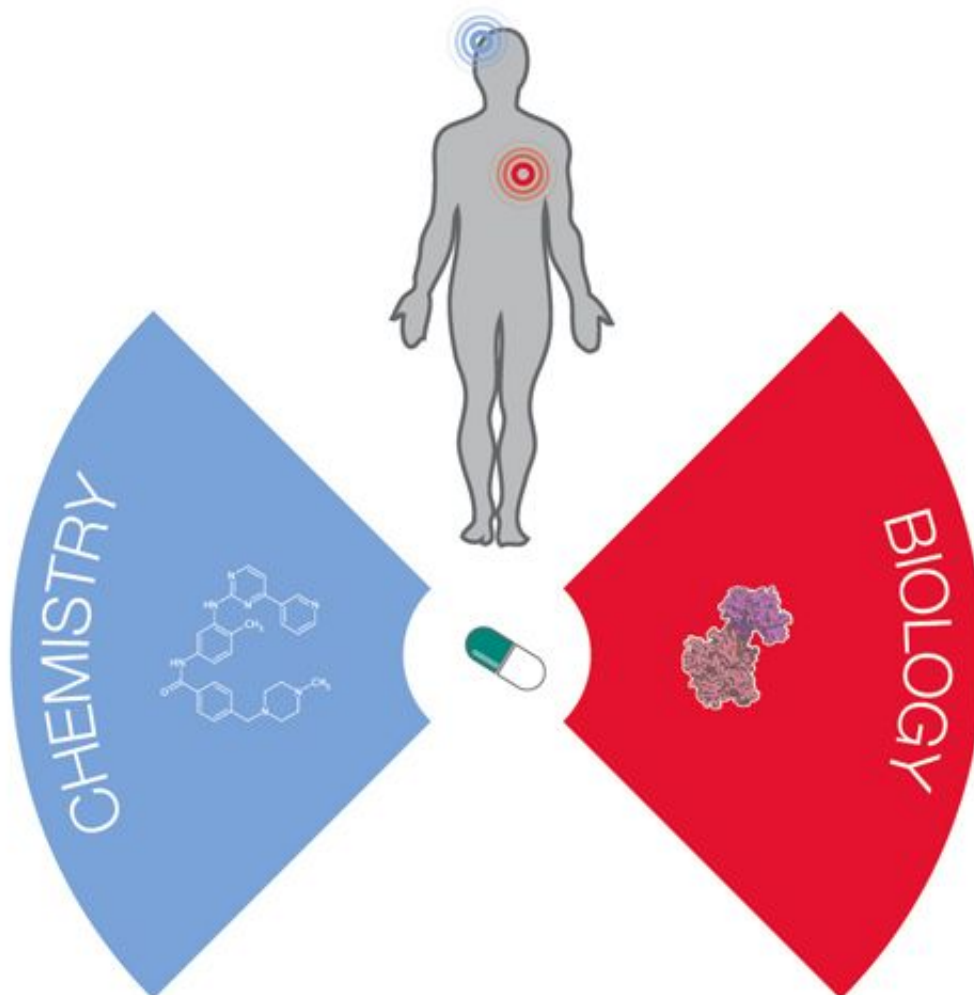


Drug side effects examined

April 19 2013



Graphic representing the combination of chemistry and biology to determine what may cause a given drug side effect. Credit: Miquel Duran

Yellow vision, pseudo-pulmonary obstruction, involuntary body movements, respiratory paralysis. These are some of the 1,600 known side effects (SEs) produced by drugs. Adverse effects are one of the main causes of hospital admission in the west. These effects are difficult to predict, and in practice specific assays are required to test the safety of agents in pre-clinical phases, thus these effects are often not discovered until the drug has been launched. A study published by scientists at the Institute for Research in Biomedicine (IRB Barcelona) seeks to fill this information gap. The objective of the study is to shed light on the molecular bases of SEs and provide medical chemists with the tools to design safer drugs and to predict their effects. The study collects and proposes molecular hypotheses for 1,162 side effects. This information, which is about to be tested experimentally, is now available to the scientific community through the most recent issue of the specialized journal *Chemistry and Biology*, part of the *Cell* group.

The researchers Miquel Duran and Patrick Aloy collated all the drugs that cause each known SE. Next, they studied the proteins with which they interact and their chemical structure. "For most of the [side effects](#) we have a biological hypothesis, and for many of these cases we also have [chemical information](#) about the drug, which may be useful to predict a specific secondary effect," explains ICREA researcher Patrick Aloy, head of the "Structural Bioinformatics and Network Biology" at IRB Barcelona. Of the 1,162 SEs for which they have found a molecular description, 446 can be explained solely on the basis of biology and 68 only on the basis of chemistry, while for 648 (56%) both biological and chemical considerations are required.

One of the SEs described is buccoglossal syndrome, a disorder involving [involuntary movements](#) of the body and caused by six different drugs. The researchers propose that drugs whose structures include a piperazine ring and, in addition, interact with the receptors 5-HT_{2A} and/or DRD₂ are more likely to cause this syndrome. "This is one of the examples

where we need a biological and chemical explanation," says Miquel Duran, a chemist doing his PhD in Aloy's lab, and first author of the paper. "Another interesting case is xanthopsia, a predominance of yellow in the vision, a condition supposedly experienced by Van Gogh", explain the researchers. "In this case we do not suspect any related protein but observe that there are chemical structures that can cause this disorder, which we have annotated in 13 drugs that include this condition as a possible side effect" .

"We are providing the scientific community with lists of proteins and the chemical features associated with SEs. We refer to these as "alerts": they can be used by drug design experts to try to avoid certain interactions and/or structures in order to develop safer drugs," says Aloy.

For these scientists, it is necessary to combine biology and chemistry in order to determine what may be causing a given SE. "In practice, and for each unwanted effect, there is a biological part that we know, but this part does not offer a complete picture of the mechanism and perhaps we will be able to fill this gap by "looking at" the [chemical structure](#)," upholds Duran. "The multidisciplinary provided by IRB Barcelona allows us to start studies with these characteristics, which require the convergence of several fields to achieve a more complete understanding," says Dr. Aloy, an expert in systems biology.

Provided by Institute for Research in Biomedicine (IRB Barcelona)

Citation: Drug side effects examined (2013, April 19) retrieved 26 June 2024 from <https://phys.org/news/2013-04-drug-side-effects.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.