For a proper use of Radiolab is essential to read thoroughly this manual
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Introduction

According to ISO 8402, traceability is the ability to verify the history, location, or application of an item by means of documented recorded identification. With respect to Radiopharmacy, traceability can be defined as those procedures that allow to know the identity, the history and the trajectory of a radiopharmaceutical or batch of radiopharmaceuticals along their production chain, from the first steps of their preparation to their dispensing. In other words, the traceability of a radiopharmaceutical consists basically of tracking this radiopharmaceutical and all the products involved in its preparation chain. Therefore, all information related to radiopharmaceuticals through their production and supply chain must be recorded in order to obtain their traceability.

The primary purpose of the rules governing medicinal products is to safeguard public health. Each radiopharmaceutical medicine is produced to respect safety, efficacy and quality of the product according to Good Manufacturing Practices in accordance with the quality standards appropriate for their intended use and as required by the applicable marketing authorization or product specifications. In addition to the pharmaceutical regulation, an important issue is the radioactive part of the radiopharmaceuticals. A reliable traceability is the key to improved safety and therefore radiopharmaceuticals must be continuously monitored from production site to the final patient (batch number, vial, date and hour of production and administration, activity, etc.).

With the introduction of new guidelines and statutory requirements, the quality requirements for the production of radiopharmaceuticals have increased significantly. The down side of this increase in quality assurance is the great increase of paperwork, before, during and after the production of radiopharmaceuticals. Increasingly you now have to justify, report and validate each process in your radiopharmacy: preparation of radiopharmaceuticals, quality control, stock management, waste management, etc. All these work processes are based on national and international guidelines and statutory requirements. Besides, every hospital or institute has its own way of working.

With Radiolab you do not need to change the way you work, because this software fit into your work processes without changing your workflow. The only way to realize this is with a flexible system that complies with the guidelines and requirements. And that is what Radiolab offers with a modular structure and customizable system settings.

Radiolab has been developed in the Windows environment so that it is easy to learn and use. It is a database application with which you can record, store and manage all the information generated by the activity of your radiopharmacy, thus providing an immediate and complete traceability of all preparations, controls, dispensations of...
radiopharmaceuticals, as well as a great help in the management of orders, stock and radioactive wastes.

Radiolab can work both as a desktop application and as a multi-user mode, allowing multiple users from different computers gain access to the same file and work simultaneously.

Radiolab is a modular software system consisting of 12 interrelated modules. Each module has a different colour or tonality to help their identification at first glance. Five of these modules are of compulsory use (Orders, Generators, Labelling, Dispensing and Maintenance) in order to achieve a proper traceability. Four of them are of optional use (Controls, Protocols, Reports and Agenda). And three modules show the results from its relationship with other modules (Stock, Waste and Traceability).

Radiolab can automatically import prescriptions of radiopharmaceuticals to patients through a computer file (such as xls, txt, etc.) generated from any NMIS (Nuclear Medicine Information System).

Eventually, it is necessary take into account that for proper use of Radiolab it is very important to read very carefully this manual.

Any doubt, however small or large it may be, it will be solved by email support by writing to us at radiolab@radiopharmacy.net

Diagram of relationships between the modules of Radiolab
Previous requirements to install Radiolab

The system requirements of your computer to install and use Radiolab are:

- Microsoft Windows 7 or newer.
- 1 GHz processor.
- 1 GB of RAM.
- The minimum screen resolution required for proper display of Radiolab is 1024x768 pixels.
- Microsoft Access 2013 or 2016. If you do not have installed any of these versions of Access, it can also work installing its freely available runtimes.
- Microsoft Excel 2013 or 2016. This requirement is not essential but if it is not installed, the links of Radiolab with Excel do not work.
- Adobe Reader which can be freely downloaded from the Internet. It is necessary for the operation of the Protocols module and to manage radiochromatograms in pdf format.
Installing Radiolab

Radiolab is installed on your PC by the installation file called Radiolab-4.2-Setup.exe. When you run this installation program it opens the following window:

Close all other applications and click "Next" to proceed to the next window:

After reading the license agreement, click on "I accept the agreement" and click "Next", so it will open the following window with information about the installation:
By clicking "Next" it will open the following window:

Click the option “Create a desktop icon” to create a shortcut icon on the desktop to Radiolab (recommended). Then click "Next" and the following window will open:
When you click in "Install" a window appears with a progress bar of the installation, which takes a few seconds:

Then the following window is opened:
Clicking "Next" displays the last window where it gives the option to run the program.

If the option “Launch Radiolab” is selected, when you click on “Finish” it will be opened the following window:
During the 30-day trial you can access the demo of Radiolab without registering the program by clicking on "Enter".

You can do that during 30 days for testing the program with some restrictions on its features (see the section “Access control to Radiolab”).
Possible installation problems

It is possible that some error messages appear when you install Radiolab, because some type of missing file, such as dll, ocx, etc. This is due to differences between the various versions of Windows operating systems (XP, Vista, 7, 8 or 10). These problems can be easily solved by searching in the Internet these missing files, copying them into the appropriate directory and registering them in the cmd console. Anyway, you can send us an email (radiolab@radiopharmacy.net) with a detailed description of the error message so that we can guide you step by step through the process of solving the problem.

Updating Radiolab

Radiolab is in continuous development to expand its capabilities. Whenever a new version of the program appears, you can update the version you have installed. To do this there are two possibilities:

1) Update by the file “Radiolab-update.exe”. In this case you do not need to uninstall the previous version nor any other precautions.

2) Update by the file “Radiolab-setup.exe”. In this case must follow the following steps:

- In order of not to lose the data of your records, that is, all information that you have introduced, make a backup of the database Radiolab (see the section Backup in the Maintenance module).

- Run the file “Radiolab-setup.exe” of the latest version of the program. It is not necessary to uninstall the previous version.

- Restore your database which you made a backup (see the section Database recover of Maintenance module).

It is very important to carry out backups of the Radiolab database, not only in the case of making upgrades of the program, but also as a security measure to avoid losing all the data we have introduced in the program, in case of serious mishaps in the computer where you have installed the database. For this reason is highly recommended to read very carefully the sections of Backup and Recover of the Maintenance module.
Uninstalling Radiolab

**Warning**: If you are going to uninstall Radiolab but you want to keep all the data you entered in it, you should save a copy of Database_Radiolab.mde file in a location different to “C:\Radiolab” prior to uninstalling the program.

To uninstall Radiolab run the uninstaller file that you will find in the Radiolab start menu or in the control panel of your operating system. The following window will appear:

![Uninstall window](image)

When you click "Yes" a window appears with a progress bar which takes a few seconds:

![Uninstall status window](image)

Then the following window opens:

![Uninstall completion window](image)
Registering Radiolab

After testing the program and stating that it meets your requirements, you can purchase the registration key of Radiolab, which will allow you to use the program fully and indefinitely in your computer. In addition, you can also request a personalized quote, describing any necessary modifications to customize Radiolab to the particular way of managing your radiopharmacy.

When you buy a license for Radiolab, you will receive an email with a key to activate the registered version of Radiolab, which will make a final version that can be used indefinitely on the computer in which it is registered. You only have to enter the registration key and click on "Register".

It will appear the following message:
Access control to Radiolab

The Access Control to Radiolab allows protecting data and registering the name of the user who created or modified any record. When Radiolab is registered the user access control is activated. Then the administrator of the radiopharmacy (ADMIN) may authorize the access to Radiolab to the staff of the radiopharmacy by creating users and assigning them passwords (as described below). After registering Radiolab, the next time the program is opened it is displayed for the first time the following window:

Clicking on the combo box “User” it will display the list of users, which at first has only the administrator (ADMIN).

Select "ADMIN", enter the password "admin" and click on the button with the keys
To change the administrator password and to add new users and passwords, you must open the “Maintenance” module and click on the button "USER". Then, in the window of "User data", click on the button "Permissions" and the following window will be opened:

Here you must type the password of the Administrator ("admin" if it has not been changed) to open the following window:

In this window the administrator (ADMIN) can change her or his password (by default is "admin"), add new users with their corresponding passwords, change user names or their passwords and delete users.

You must NEVER remove or change the user "ADMIN".
However, you can change the password “admin” but if you do it, you must save the new password in a safe place in the case that you forget it.
Getting Started with Radiolab

Although for a proper use of Radiolab is essential to read thoroughly this manual, in this section it is summarized the initial steps to be performed.

When Radiolab is installed you found a nearly empty database, so it cannot be of any use until you introduce some related data of your radiopharmacy.

You must begin entering the data of your radiopharmacy and the staff. To do it open the Maintenance module, then open “USER” and enter you data.

The data that you enter in the fields Hospital, Section and Unit will appear in the page header of the reports. And the name that you enter in the field Signed will appear in the page footer of the reports.

Then open “STAFF” and enter the names and other data of the radioharmacy staff.

Although the Catalog is already loaded with a few records of studies and radiopharmaceuticals, you must customize your catalog. To do this open the Maintenance module, then open “CATALOG” and enter you data. You can delete or modify the existing records or add new records.
The first module you must start working with is the *Orders* module. But before you start doing any order, you must create your own list of radionuclides, suppliers and products.

In the radioactive *Orders* section, by clicking on the button ![radioactive symbol] you can introduce the authorized radionuclides in your radiopharmacy, assigning for each radionuclide its physical half-life (in hours), its maximum permissible activity and, if necessary, its group in the classification of radioactive waste, and the number of pit and alveoli where it must be stored as radioactive waste until its declassification and disposal. They are already several exemplary records which may be modified or deleted.

You must enter the data of your suppliers by clicking the button ![truck] in any of the three sections of *Orders*. They are already some exemplary records which may be modified or deleted.

You must enter the data of the radioactive products supplied by each supplier by clicking on the button ![radioactive products] in the *Radioactive products* section. They are already various exemplary records which may be modified or deleted.

You must enter the data of cold kits, supplied by each supplier, in the *Cold kits* section by clicking on ![cold kit]. They are already several exemplary records which may be modified or deleted.

You must enter the data of disposable materials, supplied by each supplier, in the *Disposable materials* section by clicking the button ![disposable materials]. They are some exemplary records which may be modified or deleted.

After entering the above data, you can start ordering your products. But the first orders must be those of the stocks that already are in your radiopharmacy, so that they can appear in the stock of Radiolab, so doing possible their use for labelling and dispensing.

Now you can begin to work with modules Generators, Labelling and Dispensing.

Optionally, you can use the modules Controls, Reports, Protocols and Agenda.
Form view and datasheet view

Almost every module of Radiolab can be displayed as form or as a datasheet. To illustrate this with an example we use the Orders module.

Clicking on the button , the request and receipt forms will be shown as datasheets:
Now clicking on the button we will see again the form views.

**Editing and deleting records when Radiolab is registered**

For security and data protection in Radiolab the majority of records are protected from being edited and deleted, thus preventing any record of being modified or deleted by mistake or intentionally. To illustrate this we use the Orders module. If in the view datasheet you select a record with the right mouse button, in the context menu is not active the option "delete record". Likewise, we cannot modify any field of any record.

However, it is not unusual to make mistakes when entering data into a record, being necessary modify or delete that record. To do it you must click the button and the following window will appear:

In this window it must entered the password of the user who opened the program.

Then clicking the button the edit control buttons appear.
Clicking the button \[\text{lock}\] these buttons will hide again.

Clicking the button \[\text{share}\] it will open the next window:

```plaintext
Radiolab

⚠️ Do you want to activate the possibility of delete records?

Yes  No
```

Clicking the button "Yes" the user will be able to delete records under their responsibility.

Clicking the button \[\text{edit}\] the user will be able to edit and modify records under their responsibility. In the database it is recorded the name of the user who has modified the record.

Clicking the button \[\text{view}\] it will be shown the name of the user who created or modified that record.
Editing and deleting records when Radiolab is not registered

When clicking the button 🗝️ in any module the following window will appear:

Without entering any password, you must click the button 🔑 and the following message will appear:

Click OK

Once again in this window, without entering any password, click the button 🔑 and the edit control buttons will appear. 
Additional information

• Auto Backup
Every time that Radiolab is closed it appears the following window:

![Backup window]

Do you want to make a backup of the database of Radiolab before you close the program?
The backup will take place in 'C:/Radiolab backup' replacing the last performed backup.

Clicking “Yes” a backup of the database is automatically performed in “C:/Radiolab backup” replacing the last performed backup.

• Displacement between the fields of the same record
To move from one field to the next within each record it is recommended to use the tab key, although you can also use the mouse cursor.

• Protected fields
Some fields are automatically filled, not being possible to write into them.

• Not correct format of field
It may be that when introducing the value of a field, an alert box appears warning that the format of this field is not valid. In such cases you must check in this manual the correct format of that field.

• Contextual menus
Both forms and reports have contextual menus. The forms have two contextual menus: one that opens with double-click of the left mouse button on the form and another that opens with right-click on any of the fields in a record. The following is an example:
Below the contextual menu of a report is displayed, which is opened with the right mouse click on any part of the report.

- **Entering dates and times**

The fields (boxes) for entering hours have an input mask, so that for example to enter the time "9:30" would write "0930".

How to enter a date in a date box will depend on the format in which your operating system is configured. If the format is "dd/mm/yyyy" you should type "ddmmaa". For example to enter 28/04/2017 you must type "280417".

How to enter a date and time in a date and time box will depend on the format in which your operating system is configured. If the format is "dd/mm/yyyy hh:mm" you should type "ddmmaahhmm". For example to enter 28/04/2017 09:30 you must type "2804170930".

Some date boxes incorporate a small calendar for entering the date, whose opening icon appears when the cursor is placed on the frame.

In these cases you can enter the date with the help of this calendar or write it directly, but in this case there is no input mask, so to write the date we also have to write the "/" tabs. For example 07/05/2017.
Orders module

The Orders module enables the management of orders of raw materials in your radiopharmacy. The correct use of this module is essential for the proper functioning of the modules Dispensing, Stocks, Generators, Labelling, Waste and Traceability.

This module consists of three sections:
- Radioactive products
- Cold kits
- Disposable materials

Each section allows the simultaneous display of data concerning both the issuance (above) and the reception (below) of orders.

Next it will be explained in detail only the Radioactive products section, as the other two sections work in much the same way.

When Radiolab is installed the Orders form looks like this:
It contains a first record, as an example, with an order and its corresponding reception of 123I-MIBG in January 2016. Therefore, a small amount of I-123 will appear in the Waste module.

**Important:** Do not delete this record. You must enter your first order record by modifying the data of this first example record. To do this you must first click on the button ![button](image) and then you must first click on the button ![button](image), which will allow you to modify the data of that record.

The *Radioactive products section* consists of two boxes for data entry, one for the request or issuance of orders and the other for receiving them.

The *Request* frame contains the following fields:

- **Reference**: this is the internal reference code we assign to each order. This field does not allow duplicate values to ensure traceability of products. Each user can create their own type of reference. In the example of the figure above the reference is "PRCA16/183", where PRCA is an identification code chosen by the administrator of this radiopharmacy. The number 16 indicates the year (2016) and the number 183 is the order number of that request in that year. Thus, the following reference order would be PRCA16/184, and so on. Following this method of naming, the first order of 2017 would be PRCA17/001. But anyway, each user can apply their own criteria in the way of creating these references.

**NOTE**: the traceability cannot rely on the manufacturer's batch, because it is possible the existence of different products with the same batch, as in the case of cyclotron produced radionuclides. So you can receive in the same week $^{67}$Ga citrate, $^{131}$I capsules, $^{131}$Na oral solution, citrate $^{90}$Y and so on, all of them with the same manufacturer's batch. For this reason the field *Reference* is crucial for proper traceability.
- **Supplier**: This field displays the list of your suppliers to select one, that is to say, the name of the company that manufactures or markets the product you want to buy. You can enter the data of your suppliers by clicking the button in any of the three sections of *Orders*.

- **Product**: This field displays the list of products of the supplier you have selected above. You can enter the data of the radioactive products, supplied by each supplier, by clicking on the button in the *Radioactive products* section, within the *Order* module.

You can enter the data of cold kits supplied by each supplier, by clicking the button in the *Cold kits* section, within the *Order* module.

You can enter the data of disposable materials, supplied by each supplier, by clicking the button in the *Disposable materials* section, within the *Order* module.

- **Radionuclide**: this field displays the list of radionuclides, available or authorized in your radiopharmacy, to select the one that corresponds to the product being requested. It is further explained how to generate our list of authorized radionuclides. You can enter the authorized radionuclides in your radiopharmacy by clicking on the button in the *Radioactive Products* section, within the *Order* module.

- **Order date**: this is date at which you are coursing the order.

- **Delivery date**: this is the date and time you want to receive the requested product.

- **Calibration date**: this is the date and time at which the activity of the product is calibrated.

- **A calibrated**: this is the reference or calibrated activity (mCi) that you request.

- **Quantity**: number of units of product that are ordered.

- **A required**: this is the activity (mCi) of the product at the date and time of its reception in the radiopharmacy. This value is automatically calculated by Radiolab from the calibrated activity, and the date and time of receipt.
- Order validation: this is a box to verify that the order has been issued.

- Operator: this field displays the list of the radiopharmacy staff in which can be selected the name of the person who place the order. The data of the radiopharmacy staff can be entered in the Maintenance module.

- Supplier validation: this is a box to verify that the supplier has confirmed the order.

- Comments: this field allows you to record any comment about your order.

The button (on the form view) issues the report of the order (in Microsoft Word format). In the datasheet view, this report can be issue by clicking on the field Reference of the Request box.

The Reception frame contains the following fields:

- Reference: previously entered in the Request frame.

- Product: previously entered in the Request frame.

- Receipt date: the date and time when the ordered product is received.

- Batch: manufacturer batch of the product.

- A calibrated: this is the reference or calibrated activity (mCi) that you receive. This activity may be different from the one requested.

- Quantity: number of units of the product that are received. It may be different from the number of units that were requested.

- Calibration date: date and time at which the activity of the product is calibrated. It may be different from the one requested.

- Expiration date: date and time when the product expires.

- Receipt: this is a box to verify that the order has been received.
- **Cancellation**: this is a box to indicate that the order has been cancelled because it has not been received or vice versa. The cause can be indicated in the *incidents* field.

- **Operator**: this field displays the list of the radiopharmacy staff in which can be select the name of the person who has received or cancelled the order. The data of the radiopharmacy staff can be entered in the *Maintenance* module.

- **Incidents**: this field allows recording any notes or comments of the incidents related with the orders.

**Warning**: to add, delete or modify records in the *Reception* frames you must activate the edition controls. See the section “Editing and deleting records when Radiolab is registered” or “Editing and deleting records when Radiolab is not registered”.

The *Radioactive products* section of *Orders* module has the following toolbar:

By placing the mouse cursor over each button, it is displayed help information about their function in the text box beneath the toolbar.

The functions of these buttons are as follows:

The button updates the records of the *Reception* frame after adding new records in the *Request* frame.
The button Opens the window of radionuclides:

In this window can be entered data of radionuclides that are authorized in your radiopharmacy, in order to generate your own list of radionuclides, thus enabling the software to perform the calculations related to them. In this window should also be recorded the maximum permissible activity for each radionuclide, in order that exceeding the requested activity of a given radionuclide, the software will display a warning such as the one shown below:
The button opens the window where can be entered the available suppliers:

![Suppliers Window]

The button opens the window where can be entered the radioactive products available for each supplier:

![Radioactive Products Window]
The button changes the screen from the datasheet view to the form view.

The button changes the screen from the form view to the datasheet view.

The button opens the application form of radiopharmaceuticals.

The button opens the application sheet of radiopharmaceuticals.

The button activates a filter to see only the records of orders waiting to be received.

The button activates a filter to display only the records of orders waiting to be confirmed by the supplier.

The button deletes the above filters, displaying all records.

The button opens the search and replacement screen.

The button opens a report with all the orders pending to be received.

The button opens the following window:

![Reports window](image)

This window allows issuing a report of radioactive products received, a report of total activities of radionuclides, and a report of expenses incurred in radioactive products, according to a date range defined by the user.
The button opens the following window:

![Image of Labels for radioactive products window]

This window allows to print small, medium and large labels for the radioactive products.

The button closes the module in which we are.

Both the Cold kits section and the Disposable materials section work just like the Radioactive products section.

**Important advice:** products such as Octreoscan or Zevalin must be registered both in the Radioactive products section and in the Cold kits section, so that the radionuclide reference and the kit reference are available in the labelling module.
Generators module

The *Generators* module consists of two submodules: generators of $^{99m}$Tc and generators of $^{68}$Ga.

Generators of $^{99m}$Tc

The *Generators* module consists of two sections: *Elutions* and *Disposal*. The correct use of this module is essential for the proper functioning of the modules Dispensing, Stock, Labelling, Waste and Traceability.
• Generator elutions

The following fields can be recorded in this section:

**Elution Ref.:** this is the internal reference code that the user assigns to each elution. This field does not allow duplicate values to ensure traceability of products. Each user can create their own type of reference. In the example of the figure above the reference is "E16/305", where “E” (from elution) is an identification code chosen by the administrator of this radiopharmacy. The number 16 indicates the year (2016) and the number 305 is the order number of that request in that elution. Thus, the following reference order would be “E16/306”, and so on. Following this method of naming, the first elution of 2017 would be E17/001. But anyway, each user can apply their own criteria in the way of creating these references.

**NOTE:** the field *Elution Reference* is crucial for proper traceability.

- **Order reference:** this field displays a list of generators that are in stock and not expired, in which the user selects the reference code that was associated with the generator in the *Orders* module.
- **Batch:** manufacturer’s batch of the generator. It was introduced in the *Orders* module.
- **A calibrated:** activity of $^{99}$Mo (mCi) of generator at the calibration time. It was introduced in the *Orders* module.
- **Calibration:** calibration date of the generator. It was introduced in the *Orders* module.
- **Elution Nº:** number of order of elution: 1, 2, 3, ... This value is calculated automatically by the software.
- **Date and time:** date and time at which the generator is eluted
- **A eluated:** eluated activity (mCi).
- **A theoretical:** theoretical activity which should be eluted by the generator. This value is calculated automatically by the software.
- **Yield (%):** elution yield. It is automatically calculated by the software.
- **V (ml):** elution volume (ml).
- **A/V:** concentration of the radioactive eluate (mCi/ml). It is automatically calculated by the software.
- **$\mu$Ci $^{99}$Mo / mCi $^{99m}$Tc**
- **Al$^{3+}$:** concentration of Al$^{3+}$ in the eluate (in ppm or µg/ml).
- **pH:** of the eluate.
- **Operator:** this field displays the list of staff to select the name of the person who made the elution of the generator and its quality controls.
- **Comments**
- **Apt:** in this box is validated that the eluate is apt for use.
The button 
prints the record sheet of generators elutions.

The button 
allows issuing reports of elutions made from the generators.

- **Removal of generators**

This section is of optional use.

![Removal of generators of Tc-99m](image)

The following fields can be recorded in this section:

- **Removal request**: date of application for removal the generator.
- **Order ref.**: reference code that the user assigned the generator in the *Orders* module.
- **Removal date**: date requested for the removal of the generator.
- **Batch**: manufacturer batch of the generator. It was introduced in the orders module.
- **A cal (mCi)**: calibrated activity of the generator in mCi. It was introduced in the *Orders* module.
- **Calibration**: calibration date and time of the generator. It was introduced in the *Orders* module.
- **Supplier**: company that supplies and removes the generators. It was introduced in the *Orders* module.

The button [prints the records sheet for removal of generators.](image)

The button [opens the following window:](image)

This window allows issuing a report of removal of generators.

The button [opens a report with the generators not withdrawn from the radiopharmacy.](image)

The button [opens the search screen. You must place the cursor on the field where you want to search](image)

### Generators of $^{68}$Ga

The submodule generators of $^{68}$Ga works exactly like the submodule generators of $^{99m}$Tc.
Labelling module

The Labelling module consists of four sections: Kits, Leukocytes, Erythrocytes and Platelets. The correct use of this module is essential for the proper functioning of the modules Dispensing, Stock, Waste and Traceability.

- Cold kits labelling

The following fields can be recorded in this section:

  - **Labelling Ref.**: this is the internal reference code that the user assigned to each kit labelling. This field does not allow duplicate values to ensure traceability of products. Each user can create their own type of reference. In the example of the figure above the reference is "K16/1271", where “K” (from kit labelling) is an identification code chosen by the administrator of this radiopharmacy. The number 16 indicates the year (2016) and the number 1271 is the order number of that request in that labelling. Thus, the following reference order would be "K16/1272", and so on. Following this method of naming, the first labelling of 2017 would be K17/0001. But anyway, each user can apply their own criteria in the way of creating these references.

  **NOTE**: the field Labelling Reference is crucial for proper traceability.
- **Date**: date of the labelling.
- **Time**: time of the labelling.
- **Kit Ref.**: making click on this field will display a list of the available ligands (kits) in stock. When the user select one of them, it will be displayed a list with the kit references that was associated with these kits in the order module, to select one of them.
- **Ligand**: this field is completed automatically by the software from the kit reference selected.
- **Kit batch**: manufacturer batch of the kit. This field is automatically filled by the software.
- **Expiration date**: expiration date of the kit. This field is automatically filled by the software.
- **Radionucl. Ref.**: making click on this field will display a list of the available radionuclides in stock. When the user select one of them, it will be displayed a list with the kit references that was associated with these radionuclides in the order module, to select one of them.
- **Radionuclide**: this field is automatically filled by the software.
- **Radionuclide batch**: this field is automatically filled by the software.
- **A (mCi)**: labelling activity (mCi).
- **V (ml)**: labelling volume (ml).
- **QC1**: internal reference code assigned to the first quality control of radiochemical purity of the labelling. Double-clicking this field opens the radiochromatogram of the radiochemical purity control, provided that it was saved in pdf format inside the folder "RadioC", which should be in the same folder that the file "Database_Radiolab.mdb". For example, assuming that the internal reference code was 0411, the file name should be “0411.pdf”.
- **CC2**: internal reference code assigned to the second quality control of radiochemical purity of the labelling (where applicable). Double-clicking this field opens the radiochromatogram of the radiochemical purity control, provided that it was saved in pdf format inside the folder "RadioC", which should be in the same folder that the file "Database_Radiolab.mdb". For example, assuming that the internal reference code was 0412, the file name should be “0412.pdf”.
- **% R.P.**: radiochemical purity of the radiopharmaceutical extemporaneous preparation, expressed in percentage value.
- **Apt**: in this checkbox is validated that the radiopharmaceutical extemporaneous preparation meets the requirements for radiochemical purity.
- **Operator**: this field displays the list of staff to select the person making the labelling and quality control of the radiopharmaceutical.
- **Validate**: checkbox to validate the quality control by the specialist practitioner responsible (SPR) of the radiopharmacy, thus authorizing the dispensing of the radiopharmaceutical. Validation is protected by a password so that only the SPR can perform validations. This password can be set and change in Maintenance/User/Permissions.

The button prints the records sheet for kits labelling.

The button opens the following window:

In this window can be set how far in advance the program must alert that a batch of cold kits is going to expire by the following window:

If you try to record the labelling of a kit with a batch which has expired, it opens the following message:
The button opens the following window:

![Radiochemical purity reports window](image)

This window allows issuing a report of kits labelling and radiochemical purity tests, depending on an interval of dates defined by the user.

The button opens the following window:

![Labelled kits reports window](image)

In this window you can issue a report of consumed cold kits vials, according to an interval of date defined by the user.

The button prints the labels for the radio labelled vials

![Radio labelled vials label](image)
• Leukocytes labelling

The following fields can be recorded in this section:

- **Date**: date of the labelling.
- **Patient name**.
- **Labelling Ref.**: internal reference code that the users assign to the leukocytes labelling, for example LL16/032.
- **PAO Labelling Ref.**: internal reference code assigned to the labelling of the HM-PAO vial in the section of Kits labelling.
- **Q.C. Ref.**: internal reference code assigned to the quality control of radiochemical purity of $^{99m}$Tc-PAO in the Controls section.
- **Tc-PAO %RP**: percentage of radiochemical purity of the $^{99m}$Tc-PAO preparation.
- **% Labelling yield**: labelling yield of leukocytes expressed in percentage term.
- **A (mCi)**: activity (mCi) of the dispensed labelled leukocytes.
- **Labelling start time**: time at which the blood sample for leukocytes labelling was delivered into the radiopharmacy.
- **Dispensing time**: time when the labelled leukocytes were dispensed.
- **Operator**: this field displays the list of staff to select the name of the person who performed the leukocytes labelling.
• Erythrocytes labelling

The following fields can be recorded in this section:

- **Date**: date of the labelling.
- **Patient name**.
- **Labelling Ref.**: internal reference code that the users assign to the erythrocytes labelling, for example EL16/039.
- **Radionuclide**: radionuclide with which the labelling was performed.
- **Batch**: manufacturer batch of the radioactive product that contains the radionuclide.
- **% Labelling yield**: labelling yield of leukocytes expressed in percentage term.
- **A (mCi)**: acclivity (mCi) of the dispensed labelled erythrocytes.
- **Labelling start time**: time at which the blood sample for erythrocytes labelling was delivered into the radiopharmacy.
- **Dispensing time**: time when the labelled erythrocytes were dispensed.
- **Operator**: this field displays the list of staff to select the name of the person who performed the erythrocytes labelling.
• Platelets labelling

The following fields can be recorded in this section:

- **Date**: date of the labelling.
- **Patient name**.
- **Labelling Ref.**: internal reference code that the users assign to the erythrocytes labelling, for example PL16/039.
- **Radionuclide**: radionuclide with which the labelling was performed.
- **Batch**: manufacturer batch of the radioactive product that contains the radionuclide.
- **% Labelling yield**: labelling yield of platelets expressed in percentage term.
- **A (mCi)**: acclivity (mCi) of the dispensed labelled platelets.
- **Labelling start time**: time at which the blood sample for platelets labelling was delivered into the radiopharmacy.
- **Dispensing time**: time when the labelled platelets were dispensed.
- **Operator**: this field displays the list of staff to select the name of the person who performed the platelets labelling.

Within each section of the Labelling module (in the form view mode), there is the button which print a report of the labelling.
Dispensing module

The Dispensing module consists of two sections: Dispensing and Prescriptions. The correct use of this module is essential for the proper functioning of the modules Stock, Waste and Traceability.

The prescription of radiopharmaceuticals can be done in the Dispensing section manually (entering data with the computer keyboard) or automatically in the Prescription section.
Dispensing

In this section must be recorded the following fields:

- **Date** when the dose of radiopharmaceutical is dispensed or administered.
- **Time** when the dose of radiopharmaceutical is dispensed or administered.
- **Patient**: name of the patient.
- **Birthdate** of the patient.
- **Radiopharmaceutical**: this field displays the list of radiopharmaceuticals to select one. The radiopharmaceuticals that appear on this list are those that were introduced in the Catalog of the Maintenance module.
- **A (mCi)**: dispensed or administered activity (in mCi) of the radiopharmaceutical.
- **Patient age** which is automatically calculated from their date of birth.
- **Effective dose in mSv**, which is automatically calculated, according to ICRP, from the radiopharmaceutical administered, its activity and the age of the patient. In the case of radiopharmaceuticals not covered by ICRP, this box will remain blank. See section on calculation of effective doses.
- **Radiopharmaceutical Ref.**: internal reference associated to the dose of radiopharmaceutical dispensed. In the case of a radiopharmaceutical ready for use it must be introduced the internal reference of the order module, in the case of a dose of $^{99m}$Tc-pertechnetate it must be introduced the reference of its elution, and in the case of an extemporaneous radiopharmaceutical it must be introduced the reference of its labelling. It is very important to follow these rules for the proper traceability of the dispensed radiopharmaceuticals.

**WARNING**: the field *Reference* is crucial for proper Traceability, Stock and Waste.

- **Study** (or treatment): This field displays the list of studies or treatments to select one. The studies or treatments listed here are those introduced by users in the Catalog of the Maintenance module.
- **Scheduled**: box to verify that it is a scheduled dose. By default, when creating a new record the box is not checked, i.e. the new record is considered as corresponding to a dose of radiopharmaceutical unscheduled (e.g. urgent). The scheduled doses are loaded manually or automatically (data import) in the Prescriptions section of this module.
- **Administered**: box to verify that the dose of radiopharmaceutical has been administered. By default, when creating a new record, the box is checked, i.e. the dose considered to be administered. If finally the dose is not administered for any reason, you should uncheck the box manually.
- **Invoiced**: box to verify that the dose of radiopharmaceutical has been billed. By default, when creating a new record, the box is checked, i.e., the dose is considered to be invoiced. If ultimately the dose is not invoiced for any reason, you should uncheck the box manually.

When the standard or maximum activity of a given radiopharmaceutical (for a given study in your catalog) is exceeded the software will display an alert message:

![Exceeded dose activity](image1)

When a wrong radiopharmaceutical (for a given study in your catalog) is dispensed the software will display an alert message:

![Wrong radiopharmaceutical](image2)

The button ![prints](image3) prints the records sheet for prescriptions of non-scheduled doses.

The button ![filter](image4) filter the records of Dispensation, showing only the dispensations of the selected day in the calendar of the module.
The button removes the previous filter, returning to show all the records of Dispensation.

The button opens the search and replacement screen. You must place the cursor on the field and record you want to search or replace.

The button opens the following window:

![List of doses of radiopharmaceuticals](image)

The button prints the list of doses of radiopharmaceuticals.

The button shows the list of doses of radiopharmaceuticals.

This list has the following items:
- Date of administration.
- Time of administration.
- Name of the patient.
- Identification of the radiopharmaceutical.
- Activity (mCi) at the date and time of dispensing.
The button ⬇️ opens the following window:

![Labels for the doses of radiopharmaceuticals](image)

In this window can be printed the labels for the doses of radiopharmaceuticals with the following information:

- Date of administration.
- Time of administration.
- Name of the patient.
- Identification of the radiopharmaceutical.
- Reference of the radiopharmaceutical.
- Activity (mCi) at the date and time of dispensing.

The button ⬇️ changes the module from the datasheet view to the form view.

The button ⬇️ changes the module from the form view to the datasheet view.
The button opens the following window:

![Reports window](image)

The button opens a report of administered radiopharmaceuticals that includes the date and time of dispensing, patient name, radiopharmaceutical and activity (in mCi).

The button opens a billing report of the dispensed doses of radiopharmaceuticals.
Importing prescriptions

In the *Prescriptions* section you can automatically import prescriptions of doses of radiopharmaceuticals.

The button ![open Excel file](image) opens the EXCEL file with the prescriptions of doses of radiopharmaceuticals. This button is for optional use, since it is only necessary if you have to run a macro in EXCEL before importing the prescriptions to Radiolab.

The ![import prescriptions](image) button imports the prescriptions of doses of radiopharmaceuticals from “C:\Prescriptions\Prescriptions.xls”. This Excel file should contain records with the following fields in this precise order: patient's name, study's name, administration's time, radiopharmaceutical, dose activity, date of the study and patient's date of birth.

The file Prescriptions.xls should be generated from the application (RIS) that contains the data to be imported. Radiolab could also adapt such importation to other types of files such as txt.

There are two reasons for doing the transition of the prescription data, from the source application or Nuclear Medicine Information System (NMIS) to Radiolab, through an intermediate file, such as xls. Firstly, the data protection laws prevent direct access to medical data. And second, even if such access were possible, the NMIS can be developed in different systems or programming languages (Access, Oracle, SQL, etc.), which makes it impossible to create a single module of communication between the databases of the NMIS and Radiolab.

The button ![adapt prescriptions](image) adapts the prescriptions to the format of Radiolab when necessary. This button has to be customized to each user.

The button ![transfer prescriptions](image) transfers the prescriptions of doses of radiopharmaceuticals from the *Prescriptions* section to the *Dispensing* section.
Example of importing prescriptions

When Radiolab is installed the Prescripciones.xls file is also installed, containing 40 prescriptions examples.

Clicking the button it should be opened the Excel file Prescriptions.xls, having 40 prescriptions examples. Close the Excel file without saving changes.

Clicking the button those 40 prescriptions examples will be imported from C:\Prescriptions\Prescriptions.xls to the Prescriptions frame of Radioab.

Clicking the button will delete all records of imported prescriptions.

Clicking the button will transfer these prescriptions of doses of radiopharmaceuticals from the Prescriptions section to the Dispensing section.

Then go to the Dispensation section, select the date of these prescriptions in the calendar and click the button to see only these dispensations.
Calculation of the effective doses

The dispensing module automatically calculates the effective doses received by patients according to the radiopharmaceutical, its activity and the age of the patient. These effective doses are calculated according to the indicated by the International Commission on Radiological Protection (ICRP). In this way, the effective doses will be registered for those patients whose radiopharmaceutical administered is contemplated by the ICRP.

The effective doses are calculated in two different moments. Firstly, they are automatically calculated when the prescriptions are imported in the Prescriptions section. And secondly, each effective dose is automatically recalculated when the radiopharmaceutical administered, its activity or the age of the patient are modified.

Up to the time of publication of this manual the radiopharmaceuticals contemplated in Radiolab for the calculation of effective doses are: $^{99m}$TcO$_4^-$, $^{111}$In-DTPA, $^{111}$In-Octreotide, $^{111}$In-Oxine-platelets, $^{123}$I-DATSCAN, $^{123}$I-MIBG, $^{131}$I-MIBG, $^{131}$I-Cholesterol, $^{131}$I-Iodine, $^{153}$Sm-QUADRAMET, $^{18}$F-FDG, $^{51}$Cr-EDTA, $^{51}$Cr-labeled-RBC, $^{99m}$Tc-denatured-RBC, $^{67}$Ga-Citrate, $^{90}$Y-Citrate, $^{90}$Y-Zevalin, $^{99m}$Tc-DMSA, $^{99m}$Tc-DPD, $^{99m}$Tc-HMPAO, $^{99m}$Tc-MDP, $^{99m}$Tc-DTPA, $^{99m}$Tc-Fitate, $^{99m}$Tc-HMPAO, $^{99m}$Tc-IDA, $^{99m}$Tc-labeled-WBC, $^{99m}$Tc-MAA, $^{99m}$Tc-MAG3, $^{99m}$Tc-MIBI, $^{99m}$Tc-Nanocoll, $^{99m}$Tc-Tetrofosmin.

In order to operate the automatic calculation of effective doses, the above radiopharmaceuticals must be introduced into the catalog of the maintenance module of Radiolab. In the event that the calculation of the effective dose of any radiopharmaceutical introduced by you in the catalog does not work, please contact with radiolab@radiopharmacy.net so that we can solve it.
Stock module

It is not necessary to enter any data in this module which provides information on the stock of radioactive products and cold kits, according to the information collected from the modules Orders, Generators, Labelling and Dispensing.

This module consists of two sections: Cold kits and Radioactive products.

- Stock of cold kits

This section shows the number of vials of cold kits for each batch that are not expired, subtracting the consumed vials to the received vials.
Each record of stock of cold kits contains the following fields:

- Reference: this is the internal reference code that you have assigned to each order. This reference was previously introduced in the reception frame of the Cold kits section.
- Product: identification of the type of kit.
- Batch: the manufacturer's batch.
- Expiration date of the cold kit.
- Days remaining until expiration of the kit.
- Number of vials received.
- Number of vials consumed.
- Number of vials in stock.

The button opens the following window

![Expiration notice of kits](image)

On this window can be set how far in advance the program must alert that a batch of cold kits is going to expire.

The button shows a simplified view of the stock without specifying batch or reference.

The button issues a report of the number of vials of each kit in stock.

The button opens the search screen. You must place the cursor on the field where you want to search.
• **Stock of radionuclides**

This section shows the activities of every radioactive product for those batches that remain unexpired, subtracting the activities consumed to those received and applying the corrections for the radioactive decay.

Each record of stock of radioactive products contains the following fields:

- **Reference**: the internal reference code you have assigned to each order. This reference was previously introduced in the reception frame of the **Radioactive products** in the **Orders** module.
- **Product**: identification of the radioactive product.
- **Date and time of expiration of the radioactive product**.
- **Batch**: the manufacturer's batch.
- **Radionuclide**.
- **Received activity**: referred to the moment in which you make the query.
- **Consumed activity**: referred to the moment in which you make the query.
- **Activity in stock**: difference between the received activity (that remain unexpired) and the consumed activity.
In here it is also shown the available activity of $^{99m}$TcO$_4^-$ eluted with less than 10 hours. To calculate this activity, the program adds every activity of the eluates with less than 10 hours and subtract to them the activities used for labelling and activities of $^{99m}$TcO$_4^-$ doses dispensed. All activities are referred to the moment of the query.

The button shows a simplified view of the stock without specifying batch or reference.

The button updates the activities of radionuclides, since these activities are continuously decreasing due to their radioactive decay.

The button issues a report of the activity of each radioactive product in stock.

The button opens the search screen. You must place the cursor on the field where you want to search.
• **Stock of vials labelled with Tc-99m**

This section shows in its upper frame data regarding the labelling of cold-kits vials with Tc-99m: time, activity at the time of labelling (mCi), labelling activity at the present time (mCi) and volume of labelling. The table below shows data on activities and volumes remaining in those vials for which dosages have been dispensed.
Waste module

The *Waste* module provides information on the stock of radioactive waste, according to information collected from the modules *Orders*, *Generators*, *Labelling*, and *Dispensing*.

This module consists of two sections: *Residual activities* and *Radioactive waste disposal*.

- **Residual activities of radionuclides**
  This section shows the activities (in mCi and Bq) of every radioactive product for those expired batch, subtracting the consumed activities to the received activities and applying the corrections for radioactive decay. Only those radionuclides having at least a residual activity of 0.01 Bq are shown.

![Image of module interface showing residual activities]

The button updates the residual activities of radionuclides, since due to radioactive decay these activities are continuously decreasing.

The button issues a report of residual activities.
• Declassification of radioactive waste

In this section can be recorded the following fields:

- **Id**: this field automatically generates an identification number of the radioactive waste container.
- **Type** of container: bag, container of needles, etc.
- **Opening**: date when the radioactive waste container was opened.
- **Closing**: date when the radioactive waste container was closed.
- **Disposal**: date when the content of the radioactive waste container was declassified as radioactive material and could be disposed.
- **Weight** (in kg) of the radioactive waste container.
- **State** of waste in the container: liquid or solid.
- **Group**: This field displays a list of groups of radionuclides for the waste of the container. These groups of radionuclides, as well as the well and alveoli where wastes are left to decay, are defined in the following window, which opens with the button.
- **Activity** of the radioactive waste container when it is declassified as such. The default generated value is "<100 Bq/g".
- **Dose rate** of radiation at the surface of the container of radioactive waste when it was declassified as such. It is recorded the default value "background."
- **Operator**: This field displays the list of staff to select the name of the person who carried out the declassification as radioactive material of the waste container.

The button opens the following window, where can be issued a report of declassification of radioactive waste in a given period of time.
Traceability module

It is not necessary to enter any data in this module. The Traceability module provides information on the traceability and dosimetry, according to information collected from the modules Orders, Generators, Labelling, and Dispensing.

The Traceability module consists of six sections: traceability by radiopharmaceutical reference, traceability by radionuclide batch, traceability by generator batch, traceability by kit batch, traceability by patient name and dosimetry.

• Traceability by patient name
This section displays information for all radiopharmaceuticals administered to a particular patient, detailing for each the date and time of administration, the radiopharmaceutical, its activity (in mCi), the batch (of the generator, kit or radionuclide) or reference of the radiopharmaceutical, the study or treatment for which the radiopharmaceutical was administered, and the effective dose, if it is contemplated in the IRCP.

The button issues a traceability report of the selected patient.

• Traceability by radiopharmaceutical reference
This section shows all the patients who were administered a radiopharmaceutical from a particular reference. Such reference depends on the type of radiopharmaceutical:
- In the case of radiopharmaceuticals ready for use, it is the internal reference assigned to them in the Orders module.
- In the case of $^{99m}$Tc-pertechnetate doses, it is the reference of their elution in the Generators module.
- In the case of extemporaneous radiopharmaceuticals, it is the reference of labelling in the Labelling module.

The information displayed in this section includes: patient name, date and time of administration, radiopharmaceutical, activity, and the study or treatment for which the radiopharmaceuticals were administered.

The button issues a report of traceability of the selected radiopharmaceutical.
• **Traceability by radionuclide batch**
This section displays information of all patients who have been administered radiopharmaceuticals from a given batch of radionuclide. This information includes: patient name, date and time of administration, radiopharmaceutical, activity, order reference, and study or treatment for which the radiopharmaceutical was administered.

The button ![button] issues a report of traceability according to the radionuclide batch.

• **Traceability by generator batch**
This section displays information of all patients who have been administered radiopharmaceuticals that have been prepared from a given batch of generator. This information includes: patient name, date and time of administration, radiopharmaceutical, activity, order reference, and study or treatment for which the radiopharmaceutical was administered.

The button ![button] issues a report of traceability, according to the generator batch selected.

• **Traceability by kit batch**
This section displays information of all patients who have been administered radiopharmaceuticals from a given batch of kit. This information includes: patient name, date and time of administration, radiopharmaceutical, activity, order reference, radionuclide batch, and study or treatment for which the radiopharmaceutical was administered.

The button ![button] issues a report of traceability, according to the kit batch selected.

• **Dosimetry**
The Dosimetry section allows the reporting of the effective doses of all radiopharmaceuticals administered to every patient, as well as the cumulative total effective dose of all of them.

The button ![button] issues a dosimetry report of the selected patient.
Controls module

The Controls module consists of six sections: Activimeter constancy, Activimeter linearity, Radiochemical purity, Cleaning, Microbiological, Temperature and Radiochromatograph. Using this module is completely optional, since no other module Radiolab depend on its operation.

- Activimeter stability controls

The following fields can be recorded in this section:

- **Date**: date when the constancy control was performed
- **Time**: time when the constancy control was performed.
- **Activimeter**: this field displays the list of activimeters to select one. The list of activimeters can be generated and modified by the button.
- **Calibration source**: this field displays the list of radioactive sources for calibration to select one. The list of calibration sources can be generated by the button.
- **A (t)**: activity (mCi) of the radioactive source calibration at the date of the control. There's no need to introduce it, because it is calculated by the software.
- **A (m)**: activity (mCi) measured in the control.
- **% Error**: percentage of error in the measured activity in relation to the theoretical activity of the radioactive source calibration. It is automatically calculated by the software.
- **Operator**: this field displays the list of staff to select the name of the person who performed the constancy control.
- **Comments**: this field allows recording any comment about the constancy control.

The button opens the search and replacement screen. You must place the cursor on the field and record you want to search or replace.

The button opens the window where the data of the activimeters can be entered:

The button opens the window where the data of the radioactive calibration sources can be entered:

The button shows the records sheet for printing.
The button opens the following window:

![Stability controls of the activimeter window]

In this window can be issued a report of the constancy controls performed according to an interval of dates defined by the user.

The button (within the form view) issues a report of the selected control.

The button changes the screen of the module from the datasheet view to the form view.

The button changes the screen of the module from the form view to the datasheet view.
• Activimeter linearity controls

The following fields can be recorded in this section:

- **Reference**: internal reference code that is assigned to the linearity control.
- **Date**: date when the constancy control was performed.
- **Time**: time when the constancy control was performed.
- **Activimeter**: this field displays the list of activimeters to select one.

The list of activimeters can be generated and modified by the button.

- **Operator**: the name of the person who performed the linearity control.
- **Date and time**: date and time when each of the measures were performed.
- **Period**: period of time (in hours) elapsed from the first measurement to each of the subsequent measurements. It is automatically calculated by the software.
- **A (t)**: theoretical activity (mCi) that would correspond to the radioactive source of calibration, according to the date and time of completion of each of the measures of the linearity control.
- **A (m)**: measured activity of the radioactive source of calibration, performed at each date and time of the linearity control.
- **Comments**: this field allows recording any comment about the linearity control.
The list of activimeters can be generated and modified by the button.

The button calculates the correlation coefficient R using linear regression model, according to a minimum of four measurements.

The button opens the records sheet for the activimeter linearity control.

The button opens a report of the activimeter linearity controls.

The button opens a report of the activimeter linearity control in screen.

The button opens the search screen. You must place the cursor on the field and record you want to search.
• Radiochemical purity controls

The following fields can be recorded in this section:

- **Control Ref.**: internal reference code that has been assigned to the radiochemical purity control.
- **Radiopharmaceutical**
- **Date**: date when the radiochemical purity control was performed.
- **Time**: time when the radiochemical purity control was performed.
- **Operator**: the name of the person who performed the radiochemical purity control.
- **Stationary phase**: this field displays the list of available stationary phases for radiochemical purity tests.

The button opens the window where can be entered the data of the stationary phases for radiochemical purity controls of radiopharmaceuticals.
- **Mobile phase**: this field displays the list of available mobile phases for R.P. tests.

The button opens the window where can be entered the data of the mobile phases for radiochemical purity controls of radiopharmaceuticals.

- **%₉⁹ᵐTcO₄⁻** percentage of ₉⁹ᵐTcO₄⁻
- **%₉⁹ᵐTc-RH** percentage of ₉⁹ᵐTc in the form of colloid.
- **% Others**: percentage of ₉⁹ᵐTcO₄⁻ and ₉⁹ᵐTc-RH for those cases in which an only control is performed or when there is a third type of radiochemical impurity (e.g. secondary PAO).
- **Ref. Radiochromatogram**: internal reference code assigned to the quality control of radiochemical purity of the labelling. Double-clicking this field opens the radiochromatogram of the radiochemical purity control, provided that it was saved in pdf format inside the folder “RadioC”, which should be in the same folder where the file "Database_Radiolab.mdb" is. For example, assuming that the internal reference code was 0412, the file name should be "0412.pdf".
- **% R.P.**: % of radiochemical purity. It is automatically calculated by the software.
- **Comments**: to record any comment about the radiochemical purity control.

The button opens the following window:

In this window can be issued a report of radiochemical purity controls performed, according to an interval of dates defined by the user.
• Cleaning controls

![Image of Cleaning section]

The following fields can be recorded in this section:

- **Date** and **Time** when the cleaning process was performed.
- **Cabin, equipment or material** that has been cleaned.
- **Operator**: the person who has performed the cleaning process.
- **Comments**: This field allows recording any notes about the cleaning.

The button ![Image of button](https://example.com/button.png) opens the following window:

![Image of window]

In this window can be entered the data on the areas, equipment and materials to be cleaned periodically in the radiopharmacy.

The button ![Image of report button](https://example.com/report_button.png) allows issuing a report of the cleaning processes carried out according to an interval of dates defined by the user.
• Microbiological controls

The following fields can be recorded in this section:

- **Date of de control**: date when the microbiological control has been performed.
- **Date of the result** of the microbiological control.
- **Type of labelling**: this field displays the list of the types of labelling to select that in which has carried out the microbiological control. If the process you want is not listed, it can be entered manually using the keypad.
- **Operator**: this field displays the list of staff to select the name of the person who has performed the microbiological control.
- **Result** of microbiological tests (positive or negative).
- **Comments**: This field allows recording any notes about the microbiological control.

The button allows issuing a report of microbiological controls performed, according to an interval of dates defined by the user.

The button (within the form view) issues a report of the selected microbiological control.
The following fields can be recorded in this section:

- **Date** when the temperature control has been performed.
- **Time** when the temperature control has been performed.
- **Identification**: this field displays a list to select the refrigerator or stove at which the temperature control has been performed. The button opens a window where can be entered data of the refrigerators and stoves of your radiopharmacy.
- **Temperature**: measured value of temperature.
- **Maximum temperature** recorded since the last record.
- **Minimum temperature** recorded since the last record.
- **Operator**: This field displays the list of staff to select the name of the person who has performed the temperature control.
- **Comments**: This field allows recording any notes about the temperature control.

The button shows the records sheet of the temperature controls.

The button opens the following a window where can be issued a report of the temperature controls performed in a given time interval.
• Radiochromatograph controls

This section is designed to perform the following procedure:

From the article “A simple method for checking the proper functioning of a thin-layer radiochromatograph for radiochemical purity control of radiopharmaceuticals”. Applied Radiation and Isotopes. Volume 118, December 2016, Pages 102–104

1) Prepare a strip of chromatography paper (1 x 10 cm), drawing exactly five dots: 1 cm (Rf 0.1), 3 cm (Rf 0.3), 5 cm (Rf 0.5), 7 cm (Rf 0.7) and 9 cm (Rf 0.9), respectively.

2) Take a syringe with 0.1 ml of concentrated radioactive solution of the desired radionuclide for verification.

3) Place a drop of that radioactive sample on the first point.

4) Dilute the contents of the syringe to half with water and place another drop on the second point.

5) Repeat the above process until the last point.

6) Perform the strip's radiochromatogram.
7) Cut the strip into five pieces of 2 cm each (by the dotted lines) and measure their activities in a verified activimeter.

8) Introduce in the software the peak areas of the radiochromatogram and its measures of activity in the activimeter, to calculate the correlation coefficient.

9) Obtaining the correlation coefficients, for the above measures, as close to 1 in absolute value and spatial coincidence of the peaks Rf of the radiochromatogram with the exact spots where the droplets were placed, provide the sufficient reliability for the radiochemical purity tests performed with this radiochromatograph.

Example of radiochromatograph control:
The following fields can be recorded in this section:

- **Contol Ref.**: internal reference code assigned to the radiochromatograph control.
- **Date**: of the radiochromatograph control.
- **Peak areas**: of the radiochromatogram.
- **Peak activities**: in the activimeter.
- **Radiochromatogram Ref.**: internal reference code assigned to the radiochromatogram control. Double-clicking this field opens the radiochromatogram of the radiochromatogram control, provided that it was saved in pdf format inside the folder "RadioC", which should be in the same folder that the file "Database_Radiolab.mdb". For example, assuming that the internal reference code was RC021, the file name should be “RC021.pdf”.
- **Operator**: This field displays the list of staff to select the name of the person who performed the radiochromatograph control.
- **Comments**: This field allows recording any notes about the radiochromatograph control.

The button calculates the correlation coefficient R for the measurements obtained by the linear regression model.

The button shows the records sheet of the radiochromatograph controls.

The button opens the following window

![Radiochromatograph controls](image)

where you can issue a report of the radiochromatograph controls performed in a given time interval.

The button (within the form view) issues a report of the selected radiochromatograph control.
Reports module

This module is of optional use and it helps to issue, edit, and manage your reports.

This module contains the following fields:

- **Reference**: reference code of the report.
- **Date**: the date of the event. For example the date of an incident.
- **Report date**: the date when the report is written.
- **Closing Date**: the date when, for instance, the incident has been solved.
- **Title**: brief description of the reported event.
- **Text box**: the frame where the report is written.

The button changes the module from the datasheet view to the form view.

The button changes the module from the form view to the datasheet view.

The button issues the report shown on the screen.

The button issues all opened reports.

The button applies the spell check to the text of the report.
Protocols module

This module is of optional use.
In this module you can directly open the working procedures or protocols stored in pdf format in the folder “C:\Radiolab\Protocols”.
When Radiolab is installed, it has several example protocols in that folder: “Quality control of radiochromatograph.pdf”.

Double clicking on the title of the protocol will open the corresponding document in pdf.
You can also open a protocol by placing the cursor on the title of the protocol and clicking the button.

You can customize this list of protocols by eliminating, modifying or adding records.
It is necessary that each protocol name is entered in this module exactly identical to the name of its pdf file, but without the "pdf" extension.
Maintenance module

The Maintenance module of Radiolab has the following interface:

![Maintenance module interface](image)

This module performs the customization and maintenance of Radiolab by:

- Edition of the user data.
- Edition of the catalog of radiopharmaceuticals.
- Establishment of links with the database (for networking).
- Backup of the database.
- Recovery of the database from its backup.
- Compacting and repairing the database.
**User data**

The button "USER" opens the following window:

In this window users can enter their data to customize Radiolab. The data entered into boxes Hospital, Service and Unity, are those that will appear in the headers of some reports issued by Radiolab. The name entered in the signature box, is the name that will appear at the foot of some reports issued by Radiolab.

The button "STAFF" opens the following window:

Here can be entered the data of the radiopharmacy staff.
The button "PERMISSIONS" opens the following window:

where the administrator can type his password.

Until it is changed by the administrator, the administrator password is "admin".

After entering the password and clicking the button, the following window will open:

where the administrator (ADMIN) can change his password (by default is "admin"), add new users with their corresponding passwords, change user names or their passwords and delete users.

You must NEVER remove or change the user "ADMIN".

However, you can change the password "admin" but if you do it, you must save the new password in a safe place in the case that you can forget it.
The button "PASSWORDS" opens the following window:

![Password Change Window]

where each user of Radiolab can change their own user password without having to resort to the Administrator for it.

Como el control de acceso, esta funcionalidad sólo está activa en las versiones registradas de Radiolab.
Catalog

The button "CATALOG" opens the following window:

In this window each user can enter the studies, treatments, radiopharmaceuticals, and activity of doses of their own radiopharmacy. When Radiolab is installed, this catalog contains some example records. This catalog can be updated by eliminating, modifying or adding records. Here too, the user can set the price of each dose of radiopharmaceutical.
Database links

The following information on the links is only necessary if you are going to work with Radiolab as multi-user network.

The tables of the database of Radiolab, which store all the records, are in the file "Database_Radiolab.mde", while the other objects (queries, forms, reports and modules) required to manage the data of the database, are in the file "Radiolab.mde." This way you can share the database, and therefore their data, with more than one user through a network, simply by linking them to the file Radiolab.mde into the user PC that needs them. This allows that the database can be managed by more than one user at the same time, and thus the information is always updated and available at the same time for every user. Thereby, the database is lighter and faster.

When you install Radiolab, both the application file "Radiolab.mde" as the database "Database_Radiolab.mde" will install in the same directory "C:\Radiolab." Therefore, the path linking the tables is "C:\Radiolab\Database_Radiolab.mde." In this case by clicking on the button "LINKS" will open the following window:

![Database link window](image)

If you want to work in multi-user network mode, you have to move the database "Database_Radiolab.mde" into a directory on the network server. This can be done simply with a cut-paste of it. Doing so, Radiolab will lose the links to the database so you will see the following message window when you run Radiolab:

![Not linked database window](image)
Therefore you will need to re-establish links with the database. For this you must click the button "LINKS" to open the following window:

![Database link](image1)

Then, by clicking on the button "Change" will open the following screen:

![Database link](image2)

where you have to type the file path "Database_Radiolab.mde". You can also specify the new file path "Database_Radiolab.mde" by clicking on the button that opens the following search window:

![Choose Database_Radiolab.mde file to link tables](image3)
Click on "My network" and find the new path of the file "Database_Radiolab.mde."
Once you locate the file "Database_Radiolab.mde." select it and click on "Open file". You
will then see the links window with the new path:

![Database link]

Click the button "Link" and wait until you see the following window, which may take more
or less time depending on your network:

![Radioab]

Now you have the database linked in the network server where you are working.

It is necessary to perform this process in each terminal where Radiolab is installed.
Database backup

The button "BACKUP" opens the following window:

![Database backup window](image)

where you can make a backup of Radiolab database. Clicking on the "Explore" button to choose the folder where you want to save the backup. It is advisable also to backup at external devices to the computer where you installed Radiolab (USB memory, external hard drive, CD-ROM, etc.).

**Important**: each time you close the program Radiolab, it will open the following window:

![Backup of Radiolab window](image)

If you click "No" the program will close without backing up the database. If you click "Yes" it will make a backup of the database in the following directory: C:\ Radiolab backup.
When you try to open the Database_Radiolab file, the following window opens:

![Database recover window](image)

with the information of the user who made the last backup of the Radiolab database, and when and where they made the copy.

**Database recover**

The button "RECOVER" opens the following window:

![Database recover window](image)

Here, the database Radiolab can be restored from its backup, for example in the case of reinstallation of the program. By default, it retrieves the database from the folder where the backup is performed automatically every time you close Radiolab ("C:\Radiolab\backup"), but clicking the button "Explore" you can choose a different folder from which to retrieve a backup of the database.
**Database compact**

The size of the application (Radiolab.mde file) is about 35 MB and does not increase significantly with its use. However, the initial size of the database (Database_Radiolab.mde) is 1.8 MB and the daily work routine represents an increase of approximately 1 MB per month. Since the current limit for an Access database is set to 2 GB, the lifetime of the database would be more than 165 years. To ensure optimum performance of the application is recommended compacting and repairing the database file. This process eliminates the space not occupied by records, reducing the database weight. When you compact the database, it also gain in performance and speed when making searches of records of database.

The button "COMPACT" opens the following window:

![Compact and repair database](image)

By clicking "Compact" the database is compacted and repaired.
Agenda module

The radiopharmacy agenda is a window to store information related to the activities of the radiopharmacy, which facilitates the planning of work.

The agenda includes a calendar that opens at the current date and allows you to easily choose other dates. There are eight text boxes for the entry of tasks or activities. To the right of each task box there is a check box to mark that the activity has been performed. When you open the Orders module or the Labelling module, it automatically opens the Agenda when there are unfinished tasks for this day.

The button opens the Contacts window in which you can record your contacts data: names, phones, email, fax, addresses and notes.
Activity converter

The activity converter is opened by clicking the button on the toolbar buttons at the bottom and/or at the top (depending on the version of Access) of each module Radiolab. The activity converter allows to convert quickly between curies (Ci) and becquerels (Bq) and its multiples and submultiples.

It works by entering an activity in any of the boxes and pressing the return key or tab key.

Auxiliary Excel file for Radiolab

The auxiliary Excel file for Radiolab (Radiolab.xls) is opened clicking the button located in the bar buttons at the bottom and/or at the top (depending on the version of Access) of each module Radiolab. The Radiolab.xls file perform calculations of:

- Generator $^{99m}$Mo/$^{99m}$Tc.
- Relative centrifugal acceleration.
- Paediatric doses based on weight and height
- Paediatric doses based on weight
- Radioactive decay
Changing the colour of the forms

Radiolab users can change the colour of each form to their liking.

To do this, simply click on the button, which appears in the upper right of all forms, so that the following form for selecting the color of the form is opened.