



Problems With LED Lighting for Iris Imaging

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Evaluation of the Irislab iris illuminator

The illuminator is not bad but somewhat overpriced (\$1000) for an LED light. However there are a number of disadvantages with the use of continuous lighting rather than flash and this is the main concern

Use of a strobe (electronic flash) is always superior to use of continuous light due to the higher and briefer amount of light. Anytime one is examining something in detail (especially a darkly colored subject such as the brown iris), abundant light is always helpful. Since the eye is light sensitive, it is much better to have a brief light than having a continuous light being directed at the eye. The fact that a strobe (flash) is only about 1 millisecond in duration overcomes the problem of too much light - this is easier on the retina than continuous light. Moreover the brief 1 ms duration will in effect freeze the motion of the eye -- both the eyeball and the iris are always in motion and have a brief single pulse of light will freeze the subject in the image, preventing any motion blur.

The LED type of illumination requires a larger aperture -- this light is supposed to be used with a relatively large aperture (f/5.6) which further degrades the image due to lack of depth of field. In the case of the iris, the surface terrain may have a variation in range (distance from lens) of up to 1mm, whereas the depth of field at f/5.6 may be only 1/2 to 1/4 of 1 mm. This makes it less likely that the entire iris will be in focus.

The reduced amount of light from an LED source also requires a higher ISO (e.g. 800) which further diminishes the amount of detail available in the image.

The user of this illuminator is also advised to use autofocus which is somewhat problematic in itself as it cannot focus as well as a person using manual focus and moving the camera for macro focusing.

Another disadvantage of this illuminator is that there is no provision for side-lighting. Side-lighting can often reveal more information than central lighting especially for the darker brown iris.

Since the LED light is not very bright compared to a strobe flash, the working distance (the distance from subject to camera) is quite small, in fact in this case, the front of the camera needs to be within an inch or so of the iris. The user is also directed to actually contact the client's face with the camera which is a very poor practice because it results in the front part of the lens picking up sweat, makeup, and oils from the skin and therefore requires frequent disinfection or sanitization of the front part of the camera. Another problem with this approach is that it prevents the use of proper lid retraction since the camera is too close to the eye for the client to open the lids with fingers. Use of the LED lighting also involves bracing the camera against the client's

face with the photographer's hand, which is an unwanted skin-to-skin contact that further has risks of bacterial transmission and hygienic problems.

A very short working distance also prevents this camera from being used in animal iris imaging - animals need to be photographed from 5 to 8 inches and this illuminator is not going to work for such a use since the light diminishes with the square of the distance. In other words, while the light may be at an adequate level at 1 inch (with larger aperture and higher ISO sensitivity), at 2 inches it is $1/4$ the amount of light and at 3 inches it is at $1/9$ th the level; beyond that imaging is not practical.