Software for comprehensive management of hospital radiopharmacies

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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. In the field of Radiopharmacy, traceability could define as those procedures that allow to know the identity, the history and trajectory of a radiopharmaceutical or batch of radiopharmaceuticals along its production chain, from the first steps of preparation to administration, through a specific tool. In other words, traceability of a radiopharmaceutical consists basically of tracking this radiopharmaceutical and all products involved in its preparation chain. Therefore, to obtain traceability of a product should be recording all information related to the radiopharmaceutical through its production and supply chain.

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. Product 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 downside of this increase in quality assurance is the serious increase of paperwork, before, during and after the production of radiopharmaceuticals. Increasingly you now have to report, validate and justify each process in your laboratory. Within your department many work processes are recorded and validated. Processes like; the preparation of radiopharmaceuticals, performing radiopharmaceutical quality control checks, stock management, waste management and many more. All these work processes are based on national and international guidelines and statutory requirements.

Besides this, every hospital or institute has its own way of working.
Description of Radiolab

Radiolab is a software designed for hospitals and institutes that prepare radiopharmaceuticals within their hospital or institute only for in-house use. These hospitals and institutes do not deliver radiopharmaceuticals to clients. With Radiolab you do not need to change the way you work, because this software fits 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 you with a modular structure and a custom definable database and system settings.

Radiolab is a modular software system, consisting of 12 modules, some of them interrelated: orders, stock, generators, labelling, controls, dispensing, waste, traceability, protocols, reports, maintenance and agenda. Some of these modules are for optional use, some modules are mandatory for other modules to work, and some modules show results from their relationship with other modules.

The software Radiolab consists of an application database, very easy to use, 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 your orders, stock and radioactive waste.

A database is an organized collection of data for one or more purposes, usually in digital form. The data are typically organized to model relevant aspects of reality, in a way that supports processes requiring this information. The term "database" refers both to the way its users view it, and to the logical and physical materialization of its data, content, in files, computer memory, and computer data storage. The term database implies that the data is managed to some level of quality (measured in terms of accuracy, availability, usability, and resilience) and this in turn often implies the use of a general-purpose Database management system (DBMS). A general-purpose DBMS is typically a complex software system that meets many usage requirements, and the databases that it maintains are often large and complex.

Radiolab manages the information in its tables, allowing you to work with stored data so that you can get comprehensive information. Radiolab can work in multi-user mode, allowing multiple users from different computers gain access to the same file and work simultaneously. Radiolab's design has been developed in the Windows environment so that it is easy to learn and use.
Minimum technical requirements of Radiolab

The minimum hardware and software requirements to install and use Radiolab are:
- Pentium processor or higher.
- A minimum of 1 GB of RAM.
- Microsoft Windows XP, Windows Vista or Windows7.
- Microsoft Access (2002 or higher) or Access runtime.

Installing Radiolab

Radiolab is installed on your computer using the installation program, which can be downloaded on the Internet.

When you run the installation program it opens the following window:

![Welcome to the Radiolab Setup Wizard](image)

Close all other applications and click "Next" to proceed to the next window:
After reading the license agreement, check "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:

where you can choose whether to create or not a shortcut icon on the desktop to Radiolab. By clicking "Next" it will open the following window:
When you click in "install" a window appears with a progress bar of the installation, which takes a few seconds:

Then the following window opens:
Clicking “Next” displays the last window where it gives the option to run the program.

![Radiolab Setup Wizard](image)

**Updating Radiolab**

Radiolab software is continually developed to improve and expand their services. Thus, every time there is a new version of the program, you can update the version you have installed, that is, reinstall the same program in its new version, through the following steps:

- In order of not to lose the data from our records, that is, all information that we have introduced, make a backup of the database Radiolab (see the section Backup in the Maintenance module).
- Download from the website Radiolab the latest version of the program and install it. It is not necessary to uninstall the previous version.
- Restore our database which we made a backup (see the section Retrieve 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 Maintenance module.
Uninstalling Radiolab

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

To uninstall Radiolab you should run the uninstaller file that you will find in the Radiolab start menu or in the control panel. So the following window will appear:

![Radiolab Uninstall](image)

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

![Radiolab Uninstall](image)

Then the following window opens:

![Radiolab Uninstall](image)
Getting started with Radiolab

When Radiolab is installed you found a nearly empty database, so until you introduce data from your radiopharmacy it can not be of any use. You must begin by opening the Maintenance module and by entering your data of user and staff. If necessary, you can also update the catalog.

You should begin first to work with the Order module. Before you start doing orders, you must create your listings of radionuclides, suppliers and products.

In the radioactive orders section, by clicking on the button 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.

By clicking the button in any of the three sections of orders, you can enter the data of your suppliers.

In the radioactive orders section, by clicking on the button you can enter the data of the radioactive products supplied by each supplier.

In the cold kits section, by clicking the button you can enter the data of cold kits supplied by each supplier.

In the fungible materials section, by clicking the button you can enter the data of fungible materials supplied by each supplier.

After entering the above data, you can begin to ordering your products and once you receive it, you can begin to work with other modules of Radiolab.
Orders module

The Order module enables the management of incoming orders of raw materials in your radiopharmacy. Using this module is essential for the proper functioning of other modules with which it shares its data: Dispensing, Stocks, Generators, Labelling, Waste and Traceability.

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

Each section allows the simultaneous display of data concerning both the issuance and receipt of orders.
Next it will be explained in detail only the orders section of radioactive products, as the other two sections work in much the same way.

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

The **Request** box contains the following fields:

- **Reference**: Internal reference code we want to assign to each order. This field does not allow duplicate values to ensure traceability of products.

  **NOTE**: The tracking cannot rely on the manufacturer's batch, because it is common 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, $^{131}$I Na oral solution or intravenous, citrate $^{90}$Y, and so on, all of them with the same batch.

- **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. Later we will explain how to generate our list of suppliers.

- **Product**: This field displays the list of products depending on the provider you have selected above. Later we will explain how to generate our list of products for each supplier.

- **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.

- **Order date**: The date at which you are doing the order, expressed in the format "dd/mm/yyyy". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date "09/08/2011" you must type directly "090811."

- **Delivery date**: Date and time you want to receive the requested product, expressed in the format "dd/mm/yyyy hh:mm:ss". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date and time "9/19/2011 7:30:00" you must type directly "1909110730."

- **Nominal activity**: Activity (mCi) that is known to a precise (or calibrated) value at an identified point in time

- **Calibration date**: Date and time at which the activity of the product is calibrated, expressed in the format "dd/mm/yyyy hh:mm:ss". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date and time "9/19/2011 7:30:00" you must type directly "1909110730."

- **Quantity**: Number of units of product ordered.
- Real activity: activity (mCi) at specified date and time for receipt the ordered product. This field is automatically calculated from the nominal activity and the date and time of delivery.
- Order validation: box to verify that the order has been made.
- Operator: This field displays the list of the radiopharmacy staff in which can be select the name of the person who has made the order. Later we will explain how to generate your list of staff.
- Supplier validation: box to verify that the provider has confirmed this order.
- Comments: This field allows you to record any notes 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** box contains the following fields:

- Reference: previously introduced in the request box.
- Product: previously introduced in the request box.
- Delivery date: date and time that you receive the ordered product, expressed in the format "dd/mm/yyyy hh:mm:ss". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date and time "9/19/2011 7:30:00" you must type directly "1909110730." This date may be different from the one you requested.
- Batch: manufacturer batch of the product.
- Nominal activity: activity (mCi) that is known to a precise (or calibrated) value at an identified point in time. This activity may be different from the one you requested.
- Quantity: number of units of the product received. It may be different from the number of units requested.
- Calibration date: date and time at which the activity of the product is calibrated, expressed in the format "dd/mm/yyyy hh:mm:ss". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date and time "9/19/2011 7:30:00" you must type directly "1909110730." This date may be different from the one you requested.
- Expiration Date: date and time the product expires, expressed in the format "dd/mm/yyyy hh:mm:ss". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date and time "9/19/2011 7:30:00" you must type directly "1909110730."
- Receipt: box to verify that the order has been delivered.
- Cancellation: box to indicate that the order has been canceled because it has not been received or vice versa. The cause can be indicated in the incident 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 canceled the order. Later we will explain how to generate our list of staff.
- Incidents: this field allows you to record any notes of incidents related to the order.

Radioactive products section of orders module has the following toolbar:

![Toolbar Image]

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

The functions of these buttons are as follows:

- The button updates the records in the Reception box after adding new records in Request box. The button opens the window of radionuclides:
where you can enter data on radionuclides that are authorized in your radiopharmacy, in order to generate your list of radionuclides, thus enabling the software to perform the calculations related to them. In this screen also should 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.

![Image of Exceeded the maximum authorized activity window]

The button opens the window where users can enter the radioactive products available for each provider.

The button opens the window where you can enter the available suppliers.
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.

The button opens the application form of radiopharmaceuticals.

The button opens the application sheet of radiopharmaceuticals.

The button activates a filter to display 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. You must place the cursor on the field and record you want to search or replace.

The button opens a report of all orders pending to be received.
The button opens the following window:

![Reports of radioactive products received]

This window allows users to issue a report of radioactive products received, or a report of total activities of radionuclides, or a report of expenses incurred in radioactive products, according to a date range defined by the user.

The button closes the module in which we are.

Both the cold kits section and the fungible materials section, work just like the section of radioactive products.

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.
Stock module

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

This module consists of two sections: cold kits and radionuclides.
• Stock of cold kits

This section shows the number of vials of cold kits for each batch that remain unexpired, subtracting those you consume to those you receive.

Each record of stock of cold kits contains the following fields:

- Reference: Internal reference code you have assigned to each order. This reference was previously introduced in the reception box of the cold kits orders.
- 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:

On this screen you set how far in advance you want the program to alert you that a batch of cold kits will 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.
• **Stock of radionuclides**

This section shows the activities of every radioactive product for those batch that remain unexpired, subtracting those you consume to those you receive, applying the corrections for radioactive decay.

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

- **Reference**: Internal reference code you have assigned to each order. This reference was previously introduced in the reception box of the radioactive products orders.
- **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.

It also shows 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 ![simplified view](image) shows a simplified view of the stock, without specifying batch or reference.

The button ![updates activities](image) updates the activities of radionuclides, since due to radioactive decay, these activities are continuously decreasing.

The button ![issues report](image) issues a report of the activity of each radioactive product in stock.
Generators module

The generator module consists of two sections: elutions and removal. The use of elutions section is necessary to operate the modules with which it shares its information: Dispensing, Stock, Labelling, Waste and Traceability.

- Generator elutions

This section contains the following fields:

- Elution reference: Internal reference code that the user assigns each elution, for example: E11/0123. This field does not allow duplicate values.
- Order reference: this field displays a list of generators that are in stock and unexpired, in which the user selects the reference code that was associated with the generator in the orders module.
- Batch: manufacturer batch of the generator. It was introduced in the orders module.
- Nominal activity: 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.
- Number of order of elution: 1, 2, 3, ...
- Date and time of elution: date and time at which the generator is eluted, expressed in the format "dd/mm/yyyy hh:mm:ss". It contains an input mask type __:__ "__/__/__" to facilitate the introduction of the date. For example, for the date and time "9/19/2011 7:30:00" you must type directly "1909110730."
- Activity eluted in mCi.
- Theoretical activity which must be eluted by the generator. This figure is calculated automatically by the software.
- Elution yield: is automatically calculated by the software.
- Elution volume in milliliters.
- A/V: concentration of the radioactive eluate in 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.

The button $\text{prints the record sheet of generator elutions.}$

The button $\text{opens the following window}$

![Generator elutions reports](image)

which allows to issue a report of elutions made from a generator.
• Removal of generators

This section records the following fields:

- Removal request: date of application for removal the generator.
- Order reference: 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.
- Nominal activity of the generator in mCi. It was introduced in the orders module.
- Calibration: Calibration date 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 record sheet for removal of generators.](image)

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

which allows to issue a report of removal of generators.
Labelling module

The Labelling module consists of four sections: Kits, Leukocytes, Erythrocytes and Platelets. Using this module it is essential for other related modules can work properly, namely: Dispensing, Stock, Waste and Traceability.

- **Kits labelling**
  This section records the following fields:
  - Labelling reference: internal reference code that the user assigned to each kit labelling, for example K11/0123.
  - Date of the labelling, expressed in the format "dd/mm/yyyy". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date "09/08/2011" you must type directly "090811".
  - Time of the labelling, expressed in the format "hh/mm". It contains an input mask type "__:__" to facilitate the introduction of the hour. For example, for the date "7:25" you must type directly "0725".
- Kit reference: This field displays a list of unexpired kits in stock, where the user can select the reference code that was associated with the kit in the order module.
- Ligand: This field is completed automatically by the software, according on the kit reference selected.
- Kit batch: manufacturer batch of the kit. This field is automatically filled by the software.
- Expiration date of the kit. This field is automatically filled by the software.
- Radionuclide reference. This field displays a list where the user selects the reference code that was associated with the radionuclide (or generator) in the orders module.
- Radionuclide. This field is automatically filled by the software.
- Radionuclide batch. This field is automatically filled by the software.
- Labelling activity (mCi).
- 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 "Radiochromatograms", 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”.
- QC2: internal reference code assigned to the second quality control of radiochemical purity of the labelling (if it is necessary). Double-clicking this field opens the radiochromatogram of the radiochemical purity control, provided that it was saved in pdf format inside the folder "Radiochromatograms", 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”.
- % RP: radiochemical purity of the radiopharmaceutical extemporaneous preparation, expressed in percentage value.
- OK: checkbox 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.
- Validated: check box 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 \[\text{prints the record sheet for kits labelling.}\]

The button \[\text{opens the following window}\]

\[\text{Expiration notice of kits}\]

\[\text{To warn in advance of the expiration}\]

\[\text{15 days} \quad \text{OK}\]

In this screen you can program how far in advance you want the software let you know that a batch of cold kits will expire by the following window:

\[\text{Notice of expiration}\]

\[\text{This batch expires in 6 days. Check stocks:}\]

\[\text{Aceptar}\]

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](image)

which allows to issue a report of kits labelling and radiochemical purity tests, depending on an interval of dates defined by the user.

The button opens the following screen

![Labelled kits reports](image)

where 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 radiolabelled vials

![Labelled kit](image)
• Leukocytes labelling

This section records the following fields:

- Date of the labelling, expressed in the format "dd/mm/yyyy". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date "09/08/2011" you must type directly "090811".
- Name of the patient.
- Labelling reference: internal reference code that the users assign to the leukocytes labelling, for example LL11/032.
- Labelling reference of HM-PAO: internal reference code assigned to the labelling of the HM-PAO vial in the section of kits labelling.
- Quality control reference: internal reference code assigned to the quality control of radiochemical purity of $^{99m}$Tc-PAO in the Controls section.
- Radiochemical purity of Tc-PAO: percentage of radiochemical purity of the 99mTc-PAO preparation.
- Labelling leukocytes yield, expressed in percentage term.
- Activity (mCi) of labelled leukocytes administrated.
- Labelling start time or time at which the blood sample for leukocytes labelling was delivered into the radiopharmacy, expressed in the format "hh/mm". It contains an input mask type "__:__" to facilitate the introduction of the hour. For example, if you want enter the date "7:25" you would type directly "0725".
- Time of dispensing of labelled leukocytes, with the same format and input mask as above.
- Operator: This field displays the list of staff to select the name of the person who performed the leukocytes labeling.
• Erythrocytes labelling

This section records the following fields:

- Date of the labelling, expressed in the format "dd/mm/yyyy". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date "09/08/2011" you must type directly "090811".
- Name of the patient.
- Labelling reference: internal reference code that the users assign to the erythrocytes labelling, for example EL11/039.
- Radionuclide with which the labeling is performed.
- Batch: manufacturer batch of the radioactive product that contains the radionuclide.
- Labelling erythrocytes yield, expressed in percentage term.
- Activity (mCi) of labelled erythrocytes administrated.
- Labelling start time or time at which the blood sample for erythrocytes labelling was delivered into the radiopharmacy, expressed in the format "hh/mm". It contains an input mask type "__:__" to facilitate the introduction of the hour. For example, if you want enter the date "7:25" you would type directly "0725".
- Time of dispensing of labeled erythrocytes, with the same format and input mask as above.
- Operator: This field displays the list of staff to select the name of the person who performed the erythrocytes labeling.
• Platelets labelling

This section records the following fields:

- Date of the labelling, expressed in the format "dd/mm/yyyy". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date "09/08/2011" you must type directly "090811".
- Name of the patient.
- Labelling reference: internal reference code that the users assign to the platelets labelling, for example PL11/039.
- Radionuclide with which the labeling is performed.
- Batch: manufacturer batch of the radioactive product that contains the radionuclide.
- Labelling platelets yield, expressed in percentage term.
- Activity (mCi) of labelled platelets administrated.
- Labelling start time or time at which the blood sample for platelets labelling was delivered into the radiopharmacy, expressed in the format "hh/mm". It contains an input mask type "__:__" to facilitate the introduction of the hour. For example, if you want enter the date "7:25" you would type directly "0725".
- Time of dispensing of labeled platelets, with the same format and input mask as above.
- Operator: This field displays the list of staff to select the name of the person who performed the platelets labeling.

Within each section of the Labelling module (in the form view mode), there is the button which print a report of the corresponding labelling.
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 any other module Radiolab does not depend on its operation.

• Activimeter constancy controls

This section records the following fields:

- Date of the constancy control, expressed in the format "dd/mm/yyyy". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date "09/08/2011" you must type directly "090811".
- Time of the control, expressed in the format "hh/mm". It contains an input mask type "__:__" to facilitate the introduction of the hour. For example, if you want enter the date "7:25" you would type directly "0725".
- Activimeter: This field displays the list of activimeters to select one. Later we will explain how to generate our list of activimeters.
- Calibration source: this field displays the list of radioactive sources for calibration to select one. Later we will explain how to generate your list of radioactive sources for calibration.
- Theoretical activity $A(t)$: 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 you to record any notes 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 screen where you can enter the data of the activimeters:

The button opens the screen where you can enter the data of the radioactive calibration sources.
The button shows the record sheet for printing.

The button opens the following screen

![Activimeter constancy controls](image)

where you can issue a report of 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

This section records the following fields:

- **Reference**: Internal reference code that is assigned to the linearity control.
- **Date of the linearity control**, expressed in the format "dd/mm/yyyy". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date "09/08/2011" you must type directly "090811".
- **Activimeter**: This field displays the list of activimeters to select one. Later we will explain how to generate our list of activimeters.
- **Operator**: This field displays the list of staff to select the name of the person who performed the linearity control.
- **Date and time at which it is performed each of the 10 possible measures in the linearity control**, expressed in the format "dd/mm/yyyy hh:mm:ss". It contains an input mask type __:__ "__/__/__" to facilitate the introduction of the date. For example, for the date and time "9/19/2011 7:30:00" you must type directly "1909110730."
- **Period of time (in hours) elapsed from the first measurement to each of the subsequent measurements**. It is automatically calculated by the software.
- Theoretical activity 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.
- Measured activity of the radioactive source of calibration, performed at each date and time of the linearity control.
- Comments: This field allows you to record any notes 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 📊 shows the record sheet of the linearity controls.

The button 📊 shows a report of all linearity controls performed.

The button 📊 (within the form view) issues a report of the selected control.
### Radiochemical purity controls

This section records the following fields:

- **Reference**: Internal reference code that is assigned to the radiochemical purity control.
- **Date** of the radiochemical purity control, expressed in the format "dd/mm/yyyy". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date "09/08/2011" you must type directly "090811".
- **Time** of the radiochemical purity control, expressed in the format "hh/mm". It contains an input mask type "__:__" to facilitate the introduction of the hour. For example, if you want enter the date "7:25" you would type directly "0725".
- **Operator**: This field displays the list of staff to select 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 \[\text{\textbullet}\text{\textbullet}\] opens the following screen

![Stationary phases](image1)

where the user can enter the data of the stationary phases for radiochemical purity controls of radiopharmaceuticals.

- **Mobile phase**: This field displays the list of available mobile phases for radiochemical purity tests.

The button \[\text{\textbullet}\text{\textbullet}\] opens the following screen

![Mobile phases](image2)

where the user can enter the data of the mobile phases for radiochemical purity controls of radiopharmaceuticals.
- %\textsuperscript{99m}TcO\textsubscript{4}: Percentage of \textsuperscript{99m}TcO\textsubscript{4}.
- %\textsuperscript{99m}Tc-RH: Percentage of \textsuperscript{99m}Tc in the form of colloid.
- % Other: Percentage of \textsuperscript{99m}TcO\textsubscript{4} and \textsuperscript{99m}Tc-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).
- Chromatogram Reference: 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 "Radiochromatograms", 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".
- % RP: Percentage of radiochemical purity. It is automatically calculated by the software.
- Comments: This field allows you to record any notes about the radiochemical purity control.

The button \textbf{R} opens the following screen

![Radiochemical purity controls](image)

where you can issue a report of radiochemical purity controls performed, according to an interval of dates defined by the user.
• Cleaning controls

This section records the following fields:

- Date of the cleanup, expressed in the format "dd/mm/yyyy". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date "09/08/2011" you must type directly "090811".
- Time of the cleanup, expressed in the format "hh/mm". It contains an input mask type "__:__" to facilitate the introduction of the hour. For example, if you want enter the date "7:25" you would type directly "0725".
- Material, equipment or area that has been cleaned.
- Operator: This field displays the list of staff to select the name of the person who has performed the cleanup.
- Comments: This field allows you to record any notes about the cleaning.
The button opens the following screen

![Cabins, equipment and materials](image)

where the user can enter the data on the areas, equipment and materials to be cleaned periodically in the radiopharmacy.

The button opens the following screen

![Cleaning reports](image)

where you can issue a report of cleanups performed, according to an interval of dates defined by the user.
• Microbiological controls

This section records the following fields:

- Date when the microbiological control has been performed, expressed in the format "dd/mm/yyyy". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date "09/08/2011" you must type directly "090811".

- Date of the result of the microbiological control, expressed in the same format that above.

- Labelling type: This field displays the list of the types of labellings 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: This field records the results of microbiological tests (positive or negative).

- Comments: This field allows you to record any notes about the microbiological control.
The button opens the following screen

where you can issue 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.
• Temperature controls

This section records the following fields:

- Date when the temperature control has been performed, expressed in the format "dd/mm/yyyy". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date "09/08/2011" you must type directly "090811".
- Time when the temperature control has been performed, expressed in the format "hh/mm". It contains an input mask type "__:__" to facilitate the introduction of the hour. For example, if you want enter the date "7:25" you would type directly "0725".
- Identification: This field displays a list to select the refrigerator or stove at which the temperature control has been performed.
The button opens the following screen where you can enter 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 you to record any notes about the temperature control.

The button shows the record sheet of the temperature controls.

The button opens the following screen

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

*Software for comprehensive management of hospital radiopharmacies*
• Radiochromatograph controls

This section is designed to perform the following procedure:

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 corresponding 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:

![Radiochromatograph image with data]

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>rf_center</th>
<th>rf_max</th>
<th>I Cnts</th>
<th>I/Area Cnts/mm</th>
<th>%s %</th>
<th>$^{60}Co$ MBq</th>
<th>$^{140}Ba$ MBq</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pico 1</td>
<td>0.10</td>
<td>0.10</td>
<td>8845.0</td>
<td>442.2</td>
<td>6.12</td>
<td>20</td>
<td>0.2</td>
</tr>
<tr>
<td>2</td>
<td>pico 2</td>
<td>0.30</td>
<td>0.30</td>
<td>12139.0</td>
<td>807.0</td>
<td>8.40</td>
<td>30</td>
<td>1.2</td>
</tr>
<tr>
<td>3</td>
<td>pico 3</td>
<td>0.50</td>
<td>0.50</td>
<td>26701.0</td>
<td>1335.0</td>
<td>18.47</td>
<td>91</td>
<td>3.4</td>
</tr>
<tr>
<td>4</td>
<td>pico 4</td>
<td>0.70</td>
<td>0.70</td>
<td>40639.0</td>
<td>2032.0</td>
<td>28.11</td>
<td>146</td>
<td>5.4</td>
</tr>
<tr>
<td>5</td>
<td>pico 5</td>
<td>0.90</td>
<td>0.89</td>
<td>56230.0</td>
<td>2811.5</td>
<td>38.90</td>
<td>194</td>
<td>7.2</td>
</tr>
</tbody>
</table>

Coef. Correl. = 0.9984

![Graph with regression line]

$y = 0.2007x - 0.434$

$R^2 = 0.9969$
This section records the following fields:

- **Reference**: Internal reference code that is assigned to the radiochromatograph control.
- **Date of the radiochromatograph control**: Expressed in the format "dd/mm/yyyy". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date "09/08/2011" you must type directly "090811".
- **Peak areas of the radiochromatogram**.
- **Peak activities in the activimeter**.
- **Radiochromatogram reference**: 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 "Radiochromatograms", 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 you to record 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 record sheet of the radiochromatograph controls.

The button opens the following screen

![Radiochromatograph controls screen](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.
**Dispensing module**

The Dispensing module consists of two sections: dispensing and prescriptions. The use of dispensing section is necessary to operate the modules with which it shares its information: Stock, Waste and Traceability.

![Dispensing module interface](image)

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

This interface records the following fields:

- Date of dispensing or administering the dose of radiopharmaceutical, expressed in the format "dd/mm/yyyy". It contains an input mask type "__/__/___" to facilitate the introduction of the date. For example, for the date "09/08/2011" you must type directly "090811".

- Time of dispensing or administering the dose of radiopharmaceutical, expressed in the format "hh/mm". It contains an input mask type "__:__" to facilitate the introduction of the hour. For example, if you want enter the date "7:25" you would type directly "0725".

- Name of the patient.

- Date of birth of patient, expressed in the same format as above.

- Radiopharmaceutical: This field displays the list of radiopharmaceuticals to select one. The radiopharmaceuticals that appear on this list are those that were introduced by users in the Catalog of the Maintenance module.

- Administered activity (in mCi) of the radiopharmaceutical.

- Radiopharmaceutical reference: 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 99mTc-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 proper traceability of dispensed radiopharmaceuticals.

- 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 exceeding the standard or maximum activity of a given radiopharmaceutical for a given study (in your catalog), the software will display an alert message:

![Alert message for exceeding dose](image1)

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

![Alert message for wrong radiopharmaceutical](image2)

The button ![Record sheet button](image3) prints the record sheet for prescriptions of non-scheduled doses.
The button prints the radiopharmacy worksheet from the automatically imported prescriptions, containing the following information:

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

The button prints the labels of radiopharmaceutical doses, containing the following information:

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

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.

The button opens the following screen where you can issue different reports.

The button issues a report of administered radiopharmaceuticals or performed studies, depending on the options that you have marked in the box on the left. Moreover, in the case of the report of dispensed radiopharmaceuticals, it can be differentiate those doses dispensed by the morning of those doses dispensed in the afternoon, and you can set the time of shift change from morning to afternoon.
The button gives a detailing statistical report with the number and percentage of doses of radiopharmaceuticals scheduled, unscheduled, administered, non-administered, and invoiced but not administered.

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

The button opens a billing report of doses of radiopharmaceuticals.

• Prescriptions

In the Prescriptions interface you can automatically import prescriptions of radiopharmaceuticals.

The button imports the prescriptions of radiopharmaceuticals from the file C:\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 mdb or txt.

The button transfers the prescriptions of radiopharmaceuticals from the Prescriptions section to the Dispensing section.

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

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

This module consists of two sections: residual activities and declassification of radioactive.

Activity of $^{99m}$TcO$_4^-$ with more than 10 hours from elution
28.856 mCi
• Residual activities of radionuclides

This section shows the activities (in mCi) of every radioactive product for those expired batch, subtracting the consumed activities to the received activities and applying the corrections for radioactive decay.

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

This section records the following fields:

- Id: this autonumber field automatically generates an identification number of the radioactive waste container.
- Type of container: bag, container of needles, etc.
- Date of opening of the radioactive waste container, expressed in the format "dd/mm/yyyy". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date "09/08/2011" you must type directly "090811".
- Date of closing of the radioactive waste container, expressed in the same format as above.
- Date of declassification of the radioactive waste container, expressed in the same format as above.
- 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 screen, which opens with the button.
- Activity of the radioactive waste container when it is declassified as such. The default generated value is "$<100 \text{ Bq/g}$".
- 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 screen

where you can issue a report of declassification of radioactive waste in a given period of time.
Traceability module

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

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

• **Traceability by patient name**

This section displays information for all radiopharmaceuticals administered to a particular patient, detailing for each: date and time of administration, radiopharmaceutical, activity (in mCi), batch or reference of the radiopharmaceutical and the study or treatment associated with the radiopharmaceutical administered.

The button issues a traceability report of the selected patient.

• **Traceability by radiopharmaceutical reference**

This section displays information of all patients who were administered a radiopharmaceutical from a particular reference. Such reference depends on the type of radiopharmaceutical:

- In the case of a radiopharmaceutical ready for use, it is the internal reference assigned to it in the Orders module.
- In the case that the radiopharmaceutical is 99mTc-pertechnetate, it is the reference of its elution.
- In the case of extemporaneous radiopharmaceutical, it is the reference of its labelling.
The information displayed in this section includes: patient name, date and time of administration, radiopharmaceutical, activity, and the study or treatment for which the radiopharmaceutical was administered.

The button 📚 issues a report of traceability, according to the reference of radiopharmaceutical selected.

• **Traceability by radionuclide batch**

This section displays information of all patients who have been administered radiopharmaceutical 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 📚 issues a report of traceability, according to the radionuclide batch selected.

• **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 📚 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 📚 issues a report of traceability, according to the kit batch selected.

*Software for comprehensive management of hospital radiopharmacies*
Protocols module

In this module you can directly access the working procedures or protocols that have been stored in pdf format in a folder called "Protocols" which in turn is in the same folder as the file "Database_Radiolab.mde". Double clicking on the title of the protocol will open the corresponding document in pdf.

Reports module

This module helps to issue, edit, and manage reports related to the radiopharmacy.

This module contains the following fields:

- Date of the event: for example the date of an incident, expressed in the format "dd/mm/yyyy". It contains an input mask type "__/__/__" to facilitate the introduction of the date. For example, for the date "09/08/2011" you must type directly "090811".
- Report date, in the same format that above.
- Closing Date: The date considered for close the event reported, in the same format that above.
- Title: brief description of the reported event.
- Text box where the incidence is detailed.

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.

The button issues the report which is on the screen.

The button issues all opened reports.

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

The maintenance module presents the following window:

This module performs the customization and maintenance of Radiolab.
The button "USER" opens the following window:

where 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:

![Staff Window]

where you can enter the data of the radiopharmacy staff.

The button "PERMISSIONS" opens the following window:

![Permission Window]

where the administrator can type in his password.
Until it is changed by the administrator, the administrator password is "admin".
By validating the password opens the following screen

![Password Screen]
where the administrator can change his password (by default is “admin”), add new users with their corresponding passwords, change user names or their passwords and delete users. However, you should never remove or change the user “administrator”. If you change the administrator password, you should save the new password in a safe place in anticipation that you can forget it, as this password is what allows the administrator to open this screen of managing users and passwords.

**CATALOG**

The button "CATALOG" opens the following window:

![Catalog Window](image)

where users must enter their own studies, treatments, radiopharmaceuticals, and activity of doses. When Radiolab is installed, this catalog contains some records as example. These data can be updated by eliminating, modifying or adding records. Here too, the user can set the price of each dose of radiopharmaceutical.
LINKS

The following information on the links is only required 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 tables of 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 the database can be managed by more than one user at the same time, and thus the information is always updated and available at all times for all users. 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 screen:

![Database link](image)

If you want to work in multi-user network mode, you will 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](image)
Therefore you will need to re-establish links with the tables of the database. For this you must click the button "LINKS" to open the following screen:

![Database link screen](image)

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

![Linking database screen](image)

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 ![Folder icon](image) that opens the following search window:

![Choose mdb file to link tables](image)
Click on "My network places" 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:

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

Now you have the tables linked in the network server where you are working. You must perform this process at each terminal where Radiolab is installed.
BACKUP

The button "BACKUP" opens the following window:

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:

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:\Backup Radiolab. Then, it is also performed automatically a compacting process of the database.
RECOVER

The button "RECOVER" opens the following window:

![Recovering database window]

used to restore the backup of the database Radiolab, 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:\Backup Radiolab\"), but clicking the button "Explore" you can choose a different folder from which to retrieve a backup of the database.
COMPACT

The size of the application (Radiolab.mde file) is about 15 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 window]

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 contact data: names, phones, email, fax, addresses and notes.
### Activity converter

The activity unit converter allows to convert quickly between curies (Ci) and becquerels (Bq) and its multiples and submultiples.

![Converter Ci/Bq](image)

<table>
<thead>
<tr>
<th>Ci</th>
<th>nCi</th>
<th>Bq</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>μCi</td>
<td>kBq</td>
</tr>
<tr>
<td></td>
<td>mCi</td>
<td>MBq</td>
</tr>
<tr>
<td>Ci</td>
<td></td>
<td>GBq</td>
</tr>
</tbody>
</table>

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

Once registered Radiolab the user access control is activated. The head of the Radiopharmacy (administrator) may authorize different users of Radiolab, assigning passwords as described below. After registering the program, the next time you open it is displayed for the first time the following window:

Clicking the combo box "User" displays the list of users which at first has only the administrator. Select "administrator", type the password "admin" and click on the button

To change the administrator password and to add new users with their 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 open:
where you must type the password "admin" to open the following window:

where the administrator can change the password (by default is "admin"), add new users with their corresponding passwords, change user names or their passwords and delete users. However, you should never remove or change the user "administrator". If you change the administrator password, you should save the new password in a safe place in anticipation that you can forget it, as this password is what allows the administrator to open this screen for managing users and passwords.
Additional information

- **Automatic backup**
  Every time you close the program Radiolab it automatically performs a backup of the database in C:\Backup Radiolab.mdb and it is also done automatically a process of compaction and reparation.

- **Screen resolution**
  The minimum screen resolution required for adequate visualization of windows of Radiolab is 1024 x 768 pixels.

- **Working with records**
  For all modules where data is entered it is recommended to press the tab key to move to next field within a record.

  In the top right of almost all modules there are the following buttons.

  The filter button applies a filter by selection. To do this, place the cursor on the field of any record that contains the data you want to filter and click the filter button.

  The button removes any filter by selection.

  The button is used to sort records for a selected field in ascending order or alphabetical.

  The button is used to sort records for a selected field in descending order or reverse alphabetical.

- **Protected fields**
  Some fields are automatically auto filled, not being possible to write into them.

- **Not correct format of field**
  It may be that by introducing the value of a field an alert appears a box informing that the format of this field is not valid. In such cases, see the corresponding module to check the correct format of the field.

  If you have any problem, both the installation and operation of the program itself, please contact us at radiolab@radiopharmacy.net.