Drug administration is an important part of pharmaceutical effectiveness and spectrophotometry plays a vital role in the development and monitoring of various forms of prescription drugs. Pills, capsules, powder, orodispersibles, and liquid medications all utilize spectrophotometry to aid in the analysis of the APIs (active pharmaceutical ingredients), stability, and safety of these products. This one simple and effective tool spans a wide range of pharmaceutical compounds, textures, and viscosities. Current research is utilizing this technology to lead the pharma industry towards new horizons.

One main research area and need for growth has to do with the effectiveness of ophthalmic medications. Medications for the eyes remain difficult to administer effectively. "Conventional ophthalmic solutions frequently show poor bioavailability and a weak therapeutic response because they are often eliminated before they can reach the cornea, when patients blink or their eyes tear."[1] This greatly reduces the effectiveness of these medications, making proper dosing difficult and optimal results inconsistent. Not only do the APIs in these solutions lose their effectiveness quickly after administration, but the protective nature of the human eye efficiently removes these formulations through the tear ducts and transfers this medication to other unaffected areas of the body. This can inadvertently affect the gastrointestinal track leading to adverse responses that might otherwise be avoided.

Finding a New Solution

Various kinds of ophthalmic medications are used to treat diseases of the eye, but the effectiveness wears off rapidly once surface contact is induced. Whether medication is in the form of eye drop, ointment, or capsule, studies show that drug concentration diminishes rapidly within minutes of administration. New advancements in ophthalmic solutions have led to the development of formulations that convert to a gel-type substance once contact is made with the surface of the eye. As these solutions change in viscosity, continual monitoring must be used to confirm that drug effectiveness and uniformity prevails throughout these changes.

UV spectrophotometry is a simple way to continuously monitor these changes and is already used for a variety of applications in the pharmaceutical industry. To ensure that gelatinous ophthalmic solutions maintain drug content uniformity, it is necessary to quantify the concentration of active ingredients throughout the suspension.[2] UV spectrophotometers use absorption rates to quantify these concentrations and provide continual data and feedback on uniformity and changes that are otherwise unobservable through visual inspection. Determination of these ingredients can then be given as numerical data for consistency and repeatability testing.

Monitoring Drug Release and Stability with Spectrophotometry

Spectrophotometry is highly effective in the laboratory setting, but this technology is not limited to specific testing environments. Spectrophotometers are highly adaptable and can account for changes in various sample types. This proves extremely useful for the determination of real-life drug release simulation. In ophthalmic gelation studies, samples can be repeatedly exposed to dissolution while continual monitoring with UV spectrophotometry quantifies the data to present accurate test results based on real-world applications.

The applications of spectral technology continue beyond drug formulations to effectively monitor degradation rates in ophthalmic solutions as well. The ability to guarantee shelf-life stability and product effectiveness sets an important standard in quality control. Product reliability is dependent on meeting quality standards and starts with the right analytical instrumentation to quantify each stage of development.

Full article with photos available here:

https://www.hunterlab.com/blog/color-pharmaceuticals/taking-a-closer-look-at-improving-ophthalmic-medications-with-spectrophotometry/