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Stem-Cell Therapies Are No Longer a Distant Promise â?? The Real Challenge Is Delivering Lasting Results

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Speaking to BioSpectrum Asia at BIOPLUS-INTERPHEX KOREA 2026, Dr Sally Temple highlights how advances in RPE transplantation, regenerative neuroscience and cell engineering are bringing therapies closer to clinical reality, while safety, scalability and long-term efficacy remain critical challenges.



Regenerative medicine is entering a defining phase as stem-cell research moves beyond laboratory discoveries towards clinical applications for retinal degeneration, Parkinson's disease and diabetes. Yet achieving long-term therapeutic benefits will require significant progress in cell manufacturing, transplantation safety, treatment durability and patient selection.

Speaking to **Saradha Mani of BioSpectrum Asia on the sidelines of BIOPLUS-INTERPHEX KOREA 2026, held from 28–30 October at COEX, Seoul, under the theme *Connecting the Global Biopharma Value Chain*, Dr Sally Temple, PhD,** shared her perspectives on the evolving landscape of regenerative neuroscience, the promise of RPE transplantation for advanced dry age-related macular degeneration (AMD), and how emerging technologies, including single-cell analysis, organoids, gene editing and artificial intelligence, could accelerate the development of clinically meaningful therapies.

Stem-cell science has advanced considerably over the past two decades. Where do you believe the field now stands in moving from fundamental discovery towards clinically meaningful regenerative therapies?

I think we are at an important transition point. Twenty years ago, much of the discussion was about what stem cells might eventually make possible. Today, we are actually testing cell therapies in patients, including for retinal disease, Parkinson's disease and diabetes.

Our RPE program illustrates that transition. We went from discovering stem/progenitor cells in the adult human RPE, through years of preclinical development and manufacturing, to a Phase 1/2a trial in patients with advanced dry AMD.

So the question is no longer simply, "Can we make the right cell?" It is: "Can we make it reproducibly and safely, deliver it to the right patient, and produce a durable improvement in function?"

Neurological diseases remain among the most difficult conditions to treat. Which recent advances in stem-cell biology and regenerative neuroscience give you the greatest reason for scientific optimism?

I'm optimistic because several technologies have matured at the same time.

We can now replace specific cell populations lost in disease, as shown by trials using RPE in retinal degeneration and dopaminergic neurons in Parkinson's disease.

At the same time, iPSCs and organoids let us study human neurological disease before cells are lost, something we could never really do before.

So we now have two complementary strategies: understand disease early enough to prevent cell loss, and, if the cells are already gone, find ways to replace them.

Your work has explored neural stem cells and their potential for understanding and treating neurological and retinal disorders. What have researchers learnt about translating this biology into viable therapeutic approaches?

The biggest lesson is that making the right cell type is only the beginning. The state of the cell matters enormously, its maturity, function, proliferative capacity and ability to survive transplantation.

We saw this in our RPE program, where we identified a particular stage of differentiation that performed best in our preclinical studies.

And translation has to be considered from the beginning: Can you manufacture the cells reproducibly? Can you define their potency and safety? Can you transport and deliver them reliably?

Ultimately, a biological discovery only becomes a therapy if all of those pieces work together.

As regenerative medicine moves closer to clinical application, what are the biggest remaining challenges around safety, durability, manufacturing and patient selection?

I would highlight four: safety, durability, manufacturing and patient selection.

We have to know that transplanted cells remain safe and maintain the correct phenotype over many years. We also need reproducible manufacturing and rigorous measures of identity, purity and potency.

And patient selection is critical. Treat too early and the risks may outweigh the benefit; treat too late and too much of the surrounding tissue may already have been lost.

I think finding that defining therapeutic window will be one of the most important challenges for regenerative medicine.

How are technologies such as single-cell analysis, gene editing, organoids and AI changing the way researchers understand neural development and identify potential therapeutic targets?

What is really powerful is how these technologies work together.

Single-cell analysis tells us which cells are changing. Gene editing lets us test whether a mutation or pathway is actually causing that change. Organoids let us follow those processes over time in human tissue models, including events that occur before degeneration.

AI gives us increasingly powerful ways to integrate imaging, genomic and functional data and identify patterns we might otherwise miss.

Together, these technologies give us a much more direct path from observing human disease to understanding mechanism and identifying something we can therapeutically target.

Looking five to ten years ahead, what would constitute a genuine breakthrough for regenerative neuroscience, and which diseases or patient populations could see the earliest meaningful impact?

The real breakthrough will be showing that transplanted cells don't simply survive in patients, but produce durable improvements that meaningfully affect patients' lives.

I think the earliest successes will be in diseases where a relatively defined cell population is lost. The retina is particularly attractive because it is accessible, we can image transplanted cells directly, and relatively small numbers of cells could potentially have a significant effect. Parkinson’s disease is another strong candidate.

Diseases such as Alzheimer’s are more complex, so stem cells may initially have their greatest impact there as models for discovering treatments that prevent degeneration.

Ultimately, the goal is simple: preserve cells when we can, and replace them when they are already gone.