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New research into safer drugs puts pills through the printer

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A collaboration between the University of Leeds, Durham University and GlaxoSmithKline (GSK) is looking at 'printing' pills to order, to create safer and faster-acting medicines.

It should also bring new drugs to market faster, so patients can benefit more quickly from medical advances.

The research, led by Dr Nik Kapur from the University's Faculty of Engineering, is set to revolutionise a process which has remained unchanged for over a thousand years.

GSK has developed a way of printing active pharmaceutical ingredients onto tablets - but the process can only currently be applied to just 0.5 per cent of all medicines used in tablet form. The researchers hope the new project will see this increase this to 40 per cent.

"Some active ingredients can be dissolved in a liquid, which then behaves like normal ink, so then the process is fairly straightforward," explains Dr Kapur. "However, when you're working with active ingredients that don't dissolve, the particles of the drug are suspended in the liquid, which creates very different properties and challenges for use within a printing system.

"For some tablets, you may also need higher concentrations of active ingredients to create the right dose, and this will affect how the liquid behaves."

A medicine droplet is 20 times larger than an ink droplet in a standard ink-jet system, so the challenges facing the researchers include the numbers of drops that each tablet can hold, and how to increase the level of active ingredient in each drop. The research will also look at the properties and behaviour of the suspension, the shape and size of the printing nozzle and ways to pump the suspension through the printing equipment.

Drugs produced in this way would be faster acting, as with the active ingredient on the pill's surface, the pill would no longer need to be broken down by the digestive system before the drug can enter the bloodstream. Ultimately it would also be possible to print several drugs onto one pill, reducing the number of tablets to be swallowed by patients on multiple medicines.

Printing active ingredients onto pre-formed tablets speeds up and improves quality control, as each tablet contains exactly the correct dose. With some of the current quality assurance procedures rendered unnecessary, new drugs would reach patients much faster.

The first documented manufacture of pills goes back to Egyptian times, when active medicinal ingredients were rolled in bread or clay, but the earliest reference to a tablet - a compressed pill - is found in tenth century Arabic medical literature. The process had little changed when the first patent for tablets was applied for in 1843. First produced in small doses by pharmacists, mass production still uses the same process, but with much advanced technology and quality assurance.

Because most drugs only need very small doses, the pill or tablet acts as a carrier to make the medicine big enough to pick up and swallow. The active ingredient is usually just one thousandth of a pill, so has to be mixed with other ingredients to bulk it out to pill size. This is then split into the amount needed for each pill and compressed to create a tablet.

One of the major challenges is ensuring that each tablet contains the correct dose. This is currently done by statistically checking samples from each batch of pills post-production, but a printed system would enable quality control of each pill as it is produced. The new system would therefore both speed up production and provide a greater quality assurance and consistency of dosage than are currently possible under even the highest pharmaceutical standards.

Provided by University of Leeds