

# Hyperacusis Alliance

## Innovating the Future for Hyperacusis Research

Building on the Hyperacusis Alliance formed in 2017, a team of expert researchers met at the 2018 ARO midwinter meeting with the primary objective of an ideation working session to enhance collaboration for research for a cure. To facilitate the process, the 32 attendees were divided into the following four working groups:

**Group 1: Animal Models & Central Neural Function**

**Group 2: Cochlea & Central Neural Function**

**Group 3: Peripheral Function & Literature Review**

**Group 4: Diagnostic Assessments & Clinical Options**

Each work group provided inputs on the following discussion topics:

- I. Describe current collaboration efforts in this area of research.**
- II. Describe expanded or new collaboration opportunities to pursue.**
- III. Describe significant gaps in this area of research.**
- IV. What work can be accelerated in the near term to alleviate suffering?**

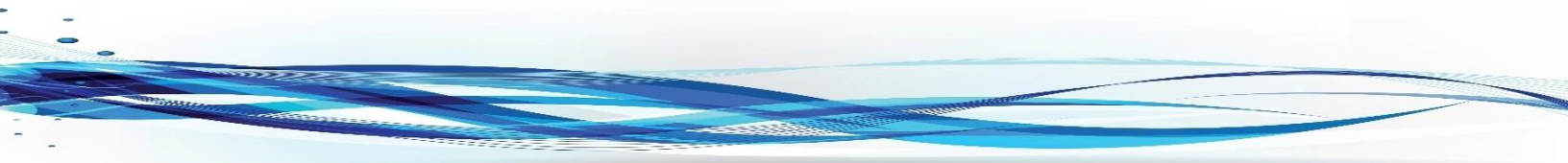
The 110 ideas were captured from the participants are shown below.

### **Group 1: Animal Model & Central Neural Function**

#### **I. Describe current collaboration efforts in this area of research.**

1. Collaborate with clinical ENT doctors to create a reasonable clinical approach on an animal model.
2. Collaborate using animal models
3. Started collaboration in clinical studies
4. Multi-institutional collaboration at UB - collaboration with Wayne State, China
5. Utilize different approaches
6. Cochlear and Central changes
7. Collaborate with Center for Hearing and Deafness

#### **II. Describe expanded or new collaboration opportunities to pursue.**

8. Studies of hyperacusis types and genomic inflammatory markers
  9. Interested in multi-institutional electrophysiology to study neuro-connectivity between AUD structures and between non-AUD structures
  10. UB and MEEI Kujawa collaboration
  11. Receive and give training to others.
  12. Joint projects with others
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13. Partner with a drug company
14. Test hypothesis in animal model and try to apply in clinical test
15. Utilize the strengths of different labs for projects
16. Translation of animal model to clinic (i.e. development of drug targets, objective endophenotypes beyond LDLs)

### **III. Describe significant gaps in this of area of research.**

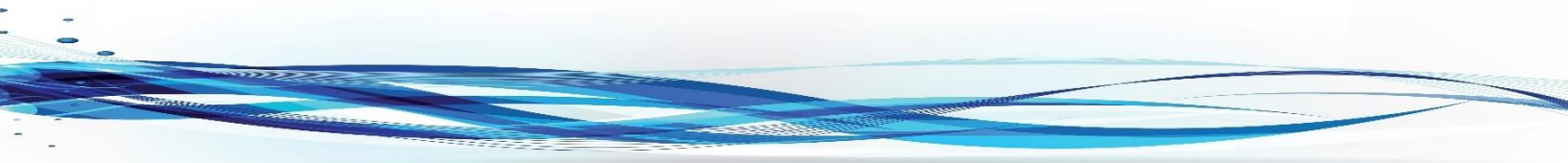
17. Cell and molecular mechanisms of hyperacusis that may identify novel therapeutic targets
18. Combine basic research and clinical cases
19. Drug treatment for hyperacusis
20. Study of genetic and disease factors
21. Separation of neural mechanisms of tinnitus and hyperacusis since both are co-morbidities
22. Study objective biomarkers
23. Look for effective treatments
24. Involving clinical facilities in current research may help to reduce the gap of research and clinical works
25. Involve genomic associations
26. The gap of current research is the lack of clinical test-retest on the current theory

### **IV. What work can be accelerated in the near term to alleviate suffering?**

27. Cognitive behavioral therapies
28. Drive cooperative studies by getting a support source
29. Genetic animal models of hyperacusis
30. Brain imaging - MRI, MRS, EEG
31. Interactions between scientists and clinicians to develop clinical protocols in different tiers

### **Group 2: Cochlea & Central Neural Function**

#### **I. Describe current collaboration efforts in this area of research.**

32. Partnering with Washington University
  33. Buffalo working within Rome to examine tinnitus patients with and without hyperacusis
  34. MEEI and Michigan (Shore) collaborating
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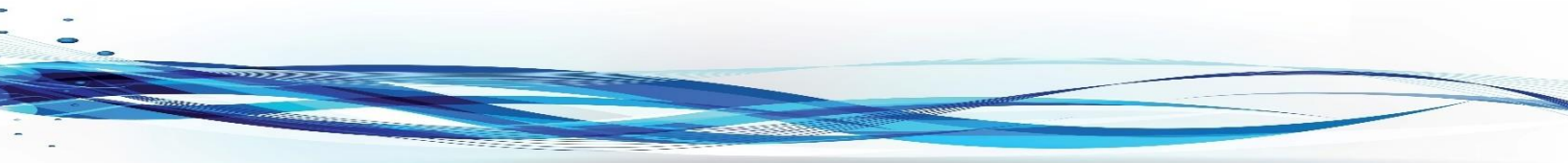
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35. Neural interactions of nociceptive system research
36. Identification of neural cause of hyperacusis
37. Do type II fibers become hyperactive? Express pain sensing molecules
38. Determining the mechanism site of hyperacusis

## **II. Describe expanded or new collaboration opportunities to pursue.**

39. Combine one institution's animal behavioral model with another institution's anatomical studies
40. Obtain input from Neurologists who focus on pain to help stratify hyperacusis with pain types
41. Partner with clinicians who treat hyperacusis patients
42. Combine clinical work with institutional research
43. Develop better models to study and assess hyperacusis
44. Develop drug treatments
45. Advance sound therapy
  
46. Hyperacusis induction and behavioral testing in animal models: fMRI, in vivo Electrophysiology, invitro electrophysiology, genetics (MRC), anatomical

## **III. Describe significant gaps in this of area of research.**

47. Inflammatory cell contribution to hyperacusis / ear pain
  48. Handicap index for patients to "measure" hyperacusis
  49. There's a lack of knowledge about the effect of low level noise on sound perception
  50. What's the mechanism behind developing hyperacusis?
  51. Which area of the brain is connected to hyperacusis?
  52. Human clinical data
  53. Any information on therapies patients are currently trying
  54. What is hyperacusis? How many forms? Do cluster analysis of symptomatology.
  55. What are the right questions to ask? What do clinicians hear from patients?
  56. Interaction of the nociceptive system with the auditory system
  57. How to study hypersensitivity of neurons after sound trauma. Animal to human translation.
  58. Is central excitability entirely causing hyperacusis or can it be protective?
  59. How to test for hyperacusis in animal models and separate from tinnitus?
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## IV. What work can be accelerated in the near term to alleviate suffering?

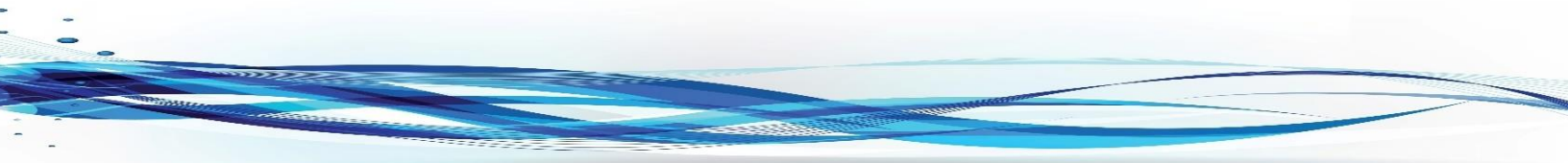
60. Categorize treatment options based on symptoms
61. Pharmacological therapy
62. Try drugs that are already on the market for other potentially related conditions (migraines, fibromyalgia)
63. Figure out what are the key questions to symptomatology to feed a cluster analysis to stratify this disorder
64. We need to generate (testable) hypothesis.
65. Model to induce hyperacusis
66. More human dynamic research
67. Are certain channels, receptors, etc. upregulated in the cochlea by trauma that could be treated pharmacologically to reduce further insult? (sodium channels, NT receptors)

## **Group 3: Peripheral Function & Literature Review**

### **I. Describe current collaboration efforts in this area of research.**

68. Raise awareness of the specific hyperacusis associated with superior canal dehiscence
69. Characterize what will help the patient the most.
70. Collaboration between basic scientists, clinicians, and patient
71. Collaboration between clinician/surgeon and basic scientist
72. Experimental audiology and neuroscience (neurology, plasticity, multi-model integration)??
73. "Collaboration" by way of teaching AuD students and PhD students the current state of hyperacusis research and areas of need.
74. Collaborative communication with allied health/ interdisciplinary care teams about hyperacusis and alternative care options

### **II. Describe expanded or new collaboration opportunities to pursue.**

75. Characterize clinically what treatments work for patients
  76. Collaboration between clinicians and scientists to develop new products
  77. Collaboration between computer modelers (e.g. Finite Element Modeling) and Experimentalists
  78. Multi-institutional training grants with audiology, otolaryngology, physical therapy, occupational therapy components/personal to establish a culture of awareness of hyperacusis care
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79. Collaboration with neurologist in the pain and migraine domain
80. Collaboration with middle ear specialists
81. Collaboration with specialists of inflammation
82. Raise awareness of this subtype of hyperacusis caused by mechanical issues in the auditory peripheral system

### **III. Describe significant gaps in this of area of research.**

83. We don't know the different kind and subcategories of hyperacusis and causes. Need new research in this area.
84. Effect of mechanical perturbation in the middle and inner ear on sound transmission
85. Trigeminal nerve involvement in hyperacusis
86. Hyperacusis secondary to chronic otitis media or other middle ear disorders
87. Mechanisms not known, No locus - Is it peripheral or central?
88. How many punitive "models"
89. Objectification of the patients - applicable in the clinics
90. The middle ear/ ossicles may cause increased sound sensitivity to sounds

### **IV. What work can be accelerated in the near term to alleviate suffering?**

91. Obtain patient medical records to note hyperacusis as a symptom to better understand the incidence and prevalence of hyperacusis.
92. Improve standard Audiologists practices in recognizing hyperacusis symptoms
93. Get a better patient pool to study and learn from
94. Evidence based treatment
95. Better diagnostic techniques
96. Mechanism -> Objectification -> Solution > Anti-inflammatory (molecules?? Provided locally), > Botox, > etc
97. ASHA and AAA membership -> Engage their members to communicate best practice or an ideal battery of tests for hyperacusis patients
98. Passive or active hearing plugs/aids that can attenuate the peak of impulse sounds

### **Group 4: Diagnostic Assessments & Clinical Options**

#### **I. Describe current collaboration efforts in this area of research.**



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99. UK patient - clinician collaborations in England

100. Work with the Hyperacusis Alliance

## **II. Describe expanded or new collaboration opportunities to pursue.**

101. Increase connections between Academia and Industry

102. Collaborate with Professional organizations

103. Increase collaboration in Asia: China, Taiwan (Taiwan Tinnitus Association), Korea

## **III. Describe significant gaps in this of area of research.**

104. Epidemiology barriers - no wide spread acceptance of hyperacusis definitions

105. Epidemiology barriers - need improved assessment tools

106. Clear definitions of hyperacusis

107. Lack of clinical knowledge of hyperacusis across the medical field (from MD's thru AuD's)

## **IV. What work can be accelerated in the near term to alleviate suffering?**

108. Improved clinical screening

109. Industry led development work

110. Shared development of clinical teaching materials on hyperacusis. Can build basic patient knowledge from Sanford CoRDs study.

