

# Exposure to Infrared Light: Case Series

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## Abstract

**Introduction :** Infrared rays(IR) have been used in many areas in recent years and nowadays, many devices have been developed with the aim of heating in open,closed areas working with infrared technology.IR can cause retinopathy.They have the risk of developing periocular skin burns, corneal epitheliopathy,retinopathy.In this study, we wanted to talk about eight cases who were exposure with infrared light in a chemical manufacturing factory where Infrared light was used for drying and all of 8 patients had burning, stinging, watering,redness in the eyes.

**Case:** 8 men with ages between 18-33were admitted to the emergency department with burning, stinging, watering, redness in their eyes.It was learnt that it was started after taking a photo in daylight with infrared light that they used to dry the chemical materials at the factory where they were working. In the physical examination, there was watering,hyperemia in both eyes.Eye movements, pupil diameters,light reflexes were natural.Analgesic eye drops and saline irrigations were performed as a first intervention.Afterwards, the cases' eyes were closed with eye closing tapes in order to minimize the photosensitivity,ophthalmology consultation were requested.Analgesic drops were given after ophthalmology consultation and outpatient follow-up was planned,they were discharged.

**Conclusion:** The use of infrared-ray devices outside of the production purpose can cause eye irritation in the simplest form, as in our study.For this reason, having more warning instructions which are put by the production company in the manual will protect us from the many health problems, users must pay attention to these instructions before they use those device

## Introduction

Infrared (IR) has been first discovered by Willian Herschel during 1800s<sup>1</sup>. The well recognized applications of IR are drying of the car paints in automotive industry and paper drying in paper industry. However, it is widely used including a simple light source and medicine<sup>2</sup>. Different from normal electric heaters, the products which operate through infrared system to heat the object by transmitting the heat by light have became popular during recent years<sup>3</sup>.

We aimed to discuss eight patients who had watering, redness and sense of stinging and burning on the eyes after exposure to infrared light in a chemical manufacturing factory where infrared light is used for drying.

## The Case

Eight male patients with age average between 18 and 33 years referred to emergency department because of burning, stinging, watering and redness on the eyes. Medical history of the patients revealed that the complaints started after taking a photo under day light within the infrared light that they

use to dry chemical materials at the factory where they were working (Image 1). Physical examination of the patients was normal. They had cooperation and orientation; watering and hyperemia were detected on both eyes (Image 2). Eye movements, pupil diameters and light reflexes were natural. Examination of the other systems was normal. Analgesic eye drops and saline irrigations were performed as a first intervention. Afterwards, the eyes of the cases were closed with eye closing tapes in order to minimize the photosensitivity, and ophthalmology consultation was requested. Analgesic eye drops were prescribed following consultation with ophthalmology department; follow-up on outpatient basis was planned and the patients were discharged.

## Discussion

IR radiation is an electromagnetic energy and exists between visible light and microwave regions at electromagnetic spectrum<sup>4-5</sup>. IR zone defines the electromagnetic radiation between 1.8 and 3.4  $\mu\text{m}$  wavelengths<sup>6</sup>. The IR lights are divided into 3 classes depending on the wavelength and emission temperature: 1-short wave or close IR zone, 0.72-2 $\mu\text{m}$  (3870-1180°C), 2-middle wave or moderate IR zone, 2-4

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Image 1.



Image 2.

$\mu\text{m}$  (1180-450°C), 3-long wave or far IR zone, 4-1000  $\mu\text{m}$  (<450°C)<sup>7</sup>. The most common IR applications include drying of the car paints in automotive industry and paper drying in paper industry. However, it is used within a wide range of processes including a simple light source and medicine<sup>2</sup>.

Mori et al. detected in their study that<sup>8</sup> the heat increase on lacrimal glands and eyelids except cornea was significantly higher when compared with other conventional heaters. Takac et al.<sup>9</sup> started that UV lights shorter than 400 nm wavelength and long infrared lights may cause moderate to severe corneal burns. It was reported that chronic exposure to middle length infrared lights (1400-3000 nm) may cause cataract and carcinogenic effects. Use of adequate spectacles was addressed to be protected from such lights. At this point, our cases did not use any spectacles. Unsal et al.<sup>3</sup> Reported a case in form of eyelid burn due to exposure to infrared heater which is used for heating; however, our cases were injured at the workplace.

## Conclusion

There is a gradual increase of infrared use at work and during daily life; the increase of incidence for use of these tools would cause an increase in burns involving sensitive organs such as eyes and in referrals to emergency department. Misuse of infrared light devices may simply cause irritation of the eye like our cases. Therefore, providing warning information and signs in the instruction manuals by the manufacturer companies and paying attention to such warnings would protect us from many possible severe health problems.

## References

1. Skjöldebrand, C., 2001. Infrared Heating. In *Thermal Technologies in Food Processing*, Edited by R. Richardson, Boca Raton, Florida, 208-227p.
2. Tuncel N.Y., Tuncel N.B. Kızılötesi Teknolojisi ve Gıda İşlemedeki Kullanımı. *Akademik Gıda* 14(2) (2016) 196-203.
3. Ünsal E et al. İnfrared Isıtıcı ile Oluşan Göz Kapağı Yanığı. *İstanbul Med J* 2013; 14: 66-8.
4. Skjöldebrand, C., 2002. Infrared processing. In *The Nutrition-Handbook for Food Processors*, Edited by C.J.K. Henry, C. Chapman, Boca Raton, Florida, 423-432p.
5. Sakai, N., Mao, W., 2006. Infrared Heating. In *Thermal Food Processing New Technologies and Quality Issues*, Edited by D.W. Sun, Boca Raton, Florida, 493-527p.
6. Fasina, O., Tyler, B., Pickard, M., Zheng, G.H., Wang, N., 2001. Effect of infrared heating on the properties of legume seeds. *International Journal of Food Science and Technology* 36: 79-90.
7. Fasina, O., 2003. Infrared heating of food and agricultural materials. *ASAE Paper No: 036219* St Joseph, Mich.
8. Mori A, Oguchi Y, Goto E, Nakamori K, Ohtsuki T, Egami F, et al. Efficacy and safety of infrared warming of the eyelids. *Cornea*. 1999; 18: 188-93.
9. Takac s, Stojanovic S. Classification of laser irradiation and safety measures. *Med Pregl* 1998; 51: 415-8.