

Computerized material management, inventory control, and purchase orders in the biotechnology laboratory

BY WILLIAM LOWRY

BIOTECHNOLOGY LABORATORIES use a variety of different supplies (items) from many different vendors. The R&D and production performed by these laboratories are dependent on sufficient volume of each item. The type of item used includes disposables such as test tubes, gloves, culture media, and reagents (i.e., restriction enzymes). Items typically need to be organized by R&D project, funding source, or division within the laboratory. For each item, detailed information such as name, size, primary vendor, catalog number, price, grade, etc., needs to be kept on file. It is prudent to maintain a low count of each item in stock in order to conserve storage space, reduce the chance of reagents expiring before they are used, and reduce the amount invested in the in-stock inventory. A variety of methods are used by laboratories to accomplish material management duties, with most laboratories using manual systems with index cards or in-house-developed spreadsheets. These systems are typically labor intensive and are unable to provide analysis of the data required for careful management of these expensive and critical items. In addition, generation of a purchase order by many laboratories is a cumbersome and slow process and is not integrated into the manual inventory system in place.

The InvMan (Cove Laboratory Software, San Mateo, CA) full-featured material management system operates on personal computers with Microsoft® (Redmond, WA) Windows™. There are five primary functions in the software that make it well suited for the laboratory: 1) automated counting of in-stock inventory; 2) grouping of supplies by project, account, or section of the laboratory; 3) automated generation of purchase orders; 4) ability to rapidly and quantitatively report on the material management data; and 5) a full-featured equipment inventory database with maintenance and problem reports.

In addition to these main functions, the software has numerous others that are of interest to the biotechnology laboratory. It has been enthusiastically received by medical laboratories and has shown significant savings in personnel time and improvements in management of inventory, purchase orders, and equipment in the laboratory.¹ The features that make it applicable to the medical laboratory should also be of interest to the biotechnology laboratory.

Physical count of inventory

InvMan has at least three different methods for counting in-stock supplies. Worklists allow users to organize supplies into groups such as frequency of counting (e.g., weekly), work duties or locations within the laboratory (e.g., polymerase chain reaction [PCR, Hoffmann-La Roche, Nutley, NJ] laboratory, QC testing, raw materials), or any other grouping. The worklists are used to direct and organize the counting of supplies. The physical count of the inventory is automated by scanning each item with a portable bar-code scanner. The bar-code labels are printed using a fast, rugged printer (LabelWriter EL40, Dymo, Greenwich, CT). The portable bar-code scanner (DuraTrax, Videx, Inc., Corvallis, OR) is lightweight and operates at a range of temperatures, e.g., in coldrooms and heated environmental chambers. The counts of each item via scanning the label are uploaded directly to the software. The system can significantly reduce hands-on time for the physical counting of inventory as well as reduce or eliminate counting errors. The worklists and bar-coded items allow the physical counting of the inventory to be delegated to any staff member.

Grouping of items

InvMan provides the laboratory with a variety of methods by which items can be grouped. This makes it

easy to categorize items by research project, funding source, section within the laboratory, research director, product, etc. The user assigns a type to each item. The type permits the user to sort the full list of items and can be used to identify items by function (chemical, solvent, restriction enzyme, oligonucleotide, etc.) laboratory (QC laboratory, micro, PCR laboratory, product release, etc.), funding source (project 21, account 3, etc.), or any other logical grouping. In addition to the type, each item is identified by a location, which can be refrigerator #1, PCR laboratory, coldroom, storeroom, etc. Along with type and location, items can be further grouped, such as electrophoresis, and as many of the items in the database as necessary can be linked to this group; for instance, in the electrophoresis group, the laboratory may have items such as Coomassie blue, molecular weight standards, 4% sodium dodecyl sulfate (SDS), and agarose.

Producing purchase orders and ordering

The system in place in many laboratories for determining what and how much to order is often labor intensive and inefficient. InvMan generates purchase orders in an organized and rapid manner. The automated method uses reorder point (ROP), quantity on hand (QOH), and desired quantity on hand (DQOH) for each item. The software produces the purchase order (PO) automatically and includes all items that need to be ordered as well as the quantity to order. The PO can be edited, with items added or deleted and quantities changed, if needed.

In addition to the PO by ROP method, InvMan provides for three other related, although slightly different, procedures for the generation of a PO. Each PO has a purchase requisition number (PR#) that is assigned by the user. This allows orders to be assigned to any particular funding source for the product, project, account, etc. The PO can be easily and rapidly generated by staff in the laboratory and then released, and approval signatures obtained if required. The final PO can be sent to the vendor by fax, e-mail, or postal service.

Receipt of shipments

With a manual system, it is sometimes difficult to determine if a package has been delivered to the correct laboratory. With InvMan, the packing list is matched with the originating PO, which is easily retrieved from the software. Labels are automatically printed, with or without bar codes, for each item in the shipment. A stock list is printed, listing all of the items in the shipment and where each is to be stored. The quantity of each item is automatically added to the quantity on hand in the software. The software automatically calculates the number of back-ordered items. For each item received, the lot number and expiration date can be entered. Receipt and recording of shipments can be performed by anyone in the laboratory, and there is a direct and easy link of the shipment to the PO. Lot numbers, expiration dates, and dates received can be recorded, and tracking of back-ordered items can be performed.

Reports, queries, and want list

One of the drawbacks with a manual system or in-house spreadsheet/database system is the inability to easily and rapidly analyze the inventory, purchase order, and equipment data. The software provides 20 standard reports and a query wizard. The standard reports cover all of the data with reports such as the Cost of Stock Report, Vendor Details Report, Lot Number Report, and Equipment P.M. Report. All reports can be printed, faxed, or saved to a file.

The query wizard is useful for creating unique searches of the database. Searches such as "list all items

that cost >\$500 and have a quantity on hand of >5 and are from vendor ABC" can be created. All queries can be saved and run at any time to analyze the data, and can be printed and saved to a file.

The want list permits anyone in the laboratory to list items that need to be ordered. This replaces a manual paper system, which is difficult to link to the PO process. When a PO is generated, InvMan automatically removes the item(s) from the want list.

Equipment inventory

The software has a range of equipment functions for the laboratory. A rapid Equipment Details Report lists all equipment in the laboratory, including model, serial number, property number, vendor, date purchased, location, owned, leased, or reagent rental. This report is useful for audits or surveys of the equipment maintained in each laboratory. In addition to this, the user can report any problems and the action taken to solve the problem along with preventive maintenance work on all equipment. Reports for problems/action taken and preventive maintenance are easily produced. InvMan helps the laboratory comply with regulatory requirements that indicate the need for detailed documentation on all instrumentation along with problems and preventive maintenance.

Ancillary site

The ancillary site function is very helpful for laboratories that use a central storeroom or routinely distribute supplies to other departments (e.g., ancillary site). A list of items typically supplied to each ancillary site is created, and then whenever the ancillary site needs supplies, this list can be updated. The list acts as a packing list for distribution of these supplies. Review of the utilization of supplies over time by each ancillary site is then easily accomplished in the software.

Cost analysis

In addition to helping to organize and automate the material management duties of the biotechnology laboratory, InvMan can reduce the cost of material management due to the reduced hands-on time for counting the inventory and for producing purchase orders, the lowered frequency of emergency orders, the lowered number of outdated reagents, and verification of the correct vendor and price for each item ordered. A number of time and cost studies of in-house manual inventory systems were done. The savings per year ranged from \$8000 to well over \$25,000. The savings in each laboratory will vary depending on the efficiency of the existing system and how well the software is implemented. Other benefits are difficult to quantify, but are equally important to the laboratory. These include the equipment functions that track problems, solutions, and preventive maintenance, and the wide variety of reports.

Reference

1. Chapman JT. Computerized material management, inventory control, and purchase orders in the clinical laboratory. *Am Clin Lab* 1999; 18:14-5.

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