A short cut to billion dollar drugs

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(Phys.org)—Scientists have found a highly efficient method of making hormone-based drugs which could generate billions of sales for the pharmaceutical industry.

Organic chemists from the University of Bristol, whose work was recently published in Nature, have perfected a quicker way of making prostaglandins which would mean many more people could be treated for a range of illnesses for the same cost.

Prostaglandins are some of the most important molecules in biology and medicine as they regulate a wide range of activities in the body including blood circulation, digestion and reproduction.

Some synthetic analogues of prostaglandin are 'billion dollar' drugs. The prostaglandin analogue latanoprost, for example, which is used to treat glaucoma and ocular hypertension, generates approximately $1.6 billion

in sales each year.

Prostaglandins have been popular targets in synthesis for the last forty years because of their breadth of biological activity and their challenging molecular architecture. However, since these molecules cannot be isolated from natural sources in sufficient quantities, they have to be synthesised, but process is lengthy. For example, the current synthesis of latanoprost requires twenty steps. Until now, despite huge synthetic effort in industry and academia, advances in the synthesis of prostaglandins have been limited.

Professor Varinder Aggarwal, who led the research funded jointly by the Engineering and Physical Sciences Research Council and the European Research Council, now reports a concise synthesis of prostaglandin PGF2a, which relies on the use of an organocatalyst, a small organic molecule, to catalyse a key step in the process. The new process has enabled them to complete the synthesis in just seven steps.

In a follow-up patent, the authors have described the application of this technology to a simple synthesis of prostaglandin-based drugs, e.g. latanoprost and bimataprost. The methodology should now make it easier to discover new biologically active prostaglandin analogues. It is a major advance and represents a step change in the synthesis of this important class of compounds.

Professor Aggarwal, from the University's School of Chemistry, said: "Despite the long syntheses and the resulting huge effort that is required for the preparation of these molecules, they are still used in the clinic, because of their important biological activity.

"Being able to make complex pharmaceuticals in a shorter number of steps and therefore more effectively, would mean that many more people could be treated for the same cost."

More information: doi:10.1038/nature11411