

MEASUREMENT OF UV FILTERS IN BREAST TISSUE

Breast Cancer UK awarded a grant to Professor Philippa Darbre at Reading University to support scientific research into the presence of UV filters in human breast tissue taken from patients with primary breast cancer. It is part of a longer term project to identify multiple environmental chemicals in the human breast and to understand why there is a disproportionate incidence of breast cancer in the upper outer quadrant of the breast.

Brief summary of results

Professor Darbre and colleagues tested for the presence of 4 different UV filters in breast tissue samples from 40 women with primary breast cancer. They showed one or more UV filters were measurable in 84% of breast tissue samples and in at least one breast region for 95% of women. Previously, all of these UV filters had been shown to be oestrogenic, and their presence in human breast tissue suggests a potential for them to influence breast cancer development.

Details of the research project: Measurement of UV filters in human breast tissue

UV filters are added to a wide range of personal care products (not just sunscreens) but some are known to have oestrogenic effects. It is widely accepted that oestrogenic chemicals may contribute to breast cancer development if they enter the breast. Whilst the presence of UV filters in the breast in itself will not prove a causal link to breast cancer, if UV filters are found at high concentrations in breast regions at high risk of cancer, it will pose serious and fundamental questions about the link between

the two and whether the use of UV filters in products should be curbed.

The specific aims of this project were to measure by liquid chromatography – tandem mass spectrometry (LC-MS/MS) the concentrations of the ultra-violet light (UV) filters benzophenone-3 (BP-3), octylmethoxycinnamate (OMC), 4-methylbenzilidene camphor (4-MBC) and homosalate (HS) in 120 samples of human breast tissue taken from 40 patients with primary breast cancer at three serial locations across the breast from underarm region to sternum. In a pilot study, BP-3 and OMC were detected in all of 20 human breast tissue samples. Although measurement of 4-MBC and HS was more sporadic, it was agreed to continue to include 4-MBC and HS in future analyses because this would provide a larger set of analyses and it would involve no additional cost. This grant provided financial support for analysis of the other 100 samples.

UV filters were extracted by a method analogous to that used to extract oestradiol from human breast tissue (Van Landeghem et al., 1984) and as used for the earlier measurements of parabens in breast tissue (Darbre et al., 2004; Barr et al., 2012). The 100 extractions of human breast tissue samples were then supplied as dried extracts for analysis by LC-MS/MS (plus blanks and plus samples in duplicate for method recovery analysis) and all analyses have been completed.

The concentrations of OMC, Bp3 and 4MBC were normalised to ng per g tissue. Homosalate was not detected in any of the tissue extracts. The data were then sorted according to linear patient number and serial location across the breast. At least one of the UV filters was detected in 101/120 (84%) of the tissue samples. OMC was measured in 89/120 of the tissue samples with a range

of 0-58.7 ng/gm tissue, Bp3 was measured in 83/120 of the tissue samples with a range of 0-26.0 ng/gm tissue, and 4MBC was measured in 15/120 of the tissue samples with a range of 0-25.6 ng/gm tissue. Both OMC and Bp3 were measured in 72/120 of the tissue samples. Of the 15 tissue samples containing detectable 4MBC, 4 tissue samples had also OMC and Bp3.

Considering the detection of the UV filters in the three breast regions for each patient, OMC was detected in at least one breast region for 33/40 of the patients, in all breast regions for 25/40 of the patients and in the region of the tumour for 30/40 of the patients. Bp3 was detected in at least one breast region for 33/40 of the patients, in all breast regions for 22/40 of the patients and in the region of the tumour for 30/40 of the patients. 4MBC was detected in at least one region for 7/40 of the patients, in all regions for 2/40 of the patients and in the region of the tumour for 6/40 of the patients. There were only two patients out of the total 40 patients who had no detectable level of OMC, Bp3 or 4MBC in any tissue sample from their breast.

References

Van Landegham, A. A. J. et al. (1984). Measurement of endogenous subcellular concentrations of steroids in tissue. *J. Steroid Biochem.* 20: 639-644.

Darbre, P. D. (2004). Concentrations of parabens in human breast tumours. *Journal of Applied Toxicology* 24: 5-13.

Barr, L. et al. (2012). Measurement of paraben concentrations in human breast tissue at serial locations across the breast from axilla to sternum. *Journal of Applied Toxicology* 32: 219-232.