Instituto Tecnológico de Costa Rica

Engineering School

Computer Engineering

CE-3104 - Lenguajes, Compiladores e Interpretes

II Semester 2017

Project

DrLog

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Group 01

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Contents

1 Abstract

Abstract

Expert systems (SE) are computer applications that involve experience not algorithmic, to solve a certain type of problem. For example, expert systems are used for the diagnosis at the service of humans and machines. The objective of this task is to develop an SE for a medical office.

Keywords: SE, ProLog

2 objectives

2.1 General Objective

Develop an application that reaffirms the knowledge of the paradigm of logical programming

2.2 Specific Objectives

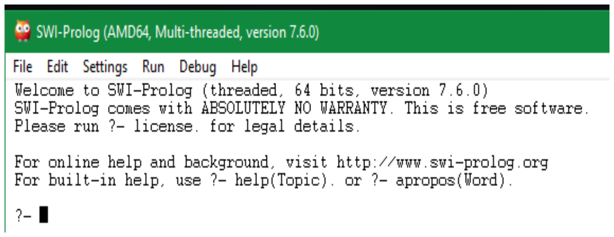
- Create an application that behaves like an Expert Doctor using Prolog.
- Apply the concepts of logical programming.
- Create and manipulate lists as data structures.

3 User Guide

- First you need to open the IDE: SWI-PROLOG::

Figure 1

- You're going to watch this screen:

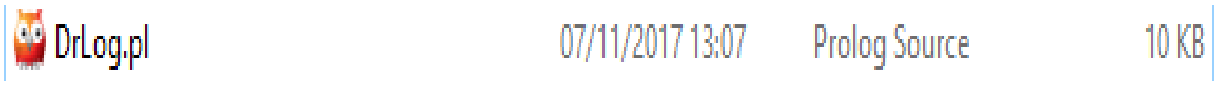


SWI-Prolog (AMD64, Multi-threaded, version 7.6.0)
File Edit Settings Run Debug Help

```
Welcome to SWI-Prolog (threaded, 64 bits, version 7.6.0)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit http://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?-
```

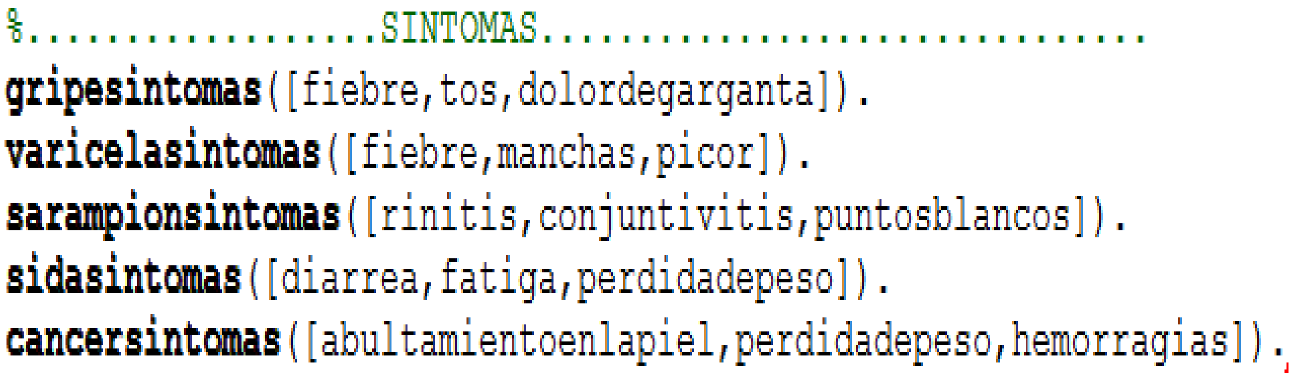
Figure 2

- After this, you need to go to file and click on “new”, so you’re going to watch this screen:



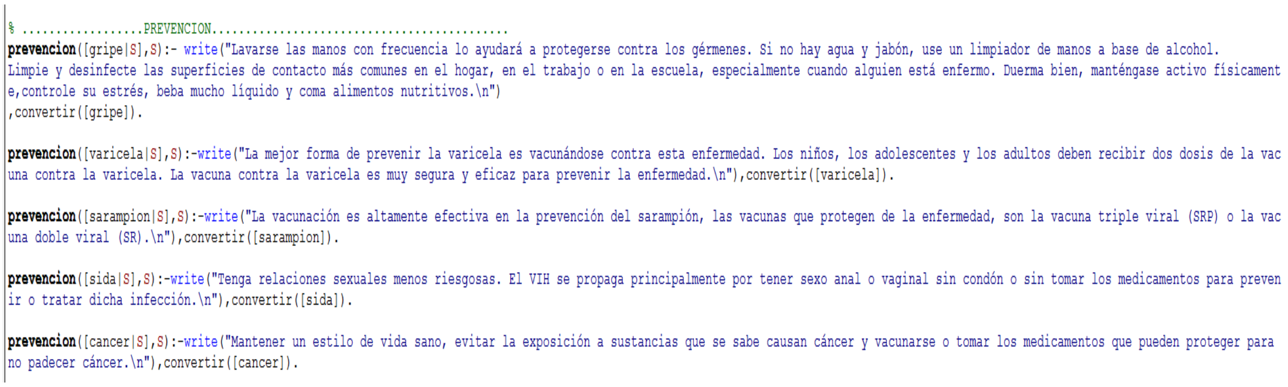
```
DrLog.pl        07/11/2017 13:07        Prolog Source        10 KB
```

Figure 3



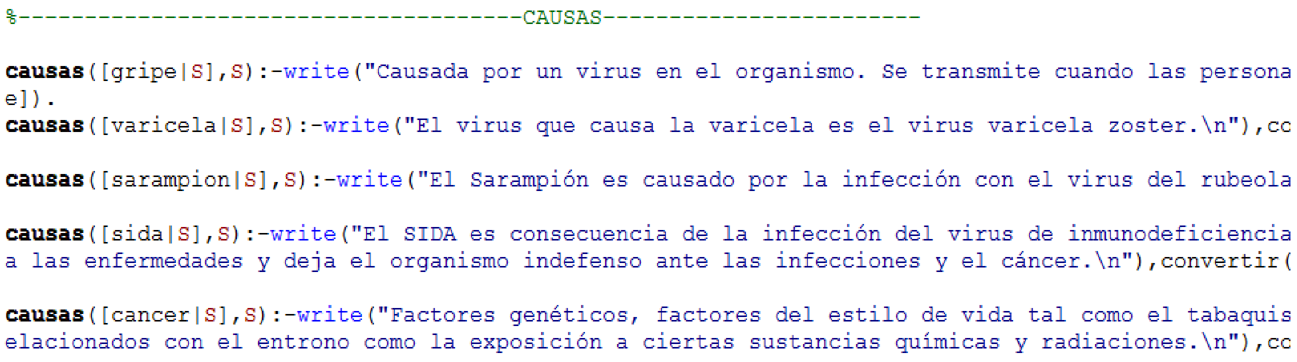
```
%..................SINTOMAS...............................
gripesintomas([fiebre,tos,dolordegarganta]).
varicelasintomas([fiebre,manchas,picor]).
sarampionsintomas([rinitis,conjuntivitis,puntosblancos]).
sidasintomas([diarrea,fatiga,perdidadepeso]).
cancersintomas([abultamientoenlapiel,perdidadepeso,hemorragias]).
```

Figure 4



```
% .................PREVENCION.........................................
prevencion([gripe|S],S):- write("Lavarse las manos con frecuencia lo ayudará a protegerse contra los gérmenes. Si no hay agua y jabón, use un limpiador de manos a base de alcohol.
Limpie y desinfecte las superficies de contacto más comunes en el hogar, en el trabajo o en la escuela, especialmente cuando alguien está enfermo. Duerma bien, manténgase activo físicament
e,controle su estrés, beba mucho líquido y coma alimentos nutritivos.\n")
,convertir([gripe]).

prevencion([varicela|S],S):-write("La mejor forma de prevenir la varicela es vacunándose contra esta enfermedad. Los niños, los adolescentes y los adultos deben recibir dos dosis de la vac
una contra la varicela. La vacuna contra la varicela es muy segura y eficaz para prevenir la enfermedad.\n"),convertir([varicela]).

prevencion([sarampion|S],S):-write("La vacunación es altamente efectiva en la prevención del sarampión, las vacunas que protegen de la enfermedad, son la vacuna triple viral (SRP) o la vac
una doble viral (SR).\n"),convertir([sarampion]).

prevencion([sida|S],S):-write("Tenga relaciones sexuales menos riesgosas. El VIH se propaga principalmente por tener sexo anal o vaginal sin condón o sin tomar los medicamentos para preven
ir o tratar dicha infección.\n"),convertir([sida]).

prevencion([cancer|S],S):-write("Mantener un estilo de vida sano, evitar la exposición a sustancias que se sabe causan cáncer y vacunarse o tomar los medicamentos que pueden proteger para
no padecer cáncer.\n"),convertir([cancer]).
```

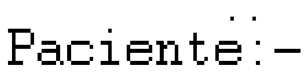
Figure 5



```
%--------------------------------------CAUSAS-----------------------

causas([gripe|S],S):-write("Causada por un virus en el organismo. Se transmite cuando las persona
e]).
causas([varicela|S],S):-write("El virus que causa la varicela es el virus varicela zoster.\n"),cc

causas([sarampion|S],S):-write("El Sarampión es causado por la infección con el virus del rubeola

causas([sida|S],S):-write("El SIDA es consecuencia de la infección del virus de inmunodeficiencia
a las enfermedades y deja el organismo indefenso ante las infecciones y el cáncer.\n"),convertir(

causas([cancer|S],S):-write("Factores genéticos, factores del estilo de vida tal como el tabaquis
elacionados con el entrono como la exposición a ciertas sustancias químicas y radiaciones.\n"),cc
```

Figure 6

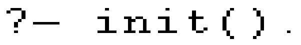
- To start the simulation, first you need, to compile the program , press on compile botton, the in compile buffer botton, after this go to the console of SWI-PROLOG, and type init(). like this:



```
Paciente:-
```

Figure 7

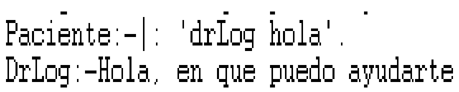
- Then, press the enter botton, and you will be able to begin the simulation asking something to drLog:, you will see something like this:



```
?- init().
```

Figure 8

- The input of Paciente must be in ' ', otherwise ,the program will not understand what you're typing.
- The input must finish with dot(.).
- For greet drLog, the sintaxis must be: saludo+sustantivo ó sustantivo+saludo. Example:
  - Also take care of this: greets compound by more than one word, need to write it together using camel convention(first word in lowercase then the first letter of the next word in uppercase and the rest of the letters of the second word must be in lowercase). For example: 'buenosDias', 'buenasTardes', 'buenasNoches'.
  - 'hola drLog'
  - 'drLog hola'
- Note: To refer to Drlog, it must be done in the following way: 'drLog'.
- IMPORTANT: all the input senteces in this program MUST be in lower case, excepts the camel convention using in the greet statement.
- Depends on the input that Paciente gives, drLog will response him. Like this:

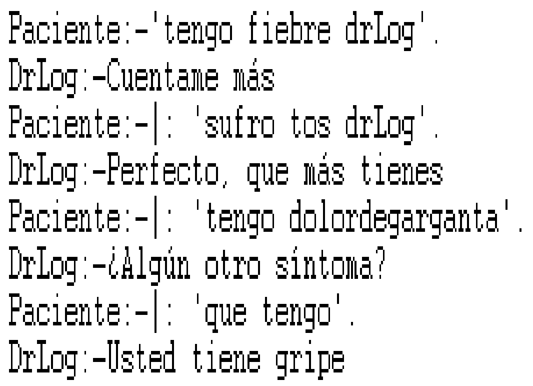


```
Paciente:-|: 'drLog hola'.
DrLog:-Hola, en que puedo ayudarte
```

Figure 9

- Explaining to drLog the symptoms:
  - The sintaxis of that must be a sintagma nominal or sintagma verbal:

- 'NOTE: Important , in the symptoms, we recomend to read first the list of they, because symptoms compound by more than one word, need to write it together. For example: 'puntosblancos', 'perdidadepeso', 'dolordegarganta', 'abultaminetoenlapiel', etc.
- Caution, the symptoms must be declare done by one, the conjuntion statement is not working this will explain later.
- The program needs at least 3 symptoms to give the return.



```
Paciente:-'tengo fiebre drLog'.
DrLog:-Cuentame más
Paciente:-|: 'sufro tos drLog'.
DrLog:-Perfecto, que más tienes
Paciente:-|: 'tengo dolordegarganta'.
DrLog:-¿Algún otro síntoma?
Paciente:-|: 'que tengo'.
DrLog:-Usted tiene gripe
```

Figure 10

-

- Asking questions to drLog.
  - drLog recognize the question that you're giving by the keyword that it's identify, those are: 'que', 'cuales', 'como', 'cual'.
  - 'NOTE: Important , in the symptoms, we recomend to read first the list of they, because symptoms compound by more than one word, need to write it together. For example: 'puntosblancos', 'perdidadepeso', 'dolordegarganta', 'abultaminetoenlapiel', etc.
  - 'que' is asosiated to the question for example: 'que tengo'.
  - cuales is asosiated to de causes for example: 'caules son las causas'.
  - 'como' is asosiated to prevents for example: 'como puedo prevenirlo'.
  - 'cual' is asosiated to tratement for example: 'cual es el tratamiento'.
- Saying goodbye to drLog.
  - Farewell compound by more than one word, need to write it together. Example: 'muchas-Gracias'.
  - 'NOTE: Important , in the symptoms, we recomend to read first the list of they, because symptoms compound by more than one word, need to write it together. For example: 'puntosblancos', 'perdidadepeso', 'dolordegarganta', 'abultaminetoenlapiel', etc.
  - The sintaxis of the farewell is: despedida+sustantivo ó sustantivo+despedida.

4 Description of the implemented functions.

4.1 sintagma$_{n}ominal(S0, S, S2)$

S0 is a list with the sentence, S is an empty list, and S2 is the list with the symptoms. It validates the input sentence if its syntactically well written. It must be compose by a subject, or symptom or a combination of them,

4.2 sintagma$_{v}erbal(S0, S, S2)$

S0 is a list with the sentence, S is an empty list, and S2 is the list with the symptoms. It validates the input sentence if its syntactically well written. It must be compose by a verb, or a sintagma$_{n}ominaloracombinationofthem.$

4.3 esSaludo(S0,S,S2)

Verifies if the input sentence is a greetings, looking if it has a subject, or a greeting from the database or a combination of them.

4.4 esDespedida(S0,S,S2)

Verifies if the input sentence is a farewell, looking if it has a subject, or a farewell from the database or a combination of them.

5 Description of the data structures developed.

5.1 Lists

The linked list is a data structure that allows us to store data in an organized way, just like the vectors but, unlike these, this structure is dynamic, so we do not have to know "a priori" the elements that can contain. It is used to manage the illnesses, and variables, and sentences.

5.2 Database

A database is defined as a series of data organized and related to each other, which are collected and exploited by the information systems. In the case of Prolog are the predefined facts so it can search for an appropriate answer to a problem.

6 Detailed description of the algorithms developed.

As the SE is able to understand the inputs from the user, in this case sentences, we had to detected the multiple combinations of sentences. In order to accomplish this task, it is defined the parts from a sentence like noun phrase and verbal phrase, where noun phrases are composed by subjects, illnesses, or a combination of them, and a verbal phrase is composed by verb, a noun phrase, a determinant or a combination of them. Those sentences parts are predefined as a fact on the database in Prolog.

To evaluate the syntactical analysis of the sentences, each word from the input is store in a list, where it recognizes each word with an space by the atomic-list-concat function from ProLog . When the program validates that the syntax is correct, it will look if a given word is a symptom, and if it finds anyone, will store it in a list. When this element has already three elements the user will be able to ask for his illness, otherwise will be asked to give more symptoms to find the illness.

7 Known Issues.

7.1 Program can not recognize conjunctions.

Because of the implementation to continue the conversation, when it is type a conjunction will not be able to recognized the second part from the sentence until the program is finished, so we decided to keep the program without this function to prevent an stack overflow on the computer.

8 Problems Found

8.1 All sentences were recognized as correct ones

8.1.1 Problem

Every input sentence given by the user were correct for the program.

8.1.2 Description

The program returns True for each sentence, so it was difficult to validate when was a symptom given

8.1.3 Solution Tries

- Look for examples about cuts and failures, in order to stop the quest.
- Reads ALOT of documentation from Prolog to understand the search behavior from it.

8.1.4 Solution

Use cut and failure in the correct fact of the database.

8.1.5 Advice

Prolog will still look for possible answer even if it already has found one, to prevent this case it is highly recommended use cut and failure to stop the quest.

8.1.6 Conclusion

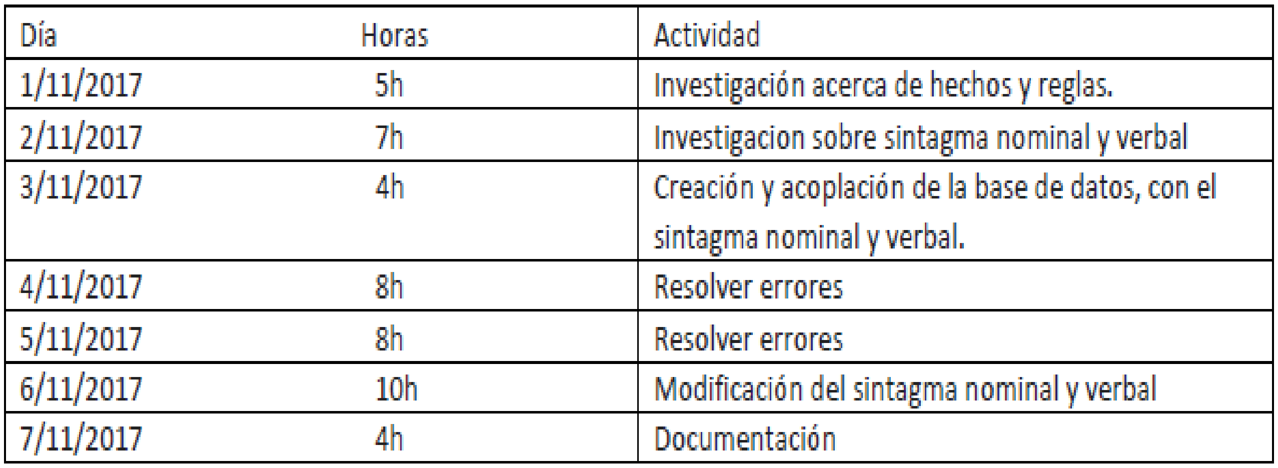
Prolog is useful to look for an answer in a database, however the developer must be careful in the manage of the database, to prevent multiple answers.

8.1.7 Links

[Cs Union] *http://cs.union.edu/-striegnk/learn-prolog-now/html/node90.html* consultado el 5/10/2017

9 Work log

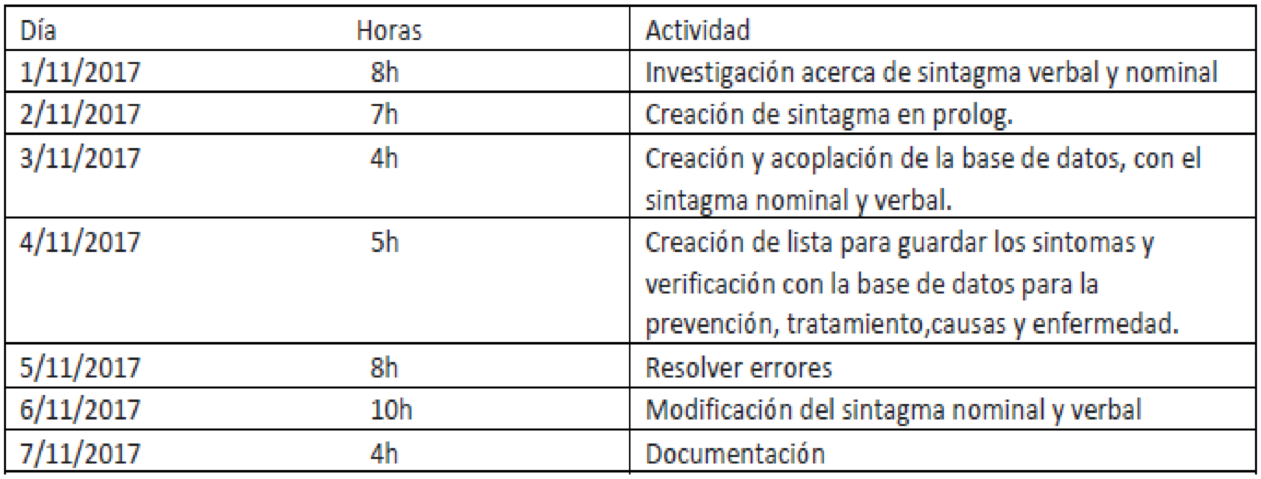
- Jose Rivera Tencio



Día	Horas	Actividad
1/11/2017	5h	Investigación acerca de hechos y reglas.
2/11/2017	7h	Investigacion sobre sintagma nominal y verbal
3/11/2017	4h	Creación y acoplación de la base de datos, con el sintagma nominal y verbal.
4/11/2017	8h	Resolver errores
5/11/2017	8h	Resolver errores
6/11/2017	10h	Modificación del sintagma nominal y verbal
7/11/2017	4h	Documentación

Figure 11

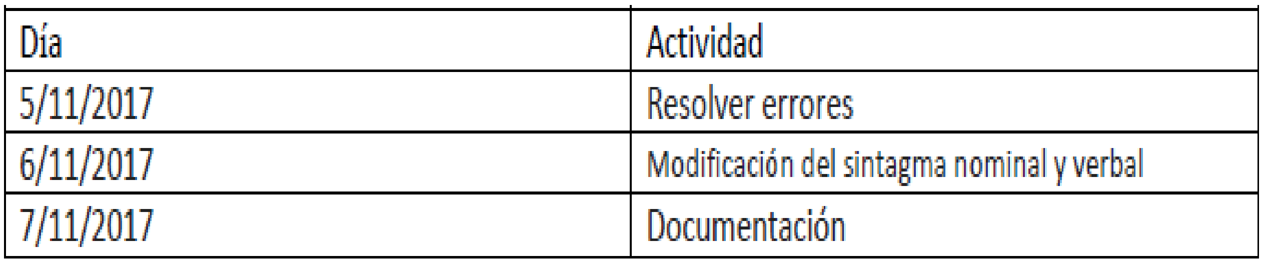
- Kenneth Alvarado Mendez



Día	Horas	Actividad
1/11/2017	8h	Investigación acerca de sintagma verbal y nominal
2/11/2017	7h	Creación de sintagma en prolog.
3/11/2017	4h	Creación y acoplación de la base de datos, con el sintagma nominal y verbal.
4/11/2017	5h	Creación de lista para guardar los sintomas y verificación con la base de datos para la prevención, tratamiento,causas y enfermedad.
5/11/2017	8h	Resolver errores
6/11/2017	10h	Modificación del sintagma nominal y verbal
7/11/2017	4h	Documentación

Figure 12

- Team



Día	Actividad
5/11/2017	Resolver errores
6/11/2017	Modificación del sintagma nominal y verbal
7/11/2017	Documentación

Figure 13

10 Conclusions

- It can be concluded with the execution times obtained, that backtracking is extremely inefficient, however easier to program in the functional paradigm
- The most effective way to find the horse's route is to use a heuristic algorithm, but it has its limitations, because when finding the best option, only one accepted route can be found.
- If its needed to implement a GUI on Lisp language, is a good idea to include the library (lib "graphics.ss" "graphics")), in your project, and look information about it. It is a powerful tool to developed nice GUI in this programming language.
- The knight tour algorithm is only valid for grids nxn with n bigger than 4. As the n value increase, the run time will increase as well in order to get a solution.
- Not every i j position given will have a solution, nor the same number of solutions as in other position. It depends basically of the position given and the size of the matrix
- As the position given is close to the center of the matrix, will performed the solution faster. The reason is because it has more possibilities to start the tour, in the other hand, if the starting position is a corner will take more time, because it will only have 2 possible paths to star the tour.

References

[1] [Monferrer]T. E. *Toledo, F., Pacheco, J. (2001). El lenguaje de programacion Prolog. Valencia.* consultado el 1/11/2017

[2] [Plus]C *Enfermedades infecciosas. Retrieved from Cuidate Plus: http://www.cuidateplus.com/enfermedades/infecciosas.html* consultado el 1/11/2017