

# BOXIT: A Database for Organizing, Managing, and Storing Information on Reagents in Molecular Biology Laboratories

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## Introduction

BOXIT is an easy to use, Filemaker-based relational database for organizing, managing, and storing information on reagents commonly used in a molecular-biology laboratory. Information about antibodies, cells, strains, oligonucleotides, plasmids, and other biological

samples is entered into different sections of the database and integrated into a common interface. By providing intuitive templates for the entry of reagent information, BOXIT offers a scientist or a lab a solution for superior information management. Through an

easy database search, one can quickly find information about a specific reagent, how it was used and where it is stored. When people leave the lab, BOXIT retains their knowledge. You no longer have to waste your time and money finding, retesting, or recreating reagents someone in the lab used and gained knowledge about previously. Just take a look in BOXIT.

Scientists are gathering more and more information about complex systems. It is tough to keep track of all the information which is published in the field, and it's even tougher to keep track of all the reagents bought, produced, or received from other scientists. To keep track of literature, most scientists are using literature databases such as Endnote, ProCite, or Reference Manager, but there is no comparable software to track information about the usage and storage of reagents. There is a need to store reliable, accurate information about reagents used, and it is even more important to find the information about these reagents and their storage location. Information on

plasmids, for example, can be entered into BOXIT and the storage location of the corresponding tubes can be defined. An easy database search will deliver all the information about a reagent right at your fingertips in no time. BOXIT facilitates the transfer of information between researchers. In addition, the software includes an order database with a company address book. This allows a project leader to keep track of all materials ordered, as well as expenses. Altogether, BOXIT offers the responsible scientist a database solution to overview, control, and distribute materials and reagents used in the lab.

## Features

The general features of BOXIT are shown in Figure 1. Upon opening BOXIT, you will enter the Main Menu (Fig. 1a). Here, the sub-databases can be accessed, as well as the integrated manual, the registration, and the preferences section. The use of BOXIT is illustrated by a description of the plasmid sub-database (Fig. 2) in the following sections. Navigation

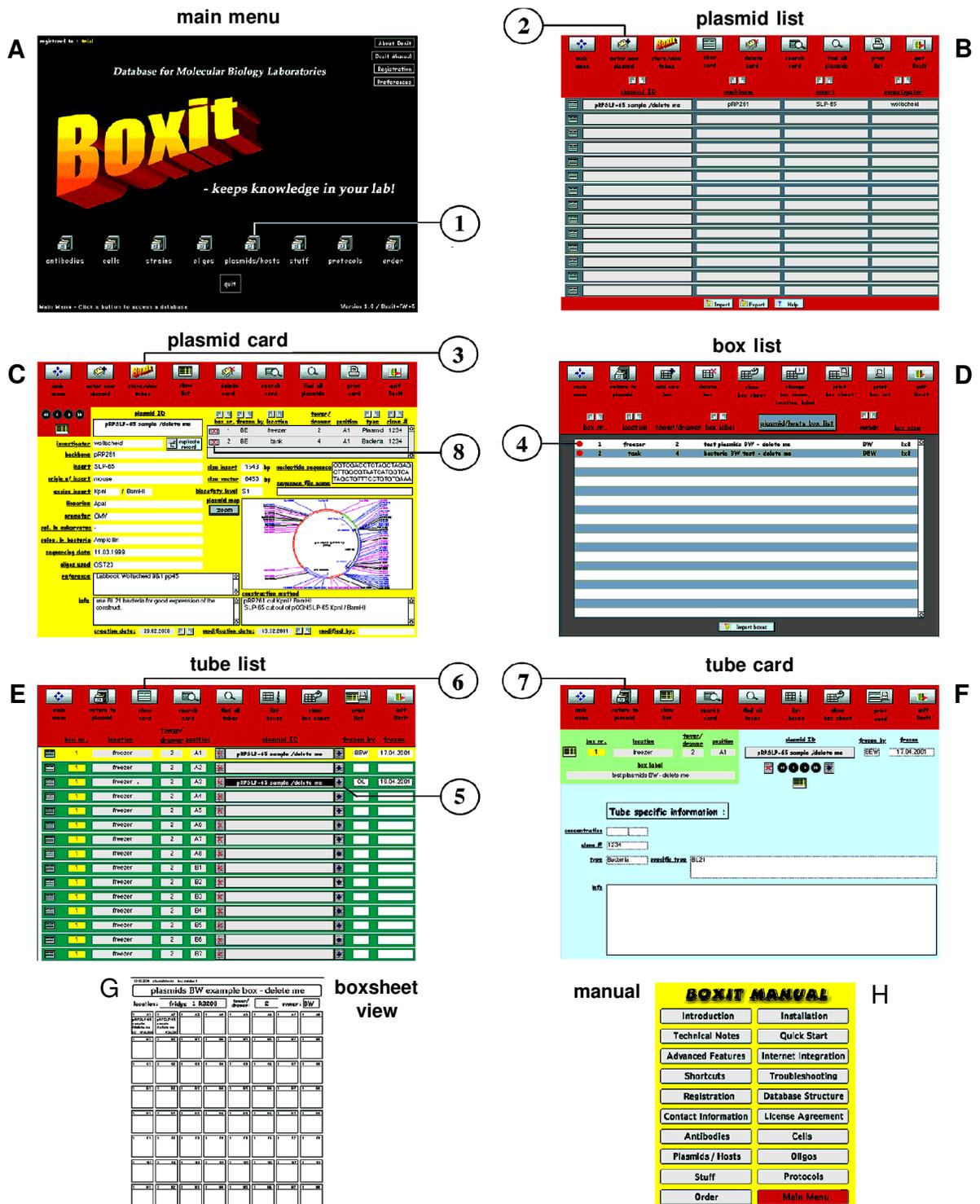


Figure 1. BOXIT interface overview and quick step guide

1) Open sub-database; plasmids for example. 2) Create new record by clicking the "enter new plasmid" button (mandatory: ID, investigator). 3) Store tube by clicking the [boxit] button (switch to the box file). 4) Choose a box (click on the box row) or create a new box. 5) To store a tube, choose a place and click the blue [+] button right next to it. 6) Switch from tube-list to tube-card layout using the [show card] button and enter tube specific information. 7) Return to the plasmid record by clicking the [return to plasmid] button. 8) To delete a tube, click the red [X] button next to the tube in the tube display portal.

Figure 2. Plasmid card interface

throughout BOXIT is performed by clicking buttons. All other sub-databases share the same overall interface.

Upon entering the plasmid list (Fig. 1b), the user has different options. Information about a new plasmid can be entered or searches for plasmids can be conducted. Furthermore, information can be imported or exported (buttons at the bottom of the interface). BOXIT can import data from Excel spreadsheets, or data from a preexisting database can be converted quickly. Each row can be sorted in ascending or descending order by clicking on the buttons at the top of the row's name.

By clicking on the "show card" button, the program switches to the plasmid card interface (Fig. 1c). Here, all of the specific information about a plasmid can be entered and accessed. Data can be entered in a logical order. The cursor moves from field to field to guide data entry. This approach makes it easier for the inexperi-

enced user to input reagent information and maintains consistency in data entry and retrieval. In order to speed up data entry, some fields have customizable pop-up menus. For example, you can choose from a list of restriction enzymes which can be used to linearize plasmids. The sequence of the plasmid, up to 40 kbp, can be entered into the nucleotide sequence field. This allows you to copy and paste the sequence into a program of your choice for further analysis. A picture of the actual plasmid map can be pasted into the plasmid map field and the map can be zoomed into. The plasmid map shown in the figure was created with Gene Construction Kit from Textco ([www.textco.com](http://www.textco.com)).

When one has finished entering the plasmid information, the user can click over to the storage box section (Fig. 1d) (via the "BOXIT" button on the plasmid card) to designate the location at which the plasmid was stored. This interface allows for the cre-

ation of virtual maps of existing boxes holding the tubes, deletion of information about boxes, viewing of virtual box sheets, and changing of information about box owners, box labels, and box locations. Upon creation of the box file, BOXIT assigns a box number to each box. This number cannot be modified and is used internally to allocate the boxes.

By clicking on the box number, the user will be transferred to the virtual tube storage section (Fig. 1e). To store information about the location of a tube, choose a place and click the [+ ] button right next to it. The date will be entered automatically. Subsequently, the "frozen by" field will pop up and allows the user to enter their initials. From the list view, the user can switch to the tube card view (Fig. 1f) where tube-specific information can be entered, such as the amount and concentration of the frozen aliquot, the clone number, and type ("plasmid" or "bacteria"). If you freeze away bacteria, you can additionally enter information about the bacterial host. This concept allows the user to find out immediately if they have the plasmids and/or bacteria stored for future usage in the storage portal on the plasmid card (Fig. 1c). Alternatively, one can store bacterial records in the strain sub-database. The "return to plasmid button" takes the user back to the plasmid card.

The plasmid card holds all of the information one might expect to find when searching in BOXIT with Filemaker's excellent search capabilities: specific information about the plasmid, the sequence in the storage portal, and the exact location of the frozen aliquots. Of course, this plasmid card is printable. If you want to remove the information about a vial, click on the red [x] button in the por-

tal, and the information about the storage location will be cleared. Finally, the virtual box sheet (Fig. 1g) is viewable and printable from the box list interface. Scale the printout to your needs and glue it right to the top and the side of the actual box!

The antibody sub-database retains within each record information about the biological identity of an antibody, as well as the location and in which dilutions the antibody was successfully used in various experiments. No more questions about the usage of an antibody for the next important experiment! In the oligo database, each record calculates from the sequence the G/C content and the melting temperature. This database allows the easy identification of primers for a specific locus, which are available in the lab, and were acquired over years of research. The "stuff" sub-database can keep track of restriction enzymes, libraries, reagents, chemicals, cell pellets, strains, DNA, RNA, embryos, tissues, and anything else that is stored in the lab. One does not need to rely on a specific person who has the information. A user can independently search the database, anytime, anywhere.

Ordering through the order sub-database helps the user build up an inventory. By simply copying a previously ordered item in the

database, labmanagers can save a lot of time and energy. Using this system to assist in ordering is easier and more convenient than searching in a catalog and looking up the item once again. Furthermore, if the whole lab places orders through BOXIT, it is easy to find out if someone has already purchased the reagent previously. A simple search will produce the name of the person who ordered the article and perhaps that person still has some of it available. Information storage can also help a lab save money! For biological security, it is always worthwhile to know which hazardous substances have been purchased and where they are stored. Finally, BOXIT allows the user to keep track of what was bought and the associated expenses. Through the integrated company database, it is possible to track how much product has been ordered from a specific company in order to request a discount the next time that product is purchased. The manual, which can be accessed at all times through the shortcut menu, gives detailed information about the concepts and procedures of BOXIT.

### **Purchasing**

BOXIT is a low-cost database which does not need a full-time

administrator. The database can be used by a single person, all members of a lab, or a lab manager who is keeping track of the most valuable reagents in the lab. BOXIT is available for Mac and PC in a Stand-alone version (BOXIT-SA; \$250), a version for people who already have Filemaker 5.0 (BOXIT-FM; \$200), and a client-server version (BOXIT-CS; \$1500) for groups which want to share information across different laboratories in the same department. BOXIT is distributed through the Internet. For further information about BOXIT, please visit <http://www.boxit-labstorage.de> and download a fully functional trial version to test BOXIT. Upon payment, the user will receive a code from Kagi (payment processing company, <http://order.kagi.com>), which unlocks the trial version. BOXIT is an excellent organizational tool for any molecular biology laboratory. No laboratory should be without such a program. Let's BOXIT!

### **Contact Information:**

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