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Rowny Systems offers free technical support and advice for Antigen Plus for one year from the date of purchase, Monday-Friday between 9 am and 5 pm U.S. Eastern Time at (301) 761-3106. International callers please call 001 301 761-3106. Rowny Systems also offers technical support via Email at *help@antigenplus.com*. All support is continued with renewal of the annual license.

Data Entry Support

Rowny Systems offers automated red cell panels for Antigen Plus. The panels provided are electronically verified to match with the specification sheets provided by the supplier. Antigen Plus assumes no responsibility for errors by the suppliers, but will correct any such errors as soon as possible when they are discovered.

Liability

Rowny Systems, Inc. dba Antigen Plus and its distributors assume no responsibility for the use of the ANTIGEN PLUS program. The licensee assumes all responsibility for the proper use of the program including establishing appropriate protocols and validation procedures to ensure accurate data entry. ANTIGEN PLUS makes no decision or final recommendation on the meaning of test results or on patient care.

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Introduction

Antigen Plus is a red blood cell inventory and antigen search program that allows the user to enter test results that are automatically evaluated to assist with the interpretation of those results. It is designed to permit fast and easy data entry of test panels, and to search the data for any combination of antigens you choose. It is intended to quickly select donor cells with particular phenotypes for antibody identification studies and to speed up the interpretation process for the blood bank technologist.

The data stored for each donor are:

- Donor ID
- Optional Donor Note
- Lot Number
- Vial Number
- Expiration Date
- Optional Retesting Information on expired cells
- Supplier Name
- Location (optional)
- Phenotype Designation
- Sex
- Blood Group
- 28 Principal Antigens Phenotype
- Additional Antigens - user-defined special typings
- Frozen flag
- Out-of-Stock flag

Data that can be stored for a patient are:

- ID number *
- Name (First*, Middle, Last*)
- Date of birth
- Short note to appear on the screen or on saved panels
- Description on a saved panel
- Phenotype Designation
- Conclusion Antibodies
- Conclusion Notes
- Specimen Numbers

*required fields

Data that can be stored on a saved panel are:

- All the data described above
- Test results (negative or positive reactions to donor cells, auto control cell, and check cells) recorded on a Results Worksheet
- Test results evaluations
- Name of technologist and dates of test for each Results column
- Names of up to two panel reviewers

The user may specify any combination of antigens to search for, search the data and select any cells desired. At this point, the user may immediately print or save the selected cells panel with or without a patient, or they may enter their test results into a results worksheet panel and then save it with a selected patient. The user may store and retrieve the selected panels with any test results as desired. Antigen Plus Version 8 must be run from inside Microsoft Windows Vista or later. It requires a printer that can print in Landscape format (11 x 8½).

Validation

Antigen Plus provides a template for validation of the software based on the **N**AACLS format on its website *www.antigenplus.com*. It is intended to be modified to meet the protocols and standards of the individual institution, but may be reliably used as is to validate the software. Antigen Plus provides technical support for this process.

The panels provided are electronically verified to match with the specification sheets provided by the supplier. The phenotypic information printed on a selected or results panel can be validated by assuring that its data exactly match the data from the suppliers. Part of a laboratory's validation procedure should be to print several lot panels and have the responsible technologist compare them with the supplier's data sheets.

Antigen Plus makes no decision or final recommendation on the meaning of test results or on patient care - this is the user's responsibility. Antigen Plus uses the logic recommended by the American Association of Blood Banks to evaluate initial test results in the same way a technologist would do.

Installation

Antigen Plus will supply your IT department with the installer file and documentation necessary to deploy the program to an application server or to individual workstations. once you are set up (these procedures are covered in our Installation Guides that comes with the installer).

For Lab Administrators Only

First Use and Set-up:
The first person to use Antigen Plus will have administrator privileges and should accomplish a few tasks before others use the program. Your IT will have installed the program according to the instructions in the Installation Guide. If someone other than you has ***run*** the program, you should have that person assign you administrative rights within the program. Once you are logged in as an administrator, these are the steps:
Go to Options/System Options/Printing and type the name of the lab the way you want it to appear on any printouts
Go to Options/Customize result columns and set up the columns in the way you would like for general use (users can change these for individual work-ups, but this what they will always start with).
Go to Options/ Exclusion criteria and set the number of rule-outs for each antigen to exclude the corresponding antibody.
Go to User/Security settings and set the time-out parameters. If you are **not** using Windows accounts for users to log in, then set the password requirements, then go to User/Account

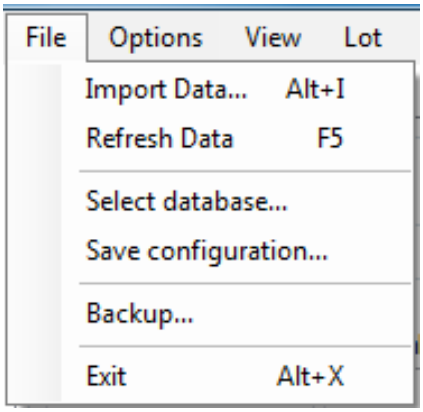
settings and set up your staff with usernames and passwords. All of these functions are described in the Menus section below.

To Run the Program

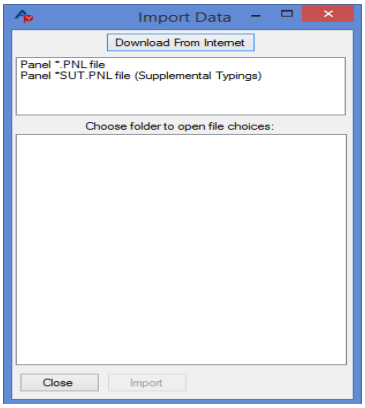
Double click the Antigen Plus icon to start the program.

Menus

File Menu



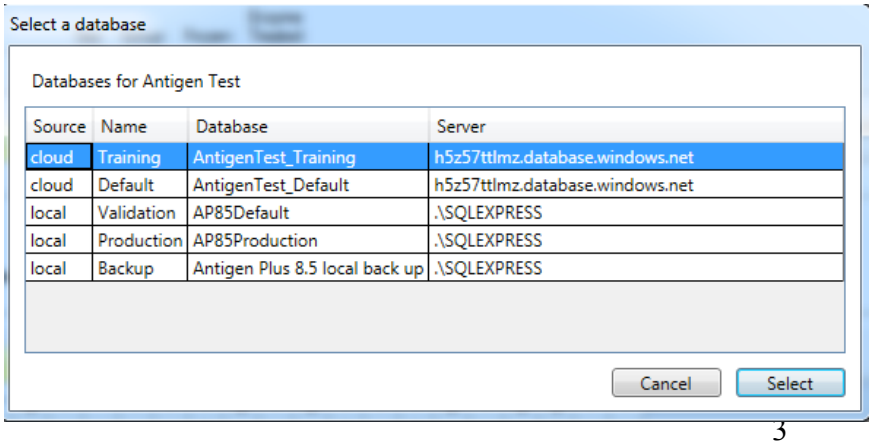
The File menu accesses five functions**: Import Data, Refresh Data, Select database, Save configuration, Backup, and Exit.**



Import Data: Allows the importation of commercial lots from the internet or the importation of panels in Antigen Plus format from other sources.

Refresh Data: If you are doing a search and another user is downloading or entering cell data at the same time**, Refresh Data** will ensure that the new data are available to you for search.

Select database:
This option opens a screen that shows the available databases and allows you to select one of them.

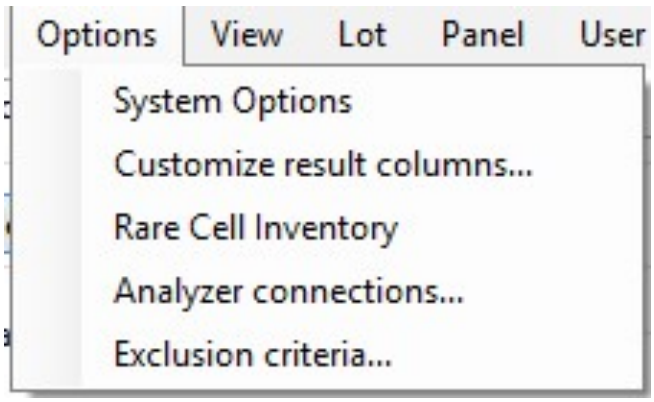


Save configuration: Available to software administrators, this item on first allows the saving of the configuration file for the software. On subsequent use, it opens the folder containing the configuration files. Instructions can be found in "Antigen Plus 8.5 Installation and Configuration."

Backup: Prompts you to select a location to back up all of your Antigen Plus data. This feature was designed for a locally hosted database but is also useful for maintaining a local fail-safe back up of the cloud hosted database for use during an internet outage or in the highly unlikely case of a massive multiple system failure both in our backup facilities and in Microsoft Azure.

To avoid losing your data in the event of a pc or system failure, we recommend that you store these data on a drive or storage device that is separate from your system. The data may be easily retrieved by Antigen Plus using SQL Server Management Studio. Instructions can be found in "Antigen Plus 8.5 Installation and Configuration."

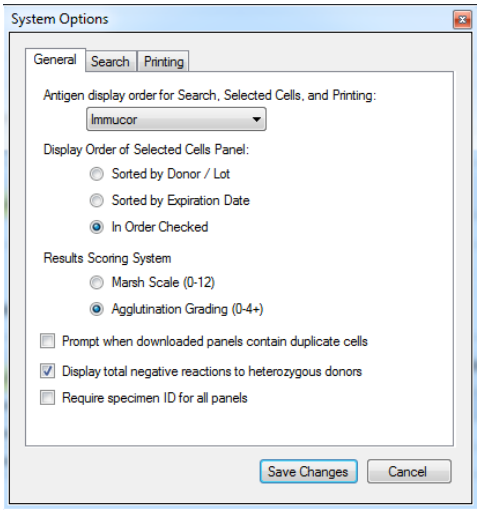
Options Menu



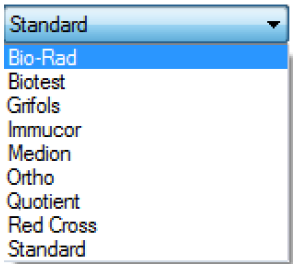
System Options

The System Options menu allows you to set and/or change general default parameters for using Antigen Plus in your lab. There are three tabs on this menu—one each for General, Search, and Printing options.

General Tab



Antigen Display Order for Search, Selected Cells, and Printing: Sets the display order for cells on each screen where the antigen array appears. The antigen array of whichever manufacturer (or alternative) is selected will be the one you use for searching, selecting, and entering your test results.

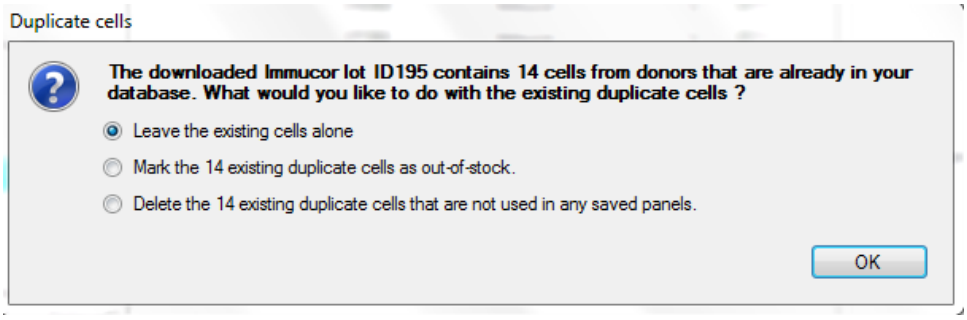


Display Order of Selected Cells Panel: Allows you to view your selected cells in one of three sorted orders in Selected Cells panels and Results Worksheets.

Results Scoring System: Allows you to select one of two scoring systems for entering your test results in the **Results Worksheet**.

Prompt When Downloaded Panels Contain Duplicate Cells: Activates an automatic check for duplicate cells when you are downloading commercial red cell panels. If you chose this option, when you download a panel, you will be alerted to the existence of duplicate donor cells in your database and be given the option to ignore them, mark them out-of-stock, or delete them (as long as they are not in any worksheet that you have saved).

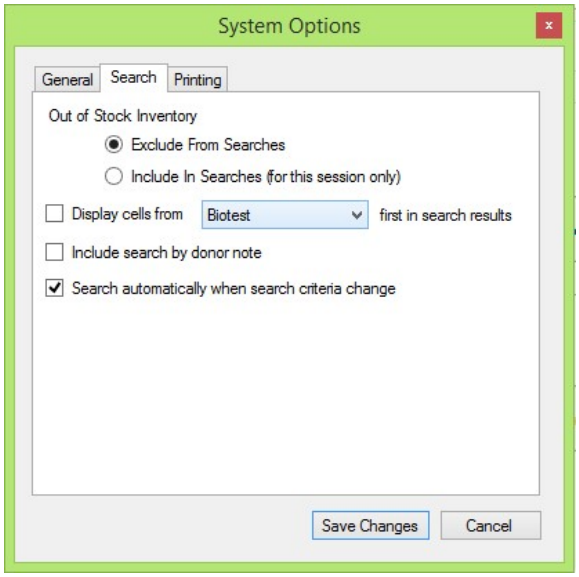
Please note: If you are importing two identical panels (e.g. Quotient panels that are the same except that one is enzyme treated), both panels will be marked out-of-stock if you have this feature turned on and choose the out-of-stock option



Display total negative reactions to heterozygous donors: This option adds a rule-out count row to the Worksheet to show reactions that that may provide more evidence toward an exclusion when the required homozygous cells are not available for testing.

Require Specimen ID for All Panels: Makes it a requirement to add a Specimen ID number to any saved panel. When this is selected, you may not save any work-up without entering a specimen ID number. Only administrators may set this option. For more information about adding specimen ID numbers, see page 34??.

Search Tab



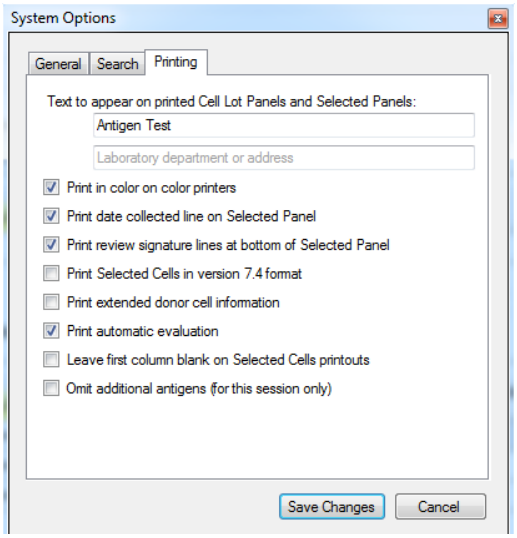
Out of Stock Inventory: Allows you to include out-of-stock cells in your searches.

Display Cells from *Supplier* First in Search Results: Allows you to prioritize your search by a single supplier. Normally, when cells are searched, the search order is freshest to oldest to frozen. This option allows you to find all the cells from one supplier in that order before other cells are found. This feature is designed to make cell selection easier for those labs that rely most heavily on a single supplier or test system and would prefer to test those cells unless none are available with the required characteristics.

Include Search by Donor Note: Activates the search by donor note function on the Search screen. The text box on the screen will search donors by whatever text is in an associated note. This is primarily useful for reference labs with frozen inventories of rare cells and cells they have typed and frozen themselves.

Search Automatically When Search Criteria Change: Removes the Search button from the **Search Cells** screen. When this is done, cells matching each criterion entered are found and displayed. As more criteria are added, the cells change to match the cumulative pattern. Hospitals and blood banks with an inventory of fewer than 200 cells may find it more convenient to search in this manner as it eliminates the necessity of hitting the search button to initiate a search.

Printing Tab



Text to Appear on Printed Cell Lot Panels and Selected Panels: Allows you to enter text that will be printed on any printed output to identify your facility. There are no limits to the amount of text you can enter, but filling more than the space available will result in overprinting issues.

Print Review Signature Lines at Bottom of Selected Panel: Allows you to print signature review lines on the bottom of the printed Selected Cells Panel if you are doing manual rule-outs.

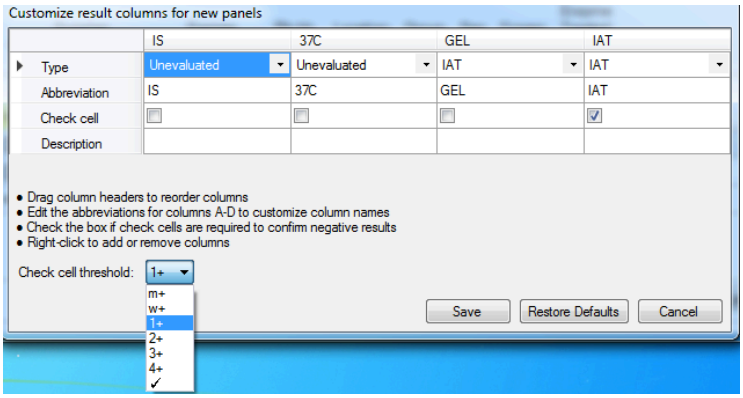
Print Selected Cells in Version 7.4 Format: Allows the **Selected Cells Panel** to print in the format used in Version 7.4. This is to satisfy SOP requirements of reference labs that have been accustomed to this format.

Print Extended Donor Cell Information: Enables the printing of extended information about each donor cell on panel at the end of a selected panel or worksheet.

Print Automated Evaluation
This feature is checked as the default for the software. Unchecking it allows the printing of the worksheet without the evaluation for those who wish to do the evaluation manually using the worksheet layout.

Leave First Column Blank on Selected Cells Printouts: Eliminates the text in the first column of a printed Selected Cells Panel –the selection order number and any out of date or frozen designation will appear on the screen but not on the printout to allow space for manual notes.

Customize Results Columns



In the **Customize Results Columns** screen, administrators may customize the results columns that will appear in Results Worksheets for all users. The default results columns are IAT, ENZ, DTT, A, B, C, and D respectively. By default, A, B, C, and D exclude by the same rules as IAT.

From here, columns may be added, renamed, repositioned, removed, or set to exclude by different rules. Right-clicking on a column will give you the option to Add Column or Remove Column. Editing the Abbreviation text will change the name of the column. By dragging a column with the mouse, it can be repositioned. The dropdown menu in the Type row allows you to assign each column to exclude by IAT, Enzymes, DTT, or by Adsorption rules (see page??), or the Unevaluated column can display results that are not evaluated on the worksheet. The description field will display any text you enter to identify the column or testing method on your worksheet.

Finally, selecting or de-selecting the Check Cell box will add or remove a check cell requirement to each result in that column. The check cell threshold may then be set by using the Check Cell Threshold dropdown menu at the bottom of the screen. If you select the check mark at the bottom, your check cell results will either be a check for postitive, or an “x’ for negative.

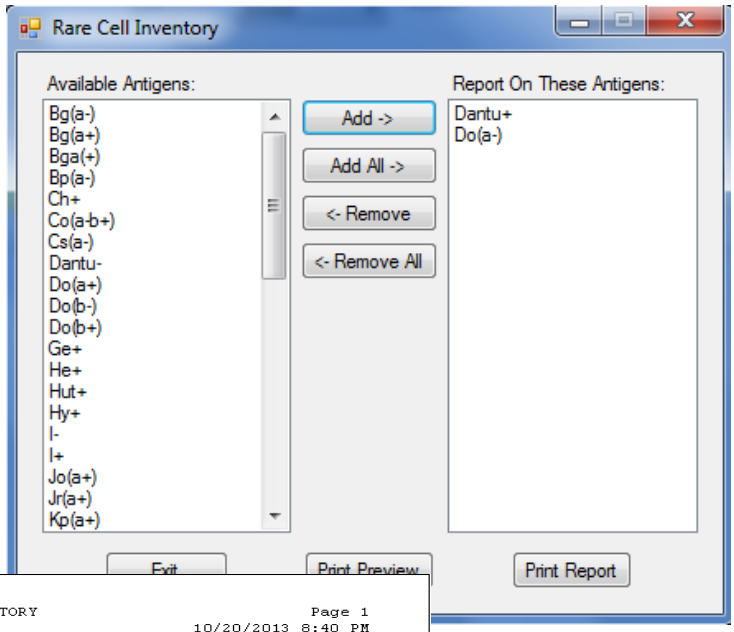
To restore the default arrangement of results columns, simply select **Restore Defaults**. Please note that when adding, removing, or editing results columns, the Results Worksheet will not reflect your changes until it is cleared and a new one is started.

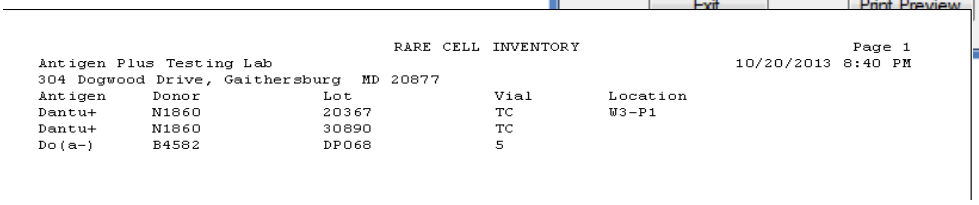
Please note that Customize Results Columns will set the default columns that will appear anytime a user opens a Results Worksheet *unless* the user is importing results from a blood analyzer machine. In this case only the blood analyzer result column will appear, and other columns may be added manually.

Rare Cell Inventory

This option calls up a list of all the special typings (additional antigens) in your database. You may search for all or some of them and print out a report.

Since BioTest has added Coltons and Diegos to their standard array and Quotient has added $Wr^{a,}$ these additional antigens will not appear on the rare cell inventory list but can be enumerated by searching for them on the Search screen.





RARE CELL INVENTORY Page 1

Antigen Plus Testing Lab 10/20/2013 8:40 PM
304 Dogwood Drive, Gaithersburg MD 20877

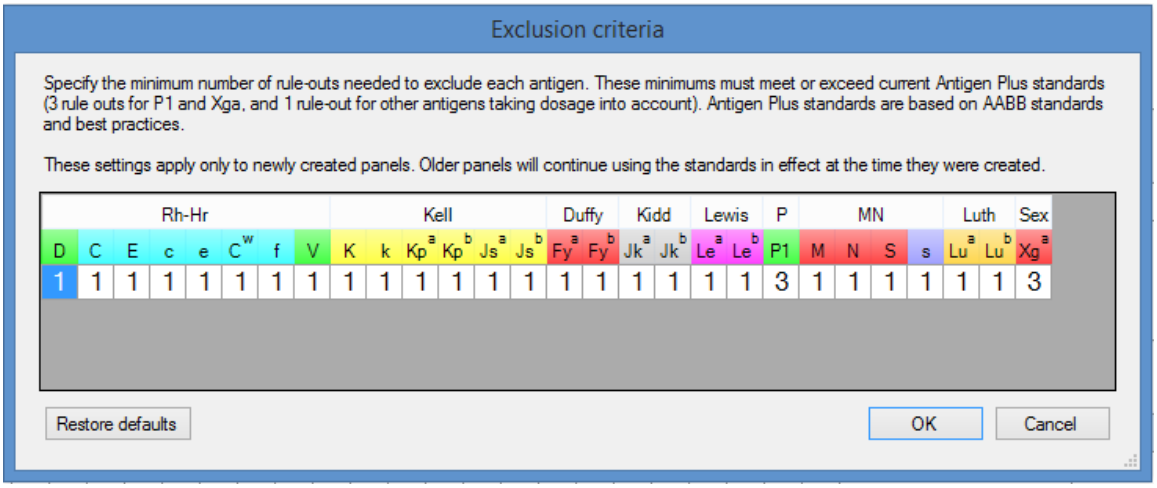
Antigen	Donor	Lot	Vial	Location
Dantu+	N1860	20367	TC	W3-P1
Dantu+	N1860	30890	TC	
Do(a-)	B4582	DP068	5	

Analyzer Connections

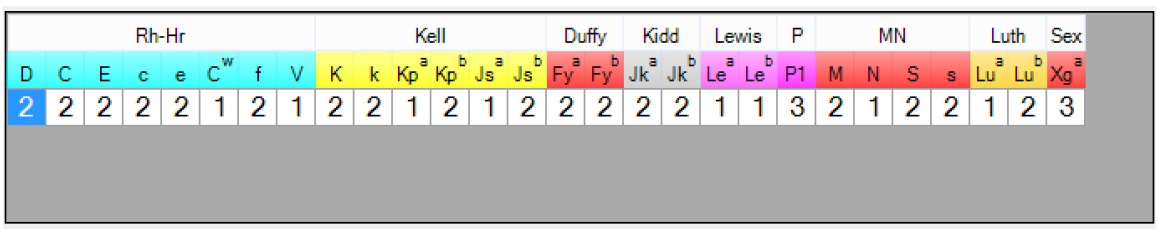
This option allows you to view and manage your blood analyzer machine connections. For more information on analyzer connections, see page 38.

Exclusion Criteria

The default exclusion criteria in Antigen Plus are taken from the AABB Technical Manual. In many cases, laboratories may wish to set stricter criteria to determine exclusion by their own standards. Therefore, each lab can establish an acceptable number of rule-outs for the exclusion of specific antigens. Only administrators may set the exclusion criteria.



In the **Exclusion Criteria** menu, you may specify the minimum number of rule-outs needed to exclude each antigen. The criteria are entered by selecting the box and typing the number with the keyboard.

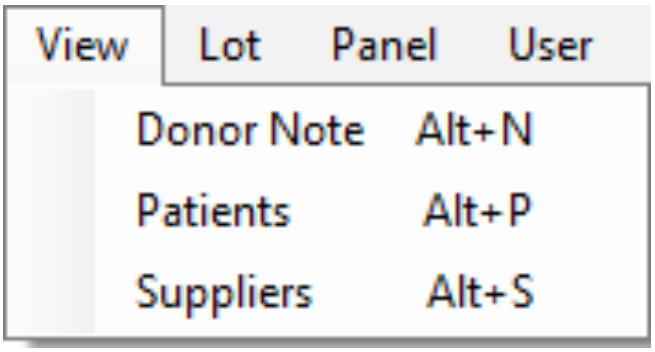


This picture is one example of custom exclusion criteria that a user may set.

These minimums must meet or exceed current Antigen Plus standards, which are based on AABB standards and best practices. These settings will apply only to newly created panels. Older panels will continue using the standards in effect at the time they were created. If you load a results worksheet that was saved before changes were made to your exclusion criteria, a warning will appear at the top of the screen.

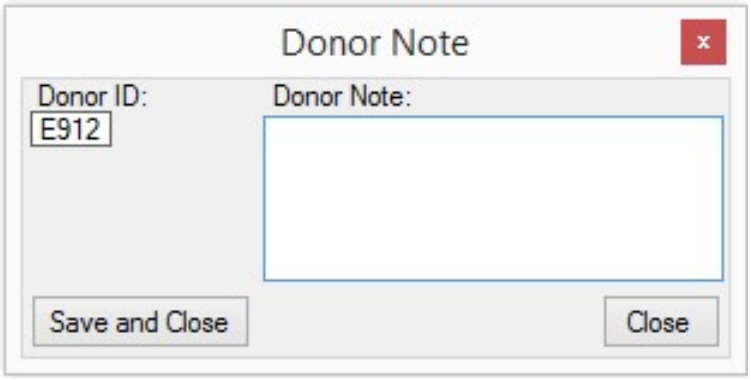
To restore your exclusion criteria back to the default AABB standards, select **Restore Defaults.**

View Menu

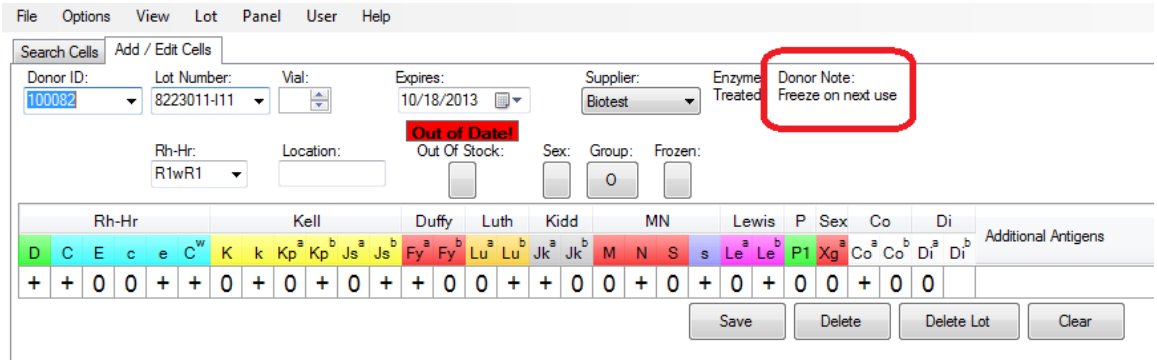


Donor Note

When a donor is selected on the Search screen or Add/Edit screen, the donor note option allows a note to be inserted that will stay with that donor number (regardless of lot number) until it is removed.

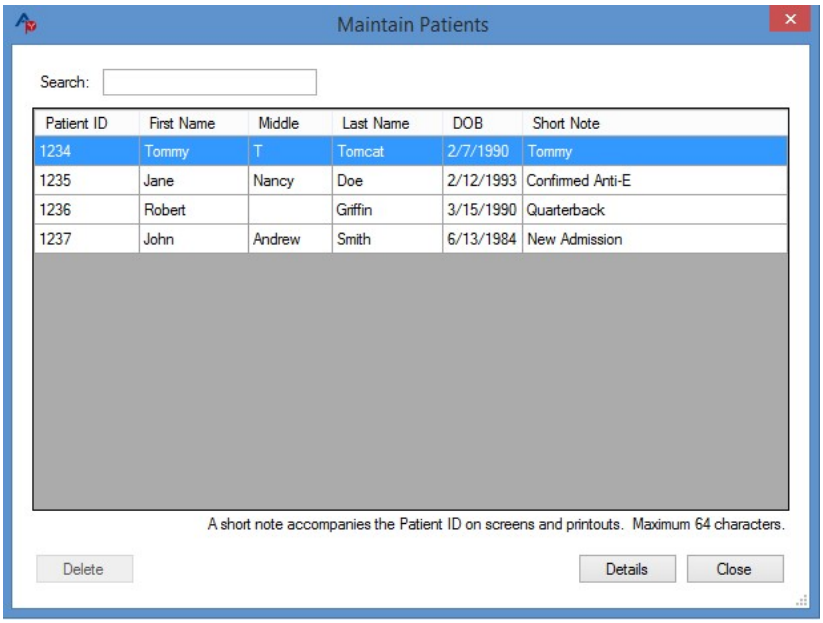


The donor note will be displayed with the cell on the Add/Edit or Search screens.



Patients

The Patients menu opens the **Maintain Patients** screen where patient information may be viewed and edited.

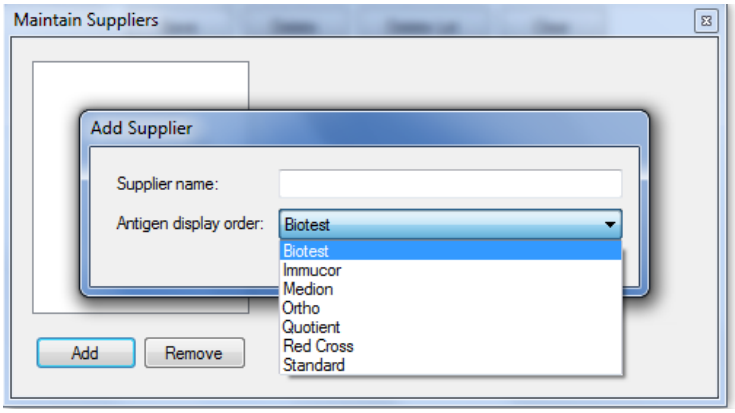


The search feature on this screen enables a search by any of the criteria in any of the columns. Double clicking on a patient will bring up the **Patient Details** screen. From there you can select Edit to change patient details and phenotype. When editing patient information, you must enter a reason for the edit. This will be saved along with the user that made the change and the date and time of the edit.

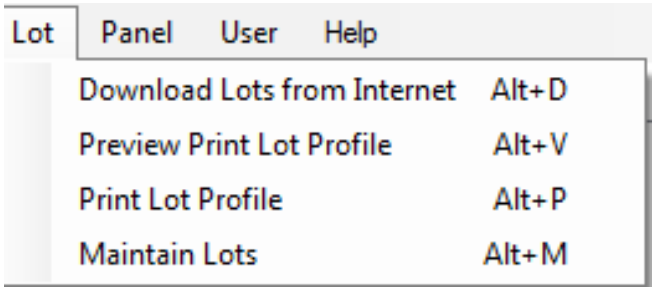
For more on working with patient information in Antigen Plus, see *Patient Information* on page 30??.

Suppliers

This option allows entry of a supplier other than the currently licensed commercial red cell manufacturers. This is primarily for reference laboratories who are typing their own cells or receiving cells from other sources. Any of the available antigen arrays may be associated with the new supplier.

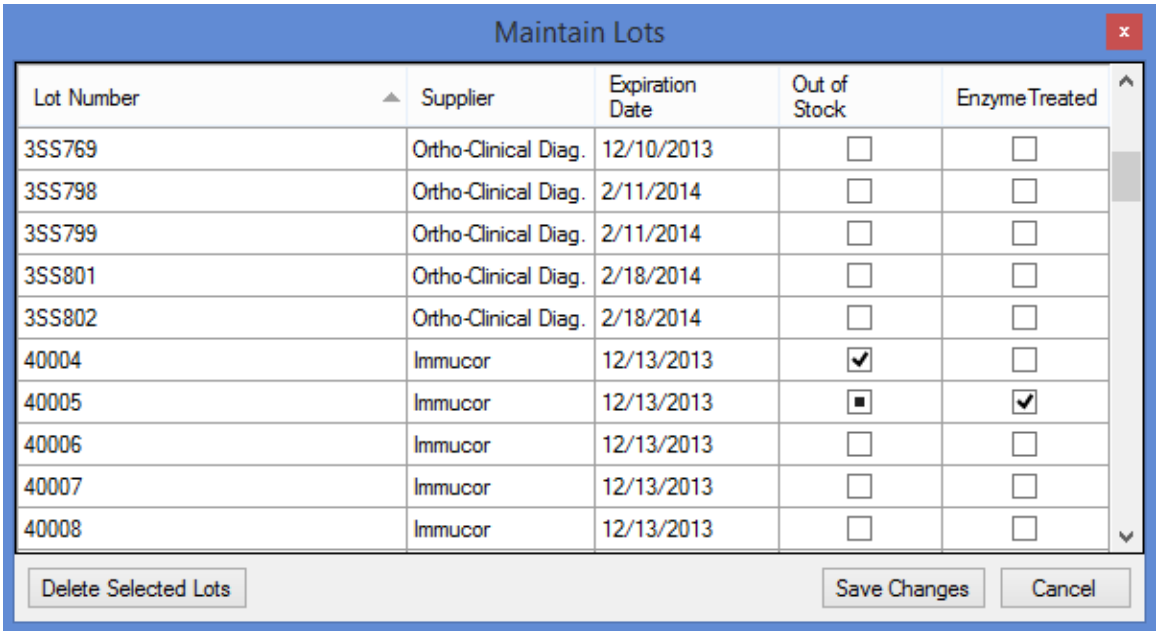


Lot Menu



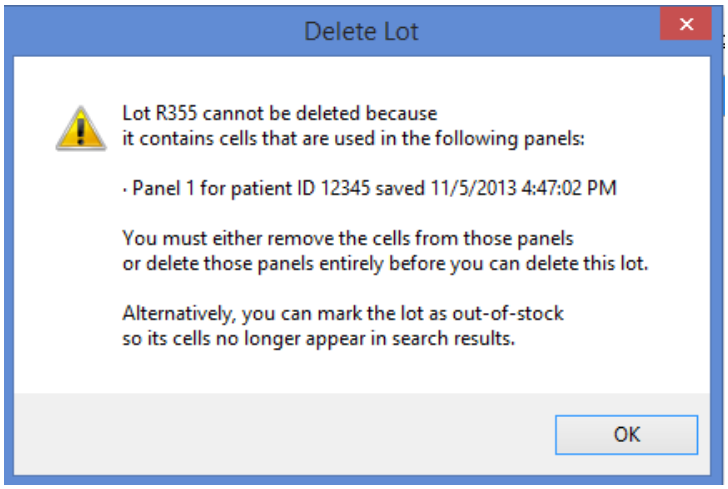
The Lot menu connects you with the Antigen Plus server for download of commercial red cell panels (see Downloading Lots on page 19), and allows for preview or printing of any lot that is selected on the **Add/Edit** or **Search** screens.

Selecting **Maintain Lots** opens the Maintain Lots table. On this table you can delete one or more lots (as long as they have not been used in any saved work in the last ten years) by highlighting a row (or highlighting several rows by holding down the CTRL key), clicking on Delete Selected Lots, and then clicking Save Changes. You may also mark any lot as out-of-stock or enzyme treated. A lot that is in-stock but has one or more cells that are out-of-stock will be marked with a square rather than a check mark in the box. Lots can be sorted in forwards or backwards Lot Number or Expiration Date order by clicking at the top of the column.

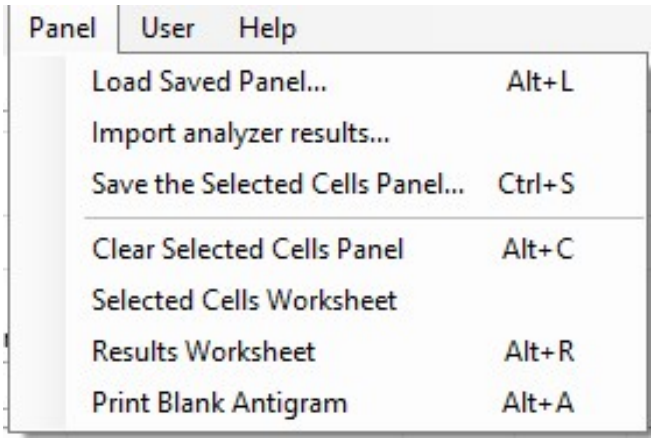


Lot Number	Supplier	Expiration Date	Out of Stock	Enzyme Treated
3SS769	Ortho-Clinical Diag.	12/10/2013	☐	☐
3SS798	Ortho-Clinical Diag.	2/11/2014	☐	☐
3SS799	Ortho-Clinical Diag.	2/11/2014	☐	☐
3SS801	Ortho-Clinical Diag.	2/18/2014	☐	☐
3SS802	Ortho-Clinical Diag.	2/18/2014	☐	☐
40004	Immucor	12/13/2013	☑	☐
40005	Immucor	12/13/2013	■	☑
40006	Immucor	12/13/2013	☐	☐
40007	Immucor	12/13/2013	☐	☐
40008	Immucor	12/13/2013	☐	☐

If you attempt to delete a lot that has been used in a saved workup, you will be notified that the saved work must be deleted before the lot can be deleted. Deletion of saved work-ups may only be done after ten years have passed since the panel was saved. If it is too early or you do not wish to delete the work and the lot, you may mark the lot as out-of-stock thus removing it from searchable inventory while saving any work that has been done with it.



Panel Menu



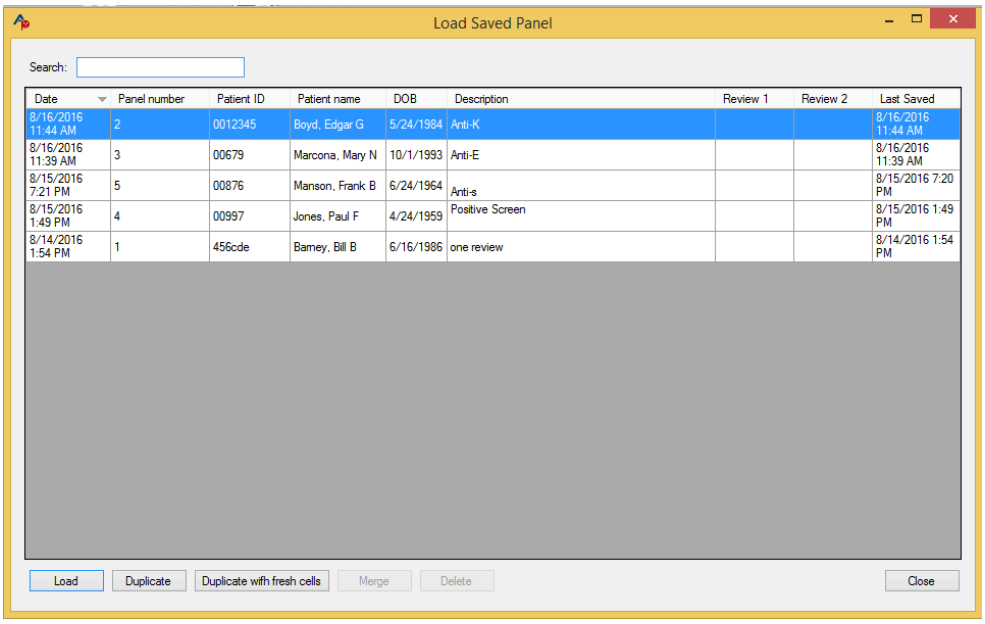
The Panel Menu brings up a variety of options that are the most frequently used in Antigen Plus. If those options are unavailable (i.e. there are no cells selected), they will be greyed out on the screen.

Load Saved Panel

This option opens up a table of all saved work-ups (any selected panel that has been saved with or without test results).

A saved panel may be retrieved for further work or review by selecting its row and pressing **Load** or by double-clicking on the row. Once the saved panel is retrieved, all of the information it was saved with will populate the appropriate screens (**Search**, **Selected Cells Worksheet**, and **Results Worksheet**).

A saved panel may also be deleted from this table if it is ten years old—a confirmatory warning will appear after Delete is selected.

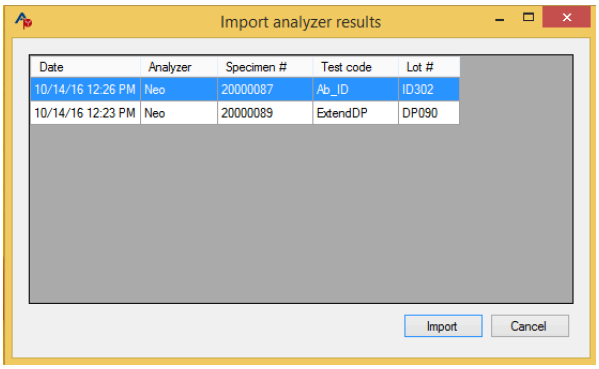


Duplicate creates an exact copy of whichever saved panel is currently selected. That panel may then be saved as a new panel.

Duplicate with Fresh Cells also makes a copy of the saved panel but will also automatically swap out any out-of-date or out-of-stock cells with fresh cells in your inventory that have antigen profiles that are as close as possible to the original.

Import Analyzer Results

This menu allows the importing of results from a blood analyzer machine. For more information about importing blood analyzer results, see page 38.



Save the Selected Cells Panel

You may save a Selected Panel (with any results included) from this screen. As this can be done more directly from the Selected Cells Worksheet or Results Worksheet, the function is here so that you may remember to save current work when you are loading another panel (there will also be a warning when you are loading a new panel that one is already in use).

Clear Selected Cells Panel

Selecting **Clear Selected Cells Panel** will clear all of the currently selected cells. You will be prompted to either save or discard your current work.

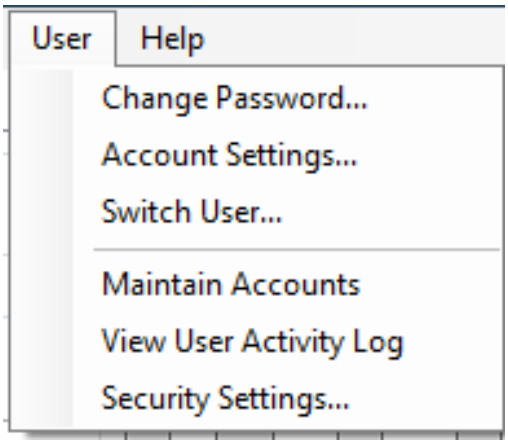
Selected Cells Worksheet and Results Worksheet

Selecting Selected Cells Worksheet or Results Worksheet will call up the current work and open those screens. For more information about Selected Cells and Results Worksheets, see Operation on page 19.

Print Blank Antigram

Prints a blank worksheet.

User Menu

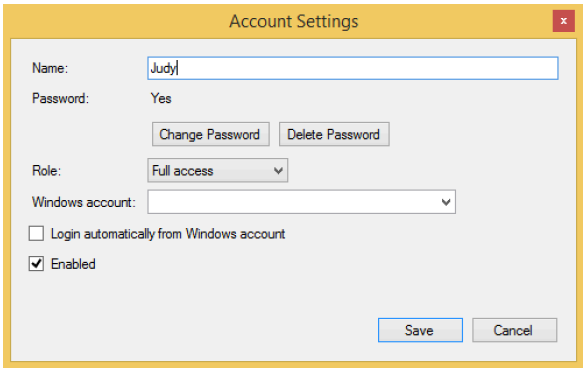


Change Password

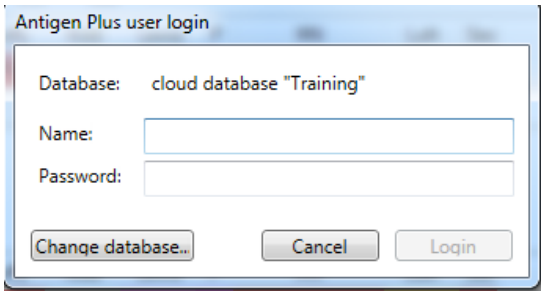
Any user can change his or her password. That change can be overridden by an administrator changing that user's password.

Account Settings

This window allows a user to change their name and password. Administrators may also assign administration rights from this window and enable or disable accounts. A new user may not log in until an administrator has added him or her in the **Maintain Accounts** table or Windows Active directory is used to authenticate new users (see Authenticating Users on page??)



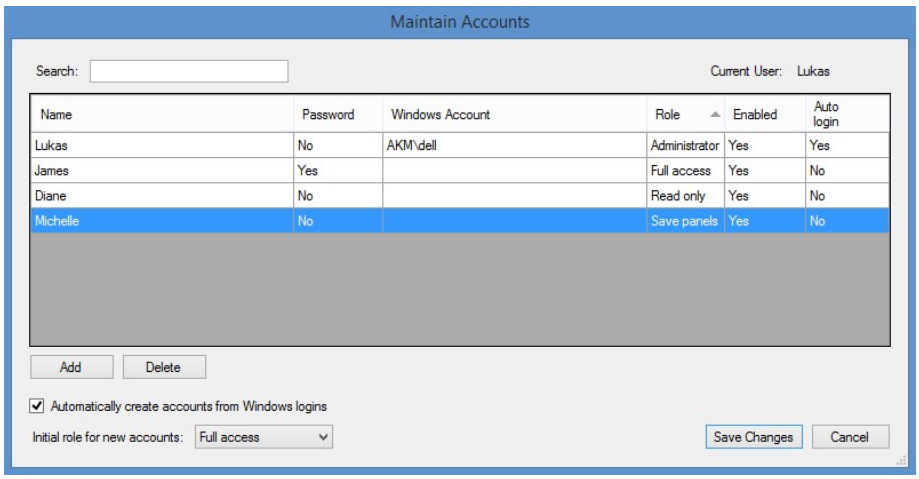
Switch User



Logs the current user out and asks for a username and password to continue. A new database may also be selected from this screen.

Maintain Accounts

This menu is available only to administrators and is used for managing user access to Antigen Plus. If **Automatically create accounts from Windows Login** is checked, Antigen Plus will recognize the user from that user's log in to Windows and require a password if the Windows login also requires it. Selecting Add will call up a fresh Account Settings screen and allow the administrator to create a new account. Selecting Delete will delete an account if that user has not saved any work. To remove a user who has saved work in the database, he or she must be disabled. In order to deactivate and account but keep that user displayed on saved work-ups, simply uncheck the Enabled box in the Account Settings window.



Double-clicking on any user will call up the **Account Settings** screen for that user. Here, an administrator may set access privileges and password preferences. If the user is not set to automatically log-in with their windows account, they must be given a password in order to log-in.

The possible roles an Administrator can grant another user are:

Administrator: Can maintain users, can save panels, can review panels tested by self or another technologist, can remove reviews, can add suppliers, can edit cells, and can edit all patient information. Administrators may also set system options including custom exclusion criteria, whether or not to require specimen numbers, and customize the default results columns.

Full access: Can save panels, can review panels tested by another technologist, can add suppliers, and can edit cells. Full access users cannot edit patient information, but they may add phenotypes to patients.

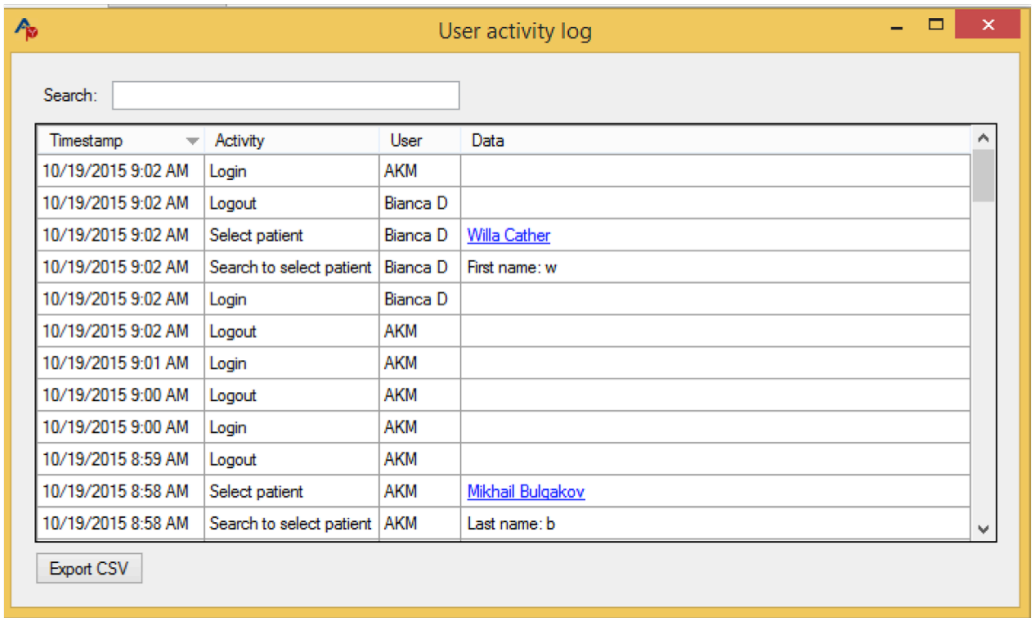
Save panels: Can search, select, enter results and save panels.

Read only: Can search, select, and enter results but cannot save any work.

Each user may change his or her own password.

View User Activity Log

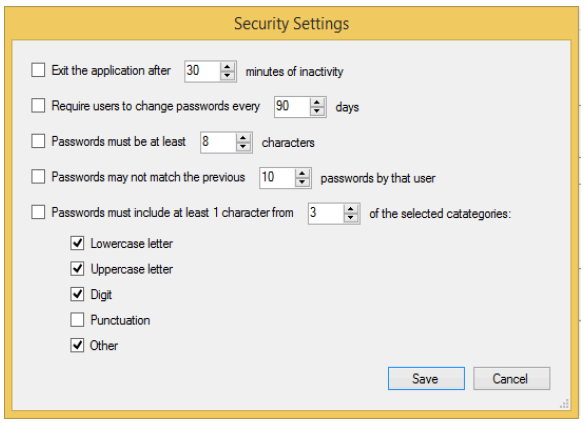
An administrator will have this feature enabled and selecting it will call up a log of all user log-ins and all activity involving patient information. This log is exportable in a csv format.



Timestamp	Activity	User	Data
10/19/2015 9:02 AM	Login	AKM	
10/19/2015 9:02 AM	Logout	Bianca D	
10/19/2015 9:02 AM	Select patient	Bianca D	Willa Cather
10/19/2015 9:02 AM	Search to select patient	Bianca D	First name: w
10/19/2015 9:02 AM	Login	Bianca D	
10/19/2015 9:02 AM	Logout	AKM	
10/19/2015 9:01 AM	Login	AKM	
10/19/2015 9:00 AM	Logout	AKM	
10/19/2015 9:00 AM	Login	AKM	
10/19/2015 8:59 AM	Logout	AKM	
10/19/2015 8:58 AM	Select patient	AKM	Mikhail Bulgakov
10/19/2015 8:58 AM	Search to select patient	AKM	Last name: b

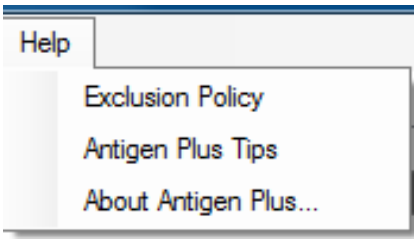
Security Settings for Time Outs and Username/Password Mode

Timing out: If you would like to have the program shut down if left unattended, check the box next to "Exit the Application…" and set your time parameter. If a user leaves the program unattended for that length of time, the program will shut down and the work in progress will reappear only when that user logs back in. This option is available for both automated and manual password access.



The other options are for manual password configurations and are activated by checking the boxes on the left of the options and setting the desired parameters to the right.

Help Menu



The Help Menu makes text regarding the use of Antigen Plus available to the user. That text is reproduced in this manual in the appropriately named sections.

Authenticating Users

User access

After database access is granted, Antigen Plus authenticates and authorizes the user within the software itself. Antigen Plus provides two different methods for authenticating users of the software: 1) Windows Active Directory authentication, and 2) usernames and passwords. You can use one of these methods exclusively, or use them in combination.

Most sites will find it easiest to use Windows Active Directory authentication, and that is the default. In this mode users are identified by their Windows login, and no additional authorization is required. If **Automatically create accounts from Windows logins** is checked in the **Maintain Accounts** window, then new Antigen Plus accounts will be created automatically whenever a new Windows user launches the software. Window Active Directory authorization can be enabled or disabled for a particular user using the **Login automatically from Windows account** checkbox in the **Account Settings** window.

If Windows Active Directory authorization fails, is disabled, or the user logs out of the software, then the user will be presented with a username/password dialog box to login. This password is maintained within Antigen Plus itself, and is distinct from the user's Windows account password.

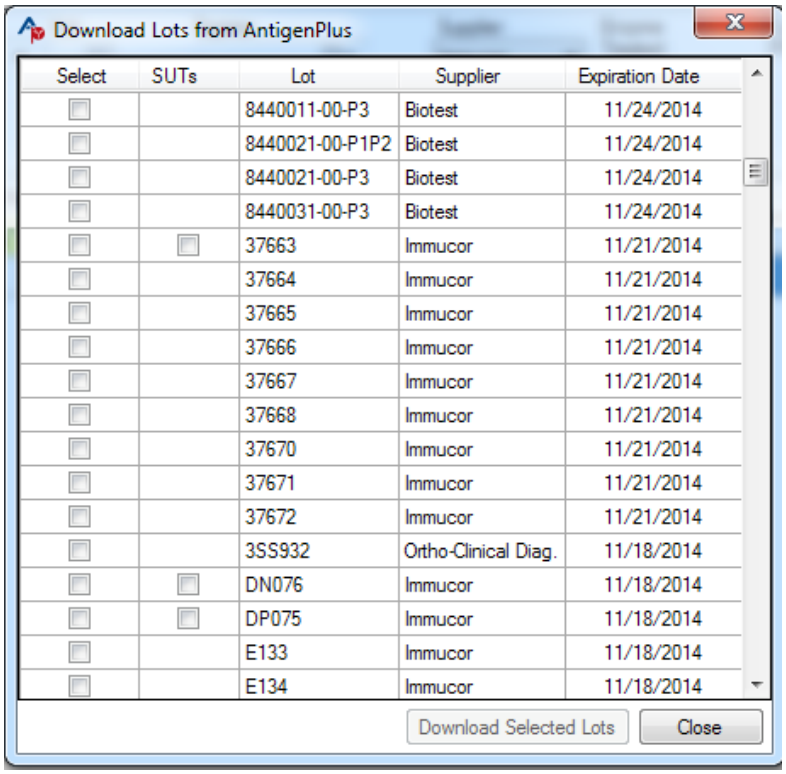
If your site wants to require a separate username/password login each time Antigen Plus is launched, this can be accomplished by:

1. Unchecking the **Automatically create accounts from Windows logins** box in the **Maintain Accounts** window.
2. Unchecking the **Login automatically from Windows account** box or deleting the user's **Windows account** from the Account Settings window.

Operation

Downloading Lots from the Internet

When you press *Download Lots from Internet* from the Lot menu, you will see the following screen:

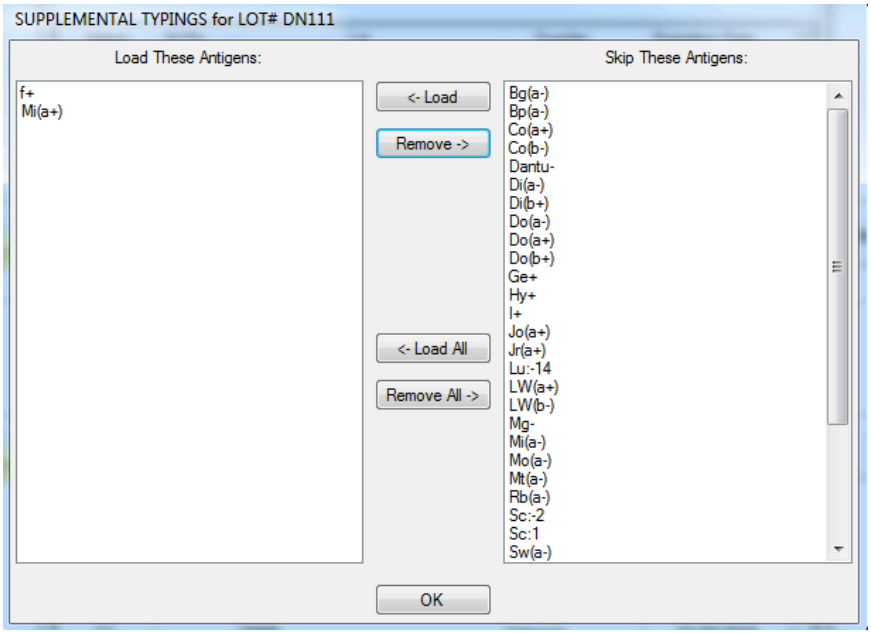


Select	SUTs	Lot	Supplier	Expiration Date
☐		8440011-00-P3	Biotest	11/24/2014
☐		8440021-00-P1P2	Biotest	11/24/2014
☐		8440021-00-P3	Biotest	11/24/2014
☐		8440031-00-P3	Biotest	11/24/2014
☐	☐	37663	Immucor	11/21/2014
☐		37664	Immucor	11/21/2014
☐		37665	Immucor	11/21/2014
☐		37666	Immucor	11/21/2014
☐		37667	Immucor	11/21/2014
☐		37668	Immucor	11/21/2014
☐		37670	Immucor	11/21/2014
☐		37671	Immucor	11/21/2014
☐		37672	Immucor	11/21/2014
☐		3SS932	Ortho-Clinical Diag.	11/18/2014
☐	☐	DN076	Immucor	11/18/2014
☐	☐	DP075	Immucor	11/18/2014
☐		E133	Immucor	11/18/2014
☐		E134	Immucor	11/18/2014

Available panels are listed in descending order of Expiration Date. They may also be sorted in ascending order or by Supplier or Lot Number by clicking on the column title. You may select as many as you wish, the number selected is displayed at the bottom of the screen as each panel is added to your database when you click Download Selected Lot(s).

Downloading Lots with Supplemental Typings

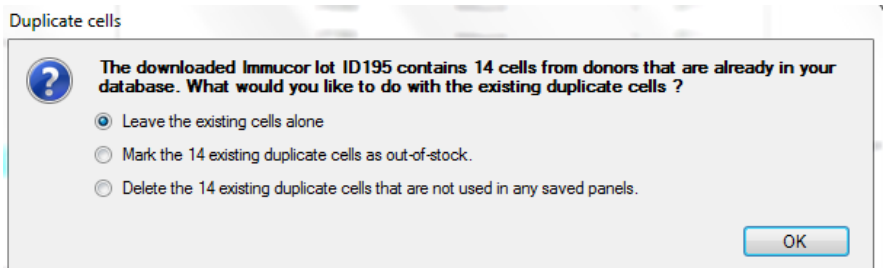
Immucor provides supplemental unconfirmed typings with some of their panels. You may download some or all of these by selecting the SUT box next to the lot number when you are downloading. You will be given a choice of which typings you wish to see on your downloaded cells in a dialog box. Your choices will remain and may be changed or not the next time you download.



While the main panel data are verified electronically and do not require physical validation (with the current exception of Medion), the supplemental typings should be checked by donor to ensure that they have all been captured. Manual entry of any missing ones can be done by pulling up the donor on the Add/Edit screen.

Download Prompt Option

If you have selected *Prompt when downloading duplicate cells* in the **System Options** menu, you will be notified whenever donors on the downloading panel exist in your database. You can ignore the notification, mark the duplicate cells as out of stock, or delete them. If you attempt to delete a cell that has been stored as part of a saved panel, you will be advised to mark it out of stock instead.



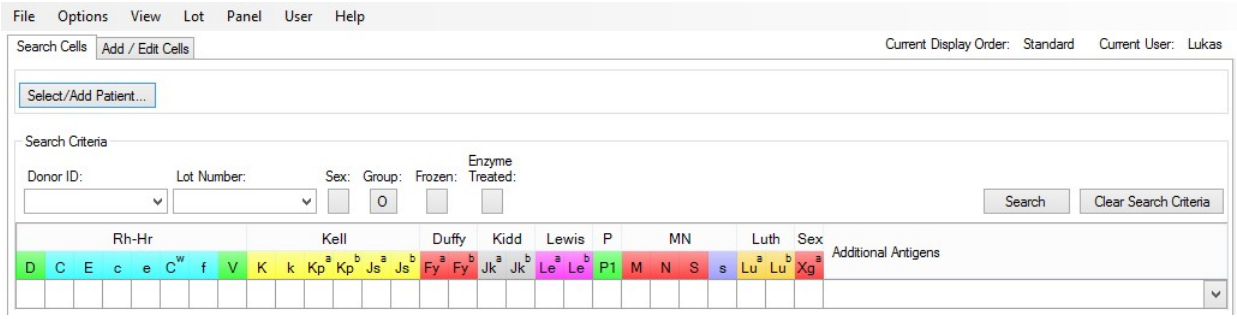
Please note: If you are importing two identical panels (e.g. Quotient panels that are the same except that one is enzyme treated), both panels will be marked out-of-stock if you have this feature turned on and chose the out-of-stock option.

Searching and Selecting Cells

Search Pattern

When the program starts, the **Search screen** will automatically be displayed. A search pattern box allows you to enter a search pattern of the 28 principal antigens and/or any additional antigens, search the inventory for matches, and mark cells or lots for inclusion in a **Selected Cells Panel** or a **Results Worksheet**. (Some red cell suppliers include additional antigens on their array and some leave off principal antigens; those arrays are displayed that way in Antigen Plus if that supplier is chosen. See **Antigen Order for Selected Cells** on page 25.)

As you search your database, you will notice color-coding that will highlight the search boxes change as you select and de-select cells. For an explanation of the color-coding function, see page 36.



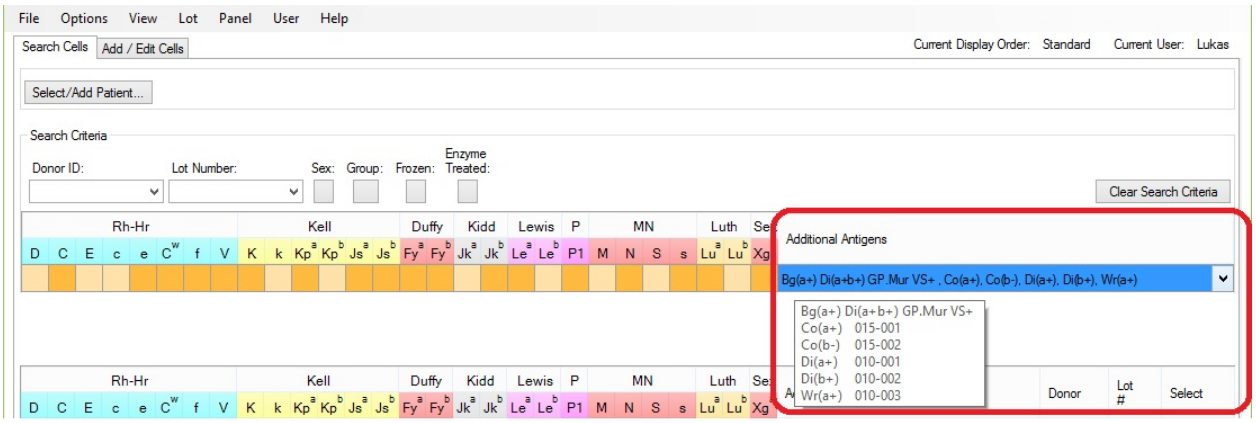
If *search automatically when search criteria change* is selected in the **Search** tab in the **System Options** menu, the search panel will immediately display how many cells are found in your database that are matches for your current search pattern. If this option is not selected, you must enter your search criteria and click **Search** to display the matching cells from your database. In either case, the number of matches that your current search has found will display at the bottom of the screen. The number of cells currently selected will also display at the bottom of the screen and will update each time you select or deselect a cell.

To enter a search pattern, click the desired antigen buttons in the search pattern box. You may set the buttons to 0, +, or blank. A 0 or + setting means that a matching cell must have a 0 or + in the same place (s or w designations will be read as + during a search). A blank setting means "don't care", and during a search those antigens will be ignored. You may also search by the following criteria: **Donor ID, Lot Number**, **Sex**, **Group**, **Frozen** cells, and **Enzyme Treated** cells. Please note that if you are currently searching by a particular lot, your searches will only include cells from that lot until you have cleared that lot from your search criteria.

When you search, the inventory will be searched starting with the newest cells first, that is, in reverse expiration date order. All frozen cells have no expiration date and will be gathered at the end of the search order unless you have specified a preferred supplier in **System Options** in which case all cells from that supplier will be found first in reverse expiration order and be followed by all other suppliers in reverse expiration order. Clicking on a cell in your search results will highlight it in light blue and information

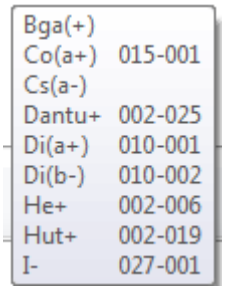
about that cell will display above your search results. Please note that Out-of-Stock cells will not be displayed in your search if *Exclude from Searches* is selected in **System Options**.

To clear your current search criteria and start a new search, select **Clear Search Criteria**. To add additional antigens to the search pattern, check those desired in the Additional Antigens box by selecting the arrow on the right of the box to drop down a list of all the additional antigens in your database. You may select as many additional antigens as you like, but only the first 8 to 10 (depending upon their length) will display on the screen and an ellipsis will indicate that more are selected. If you mouse over any of the selected antigens or the ellipsis, a box containing all of your selected antigens and their associated



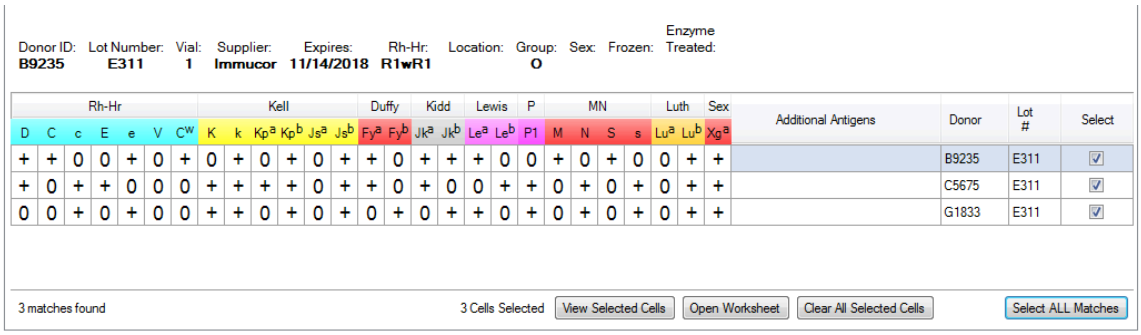
ISBT designations will appear.

A table of ISBT designations used in Antigen Plus can be found in the Appendix. To remove Additional **Antigens** from the search display box, uncheck the item(s) in the Additional Antigens drop down list.

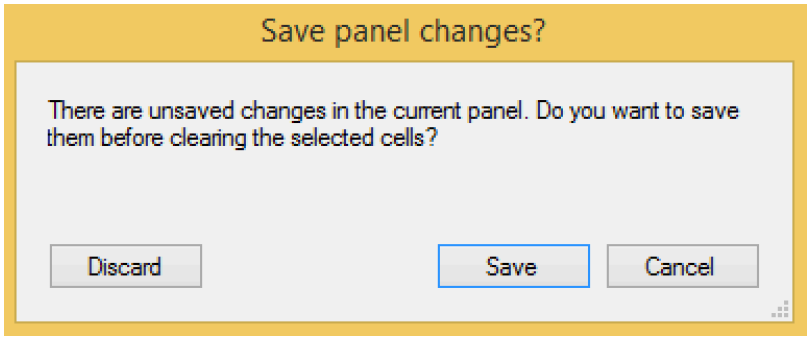


Selecting and Deselecting

To select a cell, check the **Select** box to the right of each cell. To select all cells in your current search, click **Select ALL Matches**. Cells that are selected with a check mark are automatically included on Selected Cell and Results Worksheet panels, which can be called up by choosing the appropriate option in the Panel menu or by selecting **View Selected Cells** or Open Worksheet at the bottom of your search screen. When duplicate cells are selected, they will be highlighted in yellow so that they may be easily de-selected.

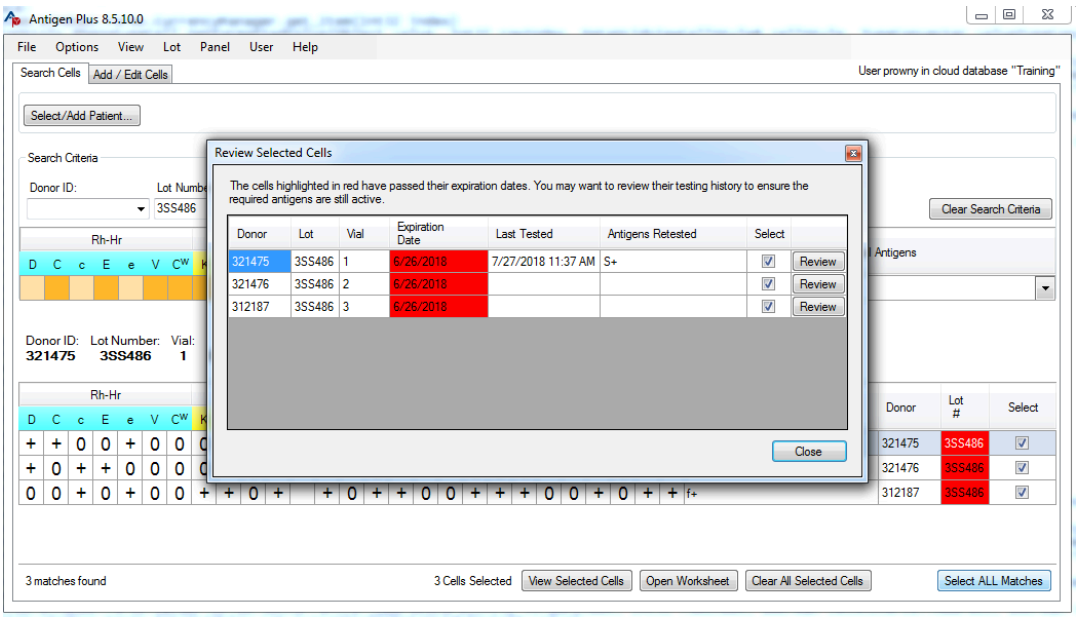


Your currently selected cells will remain selected until you uncheck the **Select** box next to each cell or until you click **Clear All Selected Cells**. If you choose to clear all selected cells and you have not saved your current work, a warning box will appear asking if you would like to either **Save** or **Discard** your current selected cells panel.

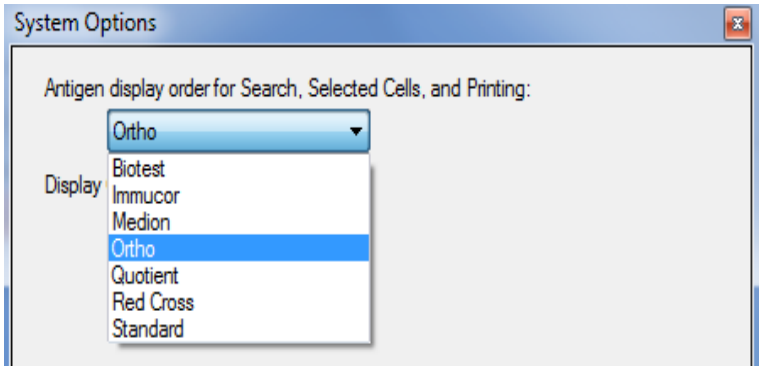


Selecting Expired Cells

Whenever you select a cell (or cells) with an expiration date that has passed, a dialog box will appear allowing you to select that cell (or cells) to enter the results of testing to ensure that cell is still reactive for the specific antigens in question. You may enter the result for any or all of the positive antigens on that cell and those results will be maintained with the date of the test and the name of the tester. You may opt out of this process by selecting **Close** and the cell will still be selected.



Antigen Order for Selected Cells



The antigen buttons are displayed in a standard default order of blood groups: Rh-Hr, Kell, Duffy, Kidd, Lewis, P, MN, Lutheran, and Sex-Linked. Some suppliers' data sheets list them in a different order, so in order to simplify searching, selecting, and entering data there are 9 display options selectable with the 9 option buttons in the **System Options** menu. These choices stay with any donor displayed in the Search mode (if more than one supplier is represented, the Additional Antigens box will accommodate any typings missing from an array; e.g. if you are using the Immucor order that omits the "f" typing and select an additional cell that has this typing, the "f-" or "f+" will appear in the Additional Antigens box (exclusion rules will consider the 28 common typings regardless of where they appear on the screen).

Please note: If the manufacturer does not provide the "f" typing, Antigen Plus will make no assumptions and will not rule it out. For more information, see page 50.

Available Arrays

Option 1: BioTest

Rh-Hr						Kell						Duffy		Luth		Kidd		MN				Lewis		P	Sex	Co		Di	
D	C	E	c	e	C^w	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Lu^a	Lu^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P1	Xg^a	Co^a	Co^b	Di^a	Di^b

Option 2: Immucor

Rh-Hr							Kell						Duffy		Kidd		Lewis		P	MN				Luth		Sex
D	C	c	E	e	V	C^w	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	P1	M	N	S	s	Lu^a	Lu^b	Xg^a

Option 3: Medion/Grifols

Rh-Hr								MN				P	Lewis		Luth		Kell					Duffy		Kidd		Sex
D	C	E	c	e	f	C^w	V	M	N	S	s	P1	Le^a	Le^b	Lu^a	Lu^b	K	k	Kp^a	Kp^b	Js^a	Fy^a	Fy^b	Jk^a	Jk^b	Xg^a

Option 4: Ortho

Rh-Hr								Kell						Duffy		Kidd		Sex	Lewis		MN				P	Luth	
D	C	E	c	e	f	C^w	V	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Jk^a	Jk^b	Xg^a	Le^a	Le^b	S	s	M	N	P1	Lu^a	Lu^b

Option 5: Quotient

Rh-Hr								Kell						Duffy		Kidd		Lewis		MN				P	Luth		Sex	Wr
D	C	E	c	e	f	V	C^w	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	M	N	S	s	P1	Lu^a	Lu^b	Xg^a	Wr^a

Option 6: Red Cross Preferred

Rh-Hr								MN				Lewis		P	Kell						Duffy		Kidd		Luth		Sex
D	C	E	c	e	f	V	C^w	M	N	S	s	Le^a	Le^b	P1	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Jk^a	Jk^b	Lu^a	Lu^b	Xg^a

Option 7: Standard (Johns Hopkins) Option

Rh-Hr								Kell						Duffy		Kidd		Lewis		P	MN				Luth		Sex
D	C	E	c	e	C^w	f	V	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	P1	M	N	S	s	Lu^a	Lu^b	Xg^a

Option 8: Bio-Rad

Rh-Hr						Kell						Duffy		Kidd		Lewis		P	MN				Luth		Di
D	C	E	c	e	C^w	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	P1	M	N	S	s	Lu^a	Lu^b	Di^a

Option 9: Grifols

Rh-Hr						Kell						Duffy		Kidd		Lewis		P	MN				Luth		Di
D	C	E	c	e	C^w	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	P1	M	N	S	s	Lu^a	Lu^b	Di^a

Selected Cells Panels

Your panel of currently selected cells can be called up and reviewed by either clicking **Preview Selected Cells** at the bottom of the Search screen, or by going to the Panel menu and choosing **Selected Cells Worksheet.** Either option will cause your Selected Panel will appear in a separate window.

Selected Panel

File View Patient

Unsaved panel

Select/Add Patient... Current User: dell

	Supplier/ Lot #	Donor/ RhHr-Vial	Rh-Hr								Kell						Duffy		Kidd		Lewis		P	MN				Luth		Sex	Additional Antigens	Selected
			D	C	E	c	e	C^w	f	V	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	P1	M	N	S	s	Lu^a	Lu^b	Xg^a		
1	Immucor DN095	E984 r'r #1	0	+	0	+	+	0		0	0	+	0	+	0	+	0	+	+	+	0	+	0	+	+	+	+	0	+	+		☑
2	Immucor DN095	F822 r"r #2	0	0	+	+	+	0		0	0	+	0	+	0	+	+	+	+	+	0	0	0	+	+	0	+	0	+	+		☑
3	Immucor DN095	E933 r'r #3	0	+	0	+	+	0		0	0	+	+	+	0	+	+	+	+	+	+	0	+	+	+	+	0	+	0	+	+	Bg(a+)	☑
4	Immucor DN095	F909 r"r #4	0	0	+	+	+	0		0	0	+	0	+	0	+	+	0	0	+	0	+	+	+	+	+	+	0	+	+		☑
5	Immucor DN095	G1708 rr #5	0	0	0	+	+	0		0	+	+	0	+	0	+	0	+	+	+	0	+	+	+	+	+	+	0	+	+		☑
6	Immucor DN095	H857 rr #6	0	0	0	+	+	0		0	0	+	0	+	0	+	+	0	0	+	0	0	+	+	+	0	+	0	+	+		☑
7	Immucor DN095	N2775 rr #7	0	0	0	+	+	0		0	0	+	0	+	0	+	0	+	+	0	0	+	0	0	+	0	+	0	+	+		☑
8	Immucor DN095	N4151 rr #8	0	0	0	+	+	0		0	0	+	0	+	0	+	+	+	0	+	+	0	+	0	+	0	+	0	+	+		☑
9	Immucor DN095	H1136 rr #9	0	0	0	+	+	0		0	0	+	0	+	0	+	+	0	+	0	0	+	+	+	0	0	+	0	+	+		☑
10	Immucor DN095	G1711 rr #10	0	0	0	+	+	0		0	+	+	0	+	0	+	+	0	0	+	0	+	0	0	+	0	+	0	+	0		☑
11	Immucor DN095	N3930 rr #11	0	0	0	+	+	0		0	0	+	0	+	0	+	0	0	+	0	0	+	+	0	+	0	+	0	+	0		☑
12	Immucor DN095	H1607 rr #12	0	0	0	+	+	0		0	0	+	0	+	0	+	+	0	0	+	+	0	0	+	0	+	+	0	+	+		☑
13	Immucor DN095	N4252 rr #13	0	0	0	+	+	0		0	0	+	0	+	0	+	+	+	+	+	+	0	0	+	0	+	0	0	+	+		☑
14	Immucor DN095	C5913 R2R2 #14	+	0	+	+	0	0		0	0	+	0	+	0	+	+	+	0	+	0	+	0	+	+	0	+	0	+	0	GP.Mur	☑

On the Selected Panel screen, you may review all of your currently selected cells and deselect any cell by unchecking the **Selected** box to the right of each cell.
You may also assign the Selected Panel to a particular patient by choosing **Select/Add Patient.** For more about entering patients and patient information, see page 30.

Your currently selected cells may also be called up in a Results Worksheet by by either clicking Open Worksheet at the bottom of the Search screen,or going to the Panel menu and choosing **Results Worksheet**. In the Results Worksheet, you may enter and evaluate

your test results. For more information about entering and evaluating test results, see page 33.

On any Selected Cells panel or Results Worksheet, the cells will be sorted according to your preferences in **System Options**.

Saving and Loading Panels

To save a panel, go to the File menu on a Selected Cells panel or Results Worksheet and choose **Save Panel**. When saving a panel, you must set a panel number. You may then add a Patient, add Conclusion Antibodies and Conclusion Notes, and add a Full Panel Description. In the panel description, you may enter as much text as you like and it will be saved along with the panel. Please note: you may save a Selected Cells panel or a Results Worksheet without a patient as long as no results are entered. Once results are entered on a Results Worksheet, you must add a patient in order to save the work-up.

Printing Panels

The Selected Panel Worksheet may be printed at any time by selecting File/ Print at the top left of the screen. If there are more additional antigens than can print on one line, more lines will be inserted underneath the cell until all additional antigens are printed. The worksheet will display the date and time it was printed. If a patient has been selected with the Selected Panel, the patient information will display on the print-out. The Selected Panel Worksheet prints out with eight blank columns on the right for manually entering test results and additional blank rows beneath the last selected cell to the end of the page.

Selected Panel

Antigen Plus Test Laboratory
Bethesda, Maryland

Unsaved panel
Patient ID: 005691
Robert E. Epps, 3/16/1961
Conclusion: _____

Page 1 of 1
Print Date: 10/17/2014 10:51 AM
Date Collected: _____

	Supplier / Lot	Donor / RhHr - Vial	Rh-Hr								Kell						Duffy		Kidd			X	Lewis		MN				P		Luth		Additional Antigens	Test Results							
			D	C	E	c	e	f	C^w	V	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Jk^a	Jk^b	Kg^a		Le^a	Le^b	S	s	M	N	P1		Lu^a	Lu^b									
1	Ortho-Clinical RA989	310845 R1wR1 #1	+	+	0	0	+	0	+	0	0	+	0	+		+	0	+	+	0	0		0	+	+	+	+	+	+		0	+									
2	Ortho-Clinical RA989	311642 R1R1 #2	+	+	0	0	+	0	0	0	+	+	0	+		+	+	+	0	+	+		0	+	0	+	+	0	+		0	+									
3	Ortho-Clinical RA989	314020 R2R2 #3	+	0	+	+	0	0	0	0	0	+	0	+		+	0	+	+	+	+		0	+	0	+	+	+	+		0	+									
4	Ortho-Clinical RA989	312351 Ror #4	+	0	0	+	+	+	0	+	0	+	0	+		+	0	0	+	0	+		0	0	0	+	+	0	+		0	+									
5	Ortho-Clinical RA989	301956 r'r #5	0	+	0	+	+	+	0	0	0	+	0	+	+	+	+	0	0	+	0		0	0	0	+	+	+	+		0	+									
6	Ortho-Clinical RA989	314372 r"r #6	0	0	+	+	+	+	0	0	0	+	0	+		+	0	+	+	+	+		0	+	+	0	+	0	0		0	+									
7	Ortho-Clinical RA989	312423 rr #7	0	0	0	+	+	+	0	0	+	+	0	+		+	0	+	+	+	+		0	+	+	0	+	0	+		0	+									
8	Ortho-Clinical RA989	313387 rr #8	0	0	0	+	+	+	0	0	0	+	0	+		+	+	+	0	+	0		+	0	0	+	0	+	+		0	+									
9	Ortho-Clinical RA989	307261 rr #9	0	0	0	+	+	+	0	0	0	+	0	+	0	+	+	0	+	+	+		0	+	0	+	+	+	+		0	+	HLA+								
10	Ortho-Clinical RA989	312146 rr #10	0	0	0	+	+	+	0	0	0	+	0	+		+	+	+	+	0	+		0	0	0	+	+	+	+		0	+	HLA+								
11	Ortho-Clinical RA989	314619 R1R1 #11	+	+	0	0	+	0	0	0	0	+	0	+		+	0	+	0	+	+		0	+	0	+	0	+	0		0	+	HLA+								

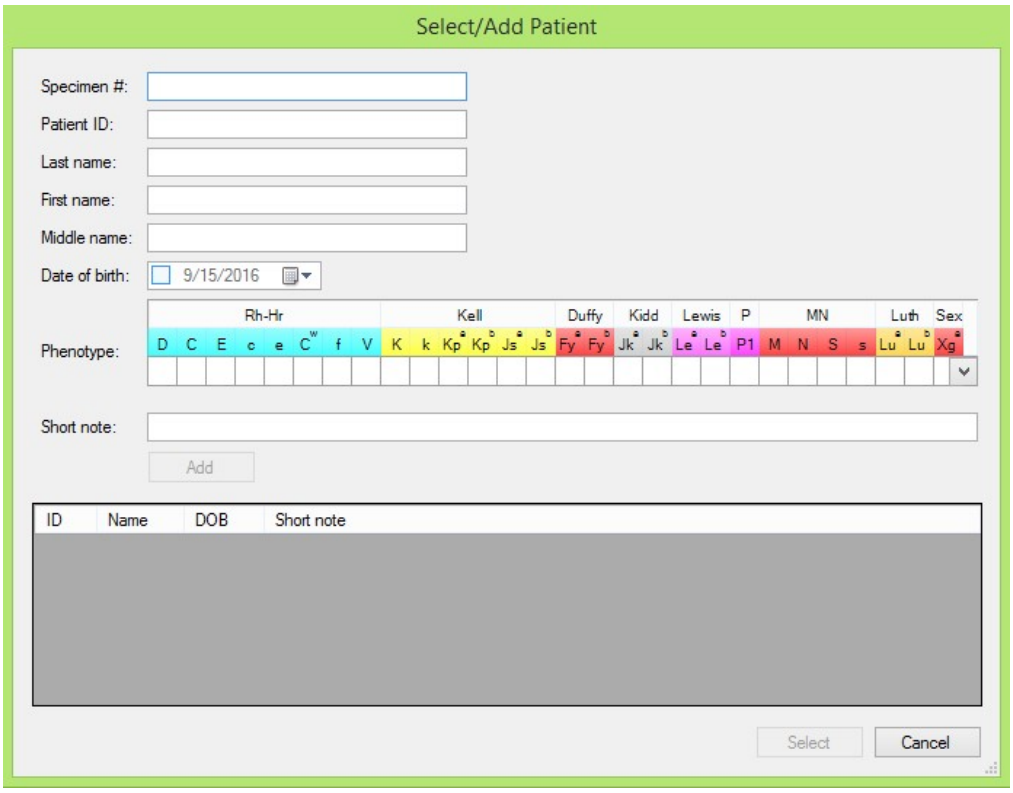
Review 1: Name _____ Date _____ Review 2: Name _____ Date _____

Print Blank Antigram:

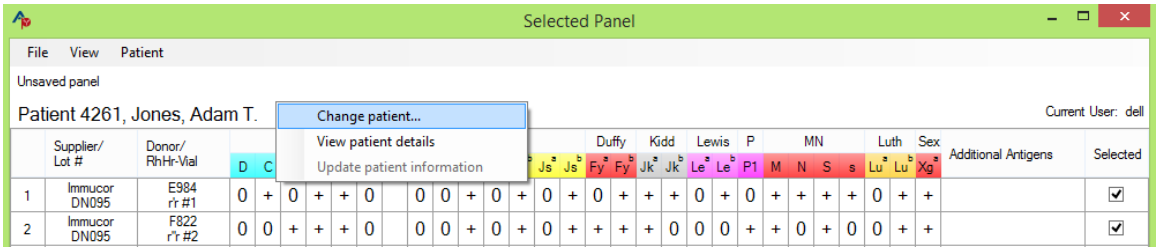
Prints a completely blank panel, just like above but with the supplier, donor, and antigen columns left unpopulated. It will have blank spaces at the top for writing patient name, patient ID, conclusion, technologist, date collected, and date tested.

Patient Information

Information about patients that will display on the Search screen and remain with saved work-ups is entered on the Search screen by selecting **Select/Add Patient.** On the Search screen, click on the Select/Add Patient button and search for a patient to modify, or fill in a new ID, name, and optional date of birth and short note and press **Add**.

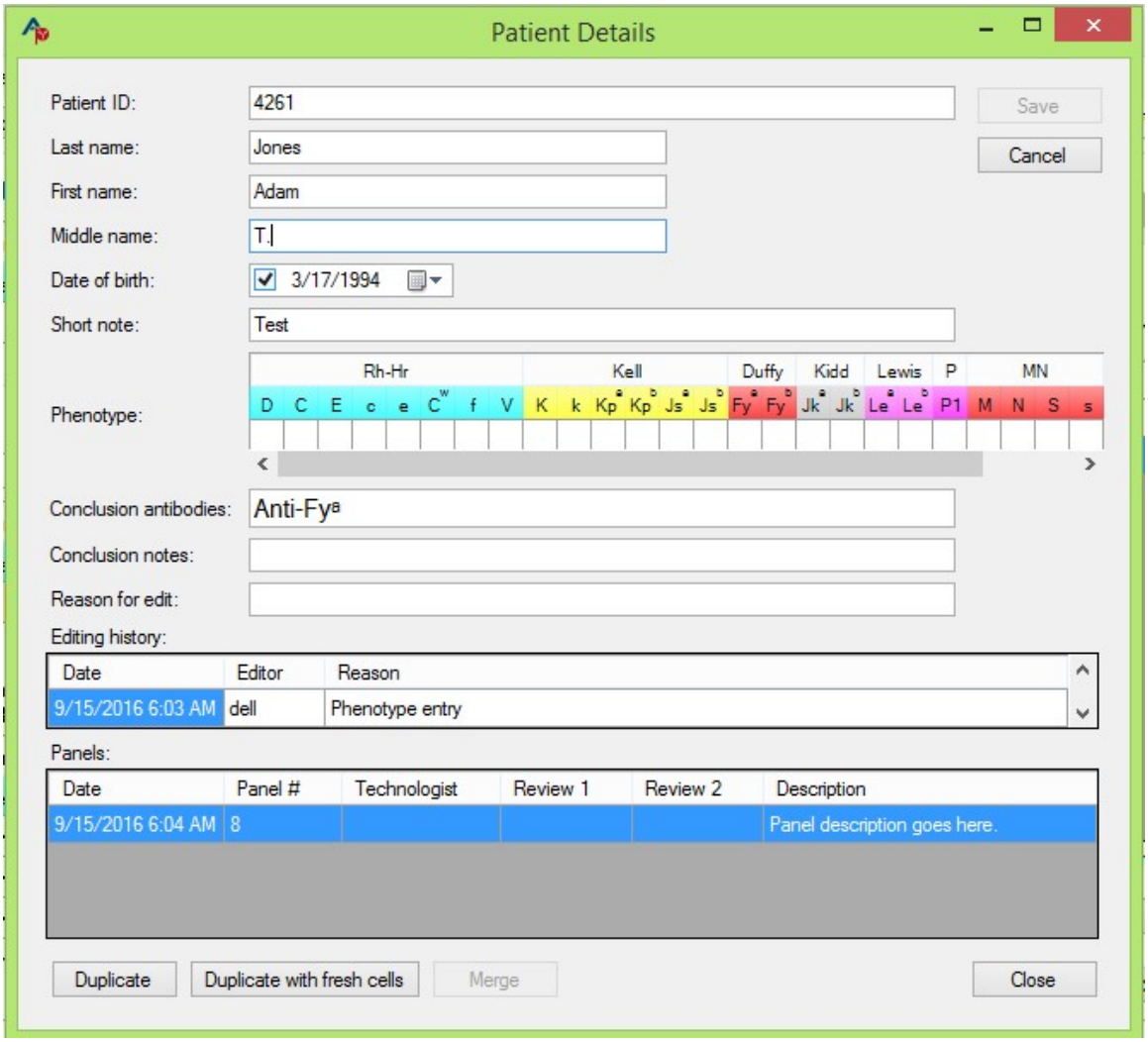


You must enter an ID for the patient that will uniquely identify that patient. The nomenclature or protocol is up to you. When a patient is selected, their ID and their first and last names will appear at the top of the Search screen as well as the Selected Cells panel and the Results Worksheet. Saving any work-up with a particular patient selected will attach that patient to the printed worksheet as well as the saved lot table.



When a Patient is selected and displayed at the top of the screen, you may right-click on the patient to either **Change Patient**, **View Patient Details**, or **Update Patient Information**. **Change Patient** will take you to the **Select/Add Patient** screen and allow you to switch to a different patient. **View Patient Details** will bring you to their patient details screen where you can edit that patient's information and view the editing history for that patient.

You may also call up a list of your patients by selecting **Patients** from the **View** menu. Double-clicking on a patient or highlighting a patient and clicking Details will call up the **Patient Details** screen for that patient where their information may be added or edited. Only administrators may edit patient details.



The following information may be stored with each patient:

ID (required)

Last name (required)

First name (required)

Middle Name

Date of Birth

Short Note

Phenotype: A patient's phenotype will populate the Auto Control row at the bottom of the selected cells in the Results Worksheet whenever a patient is assigned to the worksheet.

Conclusion Antibodies and Conclusion Notes: See page 39.

Specimen Number: When adding a new patient, there is a space to add the specimen number that will be associated with that patient's current workup. The specimen number will saved with the panel rather than with the patient. For more on specimen numbers, see page 34.

Each time you edit a patient's information in their Patient Details screen, you must enter a reason for the edits. All previous edits to that patient will be displayed on the Patient Details screen under Editing History. Each saved panel that the patient is attached to will also display under Editing History. You may double click on a saved panel to load it, or you may select a saved panel and choose to Duplicate or Duplicate with Fresh Cells.

Update Patient Information: If you load a saved panel with a patient whose information has been changed, it will be marked Obsolete. Selecting Update Patient Information from the Patients menu will bring the patient information current so that it is reflected on the worksheet. Any user may use the update patient information option.

Entering and Evaluating Test Results

Selected Panel Test Results

File View Patient Help

Specimen #:

Panel 1

Patient E123654, Luxembourg, Rosa C

Review 1

Review 2

Click in Results Box to indicate test outcome.

	Supplier/ Lot #	Donor/ RhHr-Vial	Rh-Hr D	C	c	E	e	V	C^w	Kell K	k	Kp^a	Kp^b	Js^a	Js^b	Duffy Fy^a	Fy^b	Kidd Jk^a	Jk^b	Lewis Le^a	Le^b	P P1	MN M	N	S	s	Luth Lu^a	Lu^b	Sex Xg^a	Additional Antigens	IS	37C	LIS
1	Immucor 34903	B9395 R1R1 #1	+	+	0	0	+	0	0	0	+	0	+	0	+	+	+	0	+	+	0	+	+	+	0	+	0	+	+		0	0	2+
2	Immucor 34903	C4205 R2R2 #2	+	0	+	+	0	0	0	0	+	0	+	0	+	0	+	+	0	+	0	+	0	+	0	+	0	+	0		0	0	2+
3	Immucor 34903	G1266 rr #3	0	0	+	0	+	0	0	+	+	0	+	0	+	+	0	+	0	0	+	0	+	0	+	0	0	+	0	Yt(b+)	0	0	0^{2+}
4	Immucor 34905	B9381 R1R1 #1	+	+	0	0	+	0	0	+	0	0	+	0	+	+	+	+	+	0	+	+	+	+	0	+	0	+	+		0	0	2+
5	Immucor 34905	B6409 R1wR1 #2	+	+	0	0	+	0	+	0	+	0	+	0	+	+	0	0	+	0	0	+	+	+	0	+	0	+	0	f-	0	0	2+
6	Immucor 34905	C2417 R2R2 #3	+	0	+	+	0	0	0	0	+	0	+	0	+	0	+	+	0	+	0	+	+	+	+	+	0	+	+	f-	0	0	2+
7	Immucor 34905	D503 Ror #4	+	0	+	0	+	+	0	0	+	0	+	0	+	0	0	+	+	+	0	+	0	+	0	+	0	+	+	f+	0	0	2+
8	Immucor 34905	E781 r'r #5	0	+	+	0	+	0	0	0	+	0	+	0	+	0	+	+	+	0	+	+	0	+	0	+	+	+	+	f+	0	0	0^{2+}
9	Immucor 34905	F811 r'r #6	0	0	+	+	+	0	0	+	+	0	+	0	+	0	+	+	+	0	+	+	0	+	0	+	0	+	+		0	0	0^{2+}
10	Immucor 34905	G1586 rr #7	0	0	+	0	+	0	0	+	+	0	+	0	+	0	+	0	+	0	+	+	+	0	+	+	0	+	+	Co(b+)	0	0	0^{2+}
11	Immucor 34905	H1393 rr #8	0	0	+	0	+	0	0	0	+	0	+	0	+	+	0	+	0	0	+	0	+	0	+	0	0	+	+		0	0	0^{2+}
12	Immucor 34905	N4267 rr #9	0	0	+	0	+	0	0	0	+	0	+	0	+	0	+	0	+	0	+	+	0	+	0	+	0	+	0		0	0	0^{2+}
13	Immucor 34905	N4051 rr #10	0	0	+	0	+	0	0	0	+	0	+	0	+	0	+	0	+	+	0	0	+	0	+	+	0	+	+		0	0	0^{2+}
14	Immucor 34905	B3715 R1R1 #TC	+	+	0	0	+	0	0	0	+	0	+	0	+	+	0	+	+	+	0	0	+	+	0	+	0	+	+	f-, I-, Yt(b+)	0	0	2+
15	Immucor 35912	E757 r'r #5	0	+	+	0	+	0	0	0	+	0	+	0	+	+	+	+	0	0	+	+	+	0	+	+	0	+	+	f+			0^{2+}
16	Immucor 35912	F715 r'r #6	0	0	+	+	+	0	0	0	+	0	+	0	+	0	+	0	+	0	+	+	0	+	0	+	0	+	+	f+			0^{2+}

			Rh-Hr D	C	c	E	e	V	C^w	Kell K	k	Kp^a	Kp^b	Js^a	Js^b	Duffy Fy^a	Fy^b	Kidd Jk^a	Jk^b	Lewis Le^a	Le^b	P P1	MN M	N	S	s	Luth Lu^a	Lu^b	Sex Xg^a
	Homozygous Rule Outs	Double Dose	0	0	7	0	7	0	0	0	6	0	9	0	9	2	6	3	4	1	8	6	5	4	2	4	0	8	7
	Heterozygous Rule Outs	Single Dose		2		2				3		0		0		0		0		0			0		0		1		

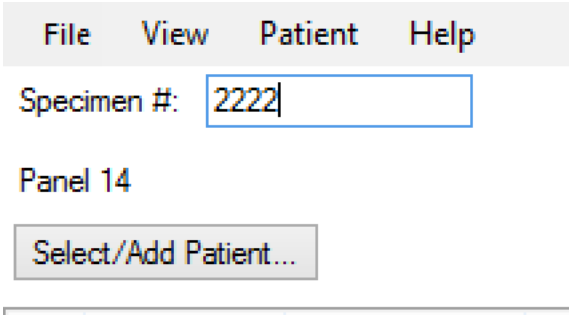
No exclusion yet No exclusion possible

Evaluation:

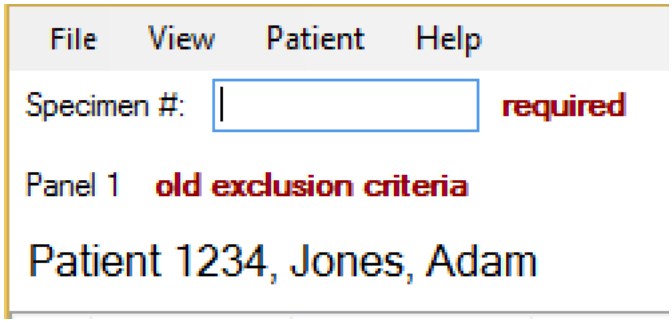
The following have insufficient negative reactions to exclude by your rules: D, Cw, V, Kpa, Jsa
Column LIS: can not exclude D, Cw, V, Kpa, Jsa
These are tentative rule-outs.

Test results may be entered and evaluated using the **Results Worksheet**. The Results Worksheet may be called up from the Search Screen or Panel menu whenever selected cells are present. Any antigens that cannot be excluded by the current selection are highlighted in the **Count** rows at the bottom of the screen. Results can be recorded as they are read by clicking in the box in the appropriate test column that is in the same row as the tested cell. The test column box will be highlighted and a drop down box will appear with a choice of results that may be entered by clicking on the desired number. The default choice is 0 through +4 (Agglutination Grading). Result choices may be seen and entered in the Marsh 0 to 12 scale by choosing that option in the **System Options** menu. If you are entering results in a column that requires a check cell entry, the check cell box will appear each time you enter a negative result. You must confirm that negative result by entering a positive result in the check cell box. Once a choice is entered the cursor will move down to the next tested cell and you may repeat the procedure. To remove a result from a box, click once on the box, then click on the blank space above the zero in the choices box.

Specimen Number



If *Require Specimen Number* is selected by an administrator in System Options, you must enter it wherever it appears. If *Require Specimen Number* is not selected, the choice to enter a specimen number on your results worksheet is optional. Whether or not the specimen number is required, once a specimen number is entered it must be entered every time the results worksheet is opened.



Note: If you retrieve a workup with a specimen number on it that you no longer have, you can retrieve that specimen number by selecting **File - Print Preview** on the worksheet.

Count Rows

The number of homozygous and heterozygous rule-outs for each antigen appear in the Count rows below the cell rows and above the Evaluation that specifies which antigens remain to be excluded. Antigens that cannot be excluded with the cells currently selected are highlighted in the Count rows. For more on colors and highlighting, see page 36.

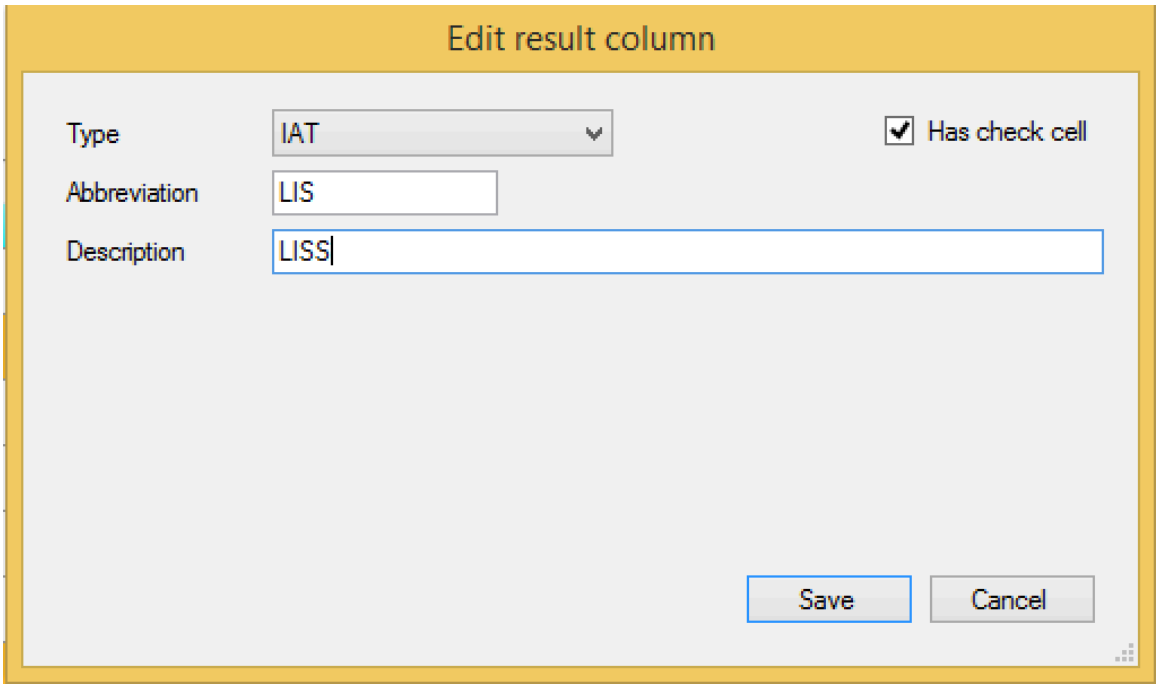
			Rh-Hr							Kell						Duffy		Kidd		Lewis		P	MN				Luth		Sex
			D	C	c	E	e	V	C^w	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	P1	M	N	S	s	Lu^a	Lu^b	Xg^a
	Homozygous Rule Outs	Double Dose	2	0	8	1	5	0	0	0	7	0	8	0	7	2	2	2	2	2	3	6	1	4	1	3	0	7	5
	Heterozygous Rule Outs	Single Dose		0		0				1		0		1		0		0		0			0		0		1		

If selected in system options, another row counting negative reactions to heterozygous donors may be added to the display.

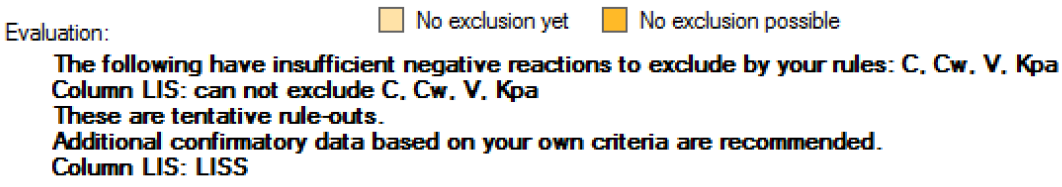
	Rh-Hr							Kell						Duffy		Kidd		Lewis		P	MN				Luth		Sex
	D	C	c	E	e	V	C^w	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	P1	M	N	S	s	Lu^a	Lu^b	Xg^a
Homozygous Rule Outs (Double Dose)	9	5	3	4	5	0	1	0	6	0	8	0	9	2	3	4	3	3	6	6	5	3	1	7	0	9	5
Heterozygous Rule Outs (Single Dose)		0		0				3		1		0		0		0		0			0		0		0		
Total Negative Reactions to Heterozygous Donors		1	1	0	0			3	3	1	1	0	0	4	4	2	2				1	1	1	1	0	0	

Result Columns

Administrators may select the default column settings by going to the *Customize Results Columns* screen in the Options menu. However, the current user may edit their current columns directly from the Results Worksheet by right clicking on a column. From here you can select **Add Result Column** to insert a new column directly to the right of the column that you right-clicked on. You may also select **Edit Result Column** to directly change the column type, abbreviation, and set a check cell. Here you may enter a column description that will appear in your evaluation text and on printouts. Finally, selecting **Delete Result Column** will remove that column from your Results Worksheet as long as there are no results entered in the column. These columns will be saved with the worksheet but will not affect the default columns on other worksheets.



Evaluation Text

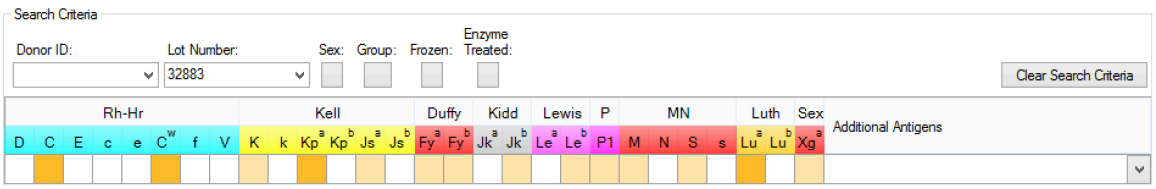


The evaluation text at the bottom of the Results Worksheet will keep a running list of which antigens are not yet excluded. This information is also presented with color-coding on the Results Worksheet and the Search screen.
The evaluation text will also display any column descriptions that you have added.

Color Coding

Antigen Plus now features dynamic color shading of cells to help guide the user as they select cells and enter test results. Color shading is changed automatically in both the search screen and the results worksheet as cells are selected and deselected, and as test results are entered.

In the search screen:

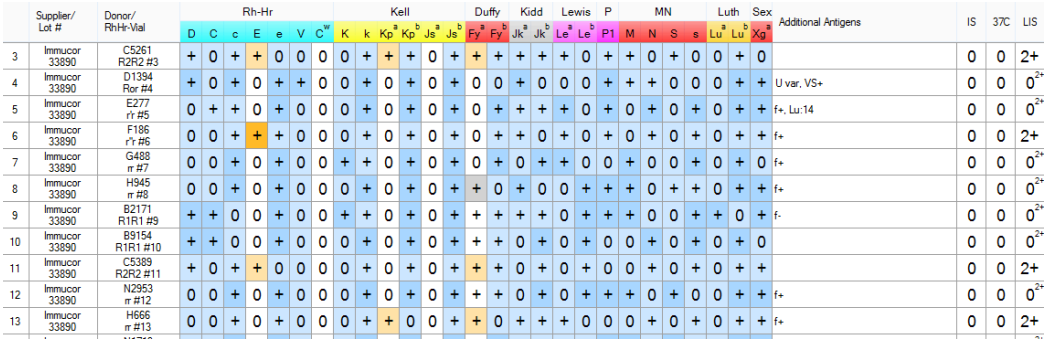


White: The antigen has already been excluded.

Light Orange: The antigen has not yet been excluded, but could be excluded if the untested selected cells are non-reactive.

Dark Orange: The antigen cannot be excluded by the current panel regardless of test results. This is an indication that additional cells need to be selected. When a cell is selected that could lead to an exclusion of that antigen with test results, the antigen will turn light orange.

In the test cell area of the Results Worksheet:



	Supplier/ Lot #	Donor/ RhHr-Vial	Rh-Hr							Kell						Duffy		Kidd		Lewis		P	MN				Luth		Sex	Additional Antigens	IS	37C	LIS
			D	C	c	E	e	V	C^w	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	P1	M	N	S	s	Lu^a	Lu^b	Xg^a				
3	Immucor 33890	C5261 R2R2 #3	+	0	+	+	0	0	0	0	+	+	+	0	+	+	+	+	+	+	0	+	+	0	+	0	0	+	0		0	0	2+
4	Immucor 33890	D1394 Ror #4	+	0	+	0	+	+	0	0	+	0	+	0	+	0	0	+	0	0	0	+	+	+	0	0	0	+	+	U var, VS+	0	0	0^2+
5	Immucor 33890	E277 r'r #5	0	+	+	0	+	0	0	0	+	0	+	0	+	0	+	+	+	+	0	+	0	+	0	+	0	+	+	f+, Lu:14	0	0	0^2+
6	Immucor 33890	F186 r'r #6	0	0	+	+	+	0	0	0	+	0	+	0	+	0	+	+	0	+	0	+	0	+	0	+	0	+	+	f+	0	0	2+
7	Immucor 33890	G488 rr #7	0	0	+	0	+	0	0	+	+	0	+	0	+	0	+	0	+	+	0	0	+	0	0	+	0	+	0	f+	0	0	0^2+
8	Immucor 33890	H945 rr #8	0	0	+	0	+	0	0	0	+	0	+	0	+	+	0	+	0	0	+	+	+	0	+	+	0	+	+	f+	0	0	0^2+
9	Immucor 33890	B2171 R1R1 #9	+	+	0	0	+	0	0	+	+	0	+	0	+	+	+	+	+	0	+	+	+	0	0	+	+	0	+	f-	0	0	0^2+
10	Immucor 33890	B9154 R1R1 #10	+	+	0	0	+	0	0	0	+	0	+	0	+	+	+	0	+	0	+	0	0	+	0	+	0	+	0		0	0	0^2+
11	Immucor 33890	C5389 R2R2 #11	+	0	+	+	0	0	0	0	+	0	+	0	+	+	+	0	+	0	+	0	0	+	0	+	0	+	+		0	0	2+
12	Immucor 33890	N2953 rr #12	0	0	+	0	+	0	0	0	+	0	+	0	+	+	+	0	+	0	+	+	+	0	+	0	0	+	+	f+	0	0	0^2+
13	Immucor 33890	H666 rr #13	0	0	+	0	+	0	0	0	+	+	0	0	+	+	0	+	+	+	0	0	0	+	0	+	0	+	+	f+	0	0	2+

Light Blue: The antigen has been excluded by other test cells.

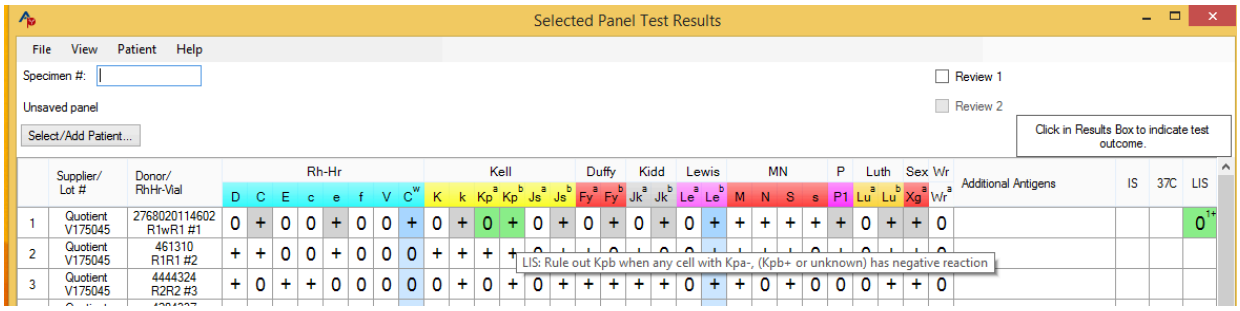
Dark Blue: The antigen has been excluded, in part because it was ruled out by this test cell.

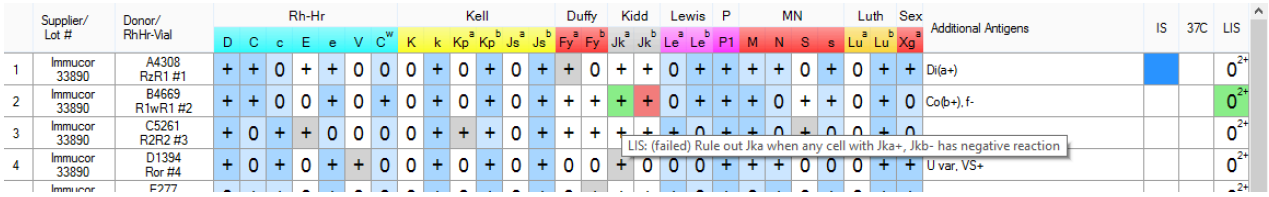
Light Orange: The antigen has not been excluded, and is one of several possible explanations for the positive reaction with this test cell.

Dark Orange: The antigen has not been excluded, and is a likely explanation for the positive reaction with this test cell because it is the only non-excluded positive antigen among the 28 antigens that are evaluated by Antigen Plus.

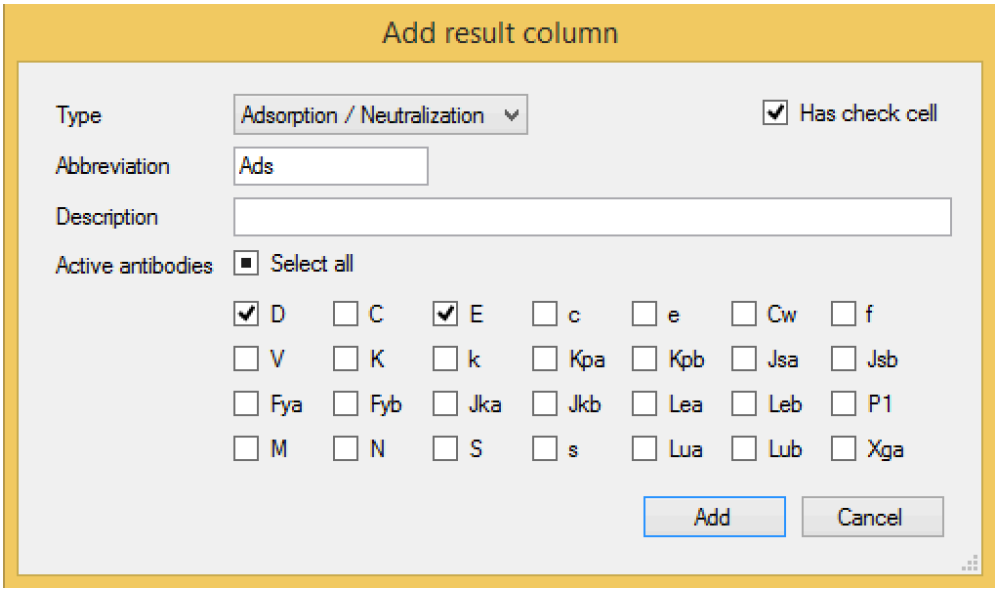
Mouse- over explanations

An added feature of Antigen Plus is the ability to see how the exclusion rules are being applied for each rule-out on the screen. Whenever a negative result is entered, you may mouse-over any positive antigen in that cell to see why it was or why it was not ruled out. Any other cell on your worksheet that is involved in a successful rule-out or an unsuccessful rule-out will be highlighted as you mouse-over.



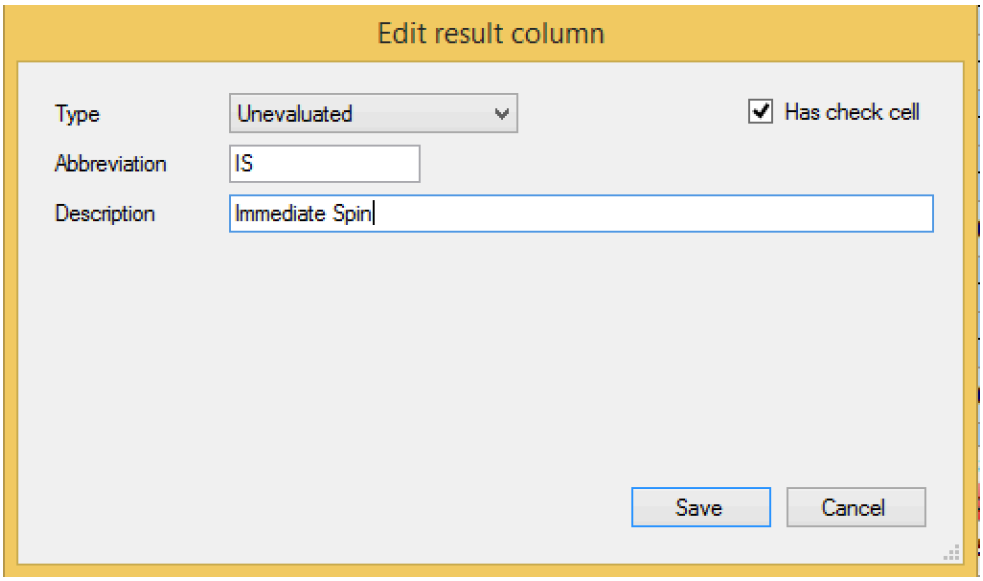


Adsorption Columns



Adsorption columns may be added and set up for consideration of specific antigens. Results in this column will only apply to the designated antigens.

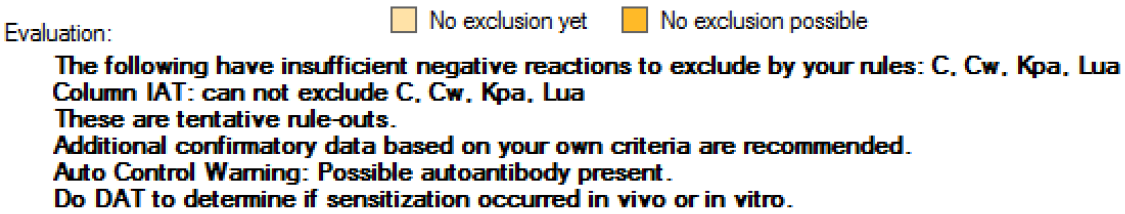
Unevaluated Columns



The Unevaluated Column type allows the user to enter results without those results affecting the evaluation text or the color-coding. These results will display in the Unevaluated column in your Results Worksheet and on printed copies, but they will have no effect on your evaluation. The abbreviation may be changed and a description may be added in the Edit Result Column window.

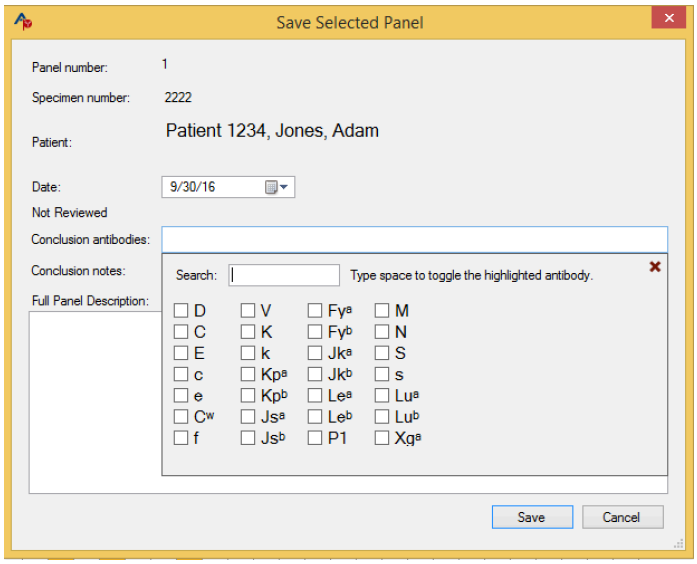
Auto Control

If there is a patient phenotype entered for your current patient, this will automatically populate the Auto Control row at the bottom of your test cells in any Results Worksheet. A warning will appear in the Evaluation text if a positive reaction is recorded in the Auto Control row, indicating a possible autoantibody.



Conclusions

If, as a result of your workup, you have reached a conclusion about the patient's antibodies, you may enter that conclusion when you save the worksheet. Two fields are available: *Conclusion Antibodies*, which allows you to select from any of the 28 evaluated antibodies, and *Conclusion Notes*, which allows free text about your conclusion, including other antibodies and any comments. Conclusion Antibodies and Conclusion Notes will display at the top of Results Worksheets next to the patient's name and in the patient details.



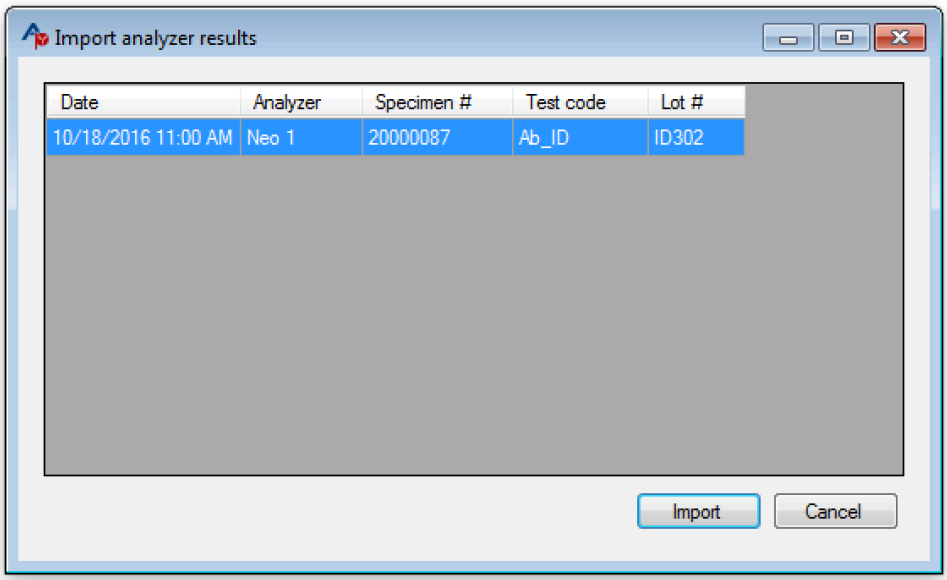
If you like, you may save the Conclusion Notes text for automatic entry in a future case. To do this, enter your text in the lower text box next to the Add button. Clicking Add will place this text in the middle text box, which will collect all saved Conclusion Notes. When adding Conclusion Notes, you may then select a saved note (or multiple notes) from this box.

Importing blood analyzer results

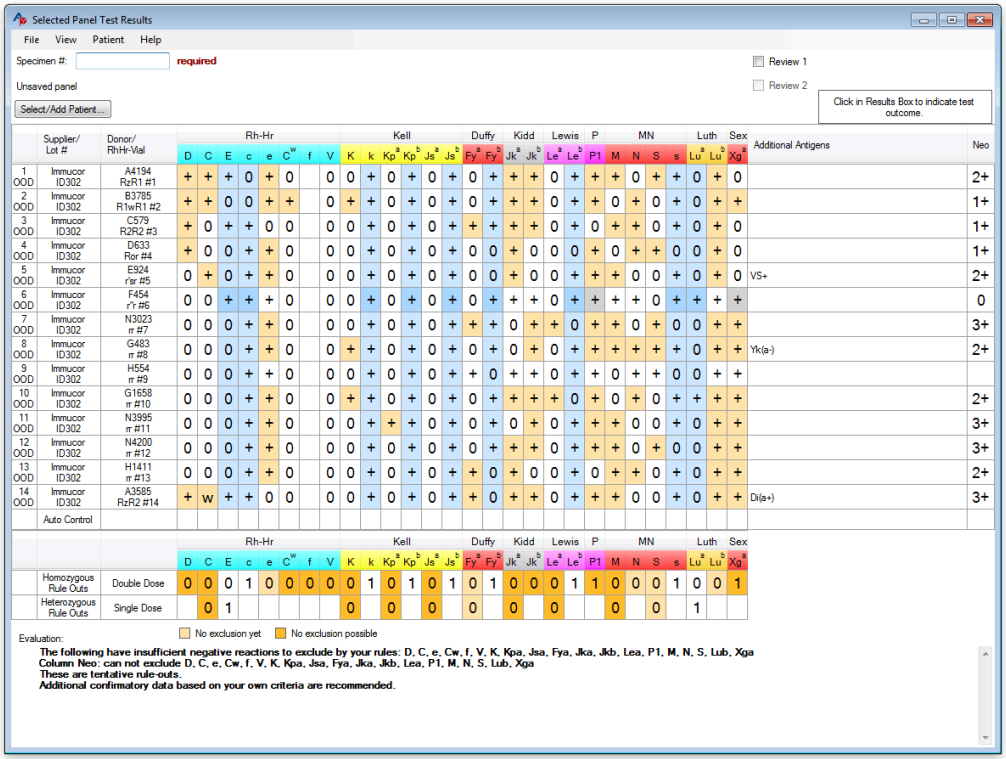
When importing results from a blood analyzer machine, a Results Worksheet will be generated that only includes the single blood analyzer results column (the default columns will not appear). The user may then add, edit, and rearrange additional columns.

For instructions on connecting with a blood analyzer, please see the document "Antigen Plus: Description, Requirements, and Specifications—What Your IT Needs to Know" available at www.antigenplus.com .

Import Anaylzer Screen:

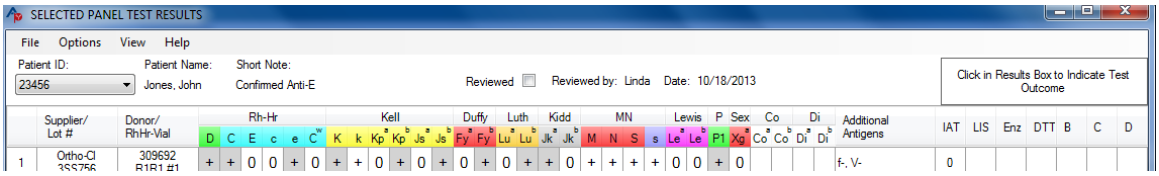


Imported Results on a Worksheet:



Reviewing a Saved Panel

Once a result or results have been entered in a Results Worksheet and the worksheet has been saved, a user with appropriate privileges may review it. After a panel has been reviewed, no further changes may be made to the worksheet, unless the reviewer unchecks the review box. Only the user who reviewed a panel or an administrator can remove the review from that panel.



A user with "full-user" privileges may only review a panel on which that she/he has not entered any results i.e. only review someone else's work. An administrator may review her/his own work.

A second review may be entered after a first review following the same rules. If anyone changes reviews on a saved panel, a prior iteration of the panel will be maintained with the original reviews in **Panel History**.

Printing

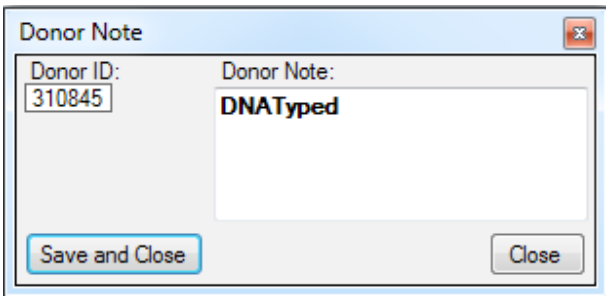
Print and Print Preview menus are accessed from the file menus of the Selected Cell or Results Worksheets. Antigen Plus allows you to choose the printer and/or paper size and orientation from either menu. Letter size in landscape mode is necessary to properly format your print out or PDF file.

Data Entry

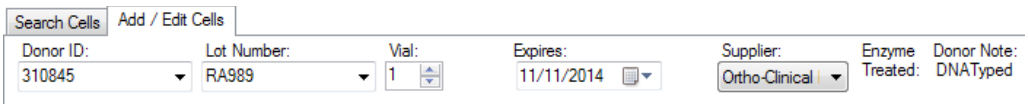
Antigen Plus allows the entry of unique cells and/or lots from suppliers other than those currently licensed by the FDA to sell red blood cell panels in the United States. Most hospital transfusion services will rely solely on commercial suppliers and entry of red cell data may never be necessary or may be restricted to adding or correcting a typing on an existing cell. Complete red cell phenotype data entry is described at the end of this section. The user may make changes to a supplier's donor phenotype based on additional typing by calling up the donor on the Add/Edit screen, entering the changes (reactions, special typings etc.), and clicking the Save button. These changes will not be maintained for the donor in any subsequent lot, so it is strongly recommended that you note the change in the Donor Note, which will remain with the donor regardless of lot.

Donor Note

An optional note may be stored with each Donor ID by selecting Donor Note from the View menu when the donor is displayed in the Donor ID box. Type your note in the Donor Note text box and then select Save and Close.



A Donor Note is associated with the Donor ID only, not the Lot, so it will appear with every Lot that a donor ID is in. When a Donor ID has a note on file, that information will be displayed whenever that donor is on the Add/Edit or Search screens.

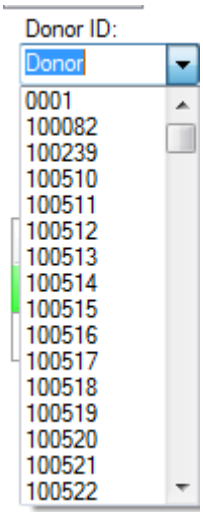


Data Entry of Individual Cells

Data may be entered or changed in a box whenever the cursor is positioned over that box. The cursor can be moved to another box by pointing to it with the mouse and clicking the left mouse button. The cursor also moves to the next box by pressing the Tab key, or to the previous box by pressing the Shift + Tab keys. Previously saved data can be viewed and selected by clicking the little down-arrow to the right of the box, or by pressing the Ctrl + Down Arrow keys while the cursor is in the box. The box will be "opened", and the data will be displayed in numerical and alphabetical order. Any item in the list can be selected with a mouse click, or by highlighting it with the Up or Down Arrow keys and pressing Enter. Alternatively, items can be scrolled without opening the box by pressing the Down Arrow key. A list box may be opened at a particular spot in the list by first entering a character or characters in the box and then opening it. A button may be activated or "pushed" by clicking it with the left mouse button, or by moving the cursor to the button and pressing any key. You can tell when the cursor is on a button because its outline becomes darker, and if it has writing on it, the writing is surrounded by a dotted line. As with boxes, the cursor can be moved from button to button by using the Tab or Shift + Tab keys, or by clicking directly with the mouse. In general, the cursor moves from left to right and top to bottom on the screen. A donor cell is identified by its Donor ID and Lot Number. A donor number or lot number may appear any number of times, but the Donor ID - Lot Number combination must be unique. In order to save a cell in the database, it must have a non-blank Donor ID and a non-blank Lot Number. When you are entering several cells from a single antigram or lot panel, the data boxes are blanked after you Save, but remain indexed at the last item entered. Therefore, when you enter one cell and save it, then enter a new Donor ID number, you can Tab to the Lot Number box and press the Down Arrow to recall the previous Lot. Its expiration date and supplier will also appear, saving you from having to re-enter the data.

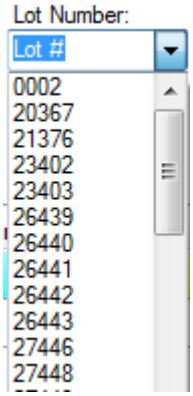
Donor Number

The Donor No. box will accept up to 16 characters and may be any combination of capital letters and characters except apostrophes. Enter a donor ID and press the Tab key to move on to the Lot Number box. If the donor is already on file, the cell data will be retrieved and displayed.



Drop-down (or list) boxes have a scroll bar. One donor may be present on several different panels. If a donor has more than one cell on file, and her previously existing ID is entered, the most recent one found will be displayed. This is to facilitate entering duplicate donors - when you wish to enter a donor who is already on file into a new lot number, the old phenotype will automatically appear, and you then need to enter only the new lot number, check the expiration date, and click the Save button. It is assumed that the phenotype will not have changed from a previous panel.

Lot Number



The Lot Number is used to show the supplier's unique lot number for this cell's panel. All cells with a given Lot Number will have the same supplier and expiration date.

The Lot Number box will accept up to 16 characters and may be any combination of numbers and capital letters. Enter a lot number and press the Tab key to move on to the Vial box. If the lot number was already on file, the expiration date and supplier will be retrieved and displayed.

Vial

The Vial box will accept any number from 0 through 99. It will also accept a TC (tech cell) vial. Enter a vial number or TC and press the Tab key to move on to the Expires box. Pressing the Up and Down Arrow keys or clicking the little up and down arrows to the right of the box will automatically raise or lower the displayed vial number. TC is located below the 0.

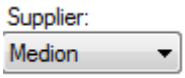
Expiration Date

The Expires box is for the expiration date of all cells in the lot number displayed. You may enter a date in any format that is comfortable for you, such as “20 Dec 10” or “12-20-11”, then press the Tab key to move on to the Supplier box. The date will be re-displayed in the format set in the

Windows Control Panel/Regional Settings/Date function. If the date is before the present system date, a bright red **Out of Date!** will appear under the Expires box. The expiration date is stored with the lot number, so if you change the expiration date of a lot number, then ALL cells with that lot number will have the new expiration date.

Supplier

The Supplier box is populated with default commercial suppliers and any that you have added in the Suppliers table found in the View menu.
When a supplier is changed in the Supplier box, the antigen array below will change to match that Supplier's array.



The supplier is stored with the lot number, so if you change the supplier of a lot number, then ALL cells with that lot number will have the new supplier.

Location

Enter a storage drawer location for a frozen cell. The location is stored independently and will not affect other cells with the same lot number--should there be any. The Location box will accept up to 64 characters in any combination of letters and numbers.

Rh-Hr

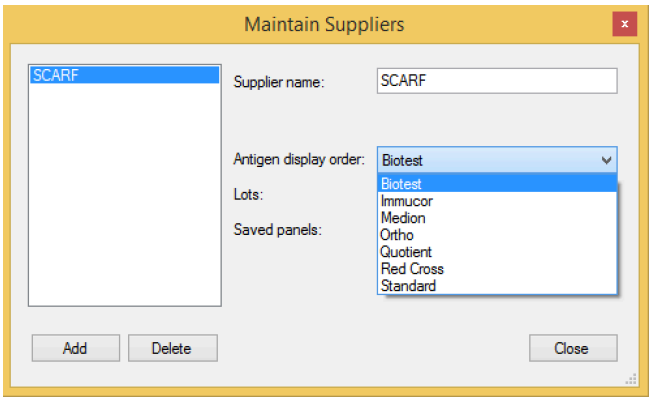
Antigen Plus comes with the standard Rh-Hr phenotype designations loaded in the drop down box that is activated by clicking on the down arrow adjacent to the Rh-Hr entry box. Choosing one of these designations by clicking on it will place it in the entry box and will mark the appropriate pluses and negatives in the Rh-Hr antigen group. If changes are made to that antigen group, the Rh-Hr phenotype will be cleared when the cell is saved. A user may save the cell again with the proper phenotype or leave it blank.

Note: Antigen Plus no longer specifies the Cw antigen in Rh-Hr designations since we cannot predict 100% when C will be on the same gene complex as Cw.

Automated Antigen Order on the Add/Edit Screen

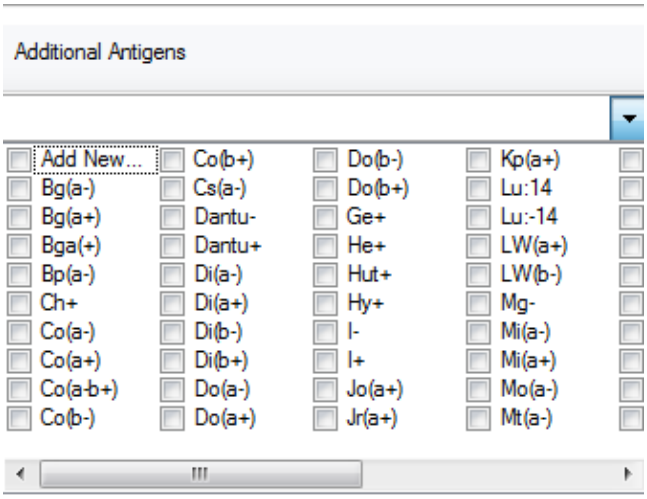
On the Add/Edit screen, the array will match the supplier currently selected and appearing in the Supplier Box and will change automatically as the supplier is changed.

You may add a supplier with any one of these arrays from

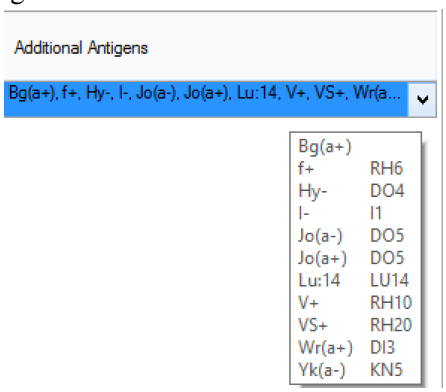


Additional Antigens

The Additional Antigens box consists of an entry box, check boxes, and a display box directly above them containing this cell's additional antigen phenotype. You may enter an additional antigen in the Add New entry box, or select one from the list by clicking the box. To add what is in the entry box to this cell, check the box. To remove an antigen from a cell uncheck the appropriate box.



There is no limit on how many additional antigens you may enter. However, once the screen space is used up, further antigens will be stored but not displayed. When there are more additional antigens than can be displayed on a Lot Panel print out, an ellipsis ("...") at the end of the additional antigen list (displayed alphabetically) will indicate the presence of the additional typings. Mousing over the display all of the antigens present along with their associated ISBT designations.



A table of ISBT designations used in Antigen Plus can be found in the Appendix.

The reason for the entry-box method of adding additional antigens is to ensure consistency: you must be consistent in your notation in order for a search to work properly. For example, to indicate a Colton b antigen (Co_b) as positive, you may enter Co(b+), CoBPos, or any other notation that is 8 characters or fewer, but you should use the exact same notation for all cells with this antigen. The entry box will contain a list of all the additional antigens previously saved in your inventory, and you should check for an antigen's presence before entering a new one. The ISBT designations can be consulted for more precision in nomenclature. A table of ISBT designations used in Antigen Plus can be found in the Appendix.

Out Of Stock

To mark a cell as exhausted, click the Out Of Stock button, click OK in response to the pop-up query, and then click the Save button. The data will remain on file so that you can recall the

phenotype in case the cell shows up in a new lot, and will remain in any saved panels. The cell will not be available in the search process unless you mark the Include in Searches feature in the Out of Stock Inventory box in the System Options menu. When you click the Save button, you will be given the option of marking the entire lot as out of stock. Click Yes or No in the popup window, or type y or n, to indicate your choice. Please note: If you do not click the Save button after marking the cell as out of stock, the cell will remain in stock and the out of stock flag will not reappear on the screen when that cell is recalled.

Sex

Clicking the Sex button will change the button from blank to M to F. This is optional information, and not normally of significance in the selection of panel cells.

Group

The Group button allows you to enter the blood group of the donor cell. Since most commercial panel cells are group O, that is the default setting. To change the blood group to A, B, or AB, click the Group button until one of those characters appears. To leave the blood group unspecified, click the Group button until a blank appears.

Frozen

Click the Frozen box to mark a cell as frozen. The expiration date will be blanked. Frozen cells will be found last in the search process, since searching is done starting with newest cells first.

Antigens

The 28 principal antigens are displayed with colored labels for easy identification. When you are entering a new cell, all the antigens will have a blank setting. You may change a setting to a +, s, w, or blank by clicking the button with the mouse pointer (right and left mouse clicks scroll through the choices in opposite orders), or by moving to a button with the Tab key and pressing any other key. A blank setting indicates that no information is available. For example, some suppliers may not include the Kell system Kp^b and Js^b, so you may blank these antigens' buttons.

Save

Clicking the Save button will save all the cell data displayed for the unique Donor No. - Lot Number combination. Any items not previously present in the data boxes (Donor, Lot, Expiration Date, Supplier, Additional Antigens, and RhHr) will be added to the lists in those boxes. The cell display is cleared and the cursor returns to the Donor No. box. The Lot Number, Expiration Date, and Supplier are saved as a group with the Lot Number. If you have changed the date or supplier of a lot, then ALL cells with that lot number will have the new date and supplier. A Donor Note is saved only with the Donor ID, and stays with the Donor ID regardless of which Lot it is in.

Delete

Clicking the Delete button will prompt you to make sure, then remove the displayed Donor No. – Lot Number combination from your inventory as long as it has not been used in the last ten years in any saved work. When a cell is deleted, any unique lot, additional antigen, or RhHr information it may have had will also be deleted from the lists in those boxes.

Delete Lot

Clicking the Delete Lot button will prompt you to make sure, then remove ALL cells with the displayed lot number (the ten year rule applies).

Multiple User Procedures

There is no restriction on the number of users who can use Antigen Plus and share its data at the same time. There are, however, some default rules of precedence in cases when new data are added to the system by one of the users and where the same data are altered and saved by more than one user in a session. Your SOP should make note of the following rules:

When a user downloads a new lot into the system, the cells within the lot that lot will be available for searches by other users and will appear in the Maintain Lots screen, but will not be available in the Lot drop down list on the Search or Add/Edit screens until the other user clicks the Refresh Data option in the File Menu (or simply presses the F5 key).

If two users have the same saved panel open, the second one to save will be the current panel iteration even if the first user has changed and/or reviewed the panel. The first user's panel will be available as a prior iteration, but will have to be recreated to be a current one (this can be done by opening the current iteration and making the necessary changes using the prior iteration as a guide). However, the first user's saved panel will appear immediately on the Panel History screen, so to ensure that there are no conflicts, a user who suspects that there may be someone else working on the same panel can check the panel history before saving his/her work.

Exclusion Policy

Antigen Plus - Ab ID excludes antigens in the manner described by the *AABB Technical Manual, 15th Edition*, (Ch. 19: pg. 428-9). Cells with apparent double dose expression (e.g. from apparent homozygous donors) of an antigen are required for the exclusion in the following blood group systems: Rh, Duffy, Kidd, MNS. In the presence of anti-D, the program will exclude E and C on heterozygous cells. Blank antigens will cause the known positive antithetical partner to be considered heterozygous for exclusion. The blank antigens themselves are not considered positive or negative and will not be considered for exclusion.

The blood group antigens that can be excluded on cells from heterozygous donors are K, Kpa, Jsa, and Lua. The program will not exclude K, Kpa, or Jsa on cells from heterozygous donors if cells from apparent homozygous on the same panel are reactive. As the Zygosity of P1 and Xg_a is not easily determined from most panel sheets, the program requires 3 examples of each antigen to be non-reactive with the patient sample before it will exclude either antigen.

It is always advisable to review AABB Technical Manual, 15th Edition, (Ch. 19: pg. 429-36) for more detailed information on Complex Antibody Identification including variability of antigen strength, the effect of storage on RBC antigens and use of autologous cells while considering the antigens excluded or not, by the program. Any final decision made by the technologist must be consistent with their facility SOP for Antibody Identification.

The program does not encompass the knowledge of all blood group systems and their patterns of reactivity. Any technologist using the program to automate the exclusion process must apply serological expertise to interpret the program's lists of antigens excluded versus antigens not excluded. The program evaluates each column of reactivity independently. Exclusions obtained from the results recorded in the default column settings will be exactly the same as those obtained from identical results recorded in the LISS indirect antiglobulin test (IAT column).

Red cell treatments, when performed correctly, do have a standardized effect that is well documented. Antigen Plus - Ab ID does employ that information when the ENZ column and DTT column have results recorded in them. The ENZ column will not exclude Xga, or Duffy and MNS blood group system antigens. The DTT column will not exclude Kell or Lutheran blood group system antigens.

High frequency antigens and low incidence antigens, which can be used as a search parameter to select cells for the results panel, cannot be used in the exclusion process or listed in the Evaluation box at the bottom of the results panel. As the antigens listed in the Additional Antigens are entered by the individual user, they are not pre-coded by the program. A list of technical tips to assist any technologist who may have an antibody to a high frequency antigen or to a low incidence antigen is included in the Help utility and is reproduced on the following pages.

The following text always appears with any results in the Evaluation box:
"These are tentative rule-outs."
If you have not set up your own rules for exclusion, the following text will also appear:
"Additional confirmatory data based on your own criteria are recommended."

It is the user's responsibility to record accurate test data and to confirm that data according to established protocols.

Complete Rule-Out Protocols

- Rule out D when any cell with D+ has negative reaction
- Rule out C when (all cells with D+ have positive reaction)
  and (any cell with D-, C+, c+ has negative reaction)
- Rule out C when any cell with C+, c- has negative reaction
- Rule out E when any cell with E+, e- has negative reaction
- Rule out E when (all cells with D+ have positive reaction)
  and (any cell with D-, E+, e+ has negative reaction)
- Rule out c when any cell with C-, c+ has negative reaction
- Rule out e when any cell with E-, e+ has negative reaction
- Rule out Cw when any cell with Cw+ has negative reaction
- Rule out f when any cell with f+ has negative reaction
- Rule out V when any cell with V+ has negative reaction
- Rule out K when any cell with K+, k- has negative reaction
- Rule out k when any cell with K-, k+ has negative reaction
- Rule out Kpa when any cell with Kpa+, Kpb- has negative reaction
- Rule out Kpb when any cell with Kpa-, (Kpb+ or unknown) has negative reaction
- Rule out Jsa when any cell with Jsa+, Jsb- has negative reaction
- Rule out Jsb when any cell with Jsa-, (Jsb+ or unknown) has negative reaction
- Rule out Fya when any cell with Fya+, Fyb- has negative reaction
- Rule out Fyb when any cell with Fya-, Fyb+ has negative reaction
- Rule out Jka when any cell with Jka+, Jkb- has negative reaction
- Rule out Jkb when any cell with Jka-, Jkb+ has negative reaction
- Rule out Lea when any cell with Lea+, Leb- has negative reaction
- Rule out Leb when any cell with Lea-, Leb+ has negative reaction
- Rule out P1 when any cell with P1+ has negative reaction
- Rule out M when any cell with M+, N- has negative reaction
- Rule out N when any cell with M-, N+ has negative reaction
- Rule out S when any cell with S+, s- has negative reaction
- Rule out s when any cell with S-, s+ has negative reaction
- Rule out Lua when any cell with Lua+, Lub+ has negative reaction
- Rule out Lua when any cell with Lua+, Lub- has negative reaction
- Rule out Lub when any cell with Lua-, Lub+ has negative reaction
- Rule out Xga when any cell with Xga+ has negative reaction
- Rule out K when (any cell with K+, (k+ or unknown) has negative reaction)
  and (no cells with (K+, k-, and all non-excluded antigens except f are - or unknown)
  have positive reaction)
- Rule out Kpa when (any cell with Kpa+, (Kpb+ or unknown) has negative reaction)
  and (no cells with (Kpa+, Kpb-, and all non-excluded antigens except f are - or
  unknown) have positive reaction)
- Rule out Jsa when (any cell with Jsa+, (Jsb+ or unknown) has negative reaction)
  and (no cells with (Jsa+, Jsb-, and all non-excluded antigens except f are - or unknown)
  have positive reaction)

The Case of **f**

Some manufacturers have stopped typing all or most donors for the f antigen. While the RhHR phenotype indicates the value of f, it does not do so with 100 percent certainty. Antigen Plus will not make this assumption. Therefore, if f does not appear on the donor cell or cells, those cells will not be evaluated for f, and f will appear as not ruled out in the evaluation. Your SOP should indicate how you wish to handle these situations. You may ignore the lack of exclusion, or you may add the f to the donor cell supplied by the manufacturer. Antigen Plus makes no recommendation in this regard.

Because the f is likely to be ignored, we have exempted our Kpa and Jsa conditional rules (see above) from considering f.

Technical Information for Further Testing

1. If all cells in the first panel are reactive and the autocontrol is negative, try chemically treated screen cells and see if this alters the reactivity in any way. Chemical treatment of red cells includes: enzymes, DTT, AET or CDP (chloroquine diphosphate). Methods and information on obtaining any of the products required, can be found in the *American Red Cross Immunohematology Methods and Procedures*, D. Mallory, ed. Selecting 2 or 3 cells from the panel, or using the screen cells, will save time, save plasma and still provide new information. If the information is that nothing changed, go to step 2.
[More information on the actions of specific chemicals is listed in step 2, (iii).]

2. If all cells in the first panel tested are reactive and the auto control is negative, perform a common phenotype on the patient's red cells (patient must not have been transfused in the preceding 90 days). Blood group systems to include Rh, Kell, Duffy, Kidd and MNS. Select a cell from any of the panels or screen cells in your inventory that is negative for the same antigens the patient lacks and test it. This is referred to as running a phenotype matched cell.

EXAMPLE: PATIENT D+C+E-c+e+, K-, Fy (a+b-), Jk(a-b+), M+N+S-s+.
POSSIBLE MATCHES: D-C-E-c+e+, K-, Fy(a-b-), Jk(a-b+), M-N+S-s+
D+C+E-c-e+, K-, Fy(a+b-), Jk(a-b+), M+N-S-s

i) If the phenotype matched cell does not react with the patient's plasma, select a panel of red cells based on one example of each antigen to be excluded per cell.

EXAMPLE: FOR THE PATIENT LISTED ABOVE THE SELECTION CRITERIA WOULD BE:
CELL 1 E+, K-, Fy(b-), Jk(a-), S-.
CELL 2 E-, K+, Fy(b-), Jk(a-), S-.
CELL 3 E-, K-, Fy(b+), Jk(a-), S-.
CELL 4 E-, K-, Fy(b-), Jk(a+), S-.
CELL 5 E-, K-, Fy(b-), Jk(a-), S+.
This will confirm or exclude which antibody(ies) to the common antigens the patient has formed and what is left to form in the future.

ii) If the phenotypically matched cell(s) is reactive with the patient's plasma and the

autocontrol is negative, the most probable cause is an antibody to a high frequency antigen. Use Antigen Plus to select any examples of high frequency antigen-negative red cells in your cell library. I.e... At(a-), k-, Kp(b-), Js(b-) etc.
iii) If you have a limited rare cell library or failed to obtain a negative reaction with the high frequency antigen-negative red cells available, consider that various red cell treatments which modify or destroy certain antigens on red cells can also be useful. DTT/AET treatment will destroy: Kell (not K_x), Lutheran, Knopps/McCoy, Cartwright, Cromer, Dombrock, Auberger, JMH and Lw_a. Gerbich is destroyed by DTT but not AET. ENZYMES (papain, ficin, trypsin, bromelin) will remove: Duffy, MNS, Chido, Rogers, JMH, Gerbich, Gilfeather, Xg_a, Pr, V_w, Cartwright, Mi_a, Cl_a, Je_a, Ny_a and most En_a. Chloroquine diphosphate (CDP) will destroy Bg and class I HLA antigens.

3. If all cells in the first panel tested are reactive and the auto control is positive, do a direct antiglobulin test (DAT) on the patient's cells before doing further serum testing.

i) If the DAT is positive, a warm autoantibody should be suspected and may hide underlying alloantibodies in the patient's plasma. The autoantibody should be removed by adsorption before further antibody identification can be achieved. Adsorption can only be performed using pre-transfusion patient red cells. The patient must not have been pregnant or transfused in the preceding 90 days. For further information and testing methods, refer to the *AABB Technical Manual, Current Edition*, or the *American Red Cross Immunohematology Methods And Procedures*, D. Mallory, ed.

ii) If the DAT is negative, a cold autoantibody should be considered. A cold screen tested from room temperature down to 4_oC will indicate if an autologous absorption done at 4_oC will be useful to remove the autoantibody. Again, the patient must be untransfused in the preceding 90 days.

iii) If adsorption, warm or cold, is not possible, there are alternatives. Allogeneic warm absorption is possible using R1R1, R2R2, and rr cells. A prewarm method may be useful to remove any cold reactivity. Prewarm methods must be used with caution preferably after the clinically significant antibodies have been tentatively identified. Prewarm methods have been documented to remove anti-H activity in a Bombay phenotype and an example of anti-Vel. References on request.

4. If all the cells tested are negative, several things must be considered:

i) Repeat the cell that gave the original positive reaction that initiated the panel, i.e. the antibody screen test or one of the units being crossmatched. Note where the antibody reacts - immediate spin or IAT? Was the panel tested at the same phase the reaction occurred in?

ii) How soon after the original testing, was the panel performed? Was the sample stored properly?
iii) Is the reactive cell double dose (from an apparent homozygous donor) for any common antigen and is there another cell double dose (from an apparent homozygous donor) for the same antigen that can be used to repeat the result?
iv) Will enhancement media help reveal a weak reacting alloantibody pattern, i.e. Enz, PEG, LISS with a longer incubation time, or polybrene?
v) If none of this adds any information about antibody specificity, you may have an antibody directed against a low frequency antigen. While the identity of the antibody is a puzzle, it is rarely a significant problem when looking for compatible units of red cells for transfusion. If you have time to play with it, use Antigen Plus to locate as many low incidence antigen positive cells

as you have listed under special antigens. If none of them react, and you still wish to resolve the specificity, send the sample to a reference lab for crosstesting. Most reference labs keep their unidentified lows in hopes of finding another example.

5. If your routine test method can detect weak reacting autoantibodies at any phase of testing, positive antibody screen results can lead to a common panel result of several weak reactions with no specificity determined. Antigen Plus will perform exclusions based on its policy and may well exclude all common specificities depending on the number of reactions and phenotype of the cells which do not react. The technologist should follow his or her Blood Bank SOP for antibody identification which should address this type of panel testing outcome. Depending on method used, patient population and number of occurrences, the most common choices are likely to include:

i) Try more sensitive method if an alloantibody may be just forming or was not stimulated in the recent past.

ii) Repeat the original test by a less sensitive method, e.g. from solid phase testing back to tube LISS-IAT (a common approach to dealing with the very sensitive capabilities of solid phase testing.)

iii) Seen only at immediate spin – assess possible clinical significance and drop the IS test if appropriate.

Use the prewarm method only after significant antibodies (anti-Vel, anti-PP_1P_k, anti-H in a Bombay) have been excluded.

Backing Up

Your database is backed up on our Cloud server hosted by Microsoft Azure™. Any problems retrieving data should be immediately brought to our attention at customerservice@antigenplus.com

Additional Information About Antigen Plus

Antigen Plus is written using Microsoft Visual Studio and SQL Server. It was designed for the reference laboratory by Michael W. Lankiewicz, M.D., a hematologist with an overworked staff, in order to save untold hours of searching and drudgery; and originally programmed by Peter Rowny, a blood donor, with additional improvements for the hospital transfusion service designed by Dawn M. Rumsey, ART (CSMLS) BB(ASCP)CM.

COPYING TEXT FROM THE SCREEN

The text in the Full description box on the Save and Load panel screens and the text in the Help screens can be copied into another application by highlighting the text by placing the mouse cursor at the beginning of the text to be copied, holding down the right mouse button and dragging the cursor across the text to be copied. The text will be highlighted. Release the mouse button and press the "Ctrl" and "C" keys on your keyboard simultaneously. The text will then be copied to the Windows Clipboard and can be copied into any Windows application that has a Paste function.

COPYING TEXT TO THE FULL DESCRIPTION BOX

Text from the Windows clipboard may be copied into the Full description box on the Save screen. When the cursor is flashing in that box press the "Ctrl" and "V" keys on your keyboard simultaneously. The text you have copied from another application will be pasted into the description of the panel and may be saved with the Panel Key name by clicking the Save button on the screen.

Programming Notes

Antigen Plus is written in Visual Basic Studio and uses a SQL Server database. Users familiar with SQL Server may open the databases and produce reports, run queries, and generally explore record layouts and file structure for purposes of importing data held in other databases. Be sure to back up the original database before attempting any of these procedures.

Appendix

Guide to ISBT numbers used in Antigen Plus
(taken from ISBT web site)

http://www.isbtweb.org/fileadmin/user_upload/WP_on_Red_Cell_Immunogenetics_and/Updates/Table_of_blood_group_antigens_within_systems_v3.3_131028.pdf