

# Investigation of the Use of Accidentally Exposed to Light X-Ray Films With Artificial Solarization Method as a Duplicate

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## Abstract

**Aim** Observing the outcomes of the artificial solarization method in the use of blue light-sensitive extraoral films as duplicates due to accidental light exposure.

**Material and method** Two groups were formed using two different extraoral films (Kodak T Mat G and Agfa Curix) and these films were exposed to light. Then the films were prepared by placing them under the master copy films. Some of the films in each group were exposed to sunlight, while others were exposed to ultraviolet light as an artificial solarization method (Feket printing equipment). These duplicate films were then processed.

**Results** Duplicate films obtained from sunlight produced slightly better results than artificial solarization, and Agfa films produced a better image than Kodak films.

**Conclusion** The film method, which was duplicated by artificial solarization, is not a useful method for radiology clinics.

**Keywords** Film, Light sensitivity, Sunlight, Ultraviolet, X-ray

## Introduction

The accidental opening of extraoral film boxes in daylight is one of the most unpleasant situations encountered in radiology clinics. As a result of being exposed to sunlight, these films become unusable and cause financial harm to clinics. To avoid this, the researchers attempted to make these films reusable as duplicates by using sunlight (1-2-3). However, depending on the season, days without sunlight appear to be a disadvantage.

The purpose of this study is to evaluate the outcomes of the artificial solarization technique in the use of blue-sensitive extraoral films used as duplicates as a result of unintentional light exposure.

## Material and Methods

In this study, two groups were formed and a different brand of blue-sensitive extraoral film was used in each group. While Kodak T Mat G extraoral films (Eastman Kodak Company, Rochester, New York) were used in one group, Agfa Curix extraoral films (Agfa-Gevaert Group, Mortsel, Belgium) were used in the other group. These films were deliberately exposed to sunlight at the beginning of the study. Panoramic radiographs obtained previously under normal conditions in both groups were used as master copies. At this stage, the 'photographic print frame' or 'visor' used in photography was chosen as the cassette containing both the film exposed to light and the master copy radiography. In the cassettes, the master copy films were placed on top and the extraoral films exposed to light were placed on the bottom. In the first phase of the

research, the cassette containing the two films was placed in sunlight for 15-20 minutes to reproduce the images of the panoramic radiograph onto the light-exposed film. The light-exposed film was processed, resulting in a duplicate radiography of the panoramic radiography. In the second stage, ultraviolet light was used instead of sunlight for the artificial solarization process.

Feket printing equipment (70x100 cm) (Feket Company, Turkey) was used as an ultraviolet light source. This apparatus is used for copying prints in printing with ultraviolet light. The cassettes were prepared as in the previous step and exposed to ultraviolet light for 10 minutes. The resulting duplicate films were processed by reducing the contrast of the routinely used film baths by half.

## Results

Duplicate films exposed to sunlight produced slightly better images than duplicate films exposed to ultraviolet light. However, when these films were exposed to ultraviolet light, the image became extremely foggy and blurry. As a result, it has been demonstrated that artificially solarized films cannot be used as duplicates. Agfa brand films produced better images than Kodak brand films.

## Discussion

The printing of films using special emulsions known as "daylight films" uses the method employed in this study. In radiology, sunlight is used as a quick and easy method to examine films that have unintentionally been exposed to light. The duplicate films obtained using this method had a murky image, according to Thunthy (3), but the image was radiographically acceptable. In our application, duplicate films made with natural sunlight outperformed films made with artificial solarization significantly, but

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even though good images were produced, the fogging was not at an “acceptable” level. As a matter of fact, in our study, relatively better results were obtained from Agfa films compared to Kodak films. Although the reason for this situation created by solarization is not yet known, the accepted view is the ‘rebromination (rehalogenation) hypothesis’. According to this view, the low number of bromine that occurs in normal latent image formation has the ability to be neutralized by gelatin. The amount of bromine released during solarization cannot be broken down by gelatin. In contrast, most of the bromine settles in the spaces between the emulsion grains. When the exposure is complete, metallic silver in the latent image foci and residual bromine react and a silver bromide layer covers the latent image foci. This layer is easily isolated in the first bath solution. Thus, the grains do not react even though they have one or more latent image foci (4).

According to researchers, when films are exposed to sunlight for a prolonged period of time, the fog gradually disappears (3-5). However, the artificial solarization method’s overheated ultraviolet lamp prevented the films from being exposed for longer than 10 minutes. It was believed that this brief exposure time may have contributed to the lack of radiological suitability of the duplicate films produced using this method. Our investigation led us to the conclusion that radiology clinics cannot benefit from the artificial solarization method.

### **Declarations**

**Author Contributions:** Conception/Design of Study- G.A.; Data Acquisition- G.A., O.E.B.; Data Analysis/Interpretation- G.A., O.E.B.; Drafting Manuscript- G.A.; Critical Revision of Manuscript- G.A., O.E.B.; Final Approval and Accountability- G.A., O.E.B.; Material and Technical Support- G.A., O.E.B.; Supervision- G.A.

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