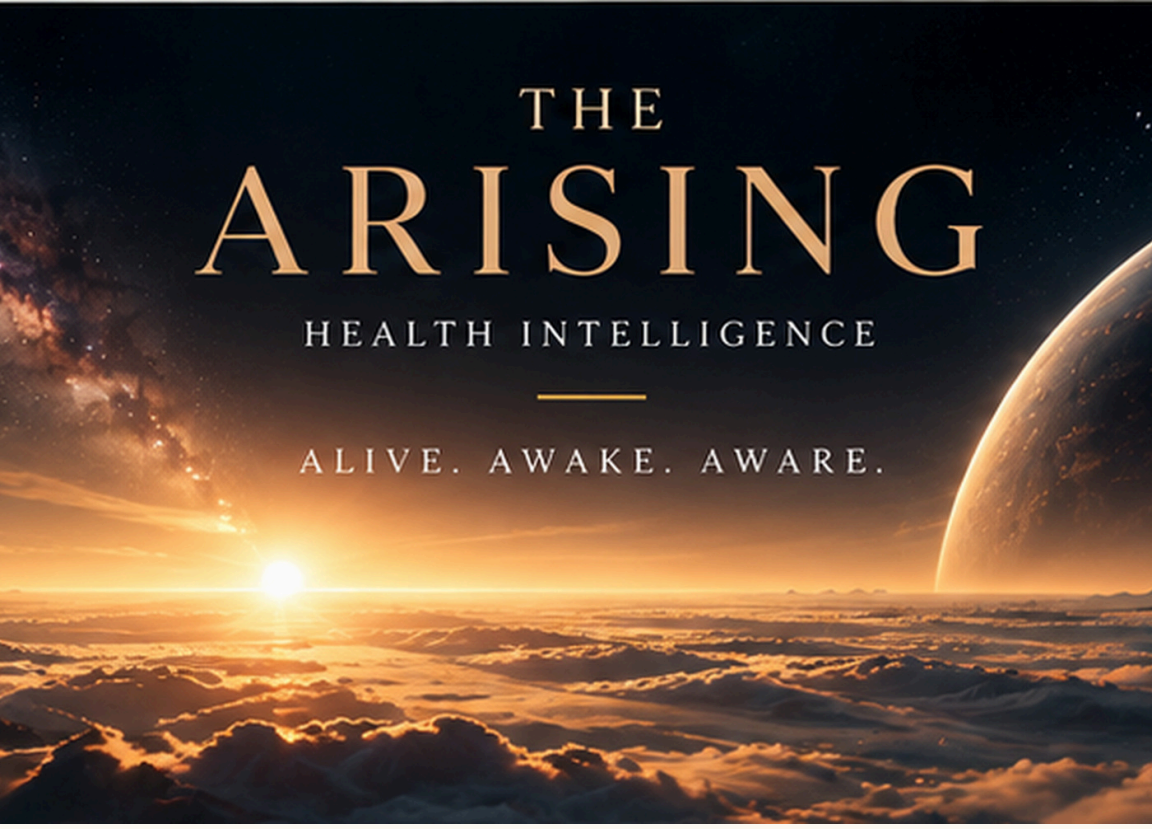


25 / BIOLOGY AND REPAIR

The Body Parts We Might Learn to Rebuild

Scaffolds, living tissue, and the demanding step from structure to sustained organ function.

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An organ is an arrangement

Replacing an organ asks more of biology than making the right cell type. Cells must be arranged, supplied, connected, and able to perform coordinated work. The route by which fluid enters and leaves can be as consequential as the identity of the cells.

This is why organ-regrowth stories should specify the scale of the achievement. A cell culture, a tissue fragment, and a transplantable organ solve different parts of the problem.

A foundational kidney experiment

A 2013 study removed cells from kidneys to retain a structural scaffold. Investigators seeded rat kidney scaffolds with epithelial and endothelial cells and supported them in a bioreactor. The resulting grafts produced rudimentary urine in vitro and urine after experimental transplantation in rats. [1]

The finding demonstrated elements of structure and function. It did not establish a fully restored kidney suitable for human transplantation or durable independence from renal replacement therapy. The age of the paper matters: this is a foundational example, not a new clinical result.

Function can arrive in smaller units

Cell replacement may sometimes address a narrower function without rebuilding an entire organ. The stem-cell-derived islet research discussed elsewhere in this series is an example of that different strategy. Its clinical results and burdens must be evaluated on their own terms. [2]

The distinction helps readers avoid treating all regenerative medicine as one technology. A scaffold-based organ, a differentiated cell product, and a patient's own tissue responding to a signal require different manufacturing and safety evidence.

The milestones worth following

For whole-organ engineering, useful questions include perfusion, specialized function, waste handling, compatibility, stability, and long-term performance. A dramatic image is informative only when paired with those measurements.

A future success would be judged by what the recipient can rely on, not simply by whether the graft resembles the organ it is intended to replace. The possibility of rebuilding tissue is extraordinary. Its practical meaning will be earned through the patient, persistent work of making the new structure function as part of a living person.

SOURCES & READING SCOPE

Keep the claim beside its evidence

1. Jeremy J Song, Jacques P Guyette, Sarah E Gilpin, et al. Regeneration and experimental orthotopic transplantation of a bioengineered kidney. Nature medicine. 2013 May;19(5):646-51. doi:10.1038/nm.3154. PMID:23584091. Open source →

2. Trevor W Reichman, James F Markmann, Jon Odorico, et al. Stem Cell-Derived, Fully Differentiated Islets for Type 1 Diabetes. The New England journal of medicine. 2025 Sep 04;393(9):858-868. doi:10.1056/NEJMoa2506549. PMID:40544428. Open source →

Selected primary publication records and abstracts checked 25–26 October 2026. This is a focused reading companion, not a systematic review, a treatment protocol, or a complete appraisal of methods, supplements and later evidence.

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