

# **PHOTODYNAMIC**

**PROF. ALFREDA PADZIK -GRACZYK**

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# **RESEARCH**

# **POINT**



Prof. dr hab.

Alfreda Padzik - Graczyk



Prof. A. Padzik-Graczyk is:

- Head of Biochemistry and Spectroscopy team of Optoelectronic Technology department;
- The inventor of photosensitizer application in diagnosis and treating cancer;
- Working on influence of bioelement and toxic metals on human body;
- Developed number of preparations to complement deficiencies of bioelements in human body;
- Professional career based on detecting and treating cancer;

# Basic Concepts

**Photodynamic diagnosis (PDD)** is a method which evaluates the severity and extend of cancer spread. It enhances the visual contrast between benign and malignant or cancer tissue by inducing a photodynamic process, resulting in selective emission of fluorescence from cancer cells.

**Photodynamic therapy (PDT)** is a form of phototherapy. PDT is using nontoxic light-sensitive compounds that are exposed selectively to light, whereupon they become toxic to targeted malignant, cancer and other diseased cells. PDT has proven ability to kill microbial cells including bacteria, fungi and viruses.

**Phototherapy** - is form of treating by specific wavelengths of light. When phototherapy activates applied prior chemical agents, is known as **photochemotherapy**.

**Photosensitizer** - a chemical compound, showing no toxicity to living cells. It can be activated by light to excite of a specific wavelength, which corresponds to its absorption band.

# Photodynamic Method

## (PDT - Photodynamic Therapy)

Diagnosing and treating cancer by appropriate pigment and specific wavelengths of light.

It can be used to **identify malignant or cancer diseases and destroy cancer cells in human body.**

Photodynamic Therapy is mainly used in diagnosis and treatment:

Oral cavity

Skin

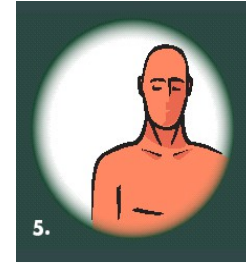
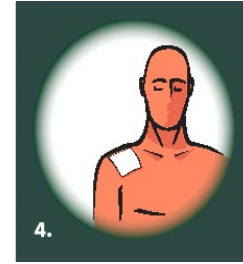
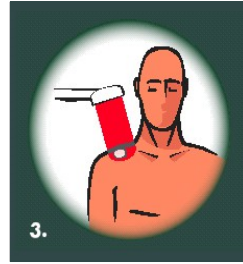
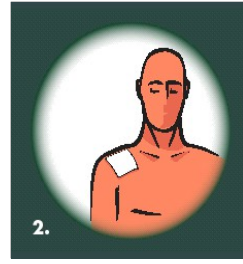
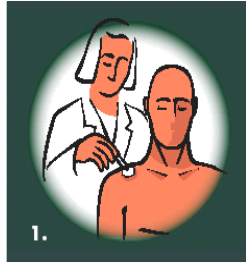
Gynecology (vulva, vagina, cervix)

Male external genitalia

Laryngology

**It destroys the cancer only in its place, doesn't harm any other organs in the body.**

# Different stages of the PDT procedure



## 1. Application

Thin layer of **5-aminolevulinic acid (ALA)** is applied locally to the target area.

## 2. Accumulation

Target area with applied ALA is covered with light-off dressing to protect it from light and physical damage, which allows ALA the penetration of cancer cells and accumulation of the active agent.

## 3 Irradiation

After 3-4 hours, the treated area is exposed to the specific wavelengths of light for about 15 minutes.

## 4. The formation of the wound

The result of the surgery is a flesh wound in the area of cancer. It is important to protect the area from light for about 48 hours after irradiation in order to avoid secondary photodynamic reactions.

## 5. Healing

The wound usually heals within one to three weeks. At this time, it is important to prevent infection and assure good cosmetic result.









# Summary of PDT Acne Treatment Research

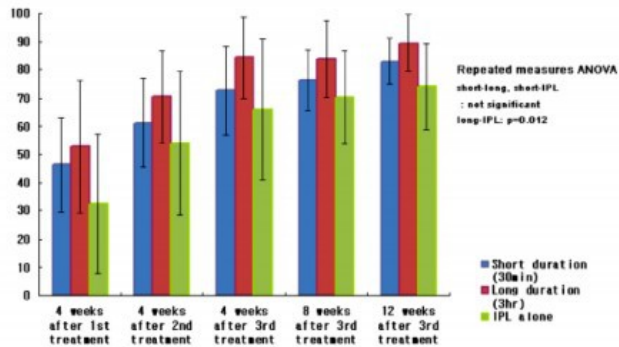


Figure 4. Mean reduction of inflammatory acne lesions at each time point for the short incubation group, long incubation group, and intense pulsed light alone group.

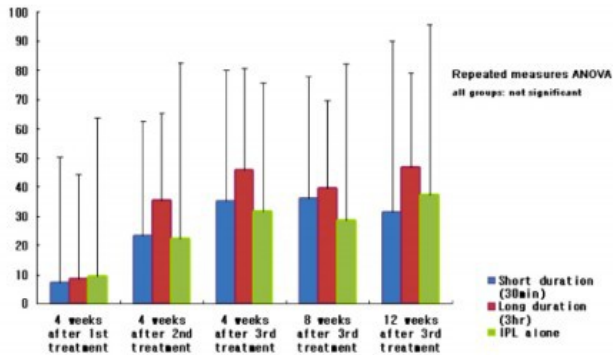


Figure 5. Mean reduction of sebum secretion at each time point for the short incubation group, long incubation group, and intense pulsed light alone group.

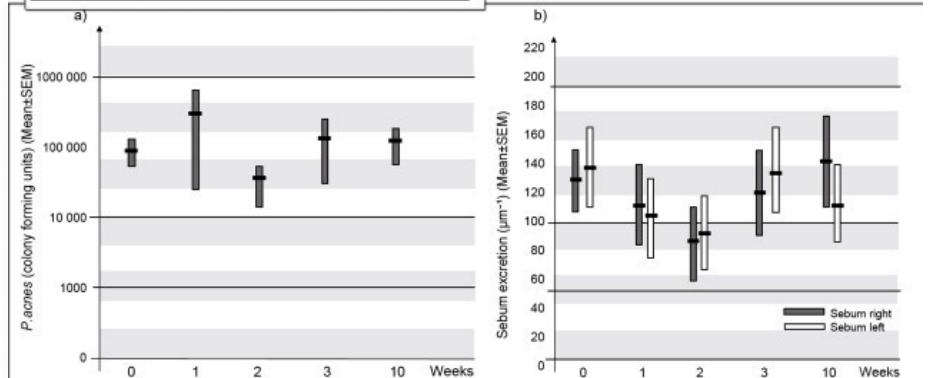
Comparison of ALA-PDT compared to IPL alone shows the PDT is slightly better (Oh, et al)

Table I. Characteristics of 10 patients with acne on the cheeks before and after photodynamic therapy (PDT). Clinical acne score (1–4) was graded according to Pillsbury et al. (17)

Patient no.	Sex/age (years)	Skin type <sup>a</sup>	Acne score before PDT		Acne score 10 weeks after PDT	
			Left	Right	Left (30 J/cm <sup>2</sup> )	Right (50 J/cm <sup>2</sup> )
1	M/17	III	3	3	2	2
2	F/21	III	1	1	2	1
3	F/30	II	2	2	1	1
4	F/22	IV	1	1	1	1
5	M/16	II	3	3	1	2
6	M/22	III	2	2	1	1
7 <sup>b</sup>	M/19	IV	3	3	NA	NA
8	M/44	II	2	2	1	1
9	M/16	III	3	3	1	2
10	F/27	II	3	3	1	2

Table II. Characteristics of 5 patients with acne on the back. Back 1 and Back 2 represent the skin areas treated with PDT with different light doses.

Patient no.	Sex/age (years)	Skin type <sup>a</sup>	Acne score before PDT		Acne score 20 weeks after PDT	
			Back 1	Back 2	Back 1 (50 J/cm <sup>2</sup> )	Back 2 (70 J/cm <sup>2</sup> )
11	F/30	II	2	1	Resolved	Resolved
12	F/29	II	1	1	Resolved	Resolved
13 <sup>b</sup>	M/24	II	2	2	NA	NA
14	M/43	II	4	4	4	4
15 <sup>b</sup>	M/17	III	3	3	NA	NA



Summary of test results of photodynamic therapy of acne (Horfelt, et al)