Researchers explain science behind scalp cooling and hair loss in cancer treatment

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Hair loss is one of the most distressing side-effects of cancer treatment and can even deter some patients from undergoing life-saving chemotherapy. But researchers at the University of Huddersfield are establishing the scientific basis for a rapidly-advancing scalp cooling technology that can ensure hair retention in a vast number of cases.

There is also an added benefit that the increased positivity of patients who retain their hair can help to boost their immune systems and therefore aid recovery.

Experienced cancer researcher Dr Nikolaos Georgopoulos heads the project and the other key figure is Omar Hussain. With an academic background in the pharmacology of cancer treatment, he has been working closely with the Huddersfield firm Paxman Coolers Ltd, an innovator in the field of scalp cooling and which is now the world's leading supplier of hair-loss prevention systems. Its scalp coolers have been used by more than 100,000 patients in 32 countries.

Omar has recently completed his two-year position as the associate in a UK government-backed Knowledge Transfer Partnership (KTP) formed between Paxman and the University of Huddersfield. Now he has embarked on a programme of doctoral research supervised by Dr Georgopoulos and fully-funded by Paxman.

The PhD project will build on the findings of the research team, who have conducted laboratory experiments which provide scientific backing for clinical evidence that scalp cooling can eliminate hair loss during chemotherapy in at least 50 per cent of cases.

The effectiveness of cooling

Progress has also been made in establishing why cooling works and the researchers have also explored its effectiveness and its limitations when different combinations of drugs are used during chemotherapy. Dr Georgopoulos, Omar Hussain and their collaborators are the first to have published scientific papers which demonstrate that cooling works. They include an article in the journal Toxicology in Vitro.

Dr Nikolaos Georgopoulos (left) and PhD researcher Omar Hussain

The two Huddersfield scientists have also attended the recent St Gallen International Breast Cancer Conference, held in Vienna, where they gave two poster presentations on aspects of the scalp cooling research.

Dr Georgopoulos said that there was a range of explanations for the effectiveness of cooling. For example, the lowered temperature of the scalp could result in greatly reduced blood flow to the area, so that less of the drug finds its way to the hair follicles. It is also possible that cooling reduces the level of drug uptake in the region of the hair cells, or that the same effect is produced by a lowering of the metabolism.

Omar's PhD research will lead to a deeper understanding of the science behind cooling, focussing on the issues of drug uptake and drug release.

Happier patients have stronger immune systems

The University of Huddersfield researchers and the Paxman firm are aware that the benefits of scalp cooling technology can extend beyond the issue of hair loss.

Figures have shown that eight per cent of patients refuse chemotherapy because they fear losing their hair, said Omar Hussain. "So to have our research out there is a reassurance to them," he added.

Clinicians tend to regard hair loss as "collateral damage" said Dr Georgopoulos. "What they care about, of course, is saving lives. But we know the difference that keeping hair makes to patients and there is evidence that happier patients have stronger immune systems."

"Mood relates to hormonal release and that can affect the function of the immune system. Positivity can have an effect – there are scientific papers which suggest that it affects the efficacy of the treatment.

"So if you look in a mirror and feel good about yourself because you have a full head of hair, that is a big psychological boost that can help people through their treatment."

The researchers and Paxman now hope that scalp cooling will be embedded as a routine part of chemotherapy and that it will be an established element of nurse training.

The managing director of Paxman is Richard Paxman, who commented: "We are delighted with the results of the University of Huddersfield research and are extremely excited that it is being presented at this year's International Breast Cancer Conference. Every day we hear personal stories from patients and their families about the positive results of scalp cooling so it is great to see clinical evidence to back this up."

More information: "Use of in vitro human keratinocyte models to study the effect of cooling on chemotherapy drug-induced cytotoxicity," *Toxicology in Vitro*, Volume 28, Issue 8, December 2014, Pages 1366-1376, ISSN 0887-2333, dx.doi.org/10.1016/j.tiv.2014.07.011

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