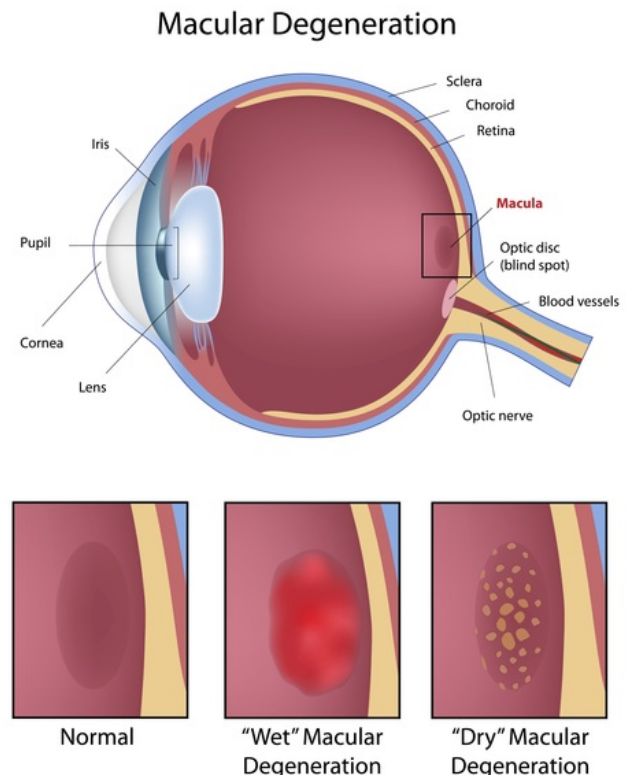


Age-related macular degeneration is the leading cause of severe vision loss and blindness worldwide. The condition mainly affects individuals over the age of 65. The retina is responsible for the conversion of light stimuli to neural impulses, which are transmitted to the visual cortex. It consists of an outer pigmented layer (retinal pigment epithelium, RPE), which lays on Bruch membrane and an inner sensorineural layer (sensory retina), including the photoreceptors which transmit the electrical stimulus to nerve fibers layer, forming the optical nerve. The macula is located in the center of the retina and displays the highest visual acuity due to the high concentration of photoreceptors.<sup>1</sup>

The two main types of age-related macular degeneration include dry form and wet form. Approximately 10-15% of the macular degeneration cases are wet form. Dry form is the more common type, but it usually progresses slowly. Dry macular degeneration can progress to wet (neovascular) macular degeneration which can cause a relatively sudden change in vision resulting in serious vision loss. The wet form always begins as the dry form.

In dry form macular degeneration, patients' may have yellow deposits, called drusen, in their macula. Drusen are located between the RPE and Bruch's membrane of the macula or the peripheral retina and they mainly consist of phospholipids, triglycerides, cholesterol, cholesteryl esters, apolipoproteins, vitronectin, immunoglobulins, amyloid, and complement system components.<sup>1</sup> As the drusen get larger and more numerous, they can dim or distort vision. As the condition progresses, the light sensitive cells in the macula get thinner and eventually die. In this atrophic form, the patient may have blind spots in the center of their vision.



The symptoms associated with dry form macular degeneration progress gradually over the years. In the beginning, patients' may not have any noticeable signs of macular degeneration and may not be diagnosed when only one eye is affected, and the good eye may compensate for the weak eye, until the condition progresses to be more severe or once it affects both eyes. The most common symptoms include worse or less clear vision, blurred vision, difficult to read fine print or drive, dark and blurry areas in the center of their vision, and worse or different color perception.

In wet form macular degeneration, abnormal blood vessels, also known as choroidal neovascularization, grow underneath the retina and macula. These new blood vessels may then leak blood and fluid, causing the macula to bulge or lift up from its normal flat position. The patients' vision may be distorted where straight lines appear wavy. They may also have blind or dark spots in central vision and eventually loss of central vision. Overtime, the blood vessels and their bleeding can eventually form scar tissue and by then severe vision loss can occur rapidly.

### Pathogenesis of Age-related Macular Degeneration

Chronic parainflammation is believed to play a critical role in the development of age-related macular degeneration. Parainflammation is a tissue adaptive response to noxious stress or malfunction and it is an intermediate state between basal and inflammatory states. The physiological purpose of parainflammation is to restore tissue functionality and homeostasis. Parainflammation may become chronic or turn into inflammation if tissue stress or

malfunction persists for a sustained period. Chronic parainflammation contributes to the initiation and progression of many human diseases including obesity, type 2 diabetes, atherosclerosis, and age-related neurodegenerative diseases.

Parainflammation in the aging retina in physiological conditions might contribute to age-related retinal pathologies.<sup>4</sup> The presence of any harmful agent results in activation of parainflammation. Prolongation of parainflammation leads to oxidative stress and degenerative processes.<sup>1</sup> Activation and accumulation of microglial cells in the retina and subretinal space, potential disruption of the blood-retinal barrier, thickening of the choroid, accompanied by deposition of macrophages and mast cell activation, and fibrosis are some of the events observed in retinal parainflammation.<sup>1</sup> A variety of inflammatory mediators, including aldose reductase, platelet activating factor, cytokines, such as tumor necrosis factor-alpha (TNF-a), chemokines, arachidonic acid, and oxidative stress, seem to be involved in many ocular diseases including age-related macular degeneration.<sup>1</sup>

Many harmful agents may activate the parainflammation and they can come from many sources. A liver deficiency due to aging can lead to a decreased efficiency in detoxifying the harmful substances in the blood which may come from food intake, environmental, or our own metabolites. Age-related decrease in microcirculation can cause malnutrition of the retina and the functionality may not be fully restored through parainflammation. Therefore, the parainflammation may become an on-going process and can run into chronic inflammation.

Smoking is considered to be a major risk factor for the onset and the progression of age-related macular degeneration, which has been positively correlated with the duration of smoking and the number of cigarettes. The toxic effect of hydroquinone on retinal cells includes the accumulation of vascular endothelial growth factor (VEGF) and the decrease in macular pigment.<sup>1</sup> Consuming heavy amounts of alcohol can also increase the risk of age-related macular degeneration. Alcoholic beverages can cause oxidative damage to the retina which can lead to the development of age-related macular degeneration.

### **Wellness Recommendation**

The wellness recommendation for dry form age-related macular degeneration includes Eye-Brighter, LC Balancer and Brown. Eye-Brighter nurtures the eye Qi. It helps to improve blood supply to the optical system to help aid in the repair of the macula. Herbal ingredients in Eye-Brighter have been shown to have strong antioxidant effects through alleviating oxidative stress and decreasing ROS production; specifically, it protects the retinal epithelium cells from oxidative stress.<sup>2</sup> The herbal ingredients also have strong anti-inflammatory effects to combat the parainflammation seen in age-related macular degeneration patients. The herbs downregulate inflammatory cytokines and TNF-a.<sup>2</sup> LC Balancer enhances microcirculation and nurtures the Kidney Yin to help provide the necessary nutrients for retinal repair. Brown is a liver yin formula. The liver meridian in TCM is connected the eyes and visual ability relies heavily on the nourishment of the livers blood. By increasing the liver function, Brown helps the liver to conduct more efficient detoxification and clear the toxic substance from the blood to reduce the irritation to the retina and prevent the reoccurrence of parainflammation. Herbal ingredients in Brown have been shown to increase plasma zeaxanthin and antioxidant levels as well as protects hypopigmentation and soften drusen accumulation in the macula.<sup>3</sup> Patients can see symptom improvements in three weeks and up to three months of the protocol is recommended for significant improvement.

For wet form macular degeneration, an additional formula including Eye-Brighter-W is also recommended. Eye-Brighter-W nurtures the Blood of the eye and clears the Blood Stasis of the retina. It supports the blood vessel integrity of the eye and helps resolve the leakage from the blood vessel as well as dissolve the scar tissue. With the use of Eye-Brighter, Eye-Brighter-W, LC Balancer, and Brown, patients can see symptom improvements in three weeks and up to three months of the protocol is recommended for significant improvement.

### **References:**

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