



Fig. 3. Histologic aspect of the thymus of a BALB/c mouse, 12 days after a dose of 2000 R of X-rays and pretreatment with a mixture of chemical protectors. $\times 160$.



Fig. 4. Histologic aspect of the Peyer's patches of a BALB/c mouse, 30 days after a dose of 2000 R of X-rays and pretreatment with a mixture of chemical protectors. $\times 65$.

the lymph nodes is hypertrophic, the sinus dilated; mitoses are rare and some cell debris and many plasmocytes are present. The germinal centres are not well discernible. At this time, the regeneration of the Peyer's patches is more advanced (Figure 4); some cell debris and many young lymphatic cells are visible. All lesions in the different tissues appear sooner until the death of the animal on the fourth day and are more pronounced in the X-irradiated non-protected than in the protected irradiated mice.

Conclusions. The bone-marrow spleen and thymus show, 30 days after a dose of 2000 R of X-rays and pretreatment with AET + glutathione + 5-HT + cysteine, an almost normal histologic and cytologic picture. At the same time, regeneration in the lymph nodes and the Peyer's patches has set in, but is less advanced⁴.

Résumé. La moelle osseuse, la rate et le thymus montrent, 30 jours après une dose de 2000 R de rayons X et

un traitement préalable avec une association d'AET, de glutathione, de 5-hydroxytryptamine et de cystéine, un aspect histologique et cytologique normal. Au même moment, la régénération des ganglions et des plaques de Peyer est bonne mais moins avancée.

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Increase in Urocanate Concentration in Human Epidermis Following Insolation

Since the formulation, by ŽENIŠEK et al.¹, of the hypothesis that urocanic acid (UA) has a physiological role of protecting the skin against the damaging effect of the erythema-producing range of solar radiation, considerable circumstantial evidence has been presented in favour of this proposal by a number of authors. It has only been objected that patients with histidinemia, whose epidermis lacks histidine ammonia-lyase and UA, are not abnormally sensitive to sunburn². These views might be reconciled by the suggestion that UA is not the sole protecting mechanism operating and that these mechanisms may, if necessary, compensate for each other; it has long been known that albinos can adapt themselves to repeated insolation by the thickening of the horny layer. We wish now to report on experiments which add further support to the conception of the physiological role of UA as a natural sunscreen by showing its increase after insolation.

Three male subjects exposed one upper arm to solar radiation for the first time after the winter season. The other arm served as a control and remained covered. Erythema which followed the insolation ranged from just perceptible (subject H) to fairly strong with subsequent peeling (subject S and C). Suction blisters were produced by the method of KIISTALA and MUSTAKALLIO³ and the epidermis was then removed with scissors. Its extract was chromatographed on Kieselgel HF₂₅₄ thin-layers in a propan-2-ol-concentrated ammonia-water (17:1:2) mixture, *trans*- and *cis*-UA spots were scraped off separately, eluted, and UA estimated by spectrophotometry.

¹ A. ŽENIŠEK, J. A. KRÁL and I. M. HAIŠ, *Biochim. biophys. Acta* 18, 589 (1955).

² V. G. ZANNONI and B. N. LADU, *Biochem. J.* 88, 160 (1963).

³ U. KIISTALA and K. K. MUSTAKALLIO, *Lancet* 1, 1444 (1964).

Dry weight and UA concentration of epidermis (blister skin) before and after exposure to sunlight

Subject	Control upper arm			Irradiated upper arm			
	Dry weight (mg/cm ²)	<i>trans</i> -UA (µg/mg dry weight)	<i>cis</i> -UA (µg/mg dry weight)	Days after exposure	Dry weight (mg/cm ²)	<i>trans</i> -UA (µg/mg dry weight)	<i>cis</i> -UA (µg/mg dry weight)
H	3.16	0.43	n.d. ^a	1	1.75	0.95	0.62
				3	2.78	0.95	0.50
	2.00	0.74	n.d.	9	2.46	2.33	1.03
	2.19	1.88	0.16	20	4.50	2.43	0.26
P	2.81	0.64	0.05	10	3.40	0.98	0.26
S	4.18	0.98	0.07	11	4.11	3.93	0.57
C	4.55	0.55	0.18	2	3.59	0.70	0.38
	4.00	0.29	n.d.	10	3.27	3.20	0.25
	5.00	0.68	n.d.	17	4.55	1.40	n.d.

^a n.d., not detected.

The results are summarized in the Table. Control values were allotted from exactly contralateral, though not necessarily simultaneously obtained blisters. It is evident that irradiation caused an increase in the concentration of both forms of UA (in terms of µg/mg dry weight) as compared with the respective contralateral positions. In subject H, this increase occurred as early as the first day following insolation and was still present 20 days after the exposure. UA concentration thus shares the tendency to adaptive increase with sun-tan and thickening of the horny layer. An increase in epidermal UA levels after UV irradiation has recently been described in guinea-pigs⁴; an increase after ionizing radiation was reported by TABACHNICK and WEISS⁵. In view of the possible mechanism of this increase, it might be of interest to report the observation that another important water-soluble component of the epidermis, namely the free amino acid fraction, also seems to increase after irradiation.

Zusammenfassung. Oberhautproben wurden am Oberarm von 4 Männern in verschiedenen Zeitabständen (1–20 Tage) nach milder bis intensiver Sonnenbestrahlung entnommen. In allen Fällen war die Urocaninsäure-Konzentration (*trans* wie auch *cis*) an der bestrahlten Seite höher als an genau kontralateralen Stellen des bedeckten Oberarmes (Kontrolle).

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Hradec Králové (Czechoslovakia), 29 September 1967.

⁴ H. P. BADEN and M. A. PATHAK, J. invest. Derm. 48, 11 (1967).

⁵ J. TABACHNICK and C. WEISS, Radiat. Res. 17, 684 (1959).

Temperaturabhängigkeit der elektrischen Leitfähigkeit einiger Tocopherole

Viele organische Stoffe (Phthalocyanine, Carotinoide) haben Leitfähigkeitseigenschaften, die der bekannten Theorie anorganischer Halbleiter entsprechen (ROSENBERG¹, MEIER² u.a.).

In diesem Zusammenhang sind Messungen an den zähflüssigen Tocopherolen interessant. Die Temperaturabhängigkeit ihrer elektrischen Leitfähigkeit lässt sich im Bereich von etwa 293 bis 343 °K (nach unten begrenzt durch die Empfindlichkeit des Elektrometers, nach oben durch die Unbeständigkeit der Tocopherole) durch die Gleichung (1) beschreiben.

$$\sigma(T) = \sigma_0 \exp(-\Delta E/2kT) \quad (1)$$

Die thermische Aktivierungsenergie ΔE ist der Abstand zwischen Valenz- und Leitfähigkeitsenergieband. Die Temperaturabhängigkeit der Ladungsträgerbeweglichkeit ist zu vernachlässigen.

Messanordnung. Das Meßschema zeigt Figur 1. Als Amperemeter dient das KEITHLEY-Elektrometer 610-A, dessen Innenwiderstand in Bereichen bis 10⁻¹³ A mindestens 1–2 Zehnerpotenzen unter dem der Probe gehalten

werden kann. Probengefäß ist ein kleiner Plexiglasblock mit einer Vertiefung 2 × 7 × 2,5 mm³ und vernachlässigbarer Eigenleitung. Ebenso vernachlässigbar ($J < 10^{-14}$ A) ist die Leitfähigkeit des gesamten abgeschirmten Messkreises (ohne Probe) über den ganzen Temperaturbereich.

Die Tocopherole wurden ständig unter trockenem Stickstoff aufbewahrt und gemessen, um den Einfluss von Sauerstoff, Luftfeuchtigkeit und Lösungsmittelresten zu vermindern. Temperaturen wurden in 5-Grad-Intervallen am Thermostaten eingestellt und Ströme erst nach Einstellung des thermischen und elektrischen Gleichgewichtes (5–15 min) mit einem Linienschreiber abgelesen. Aufheizen und Abkühlen führte zu gleichen Ergebnissen. Alle Proben folgten dem Ohmschen Gesetz für Feldstärken zwischen 50 und 1000 V/cm. Die Absolutwerte der Ströme änderten sich nicht beim Umpolen der Probe und bei Benutzung verschiedener Multiplier-

¹ B. ROSENBERG, J. chem. Phys. 37, 238 (1959).

² H. MEIER, Z. phys. Chem. 208, 325 (1958).