

VETS ON THE NET

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Keeping up-to-date with current information has become one of the most difficult challenges for veterinarians. Printed material used to be the only medium for information access. More recently electronic media have become available, such as electronic versions of indexing/abstracting services or The Merck Veterinary Manual. Over the last two years the Internet (a major network connecting thousands of computers around the world) has become much more easily accessible for the general public. This paper will discuss the services provided by the Internet and their usefulness from a veterinary perspective.

The Internet

Today's Internet (often called the *Net*) is a global resource connecting millions of users that began as an experiment over 20 years ago by the U.S. Department of Defense. The Internet is composed of separate interconnected networks of computers around the world which use a common language (TCP/IP = Transmission Control Protocol / Internet Protocol) to communicate with each other. It can be thought of as an infrastructure for moving information around the world. The Internet is similar to an interstate highway system and therefore sometimes called the *Information Superhighway*. Internet users are using the system to obtain a very diverse range of information, either direct from computers, or from people through computers.

The Internet is growing exponentially. In 1995 it was estimated that the Internet was used by 23 million people and connected about 7 million computers in about 100 countries. It is now possible for virtually everyone with a personal computer and a modem in Australia or New Zealand to connect to the network through companies providing access to the Internet as a service. Hence, the Internet is likely to become as important as telephone and postal mail for communication between the people throughout the world. It provides both, the first global forum for discussion and the first global library of information. Anyone can participate in the Internet, there should be no discrimination, and nobody is in charge.

Transfer of messages on the Internet is based on a process called *packet switching*. The message to be communicated is broken into small chunks that are labeled to show where they come from and where they are to go, rather like postcards in the postal system. Packets are forwarded individually from one computer to another until they arrive at their destination. If any are lost, they are re-sent by the originator. The recipient acknowledges receipt of packets to eliminate unnecessary re-transmissions. Individual packets are *routed* to their destination using the most expedient route which does not have to

be the same for every packet belonging to the same message. The destination computer reassembles the packets into the original message. *Packet switching* is different from a more connection-oriented system called *circuit switching* which is used for telephone communication. Here, a dedicated communication path is established between the sender and receiver along which all packets travel.

Internet services

There are four main types of services provided by the Internet. The first is the *mail service* which is used to transmit and receive messages. A message is transferred through the *Net* from computer to computer until it reaches its final destination. The second service called *telnet* allows establishing a terminal session with a remote computer. It is possible to use a computer in New Zealand as a terminal to another computer at the other end of the world. The third service is called *FTP* (file transfer protocol) and allows file transfer from one computer to another. This means that documents, data or complete software packages can be *downloaded* from a computer somewhere on the Internet to a local computer or *uploaded* from the local computer to a computer somewhere in the world. The last Internet service is called *client/server* system. In this situation resources are shared between two different computers. One of them, the *server*, provides a resource and the other, the *client*, makes use of the resource. For example you may want to edit from your computer a document located on another computer connected to a network. The word processing software on your computer (*client*) will send a request to the other computer (*server*) to send the file containing the document. The computer *server* may be next door or for example in Europe.

Internet resources

Based on the above services the Internet provides a range of resources. Only the Internet services which are likely to be relevant for veterinarians are described in the following paragraphs.

Electronic Mail

This resource makes use of the Internet mail service. *Electronic mail* does not just allow sending simple text messages from one computer to another computer, it is also possible to attach computer software, video, sound or documents with complex formatting to the messages. But as the mail service can only transfer regular text, any binary files such as compiled computer programs or formatted documents have to be encoded as regular text before they are being sent and then decoded back into their original binary format by the recipient. Modern *electronic mail* software will perform both conversions automatically and uses encoding protocols such as MIME (Multipurpose Internet Mail Extensions) or UUENCODE/UUDECODE. Messages can also be sent to multiple recipients at the same time which is a feature used by *mailing lists*.

Electronic mail was the original motivation for setting up the Internet. Compared with the two major communications media, telephone and postal delivery, the first is slightly faster than *electronic mail*, whereas postal delivery is far slower (*snail mail*). *Email* is comparable with fax, but cheaper, more flexible and progressively becoming more reliable. An advantage of post and *email* can be that both do not require the caller and sender to be present at the same time as is the case in a telephone conversation. Both written media hold the writer more accountable than spoken media. *Email* is the best medium of the three for group communications.

Remote Login

Telnet allows connecting to another *remote* computer on the Internet using what is called *remote login*. If you have a valid *account* with a *userid* and *password* on the other computer, you can log into the computer. Once connected, it is as if your keyboard were connected directly to the remote computer. Access to libraries and literature databases is usually based on a *telnet* connection.

Usenet

The term *Usenet* comes from User's Network, but it is not an actual network and does not require the Internet. It is a large collection of discussion groups called *newsgroups* involving millions of people from all over the world. Each discussion group is centered around a particular topic such as jokes, gardening, mathematics, computers or biology. There are thousands of discussion or *newsgroups* on *Usenet*. New *newsgroups* can be created by posting a suggestion on *Usenet* in another *newsgroup* and asking for votes. There are now more than 5000 *newsgroups* in several different languages, covering every subject from art to zoology, from science fiction to South Africa. It is up to the administrator of the *news server*, a computer receiving the news feed, to decide which *newsgroups* will be available. A typical *news server* subscribes to more than 2500 *newsgroups* and receives in excess of 50 megabytes of information every day. Usage of the *Usenet* is free as long as Internet access is provided.

Newsgroups are organized using a hierarchical structure with seven major categories: COMP (computing issues), MISC (miscellaneous subjects), SCI (scientific topics), SOC (social issues), TALK (debate-oriented groups), NEWS (Usenet related topics) and REC (recreational activities). These *newsgroup* categories are distributed worldwide. There are other hierarchies such as ALT (anything can be discussed in here) and BIZ (business related groups). Under the top level hierarchy SCI, there is for example another category named MED which groups together discussion groups related to medical issues. Under the medical category there is a *newsgroup* used as a forum for discussions related to medical pathology which is named SCI.MED.PATHOLOGY. If a *newsgroup* has a moderator, then this person makes sure that discussions remain focused and on-target. Any contributed messages have to be sent to the moderator first, who then decides if they are posted to the *newsgroup*.

When you read the news, you are using a *client/server* system. The articles are managed and stored by a *news server* and your *news reader* acts as a *client*. There is a number of freely available *news reader* software packages which greatly simplify the use of *Usenet*. Their basic functions include *subscribing* to add individual *newsgroups* to an easy access list, so that it is not necessary to search through the huge list of *newsgroups* every time the *Usenet* is accessed. A *reading* function presents new messages to the reader and keeps track of which postings have and have not been read. Based on a function called *threading*, replies to a particular posting are grouped together with the original posting, so that a reader can follow the messages within the *newsgroup* related to particular discussion. The *news reader* software will also include *posting* and *responding* functions which allow sending new messages to the *newsgroup* and responding to particular messages either to the *newsgroup* (called *follow-up*) or to the author of the posting (called *reply*).

Many *newsgroups* have available so-called *FAQ files* (Frequently Asked Questions) which summarize issues which have been discussed frequently in a particular discussion group. These text files can be very useful as a first and up-to-date introduction to a subject area.

The *Usenet* is the major reason besides *electronic mail* why many people are using the Internet. There are a number of discussion groups which cover issues related to animals, but none of them can be considered a forum for scientific discussions. This lack of veterinary *Usenet* discussion groups can be explained by the relatively small number of veterinarians actively using the *Usenet*. In the medical field there are a number of *newsgroups* which cover specific diseases such as AIDS. This is where *mailing lists* are more appropriate.

Mailing lists

Discussion groups covering more specialized topics are unlikely to be available on *Usenet*. They can be replaced by *mailing lists* where one computer (a *listserver*) maintains a list of *electronic mail* addresses and acts as a reflector for messages sent to the discussion group. People who would like to subscribe to a particular electronic mail discussion group have to send a message to the *listserver* which will then add their address to the *mailing list*. It can be a disadvantage of this system that every message circulated among the group will reach every subscriber regardless if they are interested in the particular discussion or not.

Scientific veterinary discussion groups are only available as *mailing lists*. They include groups such as DAIRY-L which covers issues related to dairy cattle, BEEF-L about beef industry topics and EPIVET-L covering veterinary epidemiology. New discussion groups can be relatively easily set up by interested individuals.

Anonymous FTP

FTP (File Transfer Protocol) is the main service used for transferring files on the Internet. It is possible to copy files directly from one computer to another computer at the other end of the world at very fast speeds (5 to 10 kilobytes per second). In order to do this, it is normally necessary to have a user account on both the *local* and the *remote* computer. *Anonymous* FTP is a way around this restriction. It allows everybody with access to the Internet to upload to and download from a computer providing this *anonymous FTP* service. There are some sites which provide entire hard disks for storage of publicly available files. The availability of the *anonymous ftp service* allows individuals to develop software or write documents, and then make them accessible to other interested people around the world without having to involve software retailers and extensive marketing.

Archie

The use of *anonymous FTP* to download files requires knowing where particular files are located. *Archie* servers are computers maintaining a catalog of the largest library in the world, a list of the locations of worldwide publicly available files. They connect at regular intervals to *anonymous FTP* hosts around the world and download lists of publicly available files. An *Archie client* is a software which can be used from a local computer to conduct a query.

Gopher

The Internet *Gopher* is a lookup tool which allows access to a range of different resources on the Internet by simply selecting options from menus. It is similar to a library as items such as documents about a particular topic are organized in *online catalogs* which can be browsed by the user. For example, catalogs of many libraries all over the world are accessible through *gopher*. To search the *gopherspace* for all the menu items containing a particular set of words, the *gopher*-based resource *Veronica* can be used very effectively. With the advent of the *World Wide Web* the Internet *Gopher* has lost in popularity.

The library of the University of Montreal provides *gopher* access allowing searches of the table of contents of more than 100 veterinary journals.

Wais

The *Wide Area Information Service* (Wais) is a specialized search tool for *information retrieval*. The user has to specify a selection of *sources*, which are collections of data on particular topics such as *agricultural-market-news*. Then a set of keywords has to be supplied which are used during a full-text search to select the matching items within the *source*. As a result of the search, *Wais* then displays a list of items in the order of relevance measured according to the frequency of keyword appearance in

individual documents. *Wais* is another *client/server* system where *Wais servers* maintain the *information sources* and *Wais clients* are used to access them.

World Wide Web

Developed at the European Center for Particle Research (CERN) in 1989, the *World Wide Web* (WWW) is the newest Internet resource, which was largely responsible for the increase in usage of the Internet over the last two to three years. Around 1992 a programming team at the National Center for Supercomputing Applications (NCSA) at the University of Illinois developed a graphical browser for the *Web*, called *Mosaic*, which was made freely available. It literally took the world by storm. Using the *point-and-click* interface of this *web browser* it was possible to access images, sound, video clips and multifold text organised in a huge hypertext system spanning the world. There are now a range of *web browsers* either freely or commercially available and most of the major word processors can be converted into *web browsers* using *add-in* software.

Today (May 1995) there are over 30,000 Web sites on the Internet and the number is doubling every two months. Companies that were formerly unsure about the utility of the Internet have rushed to use the *Web* as a means of presenting products and services. The rest of the 1990s belongs to the content providers, who will use the rapidly evolving infrastructure to bring increasingly sophisticated material to consumers.

The WWW is based on the concept of *hypertext* which is basically text within documents containing links to other text within the same or other documents. Documents anywhere on the WWW can contain links to other documents stored on computers elsewhere in the world. The information contained in a document does not only have to be text. It can also be video clips, sound or executable programs. The software used to read these hypermedia documents is called a *web browser*. When following from one link to another, this process is called navigating (or surfing) the Internet. One of the most powerful features of the *Web* is that the *web browser* can be used to link to many different types of Internet resources including text files, *Telnet* sessions, a *Gopher*, a *Usenet newsgroup* or a *FTP* session. The *web browser* acts as a window into the Internet. The WWW also employs a *client/server* structure in that a *web client* (the *web browser* software) sends requests to a *web server*. The *web server* upon receipt of a request, sends the document requested back to the requesting *client*.

New developments on the *World Wide Web* include the possibility to explore virtual 3D worlds, which are based on the virtual reality modeling language (VRML). The major *web browsers* offer *add-ins* or *plug-ins* which will provide VRML functionality. The development of the Java™ programming language is one of the most recent initiatives which has the potential of adding yet another dimension to

the *World Wide Web*. Different from the typically static text and images on web pages, it will allow animation, sound and dynamic displays of data.

With the advent of the *WWW* the usage of the Internet for commercial purposes has increased dramatically. It is now even possible to purchase books, computer software, music compact discs and many other items through the *WWW*. Virtual Shopping Malls have been developed on the Internet which allow the user to browse or order anything from clothing to fishing gear. Many publishers of newspapers, books and scientific journals are accessible through the *Web*. International and governmental organizations are increasingly providing publicly available information on the *Web*.

Due to the huge amount of information accessible through the *WWW* special *search engines* such as *LYCOS* or *Web Crawler* have become essential to most users. They search web pages on the Internet based on a set of keywords. Different from these search engines are indexing systems such as *Yahoo* or the *World Wide Virtual Library* which maintain lists of links and information about Internet resources organised by subject.

To illustrate the use of the *Web*, at the time of the recent discussion on the possibility of a link between bovine spongiform encephalopathy and Creutzfeld-Jakob disease the first author used the *WWW* to obtain the most recent information on the subject. Through one of the *search engines* available on the *WWW* a list of web pages from all over the world containing the keyword *BSE* was obtained. It included a special page set up by MAFF in the United Kingdom with recent official statements about the issue, a special BSE web page in the Denmark containing links to other web pages about BSE located all over the world, a database of all publications about BSE including abstracts over the last 6 years from CAB International and some commentaries published in the British Medical Journal on the topic. The latter two sources provided the most useful up-to-date scientific information. Hence, the *web* allowed quick access to a wide range of up-to-date information on the subject.

The *web* can also be used to perform literature searches. This has been made possible through access to public and University libraries all over the world. Scientific literature information services such as Current Contents and CAB are developing systems which will allow table-of-contents searches across the *web* at a fee. Two organisations, the libraries of the Goddard Space Flight Center and the University of Delaware in the United States are currently providing such a service at no-cost for demonstration purposes. Some veterinary journals such as *Veterinary Pathology* published by The American College of Veterinary Pathologists provide access to the table of contents and abstracts through a web page.

There are a number of different organizations on the web which maintain a database of electronic mail addresses of Internet users around the world. Most major computer hardware and software companies are represented on the *WWW* with information about and technical support for their products. Very

often this can be the most effective means of obtaining an answer to a particular problem or to find out about particular products.

A number of book shops provide online databases of book information which can be searched and books can be ordered through a form on the web page. One Internet book shop maintains a list of more than 780.000 book titles.

There are a range of web pages available which specifically provide information about veterinary topics ranging from veterinary education to discussions on specific veterinary subjects. The best method of finding out about what is available on the Internet in a particular area of interest is to access a web page maintaining an index of web pages on the subject such as for example the *World Wide Web Virtual Library - Veterinary Medicine*. This page can then be used as the starting point for a *WWW* surfing expedition. Information related to livestock is indexed in the *Livestock Virtual Library* which has a special web page with a list of Dairy Cattle Resources covering disease, production and management topics. The United States National Agricultural Database project maintains a web site with documents and links to other resources. Complete access to the dairy section of this database is available through the *WWW*. A number of national veterinary associations such as the ones in Australia and Canada are represented with their own *web* pages containing information about the associations and providing a forum for discussion between members.

Other Internet communication resources

Internet Relay Chat (IRC) is a discussion forum where people around the world can simultaneously communicate through text messages. Given the availability of a computer with microphone and speakers, the Internet can be used to literally talk to somebody who has an Internet connection and the same equipment, on what is called *Internet telephone*. *Digital video* make it possible to attend international conferences from home. Video can be combined with *Internet Telephone* to allow *Video Chat*.

Access to the Internet

Over the last year access to the Internet has become possible through the availability of businesses in every major city and many smaller cities in Australia and New Zealand which provide Internet access on a fee basis. All that is needed is an account with such an Internet access provider, a computer, a modem, a communications software and of course a telephone line. While the speed of these connections is acceptable for most text-based information, it can be a bit slow for downloading files or browsing web pages with complex graphics, sound or animations. Over the next couple of years high speed ISDN (Integrated Services Digital Network) connections, which allow very fast data transfer, will become more widely available and less expensive.

Information about the Internet

Over the last two years literally hundreds of books have been published which provide background and tutorial information about the Internet. Now there is so much choice that it is difficult to decide which book to buy. A useful criterion for selecting a book would be to look for recent publications and probably authors from Australia or New Zealand, as they might provide information about local opportunities for Internet access. Once connected to the *Net* there will be a lot of information about the Internet available on-line.

Veterinarians and the Internet

The Internet provides an opportunity for exchange of information on a world-wide basis. This is of particular relevance at a time where everyone is struggling trying to keep up with the information explosion. The *Usenet* and *Mailing Lists* can be used as forums for discussions between veterinarians on a worldwide basis. The *World Wide Web* has developed to a stage where it is ready to be used as a medium for veterinary continuing education. Any organization such as national veterinary associations or councils can make effective use of Internet resources such as *electronic mail* and the *World Wide Web* to reach its members quickly and efficiently. The Internet is also beginning to be used for enquiries about drugs and ordering of drug supplies. At the same time with increased usage of the Internet the costs are continuously coming down.

Glossary

- archie - a system which allows searching of indexes of what files are available on public servers on the Internet. You may know that such-and-such a database or public domain program exists on the Internet, but finding it is another matter. Archie, generally accessed through Telnet, scans the directories of all the registered servers on the Internet and sends you the filenames that match your search string, together with the server where each file is available.
- bulletin boards - computer systems that function as centralized information sources and message switching systems for a particular interest group. Through network connections or through modems, users connect with the bulletin board, review and leave messages and files for other users as well as communicate to other users attached to the system at the same time.
- client/server - In a communications network, the client is the requesting machine and the server is the supplying machine.
- database - In general, any collection of data that is electronically stored. The term is often used to describe interrelated files that are created and managed by a database management system.
- email - electronic mail. The transmission of letters, messages, and memos over a communication network. The backbone of an electronic mail system is a communications network that connects remote terminals to a central system or a local area network that interconnects personal computers. Users can send mail to a single recipient or they can broadcast it to any number of selected users on the system. (A simple form of email is the use of facsimile (fax) terminals in remote locations, which use the public telephone network for transmission. The advantage of facsimile is that any form of information printed on paper can be transmitted.)
- FAQ files - These are text files containing questions which have been asked frequently about particular issues and their answers. FAQ's are available for almost every Internet service, for many scientific fields and from hardware / software manufacturers.

ftp - An application designed to move files from one computer to another. Named after the protocol it uses, the "File Transfer Protocol" permits you to have a copy of the information you find on the Internet.

gopher - A "user-friendly" lookup tool that lets you explore the Internet by selecting resources from menus. You can read or access resources through the Gopher without having to know domain names, IP addresses, changing programs, etc. Rather than looking up addresses and telnetting to them, you find entries in a menu and select them. The Gopher then "goes fer" whatever you've selected.

ID / id - identification

Internet - (1) Generally (not capitalized), any collection of distinct networks working together as one. (2) Specifically (capitalized), the world-wide "network of networks" that are connected to each other, using the IP protocol and other similar protocols. The Internet provides file transfer, remote login, electronic mail, and other services.

IP - The Internet Protocol; the most important of the protocols on which the Internet is based. It allows a packet to traverse multiple networks on the way to its final destination.

modem - a piece of equipment that connects a computer to a data transmission line (typically a telephone line of some sort).

password - a word or code used to identify an authorized user.

protocol - A protocol is just a definition for how computers will act when talking to each other. Protocol definitions range from how bits are placed on a wire to the format of an electronic mail message. Standard protocols allow computers from different manufacturers to communicate; the computers can use completely different software, providing that the programs running on both ends agree on what the data means.

remote communications - a category of software that allows a personal computer to control or duplicate the operation of another personal computer in a remote location using the standard dial-up telephone system. Remote users are interactive participants in the other computer.

telnet - (1) A "terminal emulation" protocol that allows you to log in to other computer systems on the Internet. (2) An application program that allows you to log in to another computer system using the TELNET protocol. When you're connected through telnet to any other computer in the world, it is as if your keyboard is connected directly to that remote computer. You can access whatever services that remote machine provides. Telnet creates a TCP network connection with a server, accepts your input, reformats it, accepts output and reformats that output for display to you.

UNIX - A popular operating system that was very important in the development of the Internet. Contrary to rumor, though, you do NOT have to use UNIX to use the Internet. There are various types of UNIX. Two common ones are BSD and System V.

USENET - The USENET is an informal, rather anarchic, group of systems that exchange "news." News is essentially similar to "bulletin boards" on other networks. USENET actually predates the Internet, but these days, the Internet is used to transfer much of the USENET's traffic.

userid - the user's identification code name.

WAIS - Wide-area information servers; a very powerful system for looking up information in databases (or libraries) across the Internet.

World-Wide Web - A hypertext-based system for finding and accessing Internet resources.

WWW - See World-Wide Web.