

## COMPARATIVE EVALUATION OF DRUG INFORMATION SOURCES

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تهدف هذه الدراسة إلى تقييم مصدرين من مصادر معلومات الدواء، وقد تم ذلك بمقارنة الوقت اللازم للحصول على إجابة لأحد الأسئلة بالإضافة إلى سهولة وشمولية وحجم وتكلفة هذين المصدرين وهما الأقراص المدججة لقاعدة بيانات "فهرس الدواء DRUGDEX®" ومحرك بحث ألتافستا "ALTAVISTA" في الإنترنت. وقد أجريت الدراسة في مركز معلومات الأدوية بكلية الصيدلة - جامعة الملك سعود بالرياض وتمت الإجابة على مائة سؤال باستخدام المصدرين وتم تحديد النتائج. وتبين أن الوقت اللازم للعثور على إجابة كان  $1.19 \pm 1.7$  و  $4.52 \pm 5.05$  دقيقة باستخدام فهرس الدواء وألتافستا على التوالي. ومن حيث سهولة الاستعمال، أجب فهرس الدواء عن 78% مقابل 55% لمحرك بحث ألتافستا ( $p=0.002$ ). ولم تكن هناك فروقات معنوية في الشمولية ( $p=0.545$ )، وفي حجم المعلومات ( $p=0.102$ ). وفيما يتعلق بالشمولية فإن 77% مقابل 73% من الأسئلة شملها فهرس الدواء ومحرك بحث ألتافستا على التوالي. أما حجم المعلومات (توفر الإجابات) فبلغ 77% مقابل 86% مع المصدرين على التوالي. وتستنتج الدراسة أن فهرس الدواء DRUGDEX® هو الأسرع والأكثر كفاءة أما محرك بحث ألتافستا فهو الأقل تكلفة. ويتساوى المصدران من حيث الشمولية وحجم المعلومات.

The purpose of this study is to evaluate two different drug information sources. This was achieved by comparing the time required to find an answer to a drug information question in addition to the easiness of use, comprehensiveness, breadth of information and cost of two different media namely CD-ROM database DRUGDEX® and the internet Search engine "ALTAVISTA". The study was conducted at the Drug Information Center (DIC) of the College of Pharmacy, King Saud University, Riyadh, Saudi Arabia. One hundred questions were answered using both sources and the results for each question were determined. The mean time required to find the answer was  $1.70 \pm 1.19$  and  $5.05 \pm 4.52$  min, using DRUGDEX® and "ALTAVISTA" respectively. In terms of easiness of use, DRUGDEX® easily answered 78% of questions versus 55% answered easily by "ALTAVISTA" ( $p=0.002$ ). No statistically significant differences were found in the comprehensiveness ( $p=0.545$ ), and breadth of information ( $p=0.102$ ). Regarding comprehensiveness 77% versus 73% of the questions were well covered by DRUGDEX® and "ALTAVISTA" respectively. While breadth of information (availability of answers) was 77% versus 86% with DRUGDEX® and "ALTAVISTA" respectively. The study concluded that DRUGDEX® is a faster, more efficient search source than "ALTAVISTA" search engine because it provides the answers more quickly and it is easier than "ALTAVISTA" search engine however, DRUGDEX® cost per year is much higher than "ALTAVISTA" search engine. Regarding the comprehensiveness and breadth of information, both sources were comparable.

**Key words:** drug information, drug information resources, Drugdex, Alta Vista search engine.

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### Introduction

Drug information sources can be classified as primary, secondary, and tertiary. Which are available in different media; print, compact disk read-only memory (CD-ROM), online, and microfiche.

Pharmacists working in drug information centers are faced with a wide variety of questions looking for answers. This necessitates availability and access to different types of sources to provide answers to these questions.

Answering such questions requires a quick, simple, and efficient method.

The use of tertiary drug information sources such as CD ROM or online Medias, allows pharmacists to achieve efficiency, and easiness in finding the answers.

DRUGDEX<sup>®</sup> is a tertiary drug information database available on CD ROM. It is updated four times a year and provides a wide range of databases tailored to meet the needs of healthcare professionals, including information related to drugs, acute care, toxicology, and patient education. Advantages of CD-ROM are that it contains permanent unalterable information, and provides vast storage space and efficient organized retrieval systems. Furthermore, most computers in drug information centers are already equipped with CD players as a part of multimedia packages. Disadvantages of CD-ROM include lag time, expense, and availability only DIC.

"ALTAVISTA" of Overture Services, Inc. is a leading provider of search services and technology. "ALTAVISTA" continues to advance Internet search with new technologies and features designed to improve the search experience for consumers (1). "ALTAVISTA" provides a drug information source that allows access to information virtually any time of day from any location. Thousands of databases are available and it also includes journal articles, letters to editors, editorials, law bills, and government reports, proceedings of symposia, newspaper articles, books and encyclopedias. Other advantages include searching flexibility using multiple fields and cross file searching, fast and efficient retrieval of up-to-date information, simple menu systems, and downloading of information. "ALTAVISTA" was the other drug information source used in this study. To access the internet the user needs a computer with internet browser

software, a modem, and an internet service provider (2).

There are no previous studies that compare DRUGDEX<sup>®</sup> and "ALTAVISTA" or either of them with other resources. A similar study compared drug information software for palm operating systems in terms of breadth, clinical dependability, and ease of use. The study concluded that LexiComp Platinum offered the greatest breadth of information and the most clinically dependable and helpful of these products for answering straightforward drug-information questions (3). Another study evaluated the accuracy, comprehensiveness, and ease of use of different drug interaction software for Personal digital assistants (PDAs) and concluded that both Ifacts<sup>®</sup> and Lexi-Interact<sup>®</sup> excelled as PDA pharmacopoeia for assessing drug interactions (4).

The objective of this study is to compare the time it requires to find an answer to a question in addition to the easiness of use, comprehensiveness, breadth of information and cost of two different drug information media which are the tertiary database DRUGDEX<sup>®</sup> and the online search engine "ALTAVISTA".

### Methods

A pool of 100 questions was collected at random from different drug information centers in many government hospitals at the Kingdom of Saudi Arabia.

Inclusion criteria:

1. Any drug related questions; drug dosage, drug therapy, adverse drug reactions, drug interactions, drug compatibilities or pharmacokinetics.
2. The questions may include one or more drugs.

Exclusion criteria:

Questions related to the following areas were excluded.

1. Disease related questions; diagnosis, prognosis, signs & symptoms.
2. Poisoning questions.
3. Questions about drug availability in Saudi Arabia
4. Physician's request for primary literature.

The study was conducted at the Drug Information Center of the college of pharmacy, King Saud University, Riyadh, Saudi Arabia.

It consisted of two phases, in phase I; The investigators answered the questions using DRUGDEX<sup>®</sup> System, the main drug information database of MICROMEDX<sup>®</sup> (a tertiary drug information source available as CD-ROM).

Phase II started after 3 months. This 3 months gap was intended to reduce researcher recall bias. This phase involved answering the same questions using the internet web site www. Altavista.com. the searching through that site yielded information from many primary and tertiary drug information sources to find the answer (5,6).

The same person, who answered a set of questions using DRUGDEX<sup>®</sup> in Phase I, answered the same set using AltaVista to eliminate tester bias and skill differences from affecting the results. In each phase, five measures were compared between the sources. These measures were time, ease of use, comprehensiveness, and breadth of information, and total cost. Time to locate the answer was recorded for each question in minutes; the time factor was not reported for any question that took more than 30 minutes to be answered and that was applied in the two phases. Comprehensiveness

was defined as coverage of all the question's points, while breadth was defined as availability of information that is if the questions could be addressed by the source even if not completely.

Easiness-of-use, comprehensiveness, and breadth were assessed by using a scale of 1 to 3. In easiness-of-use 1 means it was very easy to find the answer and 3 means it was very difficult. In terms of comprehensiveness, 1 means that the point is well-covered and 3 means that the point is not covered at all by this source. The fourth parameter was breadth and that was assessed by giving each question a value of 1 or 2 (available, not available). This scoring system was validated by Bryony S, *et al* (7).

Table (1) gives an example of how these parameters were determined for a sample question. The cost was a very important parameter compared in this study. The daily cost for internet was calculated by multiplying 9 hours (one working day) by the cost for each hour in Saudi Riyal (SR), while the yearly cost equals the daily cost multiplied by 360 days (SR/year). The cost of a yearly subscription of DRUGDEX<sup>®</sup> is constant (16875 SR / year).

**Table 1.** Sample Question and relevant parameters

Question	DRUGDEX				ALTAVISTA			
	Time (Min)	Easiness (1-3)	Comp. <sup>a</sup> (1-3)	Breadth (1-2)	Time (Min)	Easiness (1-3)	Comp. <sup>a</sup> (1-3)	Breadth (1-2)
Provide the FDA indication(s) for Actonel <sup>®</sup> and its mechanism of action	1.5	1	1	1	13	3	2	1

<sup>a</sup> Comprehensiveness. \* Number 1 means that it was very easy to find the answer OR that the point is well-covered OR the answer is available in that source. \*\* Number 2 means that it was more difficult to find the answer OR that the point is not well-covered, OR the answer is not available in that source. \*\*\* Number 3 means that it was very difficult to find the answer OR the answer is not covered at all by the source

**Table 2.** The Mean and standard deviation of Time required to answer questions Using DRUGDEX<sup>®</sup> and AltaVista.

Source	Mean Time (min)
DRUGDEX <sup>®</sup>	1.70 ± 1.19
ALTAVISTA	5.05 ± 4.52*

\* P < 0.001

#### Statistical Analysis:

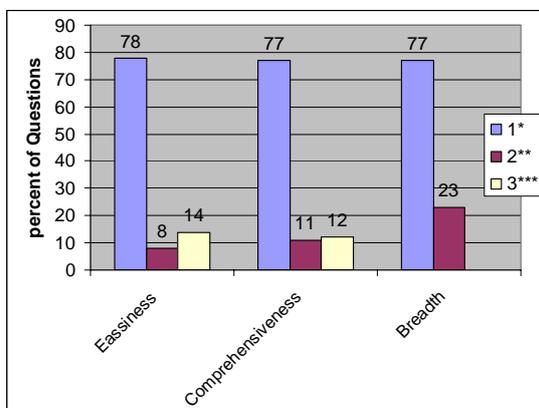
Descriptive statistical analysis was performed by SPSS (Version 11.0). The mean and standard deviation (SD) of the time to answer all questions from each source were calculated and then compared using student's t-test. The level of significance was chosen to be p<0.01. The other variables (easiness of use, Comprehensiveness, and breadth) were compared using SPSS by using the non-parametric Mann-Whitney tests and the difference was tested for statistical significance using a p<0.01 as the significance level.

**Table 3.** Evaluation of Easiness, Comprehensiveness, and Breadth of both sources.

Measures	Percentage of Questions						P- value
	DRUGDEX®			ALTAVISTA			
	1	2	3	1	2	3	
Easiness	78%	8%	14%	55%	25%	20%	0.002
Comprehensiveness	77%	11%	12%	73%	14%	13%	0.545
Breadth	77%	23%	NA	86%	14%	NA	0.102

NA (not applicable)

\* Number 1 means that it was very easy to find the answer OR that the point is well-covered OR the answer is available in that source. \*\* Number 2 means that it was more difficult to find the answer OR that the point is not well- covered, OR the answer is not available in that source. \*\*\* Number 3 means that it was very difficult to find the answer OR the answer is not covered at all by the source

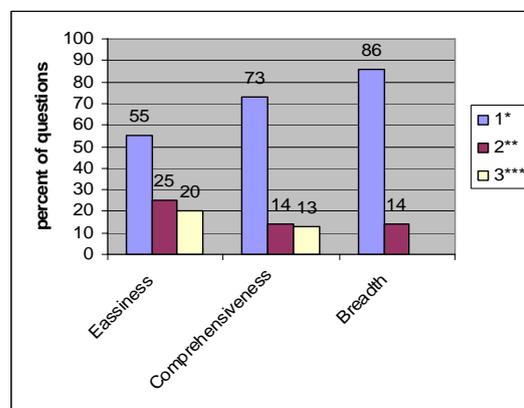


**Fig. 1.** Evaluation of Easiness, Comprehensiveness, and Breadth with DRUGDEX®

\* Number 1 means that it was very easy to find the answer OR that the point is well-covered OR the answer is available in that source.

\*\* Number 2 means that it was more difficult to find the answer OR that the point is not well- covered, OR the answer is not available in that source.

\*\*\* Number 3 means that it was very difficult to find the answer OR the answer is not covered at all by the source



**Fig. 2.** Evaluation of Easiness, Comprehensiveness, and Breadth with Internet Website www.Altavista.Com

\* Number 1 means that it was very easy to find the answer OR that the point is well-covered OR the answer is available in that source.

\*\* Number 2 means that it was more difficult to find the answer OR that the point is not well- covered, OR the answer is not available in that source.

\*\*\* Number 3 means that it was very difficult to find the answer OR the answer is not covered at all by the source

**Results**

The investigators answered different types of drug-oriented questions using two types of information sources available in the drug information center of the school of pharmacy, King Saud University, KSA. The time required to answer each question using DRUGDEX® and "ALTAVISTA" was recorded (table 2), and the mean was calculated as 1.70 ± 1.19 and 5.05 ± 4.52 min, respectively. The other measures are represented in table (3), figures 1 and 2.

Descriptive statistical analysis of time was performed to compare the two means and it revealed a p< 0.01, which was statistically significant. This indicates that it takes less time to find the answers using DRUGDEX®.

A small number (2%) of questions were not found using DRUGDEX®, the time factor was cancelled for these questions but were given a value of 2 for the breadth and a value of 3 for the other measures.

A number of questions (7%) required > 30 minutes to be answered using the search engine, which necessitates omitting of their time values from both sources while other measures for each question were included in the analysis. .

When the easiness-of-use was compared, the results showed that 78% of questions were given a value of 1 with DRUGDEX<sup>®</sup> versus 55% using the "ALTAVISTA", This difference was found to be statistically significant ( $p < 0.01$ ).

Considering the comprehensiveness and breadth, small differences were detected between both sources. Percentage of question adequately covered in the sources (i.e. given a value of 1) was 77% and 78% using DRUGDEX<sup>®</sup> and "ALTAVISTA", respectively. Percentage of questions where the answer was available in the source was 77% and 86% respectively. Differences in comprehensiveness and breadth were not statistically significant ( $p > 0.01$ )

The cost was another important parameter to be compared. The DRUGDEX<sup>®</sup> cost is constant, and equal to 16875 SR/ year while internet cost was calculated by multiplying the total number of hours spent searching the answer by the cost of each hour in KSA. The total time was 544.5 minutes (~ 9 hours) and the cost for each hour is= 4 Saudi Riyal (SR). Cost per day 9hours x 4 SR = 36 SR. Then the total yearly cost would be 360 day/year x 36= 12960 SR which is less than the yearly cost of DRUGDEX<sup>®</sup>.

### Discussion

The present Study; up to our knowledge is considered the first study evaluating two drug information sources to seek an ideal sources that is comprehensive in the information covered, easily used, inexpensive and timely efficient. In the literature other studies that used similar methods to compare between different software program for personal digital assistants (PDAs) were identified. (3,4) however, the results of those studies cannot be compared to the current one since those software were specific for PDAs and cannot be used on personal computers found in the drug information centers.

The present study shows that DRUGDEX<sup>®</sup> is faster and easier in providing the answers when compared to "ALTAVISTA". The mean time required to answer each question using DRUGDEX<sup>®</sup> and "ALTAVISTA" was  $1.70 \pm 1.19$  and  $5.05 \pm$

4.52 min, respectively, with a p -value < 0.01. In terms of easiness, 78% of questions were given a value of 1 with DRUGDEX<sup>®</sup> versus 55% using the "ALTAVISTA", This difference was found to be statistically significant ( $p < 0.01$ ). This difference was probably due to DRUGDEX<sup>®</sup> being organized in the form of drug monographs that are divided into sections of drug information e.g. dosage, drug interactions, etc. Furthermore, the user would only need to click on these hyperlinked sections in order to view the detailed document and scan it for an answer. This organization decreases the time of the search and makes it easier. On the other hand, "ALTAVISTA" required more time because keywords are used as search terms to produce a large number of results that must be reviewed individually to check whether the answer is available or not. This search approach makes it more difficult since a specific combination of keywords must be used in order to produce a suitable link. This approach does not rely on a systemic method but depends on system of trial and error until the right keywords are obtained. Moreover, finding information required detailed training and experience.

Other disadvantages of "ALTAVISTA" as reported by Flory were uncontrolled quality (as it is not peer-reviewed), unorganization, instability, and the need for special surfing skills (2). The above disadvantages were encountered in the current study. DRUGDEX<sup>®</sup> was found to be comparable to "ALTAVISTA" in terms of comprehensiveness and breadth, despite a small, yet not significant, difference detected between both sources. Percentage of question adequately covered in the sources (i.e. given a value of 1) were 77% and 73% using DRUGDEX<sup>®</sup> and "ALTAVISTA", respectively. Percentage of questions where the answer was available in the source (breadth) were 77% and 86% respectively. Differences in comprehensiveness and breadth were not statistically significant ( $p > 0.01$ ). The information obtained covered the question's point to a similar degree using the two sources and the percent of questions with unavailable answers was comparable. About 2% of the questions could not be answered by DRUGDEX<sup>®</sup> this may be attributed to different drug trade names between Saudi Arabia and United States of America which is the country of origin of DRUGDEX<sup>®</sup>. When using "ALTAVISTA" approximately 7% of the questions could not be answered as they consumed more than 30 minutes in the search, and subsequently they were

not pursued further.

As a final point, the main disadvantages of DRUGDEX<sup>®</sup> encountered in this study were the cost, lag time to access new information, and accessibility to Drug Information Centers.

The internet cost was calculated to be 12960 SR/year, while DRUGDEX<sup>®</sup> costs 16875 SR for a one year subscription, which can be utilized for answering unlimited number of questions.

The internet cost was roughly calculated based on considering 9 hours as one working day, then calculating the daily cost by multiplying this by the cost for each hour valued in Saudi Riyal (SR). Next the yearly cost was determined as the daily cost multiplied by 360 (days in year). We recommend further studies to determine the cost of answering all the questions that are submitted to a Drug Information Center per year using the internet then comparing that cost with the DRUGDEX<sup>®</sup> yearly subscription.

We acknowledge that a systemic or methodological bias could exist in this study.

The questions used were not standardized but were chosen as a representative sample of daily questions presented to the Drug Information Centers. Another limitation of this study is that the accuracy of the information provided by "ALTAVISTA" was not verified and compared to standard drug information sources as every web page contains information from the author's point of view which depends on his experience, bias, and references. Verifying accuracy of drug information obtained from internet sources such as "ALTAVISTA" is an area that requires further studies for evaluation.

### Conclusion

DRUGDEX<sup>®</sup> is superior to Alta Vista search engine because it is faster, easier, and although its cost seems to be much higher than "ALTAVISTA" search engine. Drugdex can be used to answer unlimited number of questions without further cost. However, the comprehensiveness and breadth of information were comparable in the two sources.

DRUGDEX<sup>®</sup> is regarded as a very suitable source for answering drug related questions and it fulfills all the requirements needed to provide an excellent drug information service.

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### References

1. <http://www.altavista.com/about/>
2. Flory SM, Sailor L. Practical approaches to retrieving drug information from the internet. *Hosp pharm* 2000; 35(3):310-312.
3. Flory SM. Using the internet as a source of drug information: an introduction. *Hosp pharm* 1998; 33(10):1243-1244.
4. Enders SJ, Enders JM, Holstad SG., Drug Information software for Palm operating system personal digital assistant: breadth, clinical dependability, and ease of use. *Pharmacotherapy* 2002; 22(8):1036-1040.
5. Barrons R., Evaluation of personal digital assistant software for drug interactions. *Am J health-syst Pharm.* 2004; 61:380-5.
6. Wukovitz LD. Using internet search engines and library catalogs to locate toxicology information. *Toxicology* 2001 Jan 12;157(1-2):121-39.
7. Bryony S. Dean and Nicholas D. Barber, et al. A validated, reliable method of scoring the severity of medication errors. *AJHP.* 1999;56:57-62.