The Foundations of a Cure:

Basic Research in a Shifting Policy Landscape

For nearly five decades, Professor Richard Salvi has shaped global understanding of tinnitus and hyperacusis. His body of work spans molecular mechanisms, neural plasticity, and translational pathways, and his influence continues to define how the field approaches the biology of phantom auditory perception. In this year's annual report, he reflects on the position of basic auditory research at a time when clinical innovation is accelerating and health-research policy systems are reshaping scientific priorities. His analysis highlights the foundational work that must be strengthened if future therapies are to move beyond symptom management toward true suppression or cure.

Professor Richard Salvi (USA)

A Stabilising Phase for Animal and Cellular Research

The proportion of animal and cellular tinnitus studies in recent years has declined relative to large-scale population and clinical work, prompting concerns about the future of basic auditory research. Rather than a collapse, however, the trend appears to represent a stabilisation following an earlier period of rapid growth. Animal research increased steadily from the mid-2000s to a peak around 2017, followed by a moderate decline and a largely steady plateau across the past five years. Whether levels rise or fall in the future will depend less on scientific preference and more on the availability of dedicated funding and the emergence of technological breakthroughs. In other words, the trajectory of basic tinnitus research continues to be shaped primarily by the economics of science and the tools that unlock new lines of enquiry.

The Central Bottleneck: Capturing the Phantom Sound

The most distinctive challenge in tinnitus research is that humans can verbally report the presence and quality of a phantom sound, whereas animals cannot. Behavioural paradigms exist, but they remain slow, indirect and difficult to scale, particularly for chronic tinnitus. The field's next major leap will require high-throughput systems that determine not only whether an animal has tinnitus, but also what the percept "sounds like" and how intrusive it is. Developing such tools would transform both mechanistic research and therapeutic development, enabling rapid testing of interventions while also identifying the neural correlates of tinnitus in a more precise manner. Artificial intelligence is expected to play a crucial role in this evolution, detecting multidimensional patterns in behaviour and neural activity that cannot be discerned manually.

Professor Richard Salvi (USA)

Shared Mechanisms, Distinct Triggers: Tinnitus and Hyperacusis

Tinnitus and hyperacusis frequently co-occur and may arise from similar antecedents such as ototoxic drugs or high-intensity sound exposure. Their clinical expression, however, can differ substantially. For many patients, silence increases awareness of tinnitus and moderate sound promotes habituation; yet for others, especially those with coexisting hyperacusis, quiet environments feel safer and routine sound exposure can aggravate both hyperacusis and tinnitus. Despite this variability, low-to-moderate sound exposure combined with counselling remains clinically valuable, although the therapeutic window is highly individual. These contrasting patterns suggest partially overlapping neural circuits with distinct activation thresholds and context-dependent regulation. Future mechanistic and animal studies should therefore focus not only on co-occurrence but on how neural signatures diverge under controlled acoustic conditions.

Phenotyping: The Missing Link in Treatment Stratification

One of the most persistent barriers to personalised tinnitus care is the difficulty of identifying subgroups that respond differently to specific treatments. From a mechanistic standpoint, treatment stratification in animals is constrained by the fact that subgroup distinctions in humans remain poorly defined beyond the division between subjective and objective tinnitus. Without clear clinical phenotypes, animal phenotyping cannot progress far. The path forward will require large multidimensional datasets across behaviour, physiology, genetics and neuroimaging that can reveal patterns currently invisible to conventional analysis. As these phenotypes emerge, animal research will be able to model them more precisely and support the development of targeted interventions.

Three Priorities to Advance Basic Research Toward a Cure

Professor Salvi proposes a clear three-part roadmap for moving basic auditory science toward curative outcomes. First, he argues for the development of fast and reliable methods to determine the subjective nature of tinnitus in animal models, enabling researchers to identify not only whether tinnitus is present but what the percept resembles and how intrusive it is. Second, he emphasises the need to advance brain-wide imaging techniques such as fMRI, MRS and EEG to capture the distributed neural activity that sustains persistent tinnitus rather than focusing on isolated structures. Third, once these two foundations are in place, he advocates for systematic drug-screening pipelines to identify compounds capable of suppressing tinnitus. Across all three priorities, Salvi sees artificial intelligence as a powerful accelerator, capable of integrating complex behavioural, biological and neural datasets at a scale and precision that traditional analytic methods cannot achieve.

Toward the Next Breakthrough

Professor Salvi's reflections demonstrate that the future of tinnitus treatment does not depend solely on expanding clinical services, digital therapeutics or neuromodulation devices. These developments are needed and welcome, but the ability to silence the phantom percept will ultimately rest on strengthening the biological foundations of the field. The conditions that make tinnitus so difficult to study — its subjectivity, its variability and its neural complexity — are the same conditions that make progress possible once measurement and modelling barriers are overcome.

Basic auditory research remains the foundation of a cure. As health-research policy shifts in response to economics, national priorities and technological change, the challenge for the tinnitus community will be to ensure that mechanistic science retains the support it needs to deliver the breakthroughs that clinical innovation alone cannot provide. If this balance is achieved, the next decade may mark the point where foundational neuroscience and translational medicine finally converge to deliver therapies that move beyond coping and bring true quiet within reach.

RICHARD SALVI ON SCIENTIFIC PROGRESS

Progress in tinnitus treatment will depend on revitalising basic auditory and animal research by developing far better ways to detect and characterise tinnitus in animals, then using those breakthroughs alongside AI and brain imaging to identify neural mechanisms and accelerate drug discovery for humans.