Actas Dermosifiliogr. 2014;105(3):233–242

ACTAS Dermo-Sifiliográficas

Full English text available at www.actasdermo.org

REVIEW

Study of Idiopathic, Exogenous Photodermatoses, Part II: Photobiologic Testing☆

D. De Argila,[a,*] J. Aguilera,[b] J. Sánchez,[a] A. García-Díez[a]

[a] *Servicio de Dermatología, Hospital Universitario La Princesa, Madrid, Spain*
[b] *Laboratorio de Fotobiología Dermatológica, Centro de Investigaciones Médico-Sanitarias, Departamento de Dermatología, Facultad de Medicina, Universidad de Málaga, Málaga, Spain*

Received 10 May 2012; accepted 29 July 2012
Available online 21 March 2014

KEYWORDS
Photobiologic testing;
Phototesting;
Photochallenge;
Photopatch test;
Photodermatoses;
Light tolerance

Abstract The second of this series describes the characteristics of 3 types of photobiologic studies: the light test, the photochallenge test, and the photopatch test. We explain how the tests are carried out, the expected results, and their clinical usefulness in various photodermatoses. These tests are needed before attempting to induce adaptation (skin hardening or light tolerance) in the most debilitating cases.

PALABRAS CLAVE
Estudio fotobiológico;
Fototest;
Fotoprovocación;
Fotoparche;
Fotodermatosis;
Fototolerancia

Estudio de las fotodermatosis idiopáticas y exógenas. Parte II: el estudio fotobiológico

Resumen En esta segunda parte se describen las características de los 3 tipos de estudios fotobiológicos: el fototest, la fotoprovocación y la prueba del fotoparche. Se detalla la metodología, los resultados esperados y la utilidad clínica de estos métodos en las distintas fotodermatosis estudiadas. Estos estudios son esenciales para la inducción de fotoadaptación o fototolerancia que se emplea para los casos más invalidantes.

Photobiologic studies are skin tests performed to determine a person's degree of photosensitivity and assess abnormal cutaneous responses to light. In the second part of this review, we will look at the different types of tests performed in clinical practice and focus on the interpretation of results in idiopathic and exogenous photodermatoses.

Types of Photobiologic Studies

Phototest

Phototesting involves exposing an area of skin to a known dose of UV or visible light and then observing, recording, and

☆ Please cite this article as: De Argila D, Aguilera J, Sánchez J, García-Díez A. Estudio de las fotodermatosis idiopáticas y exógenas. Parte II: el estudio fotobiológico. Actas Dermosifiliogr. 2014;105:233–242.

* Corresponding author.
E-mail address: dargilad@hotmail.com (D. De Argila).

1578-2190/$ - see front matter

interpreting the response (erythema, whealing, or pigmentary changes) at the irradiated site after a pre-established time (generally 24 hours).

The threshold above which different biologic responses are triggered is established by exposing the individual to incremental doses of light radiation. Measures include minimal erythema dose (MED), minimal urticaria dose (MUD), immediate pigment darkening, and minimal tanning dose. These last 2 measures are not widely used in clinical practice, but they do have experimental value and are also used to determine the sun protection factor of sunscreens.

Phototesting has a range of clinical applications.

- Diagnosis. The phototest is used to confirm a diagnosis of solar urticaria, systemic phototoxicity, or photosensitivity (reduced sensitivity threshold to light) in certain idiopathic photodermatoses, such as chronic actinic dermatitis (CAD). It can also help to characterize certain secondary photodermatoses induced by endogenous agents, such as erythropoietic protoporphyria or photosensitive forms of lupus erythematosus (lupus tumidus and subacute cutaneous lupus erythematosus).
- Therapy. The phototest is used to calculate the starting dose (30%-70% of MED) for desensitization therapy in photodermatoses.
- Prognosis and response monitoring. The phototest can also be conducted at different points throughout the course of a disease to monitor response to treatment, for example, to assess changes in photosensitivity in patients with solar urticaria undergoing phototherapy or immunomodulator therapy.

Phototests should preferably be performed on parts of the body that are not usually exposed to the sun. The test site recommended by the Spanish Photobiology Group (GEF) is the lower back and buttock area, although some authors consider the abdomen or the inner aspect of the arm or forearm to be acceptable. Antihistamines and nonsteroidal anti-inflammatory drugs (NSAIDs) must be withdrawn at least 2 days before the test; corticosteroids, psoralens, chlorpromazine, and high-dose vitamins a week beforehand; and chloroquine and immunosuppressive medication at least a month beforehand.

The MED for a given wavelength in the UV spectrum is the minimum dose of radiation (J/cm^2) needed to induce erythema (Fig. 1). Because UV-B radiation provokes erythema, the MED always refers to the erythemal response to UV-B unless otherwise specified. Clinical skin abnormalities induced by UV-A radiation are considered to be abnormal responses to UV-A light. Erythematous reactions are generally evaluated by the naked eye, but more objective methods, such as laser Doppler perfusion imaging, may be needed in lesions with diffuse or indistinct borders.[1]

Because practically 100% of effective erythema-producing radiation is UV-B radiation, broadband fluorescent UV-B lamps are generally used for phototesting. However, while these lamps offer stable output, are simple to use, and are relatively cheap, their spectral region is far from that of natural sunlight. Solar simulators offer the best spectral match in this respect because, when fitted with appropriate interference filters, they closely approximate

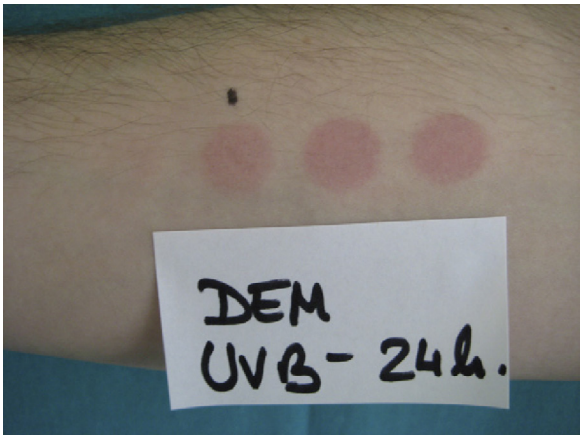

Figure 1 Phototest. Minimal erythema dose (MED) for UV-B radiation.
Erythematous response. MED determined using a fluorescent lamp with 5 test fields and a filter to determine the exposure dose according to skin contact time (Gigatest UVB, Medisun).

natural light. The erythemogenic effect of solar UV-A radiation can also be measured with filters that block wavelengths under 315 to 320 nm. Fluorescent light kits that emit UV-A light do not generally produce sufficient radiation to provoke erythema, unless the patient has a considerably reduced threshold to this portion of the spectrum, as occurs in certain phototoxic reactions. It is therefore advisable to use a monochromator, if available, to test sensitivity to UV-A light. Note that any skin reaction to visible light from any source is abnormal.

The MUD is the minimum dose of radiation needed to produce a wheal located exclusively or predominantly in the irradiated field. It must be accompanied by a reference to the action spectrum: UV-B, UV-A, visible, or infrared light, or a combination of these (Fig. 2). Irradiation doses from visible or infrared light sources cannot be measured in J/cm^2. Unlike MED responses, MUD-provoked reactions generally appear several minutes after exposure and last for between 30 and 90 minutes. Inhibition spectra can result in delayed reactions, with wheals sometimes appearing after several hours.

The phototest in patients with solar urticaria is in the strictest sense a photoprovocation test. Standardization is difficult because of the variability of individual factors (phototype, tanning ability, test site, or food-related factors such as colorants). To determine the action spectrum, the European Dermatology Forum recommends using a solar simulator or a monochromator to irradiate 3 different sites in the buttock area with 6 J/cm^2 of UV-A light, 60 mJ/cm^2 of UV-B light, and visible light from a slide projector for 10 minutes. The reaction is scored on a 6-point scale, where 0 indicates no response; (+), just perceptible erythema (corresponding to the MUD); +, erythema in the irradiated area; ++, erythema outside the irradiated area; +++, wheal in part of the irradiated area; and ++++, wheal in the entire irradiated area. The MUD is determined by irradiation with incremental doses of radiation.