Textile innovator Lauren Bowker is developing an ink that, when printed on clothing, will change colour when the wearer is about to have an asthma attack or strain a muscle.

Life-saving inks

"A lot of wearable technology does go into sportswear and healthcare clothing, but it doesn't always necessarily look good. If you understand the technology, you can design a lot better with it, which is hopefully what I'm doing," says Lauren Bowker, a masters student at the Royal College of Art, London, who is currently developing an ink that can detect an asthma attack. Responding to changes in the blood, the ink would change colour as a way of indicating an on-coming attack. "I started it a year ago, but I just got funding for it and proof of concept, so I'm now working with a reputable sportswear company to make it a reality," says Ms Bowker.

For legal reasons, *WSA* cannot name the company Ms Bowker is collaborating with, but the technology she is developing is of relevance not just for its health applications, but also for its potential sportswear applications. In an asthma attack, the muscles of the air passages in the lungs go into spasm and the linings of the airways swell. As a result, the airways become narrowed and breathing becomes difficult. The part of an attack that Ms Bowker's ink can detect is the muscle spasms – which means that the ink could also be used to indicate whether an athlete is about to strain a muscle.



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"Because of the way the ink works, it could also predict muscle tensions," she says. "So for example if you're rowing, and the back of your t-shirt turns red, then the person behind you can tell you to stop – or if it's green, they can tell you you're not working hard enough."

Blood responsive

The technology behind the ink is at this stage highly confidential, and Ms Bowker describes it simply as "layers of compounded inks which are responsive to something in the blood". Thermochromic inks are temperature sensitive compounds that temporarily change colour with exposure to heat. They were originally developed in the 1970s, and are frequently used today in clothing, but mainly for aesthetic purposes, as in American Apparel's 'Hypercolour' t-shirts. The technology Ms Bowker is developing relies on thermochromic inks which have been altered. "I've changed the structure of it and the binding solutions of it," says Ms Bowker. "So now, rather than it changing from one colour to another colour, it can change up to eight colours, between a spectrum. It was a case of working out the temperatures and working out what response you want to an alteration in the blood."

According to Ms Bowker, developing the ink to a stage where it can be used on consumer products could take up to five years.

Art meets science

The work which led Ms Bowker to begin developing the muscle tension ink was a world away from the sports- and medical-apparel



Ms Bowker believes sportswear treated with the inks she's developing could alert the wearer to an on-coming asthma attack or muscle strain, and be used in all kinds of sports training, from weight lifting to rowing.

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PHNX is an art installation piece and a garment made of feathers which have been treated with thermochromic inks. This project gave Ms Bowker the idea to use such colour-changing inks in sportswear.

Lauren Bowker

industries, in that it was her own art installation piece. PHNX, Ms Bowker says, was "an original take on dynamic chromic imaging". A garment made of feathers which had been treated with many types of ink, PHNX was displayed in a glass case and continually changed colour, due to the use of "focussed thermal beams, sequentially controlled through computer software to allow the piece to take on a life of its own". Ms Bowker says: "The technology in PHNX inspired the workings of the muscle tension ink, and was where that project started so the two are linked quite tightly. PHNX is just a more exploratory creative exploitation of the ink, and it allowed me to really understand how to manipulate and stretch the limits of the basic thermochromic inks to work more widely within a material."

Before the PHNX project, Ms Bowker worked with a school of biological and chemical sciences in Manchester to develop a carbon emission responsive ink. The pollutant absorbent jacket resulted in changes from yellow to black, and depending on the shade, tells the wearer how much carbon dioxide is in the environment. Ms Bowker exhibited the jacket widely and the innovative and thought-provoking concept won a number of awards. "It was a great platform and I've met amazing people, done amazing collaborations with it, and I'll revisit it when I need to," says Ms Bowker.

The driving force behind the textile innovator's work comes from personal experience, as Ms Bowker broke her back in her youth. "It was the best thing really, because without that I would never have done the work that I've done. It gave me a lot of time to think and I'd rather turn it into a positive. That's why I design this way and, because I have disabilities, I understand how I would like things to be designed to help me.

"I want to work predominantly as someone who inspires people to use technology in a beautiful and proper way. I also want to make people think of printed textiles differently," continues Ms Bowker. "I don't want to make clothing that is just beautiful. But if it can look beautiful and then, when you need it to, it can save your life, then it's a bonus."



PdCL2 is a jacket which changes colour depending on the levels of carbon dioxide around it. The pollutant absorbent jacket changes from yellow to black to alert the wearer of carbon emissions.

Lauren Bowker

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