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What is This?
Production of ultraviolet-light-induced skin erythema in the hairless rat: a comparison with the haired rat in screening for anti-inflammatory drugs

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Summary
The onset of this erythema in response to different times of exposure corresponds closely to that in the haired animal. Orally administered phenylbutazone (30 mg/kg) or subcutaneously administered fluocinolone acetonide (10 mg/kg) have an equivalent anticythemic effect on haired and hairless animals. The hairless rat may therefore be an attractive alternative to its haired counterpart in this model since, prior to irradiation, it requires no depilation—which itself may affect subsequent erythema production.

The guinea-pig (Swingle, 1974) and normal albino haired rat (Law & Lewis, 1977) have been described as suitable models for the production of skin erythema by ultraviolet (UV) light for the purpose of the assessment of new anti-inflammatory drugs. The albino hairless rat, designated 'a trichis', which appeared as an autosomal recessive mutation in a Wistar strain maintained by the Centre de Sélection et d'Élevage d'Animaux de Laboratoire, Orléans-la-Source, France (CSEAL) could be a promising alternative. This animal (LeFebvre-Boisselot, 1968) has a smooth skin with few hair follicles. As such it may be used for skin studies involving topical procedures without prior—potentially damaging—depilation.

The present studies were performed to determine whether the hairless rat responded similarly to the haired rat in the onset of UV-light-induced erythema, and subsequently whether the erythema was suppressed by the anti-inflammatory drugs phenylbutazone and fluocinolone acetonide in a similar fashion.

Materials and methods
Male hairless rats (80-100 g) bred at Organon Laboratories Ltd or by Bantin & Kingman Ltd, (Field Station, Grimston, Aldbrough, Hull, HU11 4QE, UK) from breeding stock supplied by CSEAL, were used in groups of 5. On their flanks 3 circular areas (6 mm diameter) were exposed to UV irradiation provided by a Kromayer Model 10 Quartz lamp fitted with a Kodak 18 A glass filter (Hanovia Lamps Ltd, 48 Bath Road, Slough, Buckinghamshire, SL1 6BL, UK). The mean erythema scores for each exposure time in the 1st experiment, and for each drug, 4 h after irradiation, in the 2nd experiment, were plotted against exposure times of 30, 60, 90 and 120 s, and Fig. 1b is the comparative data for haired rats (from Law & Lewis, 1977). In both hairless and haired animals the intensity of erythema increased with increasing exposure time up to 3 h after the irradiation, with the mean erythema scores in fairly close agreement. However, there are indications that the erythema was sustained in the haired rats, remaining present after 24 h, whereas in the hairless animals there was a diminution in intensity by that time. Nevertheless, 4 h after an exposure of 90 s, the mean erythema score for both haired and hairless animals was of the same order (about 2 units). It was therefore considered reasonable transmitting light of greater than 295 nm wavelength.

In a 1st experiment various exposure times were examined as previously described for haired rats (Law & Lewis, 1977). The intensity of erythema of each irradiated area was similarly visually assessed by a trained observer at several intervals after UV exposure. The following scoring system was used: 0 (no evident erythema); 0·5 (an area of erythema not clearly defined as a circle); 1·0 (a full circle with a clearly defined margin), and then totalled per animal.

In the 2nd experiment the UV light exposure time was fixed at 90 s and 3 groups of animals were treated as follows:

Group 1, phenylbutazone (Geigy Pharmaceuticals, Hurdsfield Industrial Estate, Macclesfield, Cheshire, SK10 2LY, UK); 30 mg/ml/kg orally;
Group 2, fluocinolone acetonide (Syntex Laboratories Inc., 3401 Hillview Avenue, Palo Alto, California 94304, USA) 10 mg/ml/kg subcutaneously;
Group 3, controls given 1 ml/kg drug vehicle. Mulgofen (5% in water -EI-719; GAF Dye and Chemical Division, Tilson Road, Roundthorn, Wythenshaw, Manchester, M23 9PH, UK) was used as the vehicle.

The mean erythema scores for each exposure time in the 1st experiment, and for each drug, 4 h after irradiation, in the 2nd experiment, were plotted against time. The data were analysed for significance by the randomization test (Siegel, 1956).

Results and discussion
Fig. 1a shows the responses of hairless animals to exposure times of 30, 60, 90 and 120 s, and Fig. 1b is the comparative data for haired rats (from Law & Lewis, 1977). In both hairless and haired animals the intensity of erythema increased with increasing exposure time up to 3 h after the irradiation, with the mean erythema scores in fairly close agreement. However, there are indications that the erythema was sustained in the haired rats, remaining present after 24 h, whereas in the hairless animals there was a diminution in intensity by that time. Nevertheless, 4 h after an exposure of 90 s, the mean erythema score for both haired and hairless animals was of the same order (about 2 units). It was therefore considered reasonable...
to use this exposure in comparing the effect of phenylbutazone or fluocinolone acetonide on the onset of erythema.

Fig. 2a shows the response of hairless rats to the 2 drugs, and Fig. 2b shows the comparative data from haired rats (from Law & Lewis, 1977). Up to 4 h it is clear that the suppression of onset of erythema corresponds closely between drugs and between animals.

However, 24 h after irradiation the hairless rat showed almost complete suppression of the erythema with either drug, whereas in the haired animal erythema was more intense than at 4 h, although it remained less than control values. This difference in response to the drugs is probably a reflection of the different time scale for development of erythema after 90 s exposure, as indicated in Fig. 1a and b, the prolonged effect of the irradiation in the haired rats overriding the diminishing drug effect. In general, however, the anti-erythemic effect of both drugs is similar for the-haired and hairless rat—particularly at 4 h, when assessment for drug action is commonly made. The hairless rat may therefore be a useful alternative to its haired counterpart in this model by virtue of its requiring no preparation (in terms of depilation) prior to irradiation with ultra-violet light.

Acknowledgement
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References
UV erythema in hairless rats


Durch UV Licht induziertes Haut-Erythem bei der haarlosen Ratte: ein Vergleich mit der behaarten Ratte im Screening für entzündungshemmende Substanzen

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Zusammenfassung

Das Auftreten dieses Erythems nach verschiedenen Bestrahlungszeiten ist dem von behaarten Ratten sehr ähnlich. Eine vergleichbare erythemhemmende Wirkung bei behaarten und haarlosen Tieren durch oral-verabreichtes Phenylbutazon (30 mg/kg) oder subkutan-verabreichtes Fluocinolon acetonid (10 mg/kg) konnte festgestellt werden. Aus diesem Grunde ist die haarlose Ratte als eine sehr brauchbare Alternative zur behaarten Ratte anzusehen, da vor der Bestrahlung eine Enthaarung, welche von sich aus die Erythembildung beeinflussen könnte, nicht erforderlich ist.