Biochemical Pharmacology, Vol. 34, No. 3, pp. 433–434, 1985.
Printed in Great Britain.

0006–2952/85 $3.00 + 0.00

ARYL-HYDROCARBON-HYDROXYLASE-ACTIVITY IN HUMAN HAIR BULBS

H. Merk* and K. Rumpf

Department of Dermatology, Joseph-Stelzmann-Straße 9, D-5000 Köln 41

and

K. Bolsen, G. Wirth and G. Goerz

Department of Dermatology, Moorenstraße 5, D-4000 Düsseldorf 1

INTRODUCTION

Differences in the biological response to polyaromatic hydrocarbons and aryl-hydrocarbon-hydroxylase (AHH) activity may be of significance in cancer predictability. Vermorken et al. showed that benzo(a)pyrene is metabolized in human hair follicles (6). Hair follicles are of epithelial origin which seems to be very interesting because most human malignancies are carcinomas. Furthermore hair bulbs are able to mediate benzo(a)pyrene-DNA-binding under in vitro conditions (4). Therefore we established an AHH-assay in human hair follicles using the radiometric method as described by van Cantfort et al. (2).

MATERIALS AND METHODS

Collection of tissue: Hairs were plucked from the occipital area of the scalp as it is performed in investigations for hair diseases. Only anagen (growing phase of the hair cycle) hair follicles were used for the assay after separating the catagen and telogen hairs using a magnifying lens.

Enzyme assay: 10 - 20 anagen hair follicles were incubated with 10 pmol ^{3}H-benzo(a)-pyrene (spec. activity 25 Ci/mmol) as previously described (500 µl final incubation volume, pH 8,5) (3). The reaction was stopped by the addition of 1 ml KOH (0,15 M in 85 % DMSO) after 90 minutes. The organic phase was removed by two successive extractions in 5 ml hexane (2). The radioactivity of the watersoluble (ws) benzo(a)-pyrene derivates was expressed as pmol ws benzo(a)pyrene (BP) per hour per 100 bulbs (= follicles). Under these conditions the assay was linear with respect to the time of incubation and to the number of the hair follicles (Fig. 1).

* To whom all correspondence should be addressed.

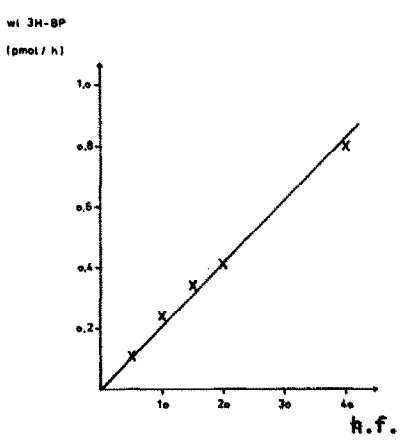

Fig. 1: The AHH-assay was linear to the number of the hair follicles (h.f.).

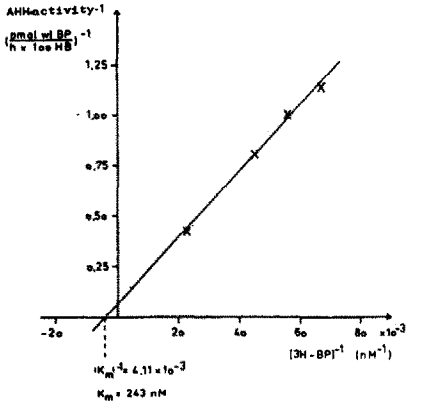

Fig. 2: Apparent K_m-value of the AHH-activity in human hair follicles was 243 nM.

RESULTS AND DISCUSSION

The measured AHH-activity in the hair bulbs of 81 subjects ranged from 0,46 up to 17,2 pmol ws BP/h/100 hair follicles. The AHH-activity was inhibited by 7,8-benzoflavone (10^{-4} M; 72 % inhibition compared to control (assay without inhibitor)) but not by SKF 525-A, metapyrone and tetrahydrofuran (up to 10^{-3} M). The calculated apparent K_m-value of AHH-activity in human hair follicles was 243 nM (Fig. 2) which is similar to the value found in human keratinocytes (1). After the local application of the coal tar-containing liquor carbonis detergens (5 % coal tar solution) over a period of five days there was an increase of AHH-activity in six out of ten cases. Those who had no enhancement had the highest value before treatment probably due to an induction by unknown substances (5). Taken together these studies suggest that human hair follicles are a suitable tissue of epithelial origin to study individual differences in the metabolism of xenobiotics.

REFERENCES

1. D.R. Bickers, H. Mukhtar, C. Marcello, J.J. Voorhees, J. invest. Dermatol., in press
2. J. van Cantfort, J. de Graeve, J.E. Gielen, Biochem. Biophys. Res. Commun. 70, 505 (1977)
3. W. Dehnen, R. Tomingas, J. Roos, Anal. Biochem. 53, 373 (1973)
4. H.F. Merk, H. Mukhtar, D.R. Bickers, Clin. Res. 32, 482 A (1984)
5. H.F. Merk., K. Rumpf, K. Bolsen, G. Wirth, G. Goerz, Brit. J. Dermatol., in press
6. A.J.M. Vermorken, C.M.A.A. Goos, H.M.J. Roeloefs, P.T. Henderson, H. Bloemendal, Toxicology 14, 109 (1979)