The color of dentures has been a major concern throughout the history of dental prosthetics, which began as early as 1500 BC when Egyptians fashioned dentures out of human teeth threaded on gold wire. Owing to both their functional and aesthetic properties, teeth obtained from other beings—human or animal, dead or alive—remained the primary source of denture materials across cultures for over 2000 years. When Alexis Duchâteau created the first set of porcelain dentures in late 18th century Europe, they were overwhelming rejected in favor of real teeth gathered from corpses, prisoners, and even live voluntary donors, in part because the porcelain was considered by many to be "too white to be convincing".[1] It wasn't until the late 1800s, when technological advances allowed for the creation of more naturally colored false teeth, that we began to see a true shift away from the prosthetic use of human and animal tissue. Today, dentures are extraordinarily sophisticated appliances typically created with acrylic resin shaded to produce a range of hues approximating human tissue, allowing for a convincingly real appearance in full dentures as well as precise color matching between restorative components and natural tissue in partial dentures. However, the initial pigmentation of dentures is only the first step; color stability is paramount for continued aesthetic success.

Maintaining Denture Color Stability

The color stability of dentures is a product of both the inherent qualities of the dentures themselves and their exposure to environmental stressors. One key area of vulnerability is repeated exposure to commercial soaking solutions, gels, creams, and pastes designed for daily denture cleaning. These cleansers must effectively remove foreign matter and harmful bacteria to protect patient health without compromising color stability or creating unwanted color changes over time. Such changes are particularly concerning when dentures must match existing tooth structure, as even minute differences may interfere with a pleasing appearance and decrease treatment acceptance amongst patients. Spectrophotometric analysis of denture color behavior before and after exposure to dental cleansers provides an objective basis for evaluating the impact of these chemicals and allows manufacturers to test and refine their formulas to minimize color change while preserving effective cleansing and disinfecting capabilities. Moreover, spectrophotometers allow you to monitor how cleansers affect particular denture materials to ensure that your product is suited for the specific resin type you are targeting and allow you to make meaningful usage recommendations. A study released last year, for example, employed spectrophotometric analysis to find that cleansers significantly impacted both teeth and base resin color and that these changes were dependent on both denture type and cleanser brand.[2] By objectively analyzing color change, you can more closely tailor your product to the needs of your customers and help them extend the life of their dentures.

Stain Removal and Inhibition

Just like natural teeth, dentures can become discolored over time due to certain foods, drinks, and cigarette smoke. While cleansing agents must be formulated to minimize color change caused by the agent itself, they must also be capable of preventing and removing the undesirable staining that comes with daily life. Using spectrophotometric instrumentation, it is possible to precisely quantify the stain-removing abilities of particular cleansers through a variety of methodologies. A group of researchers at the School of Oral and Dental Sciences at the University of Bristol, for example, examined the ability of eight denture cleansers to "remove and inhibit tea-stain build-up on acrylic resin."[3] To test for stain-removal performance, cast heat polymerized resin samples were repeatedly exposed to chlorhexidine and tea solutions to induce staining, then cleaned in one of the eight denture cleansers five times. Optical density measurements were obtained after each cleaning via a UV-Vis spectrophotometer to determine the degree of stain removal. To test for stain inhibition, acrylic resin samples were cleaned using the denture solutions, then submerged in tea five times. Optical density measurements were obtained after each exposure and compared to baseline measurements. When the results were analyzed, the researchers were able to determine that while all eight denture cleansers were more effective than water when it comes to stain removal, there were "significant differences in cleaning ability between cleansers". Additionally, there was great variety of inhibitory ability amongst the cleansers, with some offering less protection than water alone. As such, the study was able to make specific product recommendations to optimize user experience. Spectrophotometry offers dental product manufacturers the ability to perform similar evaluations of both single ingredients and completed products for comprehensive performance evaluation.

Full article with photos available here:

https://www.hunterlab.com/blog/color-pharmaceuticals/enhancing-the-color-stability-of-dentures-via-spectrophotometric-evaluation-of-cleaning-agents/