

Rhinology resources on the internet: a critical review*

Dimitrios G. Balatsouras¹, Antonis C. Kaberos¹, Stavros G. Korres²,
Nicolas C. Economou¹, Dimitris Assimakopoulos³

¹ ENT Department of Tzaniou General Hospital, Piraeus, Greece.

² ENT Department of Athens National University, Hippokraton Hospital, Athens, Greece.

³ ENT Department of Ioannina University School of Medicine, Ioannina, Greece.

SUMMARY

During recent years, the Internet has gradually evolved into a worldwide network, allowing access to vast amounts of information and providing various services. The benefits of medical professionals of using it are growing rapidly, as even more scientific, technical and biomedical resources become available on line. The Internet has always provided useful resources to rhinologists, with the number of relevant sites increasing daily, at a rapid pace. In this article, a review of the information included in several selected rhinology web sites is presented, in order to provide guidance and context for the vast amount of information which is available on the Internet, and to promote the use of the medium to rhinologists who do not have extensive experience in computers or telecommunications.

Key words: computer communication networks, internet, rhinology, otolaryngology

INTRODUCTION

The aim of this article was to provide a critical review of selected rhinology resources on the Internet, in order to provide guidance and context for the vast amount of information which is available on the Internet. Another scope of this paper was to display the breadth and the wealth of information of interest to specialists available on the Internet, in order to promote its further extension and its universal use by health professionals.

Several lists of Otolaryngology links have been published already (Kuppersmith, 1996; Rothschild, 1996; Saada, 1998; Rothschild and Kuppersmith, 1999). Detailed lists of the web sites of rhinology resources were also reported by some of the present authors (Balatsouras et al., 2002a). These rhinology links were divided in 10 categories. Several sites with their uniform resource locator (URL) addresses, selected from each category, are herein briefly presented and reviewed. The main criteria used in this selection were durability of the sites, originality, text and multimedia content, web design, and accuracy of the provided information. Even sites with evident advertisements for physician's practices and surgical skills were included in this review, provided that accurate and useful information to patients, regarding the specific diseases and surgical procedures, could be obtained. Most of these sites have appeared on the Internet for many years, and were repeatedly visited, although several new promising sites have been also included.

OPERATIVE TECHNIQUES (category 1):

Several sites, mainly patient-orientated, exist, although interesting material to professionals is also included.

Rhinoplasty tutorial (<http://www.facial surgery.com/PRE-LIM.HTM>): This site, maintained by S. Denenberg, in our view is one of the better in this category, and includes excellent images and descriptions of the basic rhinoplasty operations. It is useful to both patients and doctors and many practical issues concerning plastic procedures are considered.

Baylor College of Medicine Otolaryngology Grand Rounds Archive: Plastic and Reconstructive Surgery (<http://www.bcm.tmc.edu/oto/grand/fprs.html>) and **Rhinology** (<http://www.bcm.tmc.edu/oto/grand/rhino.html>): The Bobby R. Alford Department of Otorhinolaryngologic and Communicative Sciences was one of the first Academic Departments to present their activities on the Internet, and maintain an excellent web site, with a comprehensive list of Otolaryngology resources, which was recently extensively revised. Grand Rounds Archive includes mainly text files on various topics of Otolaryngology, classified according to the subspecialty.

Functional Endoscopic Sinus Surgery Tutorial (<http://www.otohns.net/library/ess.asp>): This tutorial is included in the commercial site of OtoHNS.net, and has been authored by Dr. Desrosiers. It includes several informative videos of endoscopic sinus surgery, using digital video technology. However, the resolution of the picture and the sound quality are moderate.

Endoscopic Laser-Assisted and Stereo Computer-Guided Nasal and Sinus Surgery (<http://toffelcenter.com/index.html>): This is a site maintained by P. Toffel, which is addressed to patients. Its organization and illustration are good and although its content is not extensive, the information provided is accurate and comprehensive.

ALLERGY (category 2):

The allergy sites are mostly maintained by allergists or physicians from other specialties, but they are useful to rhinologists, as they include information about allergic and related rhinologic diseases.

Allergy, Asthma & Immunology Online (<http://allergy.mcg.edu/>): Maintained by the American College of Allergy, Asthma & Immunology, this is a site both patient and physician orientated, in which useful resources about allergy are included, such as texts, bulletins and screening information.

The Food Allergy and Anaphylaxis Network (<http://www.foodallergy.org/>): This is a site providing information about food allergies, anaphylaxis and allergy management issues.

National Institute of Allergy and Infectious Diseases (<http://www.niaid.nih.gov/default.htm>): The web site of this Institute contains useful information including news, facts, research programs about allergy, and opportunities for clinical trials. Among its research divisions, the 'Allergy, Immunology, Transplantation' section is included.

Statistical data for allergies/hay fever (<http://www.cdc.gov/nchs/fastats/allergies.htm>): This site belongs to the U.S. Department of Health and Human Services - Center for Disease Control and Prevention. It contains statistical data about noninstitutionalized adults and children with diagnosed allergies, and data about ambulatory care of patients with allergies. It mainly concerns allergy in general and hay fever.

SMELL (category 3):

This category includes sites in which new data about the pathway of the sense of smell, the molecular base of olfaction, the role of pheromones, and recent developments on smell disorders are presented. This is a quite long list and a few only sites will be presented.

Tutorials: Interesting tutorials and articles about olfaction or related topics may be found, such as **Olfaction, a Tutorial on the Sense of Smell** (<http://www.cf.ac.uk/biosi/staff/jacob/teaching/sensory/olfact1.html>), **Chemoreceptors** (<http://www.unb.ca/courses/biol4775/SPAGES/SPAGE6.HTM>), **Olfactory Nerve** (http://info.med.yale.edu/caim/cnerves/cn1/cn1_1.html), including accurate anatomical images, the **Vomer nasal Organ** (<http://athena.neuro.fsu.edu/research/vomer nasal/>), and **Seeing, Hearing and Smelling the World** (<http://www.hhmi.org/senses/>), an excellent pdf file from the Howard Hughes Medical Institute. Among them **Olfaction - A review** (<http://www.leffingwell.com/olfaction.htm>), although part of a commercial web site (Leffingwell & Associates), pro-

vides a good scientific review of olfaction, including plenty of pictures and drawings. Useful information for the public may be also found in **Smell and taste disorders** (<http://www.nidcd.nih.gov/health/smell/taste/smell.asp>) from the National Institute on Deafness and Other Communication Disorders, and in **Smell and Taste Disorders: A Primary Care Approach** (<http://www.aafp.org/afp/20000115/427.html>).

Senselab Project (<http://senselab.med.yale.edu/senselab/>): Senselab is part of the Human Brain Project and besides various neuronal databases, it includes the Olfactory Bulb Odor Map Database (OdorMapDB), the Olfactory Receptor Database (OrDB) and the Odor Molecules database (OdorDB). The OdorMapDB is a database that supports the experimental analysis of the molecular and functional organization of the olfactory bulb and its basis for the perception of smell. The OrDB is a database of olfactory receptor genes and proteins. Finally, the OdorDB is a database of odor molecules that serve as ligands for the olfactory receptor proteins.

Flavornet (<http://www.nysaes.cornell.edu/flavornet/>): This site of Cornell University, developed by T. Acree and H. Arn, contains a compilation of aroma compounds, sorted by their chromatographic and sensory properties. Additionally, assessing 3D-models of chemical structures is possible.

About Pheromones (<http://www.nysaes.cornell.edu/fst/faculty/acree/pheronet/pherom.html>): This site contains an extensive database of pheromones, a class of chemicals that are communicated between animals of the same species and that elicit stereotyped behavioural or neuroendocrine responses. The database is called Pherolist and includes more than 2000 html and 800 picture files.

Biomedical Research from the Howard Hughes Medical Institute (<http://www.hhmi.org/annual99/a200.html>): This site contains the research activities of the Institute, including the "Sensing Smell" program, as part of the Neuroscience program.

Tim Jacob - Smell and Taste (<http://www.cf.ac.uk/biosi/staff/jacob/index.html>): The site of this researcher based in Cardiff University, contains interesting information on research issues, teaching topics, and publications. Links to other 'special senses' resources are also provided.

RHINOLOGY CLINICS AND RESEARCH CENTERS

(category 4):

Monell Chemical Senses Center (<http://www.monell.org/>): This web site of the Monell Scientific Institute for research on the chemical senses contains information about the Institute, faculty profile, research overview, publications, and educational issues. A special section deals with consultation services from the Monell Jefferson Taste & Smell Clinic.

The Smell and Taste Center at the University of Pennsylvania (<http://www.med.upenn.edu/stc/>): This world renowned center maintains a very well-organized web site. Information about the activities of the Center, its faculty, patient information, and student information is provided, as well as research programs and publications.

The Rocky Mountain Taste and Smell Center (<http://www.uchsc.edu/rmtsc/>): This site belongs to the parental site of the Department of Otolaryngology at the University of Colorado Health Sciences, which also includes the Nose and Sinus Center and the Allergy Clinic. The site of the Taste and Smell Center contains various research activities and publications, on several separate sections maintained by the researchers of the Center, each one reflecting the specific interests and activities of each laboratory.

Nasal Dysfunction Clinic (<http://www-surgery.ucsd.edu/ent/DAVIDSON/NDC/booklet.htm>): The site of this clinic, based in the University of California, San Diego School of Medicine, was developed by TM. Davidson. It contains patient information about nasal anatomy and physiology, testing, and treatment options of nasal diseases. The text is quite accessible, accompanied by several illustrations. From the same Center an on-line handbook of Nasal Diseases and a Facial Plastic Surgery booklet have been developed, which are presented in the last category of this paper.

Taste and Smell Center, University of Connecticut (<http://www.uchc.edu/uconntasteandsmell/index.html>): The site of this Center, which is based in the University of Connecticut Health Center, contains patient-orientated information about common diseases associated with test and smell problems, clinical and basic research issues, faculty information and various links to related topics.

Smell and Taste Disorders Clinic (<http://www.upstate.edu/ent/smelltaste.shtml>): This site belongs to the parental site of Otolaryngology and Communicative Sciences at the State University of New York - Upstate Medical University. It contains useful information about smell and taste problems, directed at patients.

Neurosciences & Systèmes Sensoriels, Université Claude Bernard Lyon, France (<http://olfac.univ-lyon1.fr/>): This site includes information on research activities of the Institute, faculty, publications and "Olfactory" links. Of special interest is the section on clinical testing of olfaction and olfactometry.

Sense of Smell Institute (<http://www.senseofsmell.org/home.asp>): This is an interesting site of a charitable organization, providing information resources for the public and academic sectors, and sponsoring scientific research. Its contents include smell resources, on-line library on smell and related subjects (mainly abstracts and titles of books) and research projects. A forum on chemosensory topics is also maintained, and a calendar listing upcoming events and scientific meetings is also available.

Sensory Research Institute (<http://www.psy.fsu.edu/~fsusri/>): This site includes information about the Institute based in Florida State University, news, presentations in recent conferences, and very interesting educational links and frequently asked questions (FAQs).

Institute of Laryngology and Otology (<http://www.ilo.ucl.ac.uk/>): The web site of this well-known Institute, which undertakes research activities, training and teaching, is still par-

tially under construction. However, information about various seminars and courses, including rhinology, several videos available for sale and a list of publications are provided. Interesting pages in the web site include the ILO photographic unit, with information about medical digital technology, and the site of the ILO library.

ORGANIZATIONS AND SOCIETIES (category 5):

American Academy of Otolaryngology - Head and Neck Surgery (AAO-HNS) (<http://www.entnet.org/>): This is probably the best site of this category. After a friendly welcome page, separate sections for the public and patients, for the healthcare professionals, and for its members are presented. The public pages contain a virtual museum extension of the John Q. Adams Center for the history of Otolaryngology, patient-orientated information on common diseases of the head and neck, news and press room, and a separate section on ENT for kids. The pages for the healthcare professionals contain information about the officers and governance of the organization, membership information, a history and archives section, publications, research projects, residency in Otolaryngology, calendar of events and meetings, and educational issues. The members section requires a password to log-in.

International Federation of Oto-Rhino-Laryngological Societies (<http://www.ifosworld.org/>): The site of IFOS includes an introductory page with the mission statement of the organization, general information, discussions, a calendar of congresses, newsletter, and links to the homepages of the Society members.

American Rhinologic Society (<http://www.american-rhinologic.org/>): In this site a useful introductory page with news and interesting topics is presented. Separate sections exist with information about the Rhinologic Society, news, visitors and members' information, and several links.

Association for Chemoreception Sciences (<http://www.achems.org/>): In this site, the goal of this organization which is the integration of basic and clinical research on taste and smell is initially presented, along with information about its officers and members. Membership services, research resources and training programs in chemoreception, and taste and smell resources are separately presented.

American Academy of Otolaryngologic Allergy (<http://www.aoaf.org/>): This is a well-designed web site, recently and successfully renovated. It follows the form of the AAO-HNS web site, being divided to separate sections for its members, the physicians, and the patients. It contains information about the mission and the goals of the organization, membership information, lists of physicians dealing with ENT allergy, news and useful resources about otolaryngologic allergy for patients. Scheduled basic and advanced courses about otolaryngologic allergy are also announced.

German Society of Otorhinolaryngology, Head and Neck Surgery (<http://www.hno.org/>): A very well organized web site with plenty of useful information for members and healthcare pro-

professionals. However, its content is in German without an English version.

JOURNALS (category 6):

Most peer-reviewed otolaryngology journals are represented well on the Internet by sites providing useful information to subscribers, authors, and ENT specialists in general. "Rhinology" and the "American Journal of Rhinology" should be specially mentioned as the most influential journals in the subspecialty of rhinology.

Rhinology (<http://www.rhinologyjournal.com/>): This is a recently developed and well-designed web site, including the typical information which may be obtained in similar sites, such as instructions to authors, information to subscribers and ordering guidelines. Links to the publishing company, the rhinologic societies and information on the upcoming rhinologic congresses and seminars are also provided. Detailed lists with abstracts and pdf files with the full-text articles (only for subscribers) published during the latest 7 years are also included. Finally, a comprehensive list of the rhinology resources on the Internet, compiled by several of the present authors, was recently included in the site (Balatsouras et al., 2003).

American Journal of Rhinology (<http://www.oceansidepubl.com/rhinology.html>): This site is still under construction and, unfortunately, has been so for a long time. However, useful information about the journal may be found, such as instructions to authors, information for subscribers and data about the publishing company. Abstracts and lists of contents of the past issues, ordering information and on-line trial, although announced, are still under construction. Recently, on-line submission of articles was provided, which should be very useful to the scientific contributors of the journal.

DISCUSSIONS (category 7):

Discussion groups maintained by specialists or academic departments offer valuable information to both professionals and patients. These sites can aid in medical education and usually provide interaction between the referring and consulting physicians. A good example of an American discussion site is the "**AAO-HNS Discussion Forums**" (<http://www.entlink.net/discussions/>) from the American Academy of Otolaryngology, Head & Neck Surgery, addressing mainly to its members. However, non-members are able to reply or post messages in the discussion boards. Other worldwide sites include the **German Forum AWMF Online** (<http://foren.medin-forum.de/articles.public/?newsgroup=52&lid=51>), and the **French Association PromORL** (<http://docadoc.com/>) with different virtual rooms for the public and for the medical practitioners. Of special interest to rhinologists is the site of **Rhinology Discussions: Nose listserv** (<http://www.jiscmail.ac.uk/lists/nose.html>), maintained by R. Eccles. Various clinical and laboratory issues are discussed in this group, such as rhinomanometry or treatment of various nasal diseases, and opinions by experts on the field are provided. Finally, **Otohns.net**

provides two discussion forums, one for topics about the medical practice of otolaryngology-head and neck surgery (<http://www.otohns.net/forums/otohns.asp>) and one for pediatric otolaryngology (<http://www.otohns.net/forums/ped-oto.asp>). Registration is free and many subscribers participate in these forums discussing interesting topics.

MEDICAL CONFERENCES AND NEWS (category 8):

Several sites on otolaryngology news and conferences appear on the Internet, which may be very useful to busy professionals, as new developments in the specialty are summarized and information is given about upcoming medical conferences, congresses, and seminars. Interesting sites in this section, providing free information, include **Continuing Medical Education (CME Inc.) Infostore** (<http://www.cmeinfostore.com/>), the **Doctor's guide Congress Resource Center** (<http://www.docguide.com/crc.nsf/>), and **Medical Conferences** (<http://www.medicalconferences.com/>).

News from the Otohns.net (<http://www.otohns.net/news/news.asp>): This is a section of the Otohns.net site, founded in 1995 by Dr. Koppersmith as an e-mail listserv, and further expanded, since 1997, by MediSpecialty.com. Useful information, with a special section on rhinology, and latest press release is provided, through a good web design. However, news during the last year is absent, and it is possible that the site has not been updated for many months. In the parental site, clinical resources, discussion forums, conferences, grand round presentations and educational links are available.

ORL France: News de l'ORL (<http://www.orl-france.org/index2.php>): This is an interesting site, with a busy screen full of various pieces of information, news, scientific topics, and links, maintained by the main ENT Societies of France. It looked impressive, although a little messy, resulting in difficulty in locating specific information. However, it was updated recently and rearranged with success.

COLLECTIVE OTOLARYNGOLOGY RESOURCES ON THE INTERNET (category 9):

Several collective lists of medical resources on the Internet exist, and most of them feature special sections on Otolaryngology. Examples of this type of resources are the **HealthWeb Otolaryngology** (<http://healthweb.org/browse.cfm?subjectid=69>) from the Medical College of Wisconsin, **Otorhinolaryngologic diseases** (<http://www.mic.ki.se/Diseases/C09.html/>) from the Karolinska Institute of Stockholm, **MedMark Otolaryngology** (<http://www.medmark.org/orl/>) from the Medical Research Information Center in Korea, and **Otolaryngology Sites in the MedWeb** (<http://www.medweb.emory.edu/MedWeb/>) from the Emory University. However, we think that the following two sites, which include links dedicated exclusively to rhinology and otolaryngology, deserve special mention.

Guide to Otolaryngology on the Internet - Baylor College of Medicine Bobby R. Alford (

ers.html): This is one of the oldest and most detailed indexes. It includes academic programs, audiology links, discussion groups, educational links, organizations, outcomes research, publications, research links, software and other medical sites. In the parental site research activities, news and department descriptions are presented. Also, a grand rounds archive and an otolaryngology Medical Student Syllabus are available.

Rhinologic links (<http://www.rhinologyjournal.com/links/index.html>): This is a comprehensive list compiled by some of the present authors, which has appeared on the web site of the journal "Rhinology", since the beginning of 2003 (Balatsouras et al., 2003). It consists of rhinologic sites exclusively, and includes sites of operative techniques, allergy and smell links, rhinologic clinics and research centers, rhinologic organizations and societies, journals, discussions, news and medical conferences, Otolaryngology resources and miscellaneous links. This catalogue is part of a longer list, entitled "Internet Resources available to otolaryngologists", which has appeared on the web site of the journal "Annals of Otolaryngology, Rhinology, & Laryngology" for more than 2 years (Balatsouras et al., 2002b).

MISCELLANEOUS (category 10):

Cancerweb (<http://cancerweb.ncl.ac.uk/cancernet/101402.html>): This is a site of the National Cancer Institute, with the latest information available for various types of cancer, including nasal and paranasal sinus cancer, and nasopharyngeal cancer. The information of the site is intended mainly for use by health professionals, although patients' issues are also included, such as cancer prevention, patient support, and useful resources. Treatment options and ongoing trials are also presented.

Handbook of Nasal Diseases (<http://www.surgery.ucsd.edu/ent/davidson/NASHAND/nasal.htm>): Developed by T. Davidson, from the UCSD Nasal Dysfunction Clinic, this handbook describes various nasal diseases. This is a patient-orientated web publication, with explanatory text and useful information, although a few only pictures are included. A link to a Facial Plastic Surgery booklet with similar format is also provided.

Sinusitis: A Treatment Plan That Works (<http://www.sinuses.com/toc.htm>): This is a site maintained by W. Tichenor, which is mainly addressed to patients. It contains description of the disease, answers to frequently asked questions, CT scans, colour illustrations of the nasal-sinuses system, and image-guided surgery pictures. Specific topics about treatment, surgery and options of therapy in case of treatment failure are included as well. Allergy and asthma issues and their relation to nasal disease are further presented.

UPENN Otolaryngology Referral Center (<http://www.entconsult.org/>): This is a good site, that allows easy referral of patients from primary care or specialist physicians to the Department of Otolaryngology Head & Neck Surgery of the University of Pennsylvania Health System, permitting

rapid communication and electronic transport of patients' data, such as x-rays or photos.

E-medicine (<http://www.emedicine.com/ent/>): E-Medicine comprises a large current clinical knowledge base available to physicians. Thousands of articles on various diseases and disorders are written by specialists in each field and include multimedia information as well. Among them, articles useful to rhinologists are included, such as allergy, anatomy of the olfactory system and nasal anatomy, nasal physiology, nasal and sinus diseases, congenital malformations of the nose, tumors of the nose, and various topics of rhinoplasty. This site features, also, the largest online repository of medical education credits for health professionals.

UTMB's Grand Round Archive (<http://www.utmb.edu/otoref/Grnds/GrndsIndex.html>): This is a valuable collection of articles from the University of Texas Medical Branch - Department of Otolaryngology, maintained by F. Quinn. Recent topics on rhinology include olfactory dysfunction and disorders, diagnosis and management of inhalant allergens, turbinate dysfunction, and refinement of the nasal tip. Many articles, especially recent ones, contain both text and slides, available in various formats (e.g. word documents, pdfs, power point presentations).

Medline: A special mention must be given to Medline, which is an extensive medical literature database maintained by the National Library of Medicine in the United States. **Pubmed** (<http://www.ncbi.nlm.nih.gov/PubMed>), **Medportal** (<http://www.medportal.com>), **Medscape** (<http://www.medscape.com>), **Gateway** (<http://gateway.nlm.nih.gov/gw/Cmd>) or other web-based search systems provide the option of literature searching of the journals indexed in Medline by using various keys, such as the author's name, the title, the subject, the journal, or key words. Searching is a free service available on the Internet from these sites, and probably one of the main reasons that most physicians use the Internet.

REFERENCES

- Balatsouras D, Kaberos A, Leontiadis A, Korres S, Ferekidis E, Economou C (2002a) Rhinology resources on the Internet. *Rhinology* 40: 229-234.
- Balatsouras D, Kaberos A, Korres S, Kandiloros D, Ferekidis E, Economou C (2002b) Internet resources available to otolaryngologists. *Ann Otol Rhinol Laryngol* 111: 1139-1143.
- Balatsouras D, Kaberos A, Leontiadis A, Korres S, Ferekidis E, Economou C (2003) Rhinologic links. *Rhinology*, URL: <http://www.rhinologyjournal.com/links/index.html>
- Kuppersmith RB (1996) A guide to otolaryngology resources on the Internet. *Otolaryngol Head Neck Surg* 115: 335-341.
- Rothschild M (1996) Otolaryngology and the Internet. *Otolaryngol Head Neck Surg* 115: 123-131.
- Rothschild MA, Kuppersmith R (1999) Internet resources in otolaryngology-head and neck surgery. *JAMA* 281: 971-972.
- Saada AA (1998) On-line resources for otolaryngologists. *J Laryngol Otol* 112: 854-859.

Dimitrios Balatsouras
23 Achaion Str. – Agia Paraskevi
15343 - Athens
GREECE

Tel: +30210-600-4683
Fax: +30210-459-2671
E-mail: balats@panafonet.gr