

PHARMACEUTICALS IN THE RIVER? Science Notebook

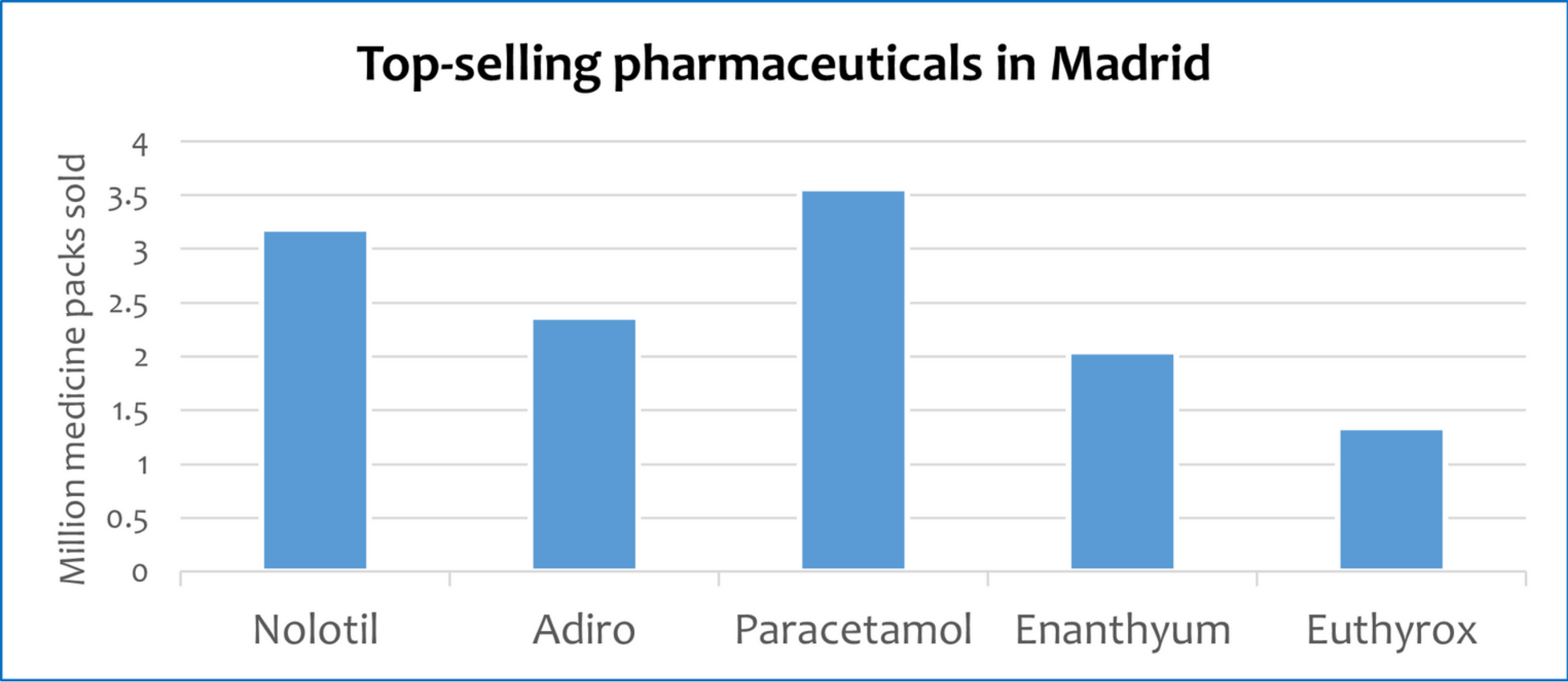
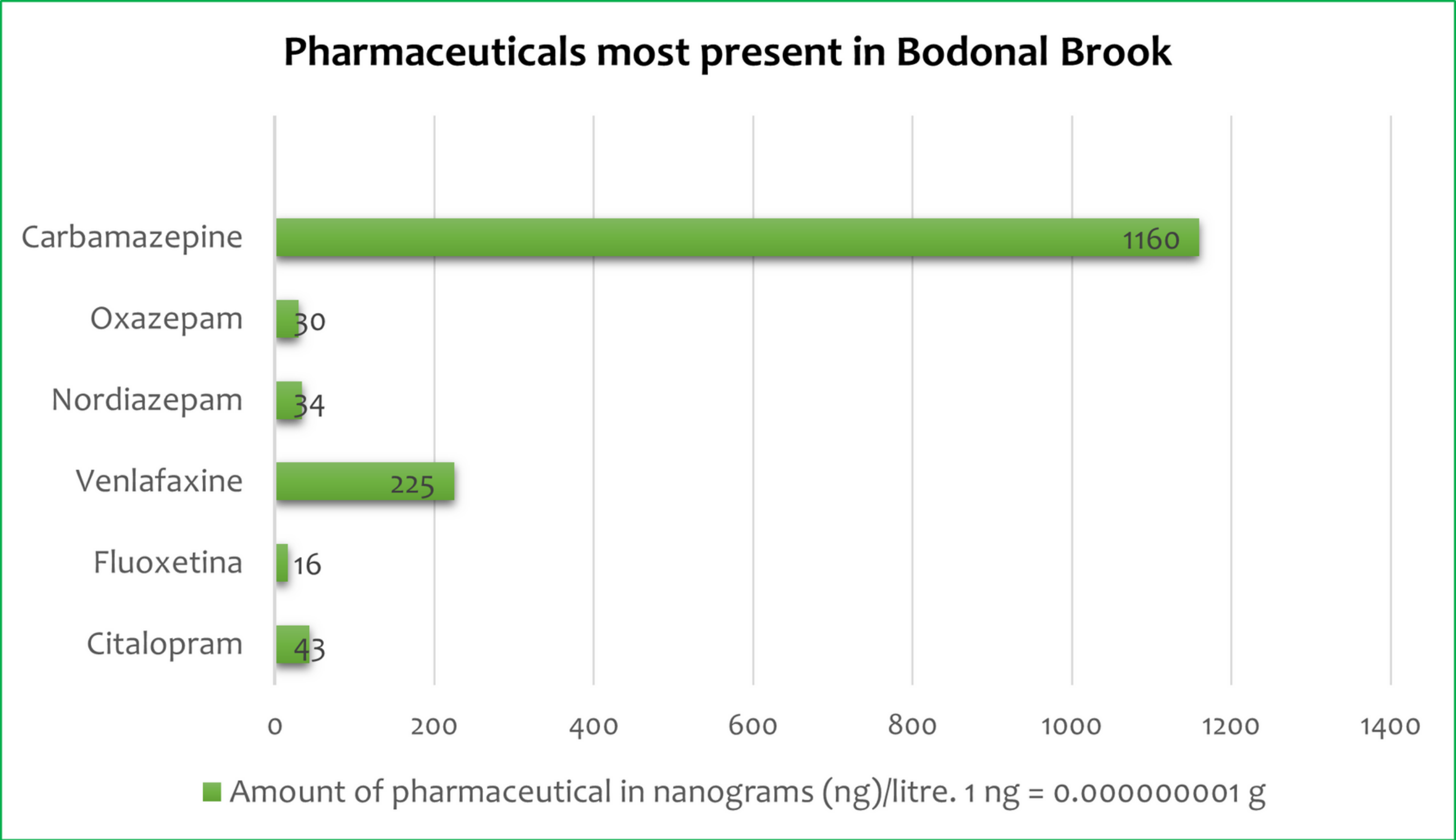
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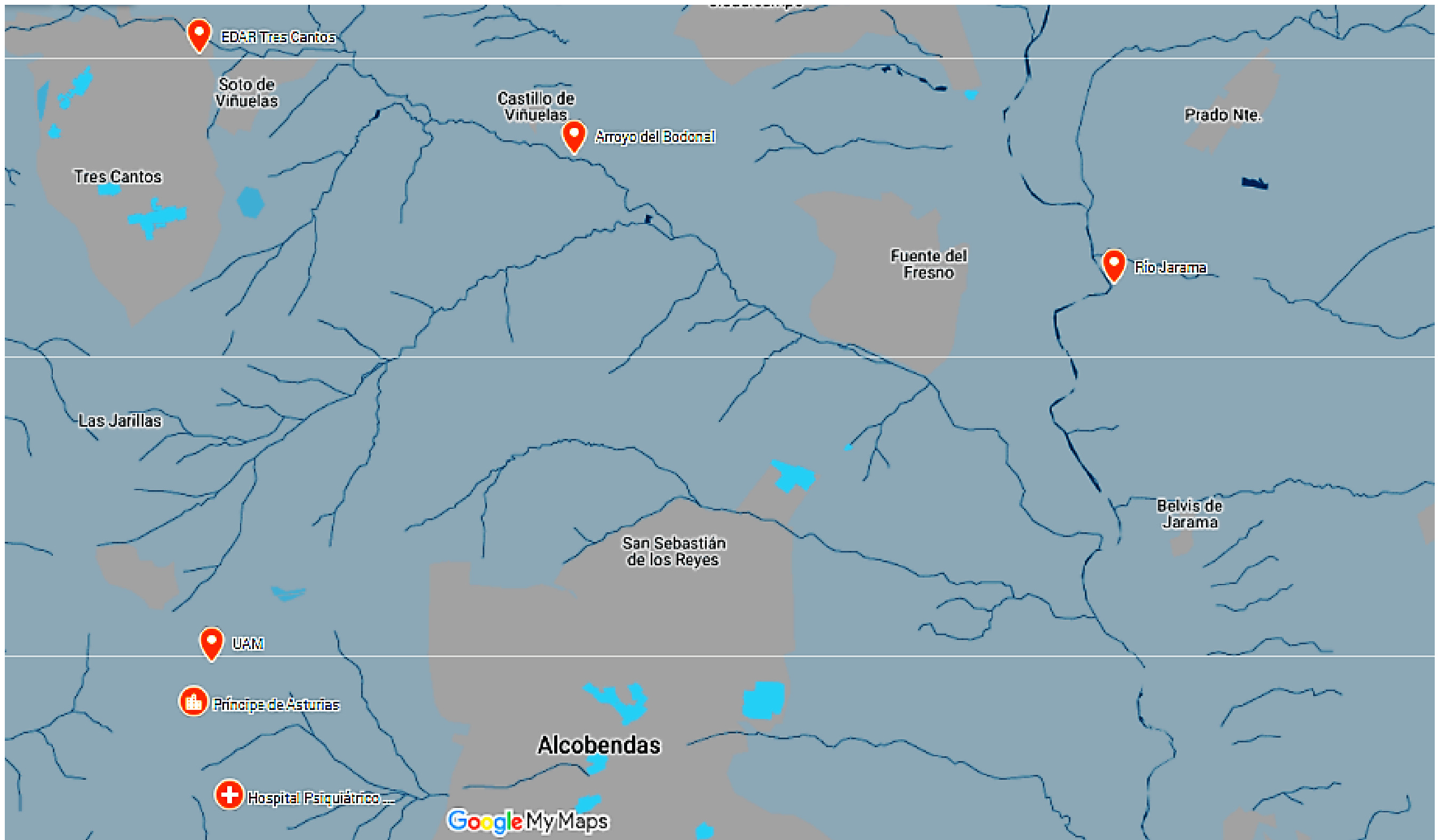
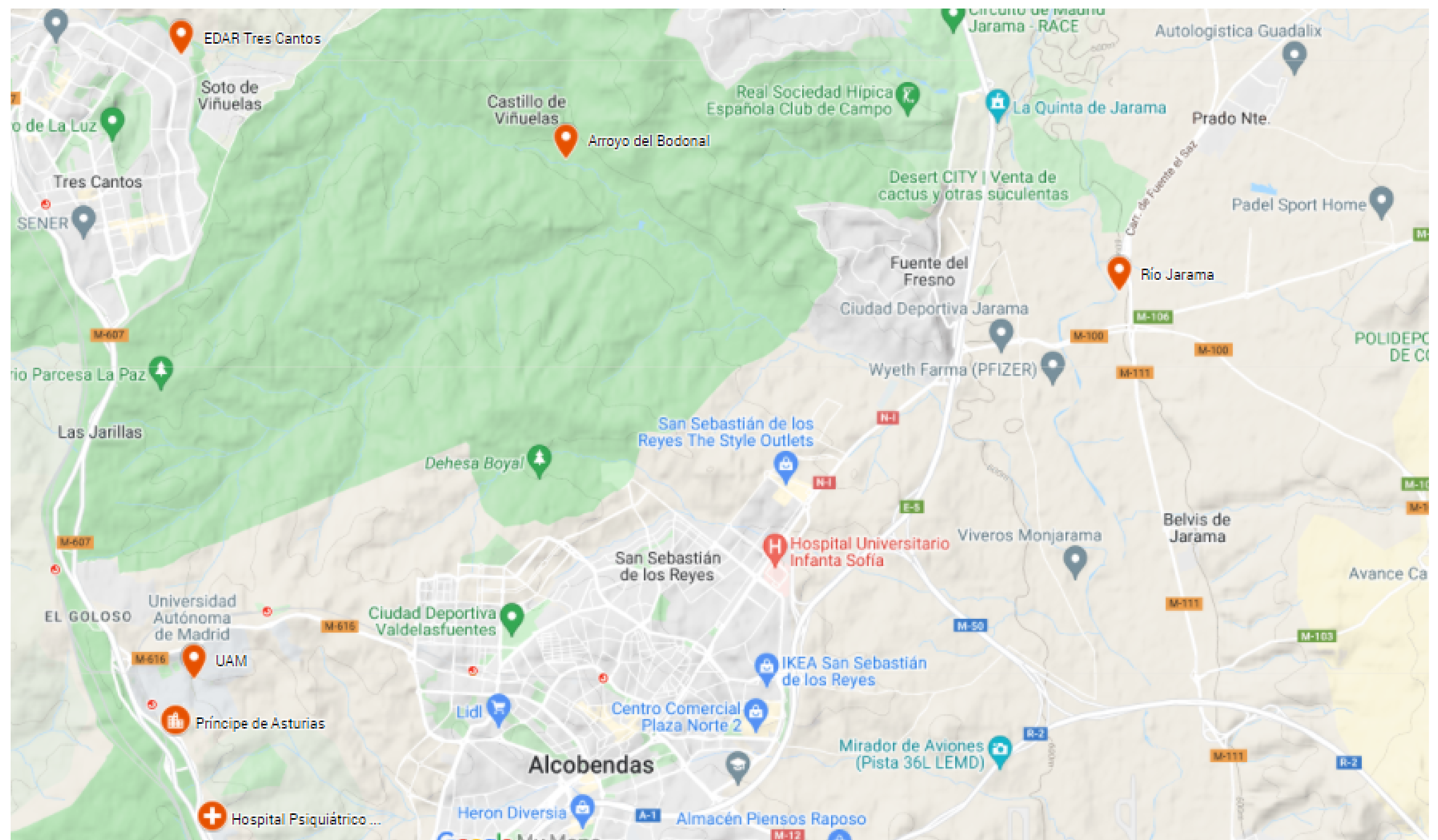


Presentation of the case

Graphs



Maps



SCAN ME

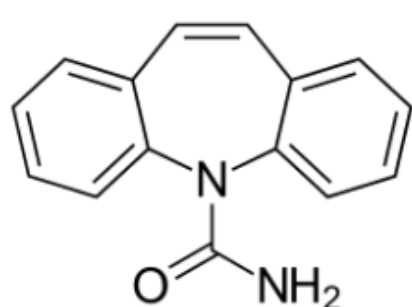
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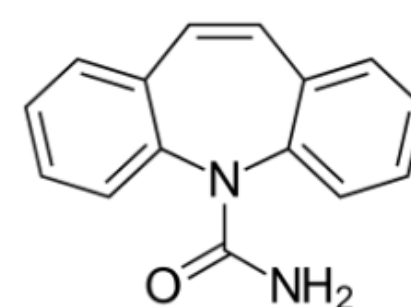


SCIENTIFIC REPORT

MARCIANIT@S LAB



CARBAMAZEPINE DISCOVERIES

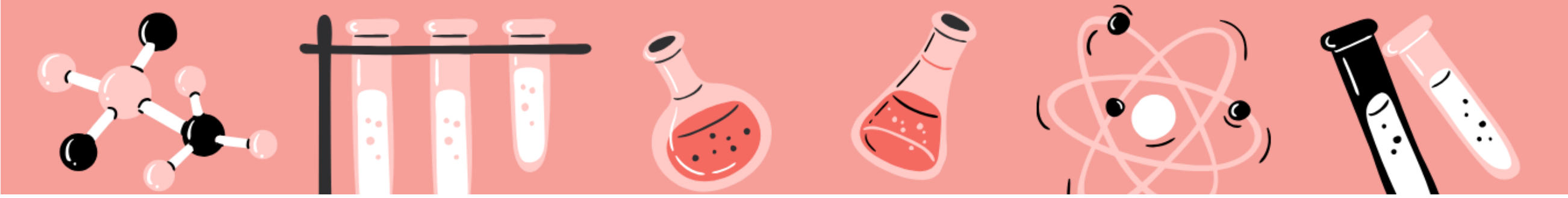


The current wastewater treatment technologies of the Wastewater Treatment Plants (**WWTP**) of Madrid's rivers cannot effectively remove fluoxetine, citalopram, venlafaxine, nordazepam, oxazepam, and especially carbamazepine, which are discharged into rivers. On the other hand, paracetamol, enantyum or nolotil can be disposed of, as they are degradable by sunlight and in sewage treatment plants.

Carbamazepine has an extremely low **removal rate** in wastewater treatment plants. That is, of the total amount of carbamazepine in wastewater, only 7% is removed in WWTPs.

Furthermore, **carbamazepine as an environmental contaminant** has been shown to be present in all parts of the aquatic environment: sewage treatment plant effluents, surface water, groundwater and occasionally in drinking water.

Two side effects of carbamazepine have been demonstrated in chickens and fish. On the one hand, sterility. Some chickens and fish have been found to be unable to reproduce due to alterations in the functioning of their sexual organs. On the other hand, carbamazepine has also been shown to cause problems and abnormalities in foetal development in these animals during pregnancy.



Trifold Leaflet

About Marcianit@s Lab

In this laboratory, we work to discover new pharmaceuticals to treat the new diseases that are threatening us.

We also investigate the effect that certain pharmaceuticals have on the environment and how we might reduce their harmful effects on health.

**LET'S TAKE CARE
OF OUR HEALTH**



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PHARMACEUTICALS



WHAT ARE THESE?
WHAT ARE THESE FOR?

CARBAMAZEPINE

Antiepileptic and antidepressant

Used to control epileptic seizures and bipolar disorder.



OXAZEPAM

Anxiolytic

Treats anxiety

NORDIAZEPAM

Anxiolytic

It is used to control anxiety disorders, panic disorders and various types of phobias.

VENLAFAXINE

Antidepressant

It is used to control different types of anxiety and panic disorders.



FLUOXETINE

Antidepressant

It treats depression, obsessive-compulsive disorder, eating disorders and panic attacks.

CITALOPRAM

Antidepressant

It is used to treat depression.



Anxiolytics, antidepressants and antiepileptics, among others, are medicines frequently consumed in hospitals and also prescribed for home use. All of them are manufactured in pharmaceutical laboratories in Spain.



Here are the most widely sold medicines among the population to alleviate different pains and some quite common specific diseases.



NOLOTIL, PARACETAMOL Y ENANTYUM

Analgesics and antipyretics

It is used to relieve pain and fever.



ADIRO

Platelet antiaggregant

It serves to reduce the chances of blood clots or thrombi occurring.

EUTHYROX

Levothyroxine

It is a thyroid hormone to treat hypothyroidism.

**BASED ON WHAT YOU HAVE READ
AND SEEN, WHAT IS POLLUTING THE
RIVER?**

A possible reference response would be as follows:

The river is contaminated with pharmaceuticals: citalopram, fluoxetine, venlafaxine, nordiazepam, oxazepam, and mostly carbamazepine (about 1200 ng/l).

**Where did you get the information to answer this question
(maps, graphics, report, videos, leaflet)?**

A possible reference response would be as follows: The graphic entitled
“Pharmaceuticals most present in Bodonal Brook”

BASED ON WHAT YOU HAVE READ AND SEEN, WHERE DO THE PHARMACEUTICALS IN THE RIVER COME FROM?"

A possible reference response would be as follows:

It is observed that the pharmaceuticals come from households (due to the domestic consumption of people who take pharmaceuticals). Specifically, from the city of Tres Cantos, and the water sampled may or may not have passed through the WWTP.

Given that the drugs present in the Bodonal Brook are antidepressants and anxiolytics, it might seem that they come from the psychiatric hospital indicated on the map, but this is not possible because, looking at the course of the water, the wastewater from the hospital would discharge in Alcobendas.

Where did you get the information to answer this question (maps, graphics, report, videos, leaflet)?

A possible reference response would be as follows: Both maps

WHAT DISEASES DO THESE PHARMACEUTICALS TREAT?

A possible reference response would be as follows:

The drugs most commonly found in the Bodonal Brook are antidepressants, anxiolytics and treat mental health related illnesses (anxiety, panic disorders, bipolar disorder, epilepsy, etc.). This information indicates that citizens are highly exposed to these types of illnesses.

**Where did you get the information to answer this question
(maps, graphics, report, videos, leaflet)?**

A possible reference response would be as follows: Leaflet

IF THE PHARMACEUTICALS MOST COMMONLY FOUND IN THE BODONAL STREAM ARE NOT THE BEST-SELLING ONES, HOW AND WHY DO THEY END UP IN SUCH LARGE QUANTITIES IN THE STREAM?

A possible reference response would be as follows:

It is observed that the most sold pharmaceutical is paracetamol, followed by nolutil. Although they are the best sellers, they are not the most present because they are degradable by sunlight and are better removed in WWTPs and are therefore not found in the sampled water. In fact, only 7% of carbamazepine is removed. Furthermore, for antidepressants and anxiolytics to be effective, much more is needed to be supplied than, for example, paracetamol. Therefore, although they are sold less, they are more present in the stream.

Where did you get the information to answer this question (maps, graphics, report, videos, leaflet)?

A possible reference response would be as follows: Graphics and report

IS IT HARMFUL FOR PHARMACEUTICALS TO BE IN THE RIVER? WHY?

A possible reference response would be as follows:

The presence of pharmaceuticals in the river poses a great risk to the entire ecosystem. In this regard, carbamazepine has been shown to alter foetal development and reproduction in chickens and fish (animal health). Furthermore, if pharmaceuticals are still present in the water treated by WWTPs, they could also be in the drinking water that we can drink or in the water used to irrigate the food we eat, and be detrimental to environmental and human health (One Health).

**Where did you get the information to answer this question
(maps, graphics, report, videos, leaflet)?**

A possible reference response would be as follows: Report

WOULD IT BE BETTER TO TAKE MEDICATION OR NOT? WHY?

A possible reference response would be as follows:

The use of pharmaceuticals in health is an important scientific advance. So it is necessary to take pharmaceuticals, but they must be used correctly, in a responsible way. We must not self-medicate, we can only take the drugs prescribed by the doctor.

WHAT SOLUTIONS CAN YOU THINK OF TO PREVENT SO MANY MEDICINES FROM REACHING THE RIVER?

A possible reference response would be as follows:

Some solutions to this environmental problem:

- Reducing the consumption of pharmaceuticals
- Better regulate the consumption of pharmaceuticals so that only those prescribed by a doctor are sold.
- Make changes or innovations in the WWTPs so that they have a greater scope for eliminating drugs such as carbamazepine.
- Given that the drugs present in the river are to treat mental health illnesses, we should question the causes of everyday stress or widespread anxiety problems in society. Solving these problems would reduce illnesses, and thus reduce the consumption of pharmaceuticals.