HEINRICH WIELAND PRIZE

HEINRICH WIELAND LAUREATE 2025 | PROFILE

Professor Adrian R. Krainer, PhD
Cold Spring Harbor Laboratory (CSHL), USA

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Adrian R. Krainer receives the 2025 Heinrich Wieland Prize for his fundamental research on the mechanism and control of pre-mRNA splicing and for his development of a therapy for spinal muscular atrophy (SMA), a genetic disease that leads to progressive muscle weakness and paralysis. SMA results from a loss-of-function mutation in the *SMN1* gene. Although the closely related *SMN2* gene is present in the human genome and differs by only a few nucleotides, it does not produce sufficient levels of functional SMN protein due to alternative splicing. Adrian Krainer investigated the mechanism underlying the exclusion of a protein-coding exon during splicing of *SMN2*. To counteract this defect, he and his collaborators developed an antisense oligonucleotide (ASO) therapy that prevents a splicing repressor from binding to the pre-mRNA, thereby restoring correct *SMN2* splicing. As a result, the *SMN2* gene produces enough functional SMN protein to halt the progression of SMA and, if administered early enough, to prevent its onset. Adrian Krainer's breakthrough research led to the first FDA/EMA-approved treatment of SMA and marked a milestone as the first nucleic-acid therapy in neurology.

Beyond SMA, Adrian Krainer has pioneered the use of ASOs to modify RNA metabolism in other diseases. In a specific form of cystic fibrosis, he developed an ASO strategy to increase levels of a partially functional CFTR protein by preventing nonsense-mediated mRNA decay of the defective *CFTR* gene. In liver and pancreas cancer, he is developing ASO-based approaches to reprogram cancer cell metabolism. And for high-grade pediatric glioma, he designed ASOs that selectively degrade the mRNA of a mutated, cancer-driving oncogene.

In summary, Adrian Krainer's pioneering research has provided fundamental insights into RNA regulation and metabolism while opening new avenues for RNA-targeted therapies in both genetic and acquired diseases.

Adrian Krainer studied Biochemistry at Columbia University in New York, USA, and earned a PhD from Harvard University in 1986. He then joined Cold Spring Harbor Laboratory (CSHL), where he became a faculty member in 1989 and was promoted to full professor in 1994. He currently serves as the St. Giles Foundation Professor of Molecular Genetics and as Co-leader of the Gene Regulation and Inheritance Program at the CSHL Cancer Center. He is also a co-founder and Director of Stoke Therapeutics. Adrian Krainer has received numerous awards, including the Albany Medical Center Prize in Medicine and Biomedical Research, the Wolf Prize in Medicine, and the Life Sciences Breakthrough Prize. He was elected to the American Academy of Arts and Sciences, the National Academy of Inventors, the National Academy of Medicine, and the National Academy of Sciences.

Boehringer Ingelheim Stiftung