postmortem is complete the poison which killed the person is determined. One poison is dealt with in one discussion. The site is a collection of 50 such discussions. A total of 49 poisons are discussed, the first discussion being on the history of poisons. Poisons discussed range from such commonly known as arsenic and Spanish fly to such exotic ones as cicutoxin and gold. Although basically meant for lay people, these discussions would interest a professional toxicologist as well, for the various interesting historical sidelights given in each discussion.

Crime and Clues (http://crimeandclues.com) is a very popular and useful site which includes a number of articles related to toxicology. Other useful sites primarily for the layman are "Poisonous plants and animals" (http://library.thinkquest.org/C007974), "Dictionary of Botanical Epithets" (http://www.winternet.com/~chuckg/), Botanical.com – A Modern Herbal by Mrs. M. Grieve (http://www.botanical. com/botanical/mgmh), "Minnesota Poison Control System" (http://www.mnpoison.org/index.htm) and "Edible and Poisonous Mushrooms" (http://www.conservation.state.mo.us/nathis/mushrooms/mushroom/).

Toxicology Quiz Sites

Quiz is one of the most interesting ways not only to test one's knowledge but also to gain additional information. A number of toxicology quizzes are being run on various sites both for lay persons and professional toxicologists alike. One of the best is Dalefield's toxicology quiz at http://www.dalefield.com/toxicology/.

Other useful sites are "Tox trivia" at http://www.Pharmacy.Arizona.EDU/centers/poisoncenter/trivia/questions/, "Hazardous Substances Review Toxicology Quiz" at http://macpost.odr.georgetown.edu/ehands/News698.html, and "School of Veterinary Medicine, Tuskegee University Toxicology quiz" at http://192.203.127.60/quiz/physiology/Toxicology.html. Anil Aggrawal's "Forensic Toxicology" page, and "Minnesota Poison Control System" mentioned above also have a number of tox trivia and toxicology quizzes, including picture quizzes.

Toxicology Newsgroups and Fora

There are a number of toxicology newsgroups, including: http://www.bio.net/charters/toxicol, http://www.bio.net/hypermail/toxicol/current, and http://groups.yahoo.com/group/cr_po.

NLM's division of SIS runs a small announcement list called NLM-Tox-Enviro-Health-L. The purpose of the announcement list is to broadcast updates on SIS's resources, services, and outreach in toxicology and environmental health. The NLM-Tox-Enviro-Health-L archives allow users to search list postings, and to modify subscription options. More information is available at http://www.sis.nlm.nih.gov/Tox/ToxListServ.html.

Conclusion

The internet is a very strong medium for dissemination of information and toxicologists have made good use of it. Today there are a number of websites, newsgroups, online journals, searchable databases, and other web-based services solely devoted to toxicology and its various subspecialties. The relevant information is no longer limited to libraries; it is not difficult to search for information either, as compared to past. All information that is needed is available at

the touch of a button. However where and how to look for information on the internet is key. Indeed, the internet has completely changed the way that toxicology is viewed today.

See Also

Internet: Forensic Medicine

Further Reading

Aggrawal A. Anil Aggrawal's Forensic Toxicology Page (http://www.geradts.com/~anil/index.html).

Aggrawal A. Best Toxicology Books (http://www.geradts.com/~anil/btb/index.html).

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Wexler P (2000) *Information Resources in Toxicology*. San Diego, CA: Academic Press.

Wexler P (ed.) (2001) Special issue: digital information and tools, Part I .*Toxicology* 157(1–2): 1–164.

Wexler P (ed.) (2002) Special issue: digital information and tools, Part II – Web resources in special toxicology topics. *Toxicology* 173(1–2): 1–192.

Wexler P (ed.) (2003) Special issue: digital information and tools, Part III – global web resources. *Toxicology* 190(1–2): 1–142.

Wexler P (2003) A forum to highlight internet resources of note for toxicologists. *Toxicology* 184: 241–242.