Drug-herb Interaction: Database of Medicinal Plants of the Caribbean, their Indications, Toxicities and Possible Interactions with Conventional Medication

DH Cohall[1], A Griffiths[1], T Scantlebury-Manning[2], HS Fraser[2], CMS Carrington[2]

ABSTRACT

Objective: *Healthcare professionals in the Caribbean today know very little about these drug-herb interactions of the popular West Indian medicinal herb practices linked to the immigrants from West Africa and India, and to the indigenous Amerindians. It is the intent of this project to produce a database which comprehensively summarizes indications and possible drug-herb interactions of these plants.*

Method: *Using the database programme Epi Info 3.5.1, one hundred and eighty-three herbs used in the Caribbean as medicine by locals have been entered into the West Indian Drug Herb Interaction Database version 0.06 (WIDHID 0.06).*

Results: *A range of one to three common names have been entered with the family and scientific name of each herb, in addition to a range of one to six conditions/illnesses for which a particular plant was to be used as a medicinal herb. One to four bioactive compounds have been made to correlate with the typical herbal preparation methods and toxicity. Thirty of the most common and popular herbs have been researched for their drug herb interactions.*

Conclusion: *West Indian Drug Herb Interaction Database version 0.06 for the first time allows easy access to Caribbean ethno-medicinal plant cures with their possible drug-herb interactions reference sources, a feature often absent although so important. In addition, WIDHID 0.06 will support pharmaco-epidemiological studies in the field. It will also ensure future public access to ethno-medicinal information through developed web pages or programmes.*

Keywords: Drug-herb, herbs, interactions, toxicity

La Interacción entre Medicamentos y Hierbas: Base de Datos de las Plantas Medicinales en el Caribe, sus Indicaciones, Toxicidades y Posibles Interacciones con la Medicina Convencional

DH Cohall[1], A Griffiths[1], T Scantlebury-Manning[2], HS Fraser[2], CMS Carrington[2]

RESUMEN

Objetivo: *Los profesionales de la atención a la salud en el Caribe saben hoy muy poco sobre las interacciones entre medicamentos y las hierbas de las prácticas herbarias populares de las Indias Occidentales, relacionadas con los inmigrantes de África Occidental y a los aborígenes amerindios. El propósito de este proyecto es crear una base de datos que resuma de manera integral las indicaciones así como las posibles interacciones medicamento-hierba presentes en estas plantas.*

Método: *Usando el programa del base de datos Epi Info 3.5.1, ciento ochenta y tres hierbas usadas como medicina en el Caribe, fueron entradas en la Base de Datos Interacción Medicamento-Hierba de West Indies, versión 0.06 (WIDHID 0.06).*

Resultados: *Un rango de uno a tres nombres comunes se ha entrado con la familia y el nombre científico de cada hierba, además de un rango de una a seis condiciones/enfermedades para las cuales una planta en particular puede usarse como hierba medicinal. Los compuestos bioactivos entre los rangos de uno a cuatro han sido entrados junto con su clase química respectiva. Las tres partes más*

From: [1]Faculty of Medical Sciences and [2]Faculty of Pure and Applied Sciences, The University of the West Indies, Cave Hill, Barbados

Correspondence: Dr DH Cohall, Faculty of Medical Sciences, The University of the West Indies, Cave Hill, Barbados, West Indies. Email: damian.cohall@cavehill.uwi.edu

comúnmente usadas de las plantas han sido puestas en correlación con los métodos de preparación herbarios típicos y la toxicidad. Se han investigado treinta de las hierbas más comunes y populares en cuanto a sus interacciones medicamento-hierba.

Conclusión: *La Base de Datos Interacción Medicamento-Hierba de West Indies versión 0.06 permite por primera vez fácil acceso fácil a la rica base de curaciones mediante plantas etno-medicinales caribeñas con sus fuentes de referencias a sus posibles interacciones medicamento-hierba, un aspecto a menudo omitido a pesar de su importancia. Además, WIDHID 0.06 permite que se emprendan estudios epidemiológicos. También asegurará el acceso público futuro a la información etno-medicinal a través del desarrollo de programas y páginas web.*

Palabras claves: Medicamento-hierba, hierbas, interacciones, toxicidad

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INTRODUCTION

The Caribbean has a rich base of folklore practices involving the use of medicinal plants. These practices are historically linked to the immigrants from West Africa and the East Indies, and to the original native inhabitants, Amerindians, from some territories in the Caribbean (1). Herbalism, folklore, and shamanism are central in an apprenticeship system of information passed from one generation to the other through a shaman, curandero, traditional healer, or herbalist (2). The ageing population is tied closer to the traditional practices and are those who tend to use herbal remedies more. In addition, the ageing population tend to suffer more with chronic conditions, thus requiring multiple medications, for which the risk for drug-herb interactions is the greatest as a result of the herbal practices and polypharmacy (3). In the Caribbean today, most health professionals know very little about the actions of herbal preparations and cannot account for any possible drug-herb interactions which may occur (4).

Most herbs have yet to be subjected to the same rigorous efficacy and safety trials as prescription drugs. Herbs sold in their natural state (such as leaves, roots, oils, teas etc) or as marketed dietary supplements may vary significantly. Even different batches of the same herbs or product from the same planter may differ in content and potency due to the plants' harvested time and location (5). In addition, most of the currently available systematic reviews address herbal preparations which are marketed and widely used in industrialized countries. However, many herbs used in Caribbean folk medicine seem to be rarely investigated (6). As a result, many of the exact mechanisms of drug-herb interactions are unknown. To date, several pharmacokinetic drug-herb interactions and several additive pharmacodynamic interactions have been identified (7). Pharmacodynamic interactions occur when the intrinsic action of one agent (drug or herb) augments or antagonizes the activity of another drug (8). Pharmacokinetic interactions however, result from changes in metabolism, excretion or (infrequently) absorption or protein binding of the active aspect of one agent (drug or herb), resulting in more-pronounced or diminished pharmacologic activity (9). Furthermore, practitioners of herbal medicine often combine different herbs and use unconventional diagnostic approaches to adapt prescriptions to single patients.

Ethno-medical information of the Caribbean was acquired from various sources such as books on medical botany and herbs, review articles (usually involving surveys of medicinal plants by geographic region or ethnic culture), notes placed on voucher herbarium specimens by the botanist at the time of collection, field work and computer databases. As a result, a database focussed on herbal remedies of the Caribbean has been created. The literature review has identified medicinal plants used to treat common ailments observed in the Caribbean, in addition to outlining their taxonomy, folklore uses, parts of plants used, toxicity effect, bioactive compounds, bioactive compound classes and documented or possible drug-herb interactions. The database will be applicable to primary care physicians and pharmacists and will be used in public education campaigns for the promotion of best practices in the use of herbal remedies.

METHOD

The task of creating a drug-herb interaction database of Caribbean folklore herbs and plants was broken up into two phases. Phase 1 involved a literature search for sources with appropriate models of projects which were focussed in the area of Caribbean folklore medicinal practices and Phase 2 consisted of creating a database applicable to primary care physicians, pharmacists and for its use in public education campaigns for the promotion of best practices in the use of herbal remedies and conventional drugs for the treatment of diseases.

Phase 1

The literature was reviewed to determine the quality of the information available and the ways in which the challenges such as the herb/plant family name, scientific name, common name, condition/illness, bioactive compounds with their chemical class, parts of the plants used and their toxic effects

and the drug-herb interactions may be organized to give a coherent database. Several models were found through the use of both papers and journals. For instance, the Barbados Museum and Historical Society, the West Indian Medical Journal and Harvard Papers in Botany were reviewed and a modelled approach of grouping and sorting herbs and their properties was used to aid in the design of the database.

Phase 2

Epi Info 3.5.1 comprises a series of statistical and database programmes bundled under a common menuing system which allows the creation of questionnaires, the entering and analysis of the resulting data and the writing-up of summary reports including mapping and graphing, and creation of reports (developed by the Centres for Disease Control and Prevention (CDC)). It was selected as the database of choice. Several reasons made Epi Info the database programme of choice: i) Epi info allows for easy manipulation; ii) it is compatible with Microsoft Access, a popular database programme which offers added support as a backup programme and iii) it supports future epidemiological studies in the field.

RESULTS

Journals (Barbados Museum and Historical Society, West Indian Medical Journal, Harvard Papers in Botany and TRAMIL database) were used to design a questionnaire which adequately allowed for several conflicts in the literature to be solved and a coherent database established (Fig. 1a and 1b).

DISCUSSION

The models found for database design gave several conflicts to compilation of the ethno-medicinal information on the herbs/plants used within the Caribbean. The journals and papers sourced had several conflicting issues and as a result several compromises were inflicted on database design. The journals and papers sourced ranged from centuries old to present day; scientific names of many herbs/plants have been changed to reflect the present taxonomic standards while common names which remained were found to vary quite a lot, in that there were more than one common name for particular plants and herbs. In fact, a particular herb may have as many as six different common names attached to it. As a result, the database was designed to accommodate three common names at most and each common name must be referenced at least twice as a standard. Further aid by means of visual images was included in the database because of the common occurrence of people using herbs and not knowing the names of these plants. Therefore, the visual representations are an added advantage for the identification of plants and herbs.

Furthermore, the location of plants/herbs is extremely important for efficacy and safety studies. As mentioned early, even different batches of the same herbs or product from the same producer may have different compositions of bioactive compounds. This variation in bioactive compound composition can be influenced significantly by the plants' harvest time and location, leading to differences in toxic

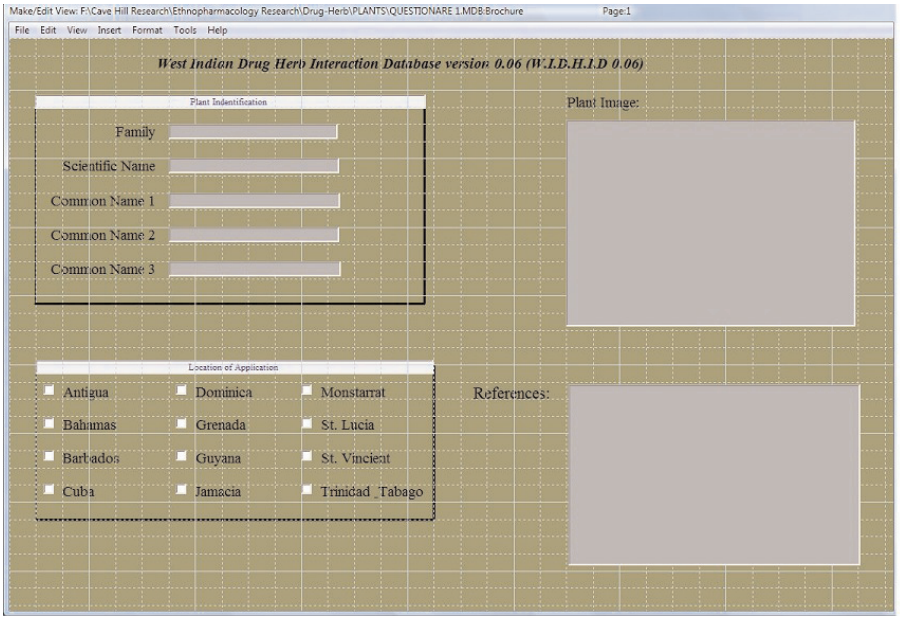


Fig. 1a: The design view of Epi Info 3.5.1 showing the plant identification page of the West Indian Drug Herb Interaction Database version 0.06 (W.I.D.H.I.D 0.06). Present at the data fields for the family, scientific, common name 1 to 3, the location of the herbal remedy practice, plant image and the references of the information sourced. The plant image field allows for an added source of identification in cases where names are not remembered; but visual images are. Several databases lack validity of the ethno medicinal information and as a result often fall victim to heavy scrutiny; however, W.I.D.H.I.D 0.06 has built into its very first page, the sources of information in an organized fashion.

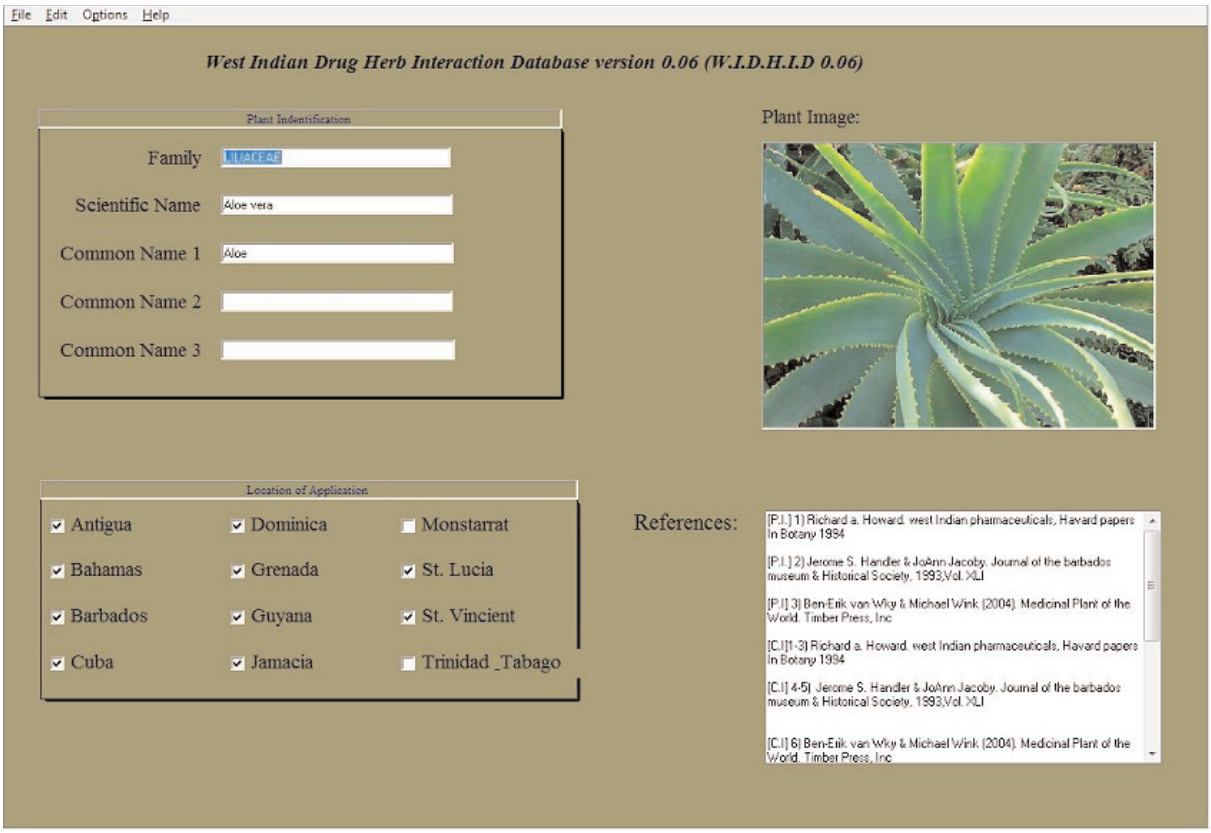
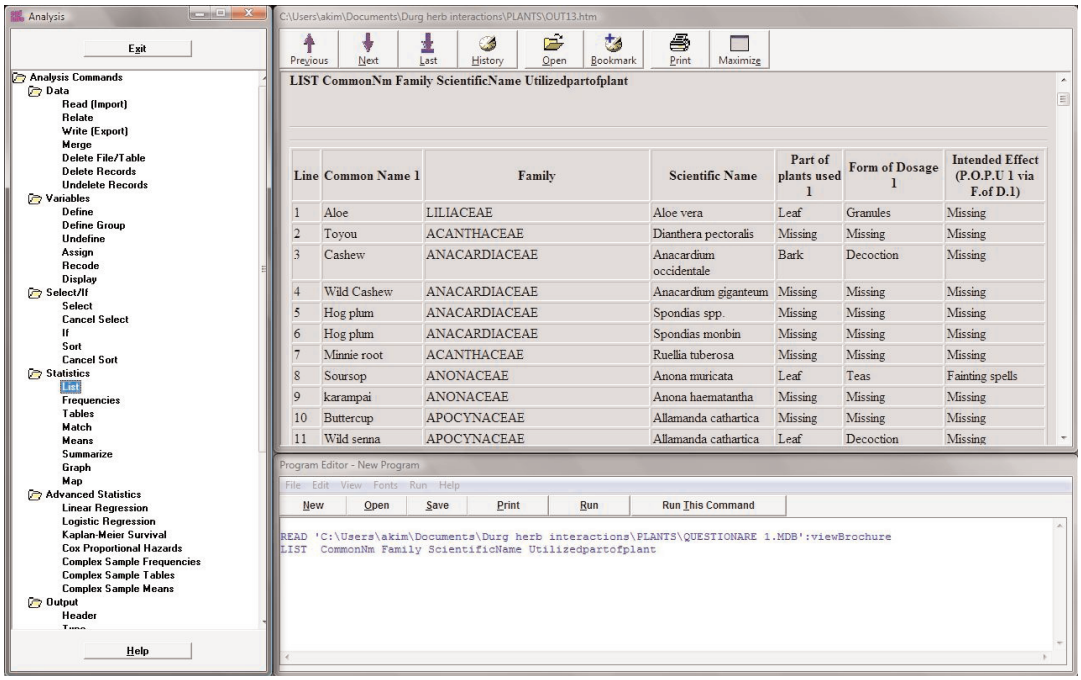


Fig. 1b: The plant identification Enter-data-view of W.I.D.H.I.D 0.06 of Aloe vera. Here the family, scientific and common names have been entered along with the location of the herb's medicinal practice.

Fig. 2: The medicinal uses Enter-data-view of WIDHID 0.06. The parts of the plants used (POPU) to prepare the form of the dosage is also entered into the database. Bioactive compounds found in these preparations are also noted.

Fig. 3: The pharmacological effects and possible drug-herb interaction(s) Enter-data-view of WIDHID 0.06. Information about the type of drug-herb interaction is entered on this page. The conventional drug (Con.drug w/Pharm.effect) which interacts with the consistituents of the herb is also entered.



Line	Common Name 1	Family	Scientific Name	Part of plants used 1	Form of Dosage 1	Intended Effect (P.O.P.U 1 via F.of D.1)
1	Aloe	LILIACEAE	Aloe vera	Leaf	Granules	Missing
2	Toyou	ACANTHACEAE	Dianthera pectoralis	Missing	Missing	Missing
3	Cashew	ANACARDIACEAE	Anacardium occidentale	Bark	Decoction	Missing
4	Wild Cashew	ANACARDIACEAE	Anacardium giganteum	Missing	Missing	Missing
5	Hog plum	ANACARDIACEAE	Spondias spp.	Missing	Missing	Missing
6	Hog plum	ANACARDIACEAE	Spondias monbin	Missing	Missing	Missing
7	Minnie root	ACANTHACEAE	Ruellia tuberosa	Missing	Missing	Missing
8	Soursop	ANONACEAE	Anona muricata	Leaf	Teas	Fainting spells
9	karampai	ANONACEAE	Anona haematantha	Missing	Missing	Missing
10	Buttercup	APOCYNACEAE	Allamanda cathartica	Missing	Missing	Missing
11	Wild senna	APOCYNACEAE	Allamanda cathartica	Leaf	Decoction	Missing

Fig. 4. An example of data analysis screen showing common and scientific names of medicinal plants, parts of plants used to make dosage form, dosage forms and the indications of use.

effects and potency as reported in the literature. Toxicity within the database is defined as the negative response to treatment with the herb or plant for the particular condition or illness. Toxicity is dependent on additional factors such as the herbal preparation and the part of the plants used to make the remedy. These were incorporated into the database design for clarity and correlation. The issues of toxicity, part of the plant used and the method of herbal preparation were found to differ with location and culture (10). This conflict is dealt with by using the reference standard as alluded to before. References for these toxic effects as well as other key data entered into the database about the plants were all referenced for quick validation.

Many herbs used in Caribbean folk medicine seem to be rarely investigated and many of the exact mechanisms of drug-herb interactions are unknown. Several key issues have been noted throughout the literature in regard to the shift from natural-products science. One such rationale has been that it often takes approximately 6 months to isolate and structurally characterize a natural product from a plant extract, which is roughly equivalent to the lifetime of a high-throughput screen for a new target and is a prohibitively long time in an ever-accelerating lead discovery race (11). This is still a concern despite such notably recent impacts of plant-derived drugs in the anti-tumour area *eg* taxol, one of the many drugs derived from plants, has dramatically improved the effectiveness of chemotherapy against some of the deadliest cancers. In addition, the increase in the practice of polypharmacy eventually leads to multiple therapies for longer durations and comes with the risk of drug interactions (3).

Drug-herb interactions of popular Caribbean folklore herbs/plants described as both pharmacokinetic and pharmacodynamic were searched for within the available literature, and found to be limited and scattered. A West Indian drug-herb database called W.I.D.H.I.D 0.06 was created using Epi Info 3.5.1 containing one hundred and eighty three herbs found in the Caribbean. Common names of the plants along with their family and scientific names, in addition to the indications for their use and bioactive compounds were entered. The three most commonly used parts of the plants which correlated with particular preparation methods and toxicities were also entered. Thirty of the most common and popular herbs found in the Caribbean have been researched for their drug-herb interactions. The information present within the database is not an exhaustive list, but one which is in current progress and in time a more complete and update database would result.

West Indian Drug Herb Interaction Database 0.06 for the first time allows easy access to the rich base of Caribbean ethno-medicinal plant remedies with their possible drug-herb interactions reference sources, a feature often absent but so key to the use of herbs in the provision of healthcare. The ability to map these folklore practices would be a key feature in pharmaco-epidemiological studies, especially studies involving a chronic disease population, who may be engaged in herbal practices within the Caribbean. In the near future, WIDHID 0.06 will be enhanced to allow for public access through the development of a comprehensive database which will be easy to navigate for those who deem it to be worthy of use.

The field of herbal medicine is rapidly evolving. Unfortunately, the internet often provides a lot of information about herbs which is not properly validated. Trustworthy sources of information concerning herbal products and dietary supplements have to be compiled in order to give protection to the community as well as aid in the discovery of the validated treatment options.

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