‘CONTACT’ IN SPACE LEADS TO NEW LENSES

ORIGINATING TECHNOLOGY/ NASA CONTRIBUTION

While gravity has its advantages in keeping us balanced and grounded here on Earth, scientists often find that they are at a disadvantage when trying to conduct research under its powerful, pulling influence. In these instances, the scientists prefer performing their studies in the weightless atmosphere of microgravity, where gravity is greatly reduced and solids, liquids, and gases behave differently.

In 1993, Paragon Vision Sciences, Inc., of Mesa, Arizona, participated in a research project with NASA’s Langley Research Center to perfect a process for developing contact lenses. The project called for three experiments that would fly onboard the Space Shuttle over the course of three separate missions, from 1993 to 1996. By unleashing contact lens materials to the microgravity settings of space, scientists from NASA and Paragon hoped to better understand how polymers—large molecules that make up plastics—are formed.

PARTNERSHIP

At Paragon, a manufacturer of premium performance plastics used in gas permeable contact lenses, scientists must perform a complicated process called polymerization to ensure that the materials they are using to make contact lenses are nontoxic, highly biocompatible, extremely permeable to oxygen, durable under abrasive cleaning conditions, wettable, transparent, and machineable. Given all of these divergent properties, it is necessary for the Paragon scientists to synthesize polymer chains wherein the various links in the chains are of substantially different chemical character.

During polymerization, some of the links are preferably incorporated into the growing chains simply due to their compatibility to the environment of the chains. The result, however, is an uneven distribution of these “precursor” links in the final polymer, leading to an uneven distribution of properties throughout the final product. This can be detrimental in developing materials for contact lenses.

To avoid this consequence, it is essential to minimize the redistribution of the precursor links during polymerization. While many of the driving forces for redistribution can be restrained in laboratories on Earth, one cannot: convection, the response to density differences arising from uneven heating in the reaction mixture. Since convection is driven by gravity, it was apparent to Paragon scientists that the microgravitational atmosphere of space was the only environment where they could correctly study the properties of new polymer formulations plagued by this problem.

Paragon and Langley designed three experiments to go into space on Shuttle Missions STS-57 (Endeavor), STS-63 (Discovery), and STS-77 (Endeavor) and explore such formulations. The “Gas Permeable Polymer Materials” experiments were performed in SPACEHAB, a pressurized research laboratory within the Space Shuttle’s cargo bay that was created for scientific and commercial experimentation.

The Space Shuttle research showed which plastic formulation components made the strongest contributions to the nonuniformity and lesser permeability characteristics seen

Paragon Vision Sciences, Inc. and Langley Research Center designed experiments to go into space aboard the Space Shuttle, in order to perfect a process for developing contact lenses.

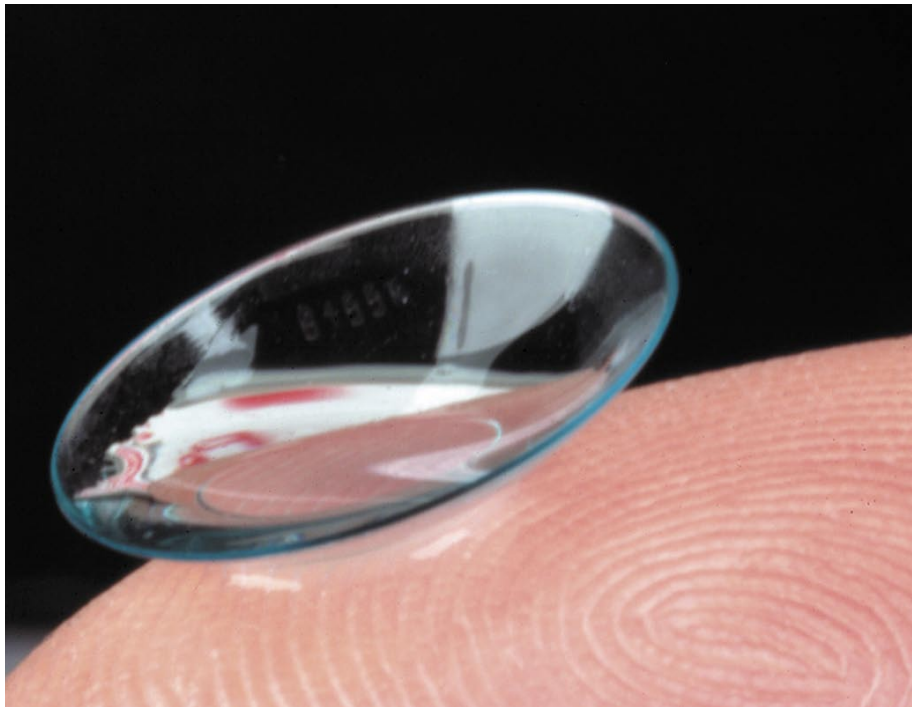
in similar formulations made on Earth (permeable plastics are ideal for extended-wear contact lenses because they allow more oxygen to reach the cornea, which is vital to preventing swelling of the eye). For Paragon, the findings led to an improved ground-based synthesis process and yielded new and better polymers for advanced uses in treating vision problems.

PRODUCT OUTCOME

Paragon's HDS® (hyperpurified delivery system) contact lenses are based on the unique technological advancements derived from the company's experiments with NASA. HDS lenses are considered gas permeable, and therefore do not contain water, are resistant from deposits, and are less likely than soft contact lenses to harbor bacteria. The rigidity of gas permeable contact lenses also makes them easier to handle than soft lenses, plus they retain their shape over time to provide crisper vision.

The HDS line effectively eliminated "bad" silicones, making the lenses extremely oxygen efficient. HDS has been approved by the U.S. Food and Drug Administration (FDA) for up to 7 days of continuous wear. Along with this approval, HDS was the subject of the most complete and comprehensive study on gas permeable extended-wear lenses ever conducted, according to Paragon. The National Institutes of Health-sponsored study confirming the safety and efficacy of the lenses was performed over a 5-year period and published in the August 2001 edition of the peer-reviewed journal, Ophthalmology.

Paragon additionally leveraged what it learned from the Space Shuttle experiments to invent a contact lens made from HDS materials that nonsurgically reshapes the cornea during sleep. Paragon CRT® (Corneal Refractive Therapy) is the company's latest product and the first therapeutic lens design approved by the FDA for overnight Corneal Refractive Therapy for the temporary reduction of myopia, or nearsightedness, with or without moderate astigmatism. When users awake, they simply remove the CRT lenses and experience clear, natural vision without daytime contact lenses or glasses. The FDA approval was based on results of an extensive and successful study in which almost 70 percent of the patients wearing the CRT contact lenses achieved 20/20 vision or better and more than 93 percent achieved 20/32 vision or better, which exceeds the 20/40 vision acuity that most states require to drive a car with an unrestricted license.



Paragon Vision Sciences, Inc.'s CRT® (Corneal Refractive Therapy) contact lens is a noninvasive alternative to laser-corrective surgery, as it reshapes the cornea during sleep to reduce nearsightedness. When users awake, they simply remove the CRT lenses and experience clear, natural vision without daytime contact lenses or glasses.

"Consumers no longer have to tolerate daytime contact lens irritation due to dry eyes, interference of glasses or contacts during sports and recreation, and countless other hassles," asserts Joe Sicari, Paragon's president and chief executive officer. "Further, consumers now have a nonsurgical option to gain the benefits of device-free vision."

Not only is Paragon CRT a noninvasive alternative to laser-corrective surgery, there are no age restrictions. The process is also reversible, so if a user wishes to discontinue wearing the lens, the cornea will return to its original shape. Moreover, Paragon CRT allows for adjustments for normal changes in vision that occur as people age.

Paragon has trained and certified over 2,000 eye care practitioners nationwide to prescribe Paragon CRT for overnight Corneal Refractive Therapy and tens of thousands of consumers are already enjoying the benefits of this safe, remarkable technology. The process is years ahead of the conventional methods of orthokeratology, which also depend on contact lenses to nonsurgically reshape the cornea, but take months to accomplish the desired result.