



**GEORRIC 2026**

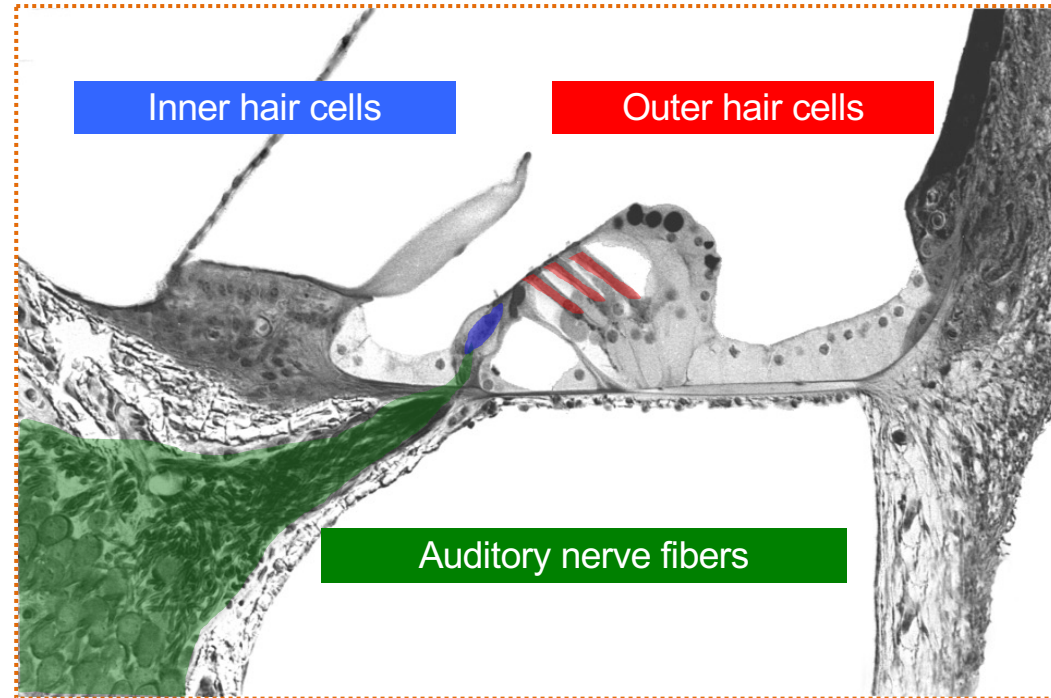
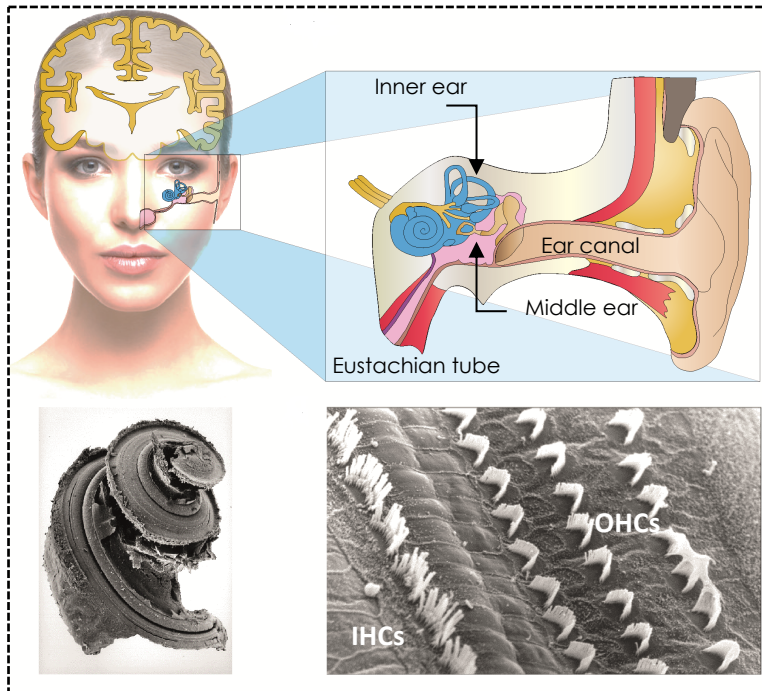
**Bordeaux 09 & 10 avril 2026**

# **L'impact de la synaptopathie sur les acouphènes et l'hyperacousie**

**Jean-Luc Puel**

*Institut des Neurosciences de Montpellier*

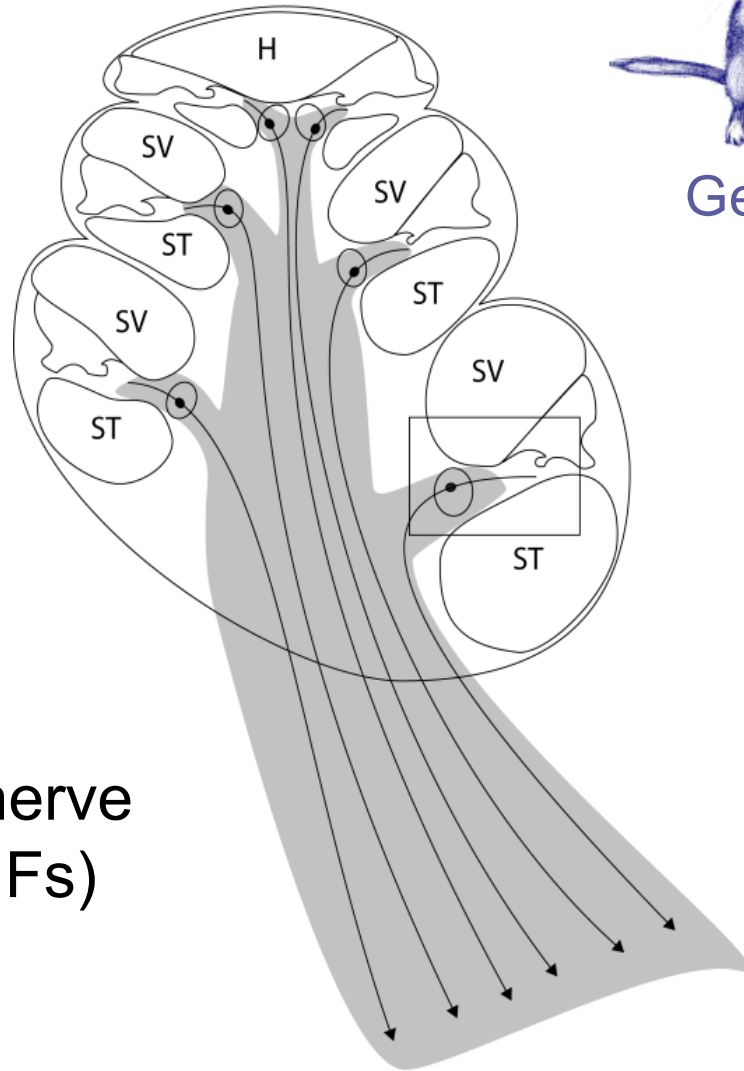
# Codage des sons par la cochlée et le nerf auditif



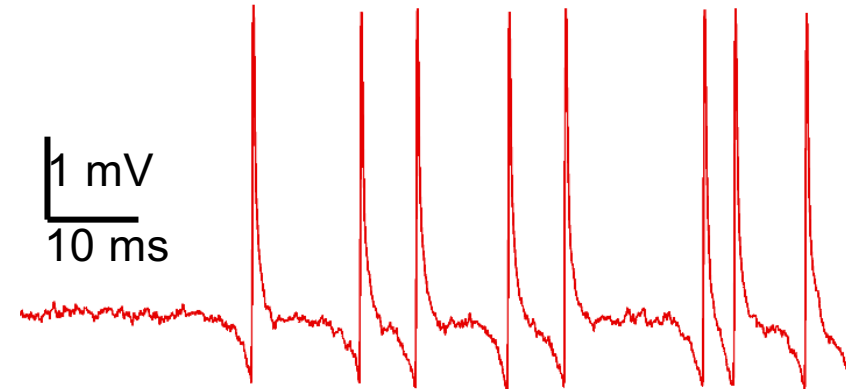
# Codage des sons par la cochée et le nerf auditif



Gerbils



Auditory nerve fibers (ANFs)

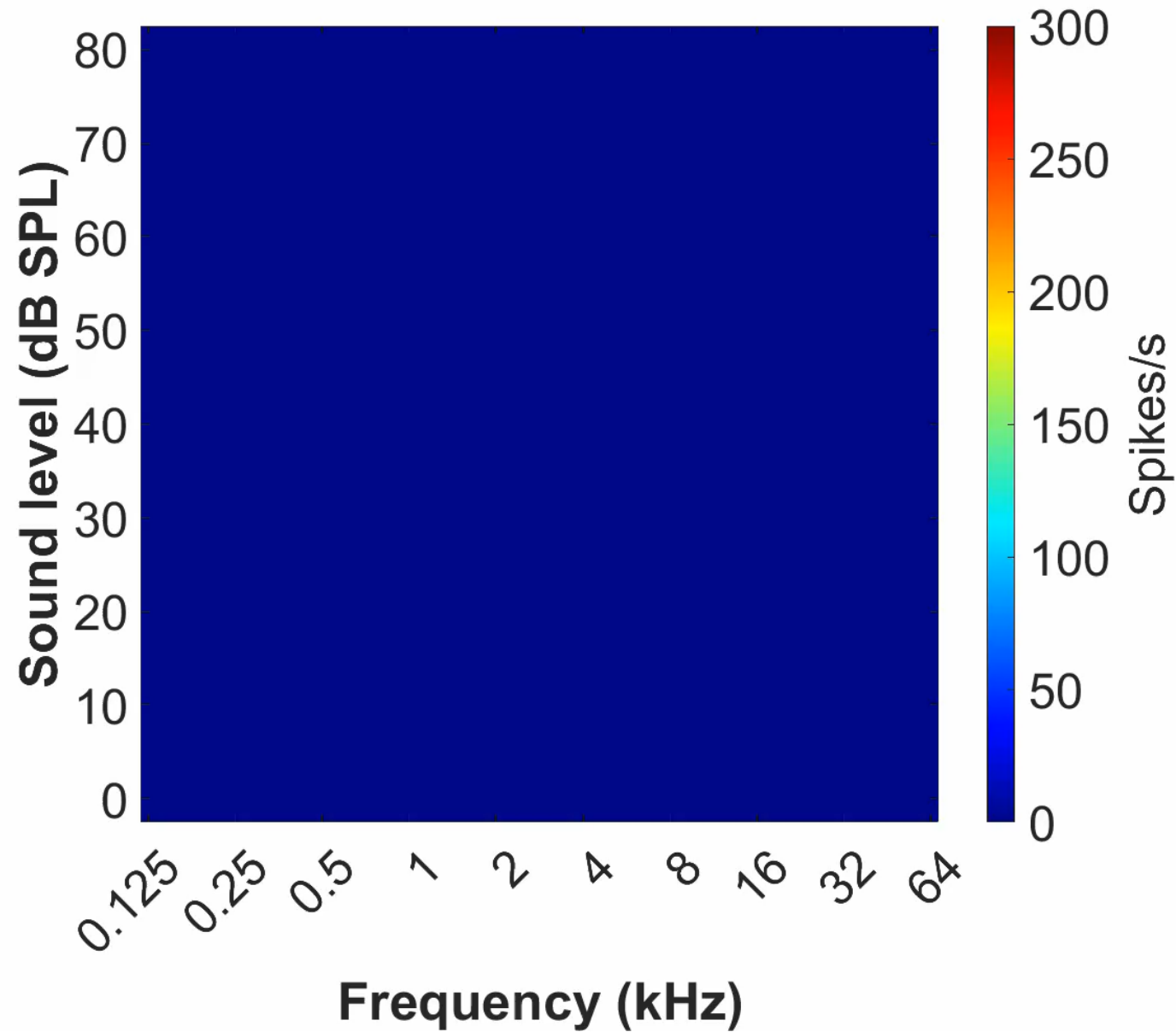


Bourien et al, *J. Neurophysiol.*, 2014  
Huet et al, *Hearing res*, 2016  
Huet et al, *J. Neurosci.*, 2018; 2022

# Codage des fréquences



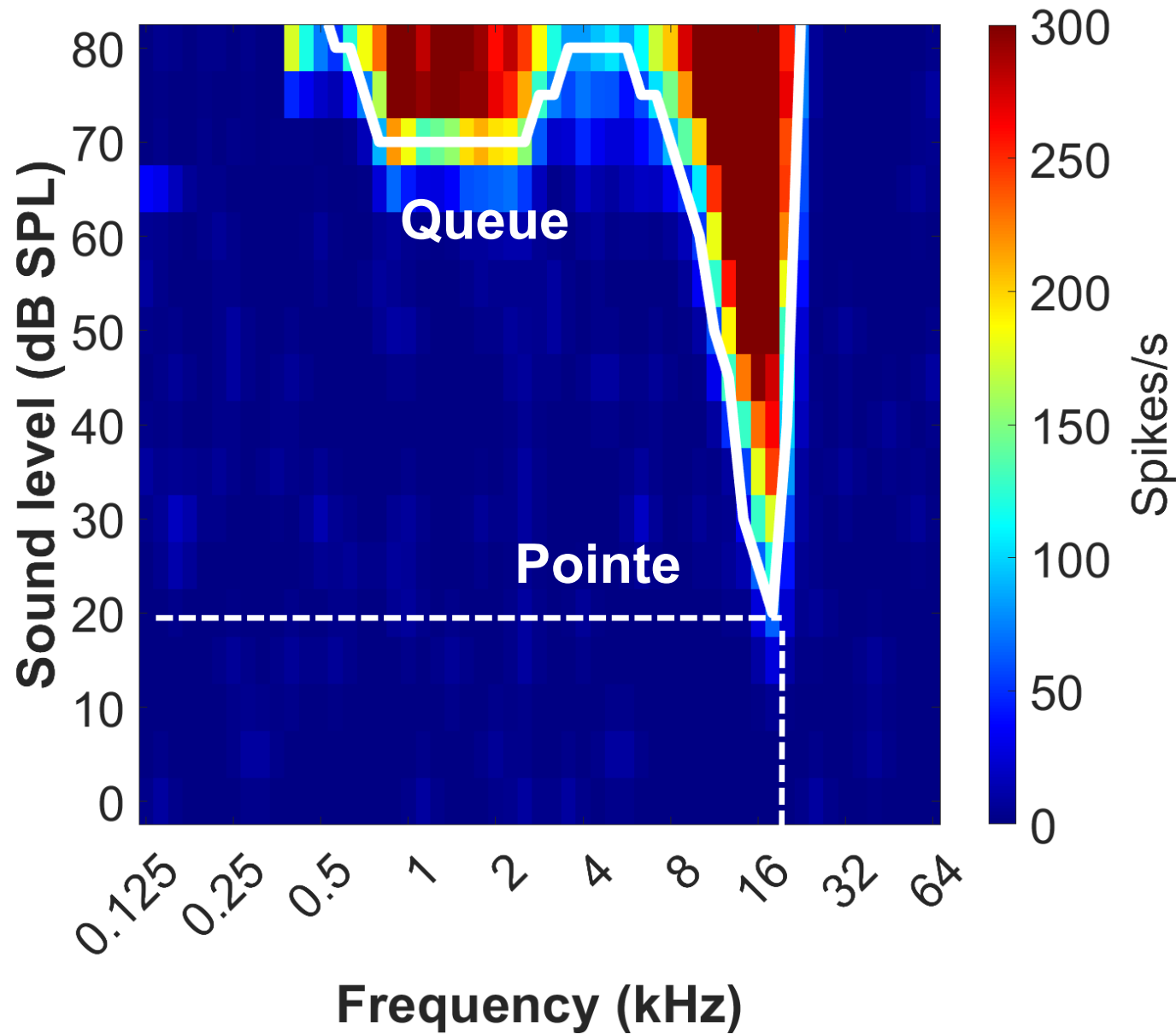
Daniil Kiselev  
(Postdoctorant)



# Codage des fréquences



Daniil Kiselev  
(Postdoctorant)



**Fréquence caractéristique**

**(CF): 19 kHz**

**Seuils:**

20 dB SPL

**Activité spontanée**

**(SR): 3 spikes/s**

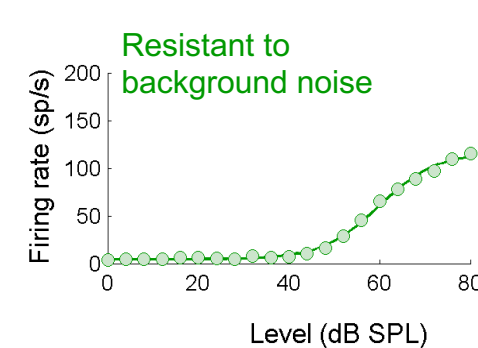
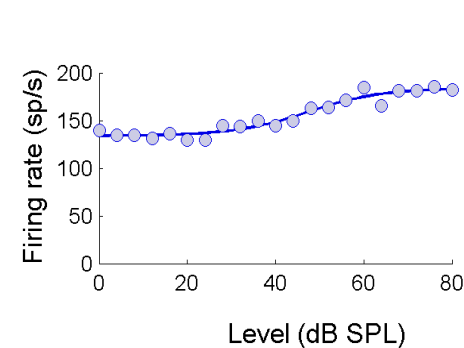
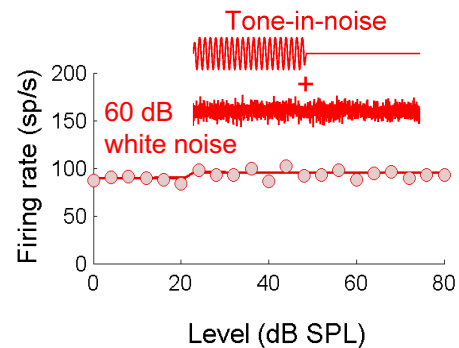
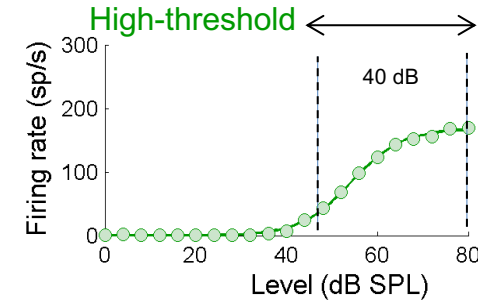
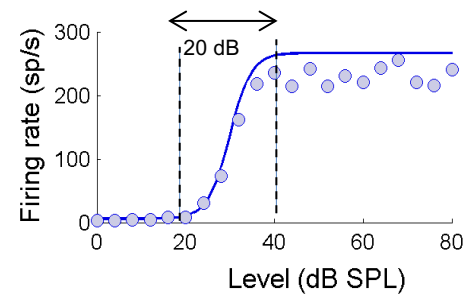
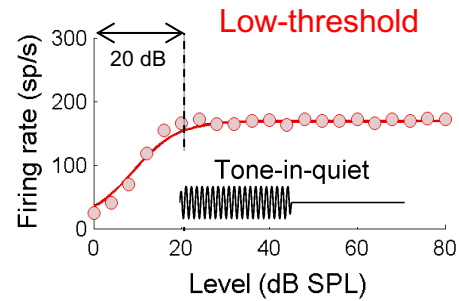
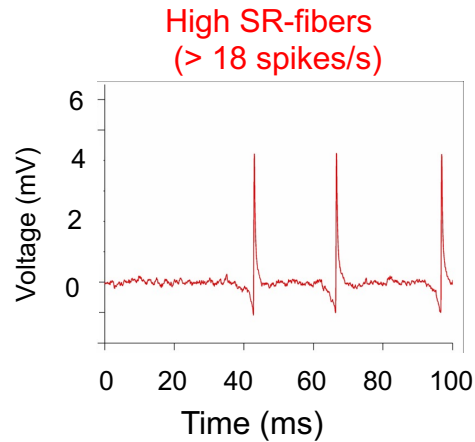
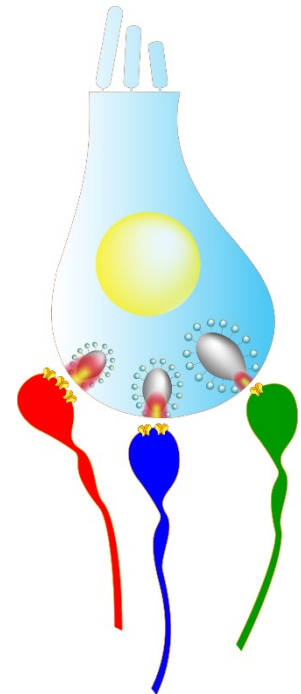
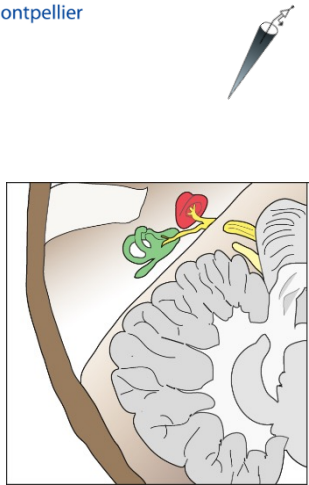
# Codage de l'intensité



Antoine Huet  
CRCN Inserm



Jérôme Bourien  
MCU UM



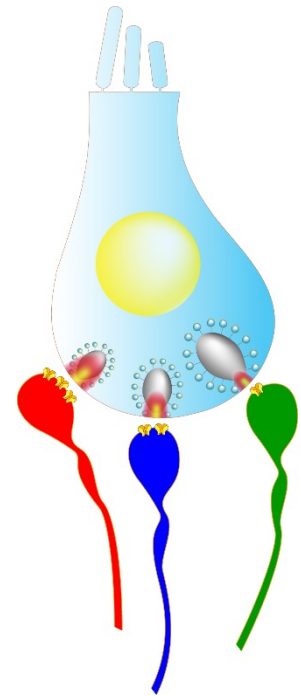
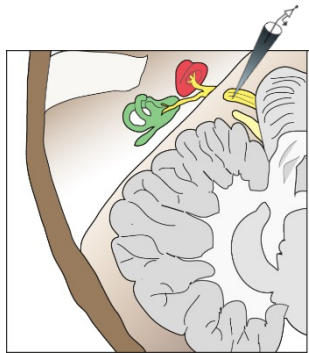
# Codage de l'intensité



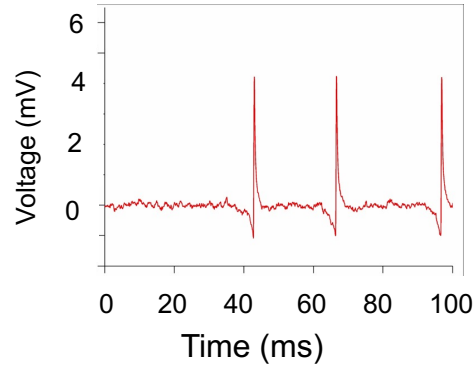
Antoine Huet  
CRCN Inserm



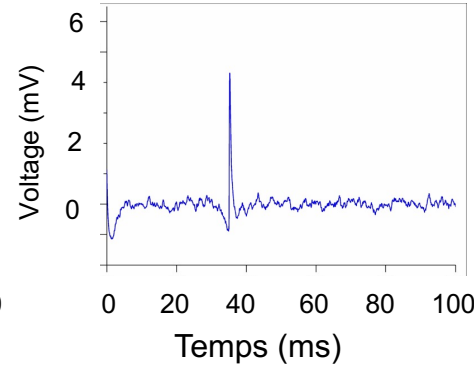
Jérôme Bourien  
MCU UM



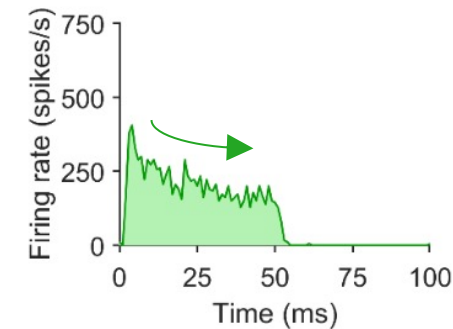
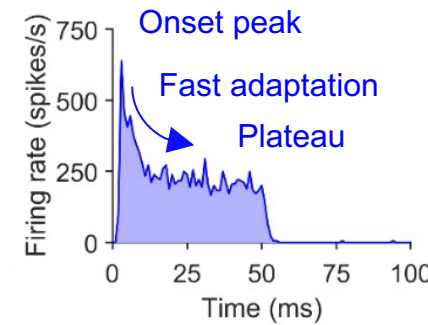
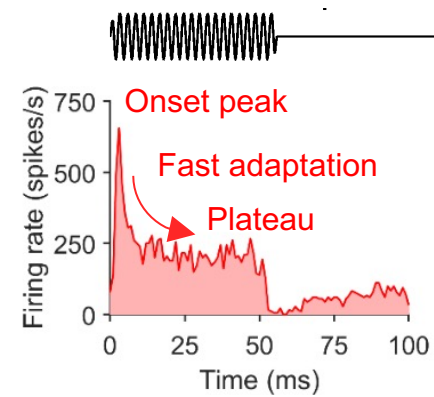
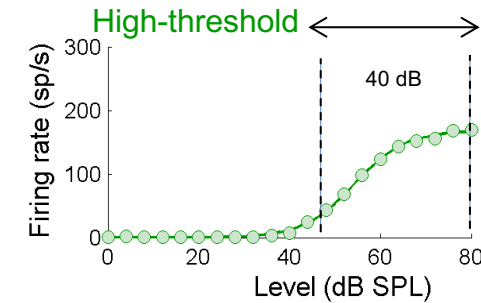
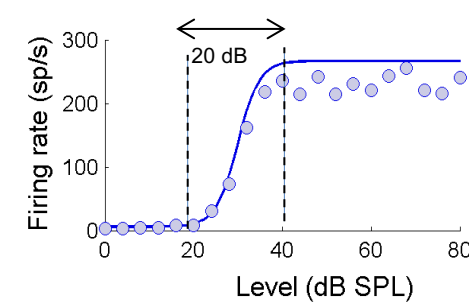
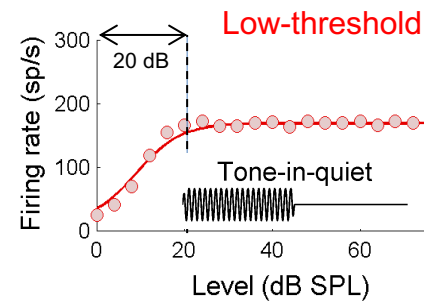
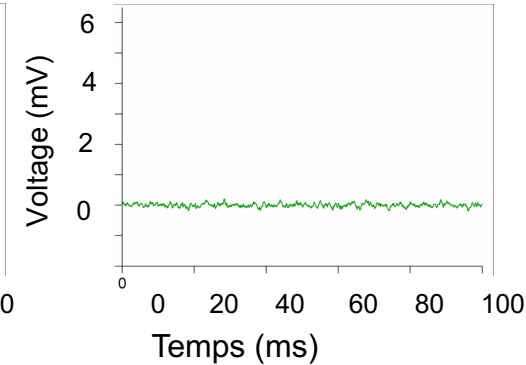
**High SR-fibers**  
( $> 18$  spikes/s)



**Medium**



**Low SR-fibers**  
( $< 1$  spike/s)



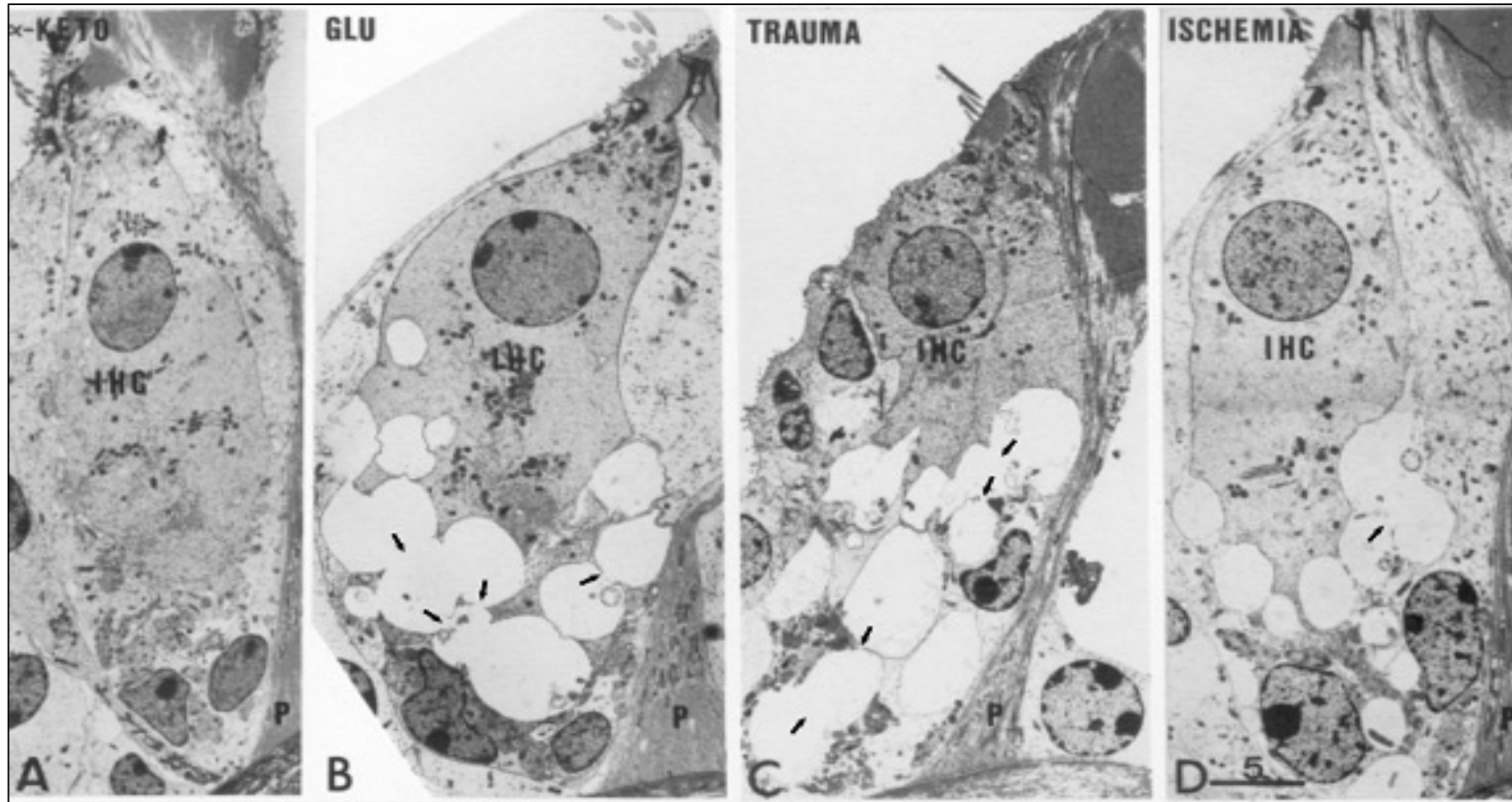


**GEORRIC 2026**

**Bordeaux 09 & 10 avril 2026**

**Codage des sons en conditions  
pathologiques**

# Excitotoxicité: libération excessive de glutamate





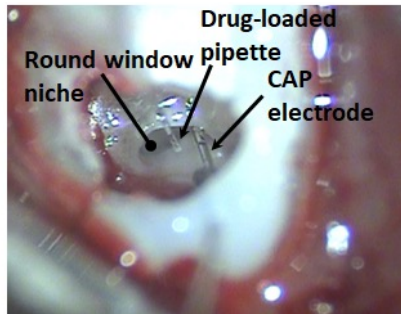
Jérôme Bourien  
MCU UM



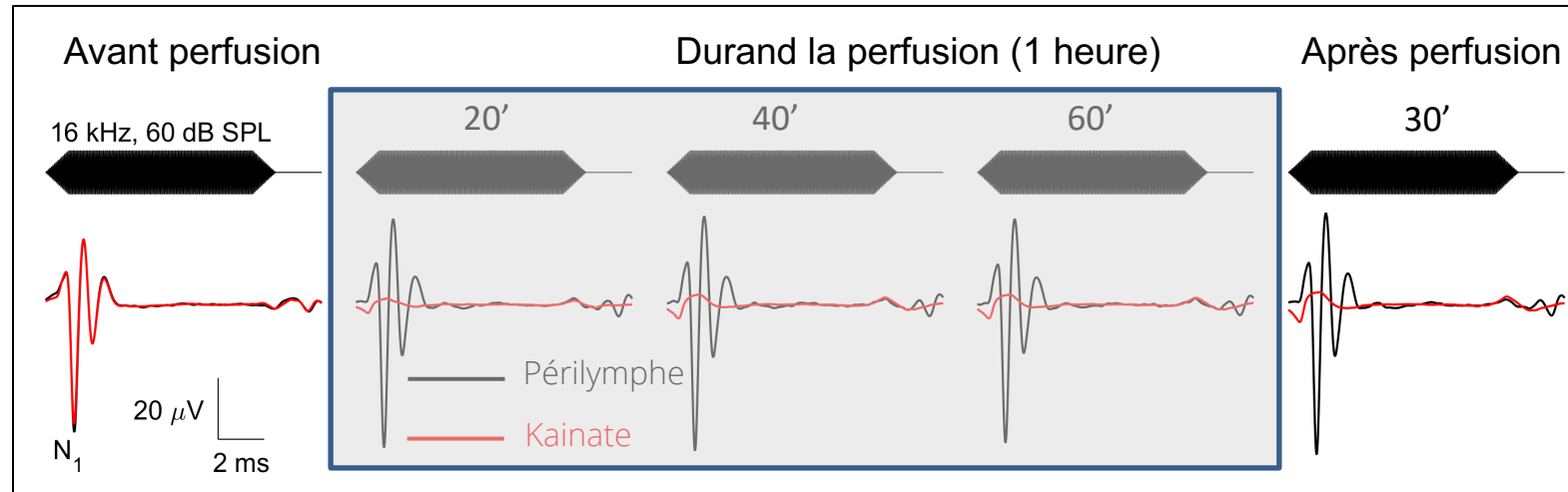
Artem Diuba  
postdoctorant

## Perfusion aigue

25 mM Kainate sur la fenêtre ronde



Protocole expérimental





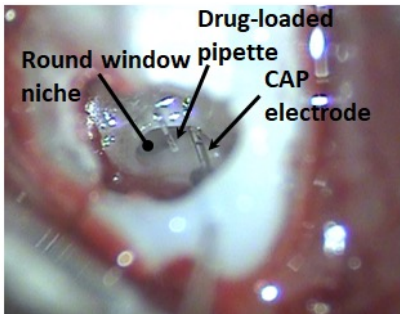
Jérôme Bourien  
MCU UM



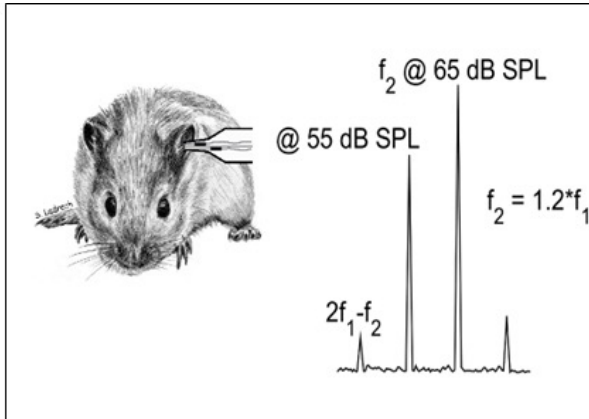
Artem Diuba  
postdoctorant

## Suivi durant 20 semaines

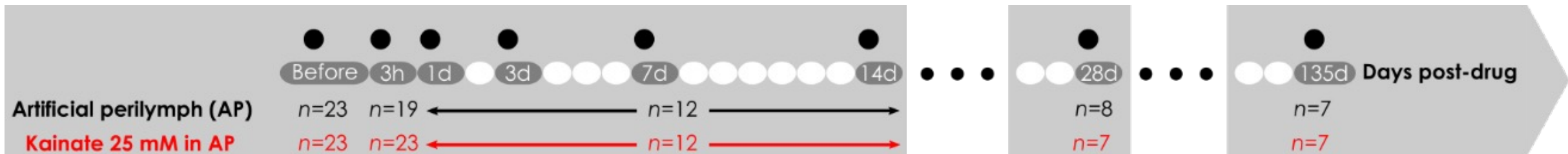
25 mM Kainate sur la fenêtre ronde



Protocole expérimental



Produit de distorsion acoustique





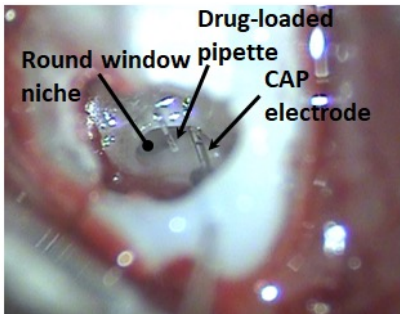
Jérôme Bourien  
MCU UM



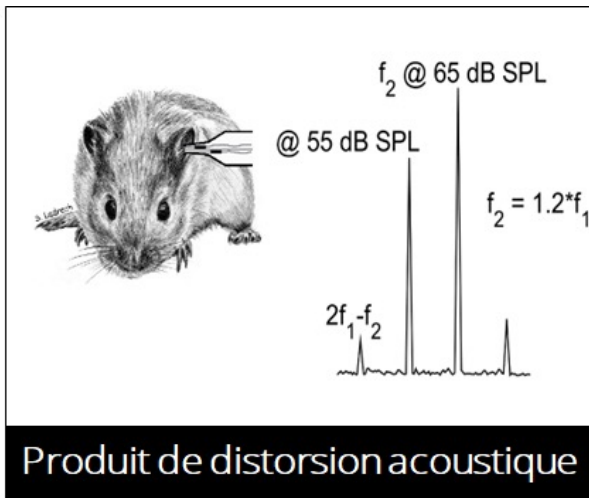
Artem Diuba  
postdoctorant

## Suivi durant 20 semaines

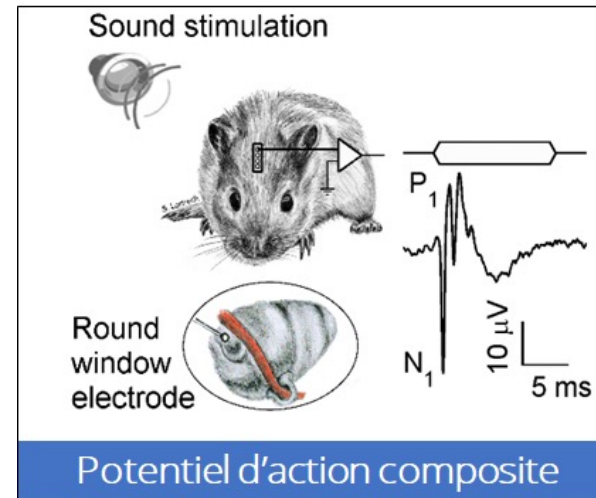
25 mM Kainate sur la fenêtre ronde



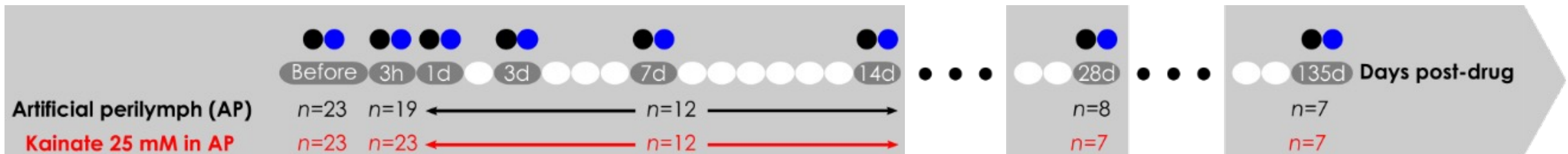
Protocole expérimental



Produit de distorsion acoustique



Potentiel d'action composite





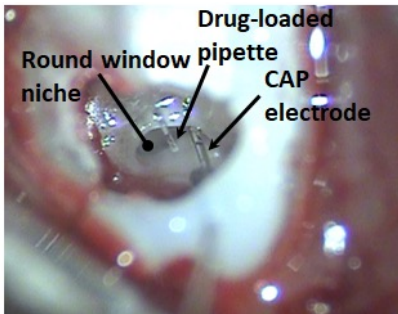
Jérôme Bourien  
MCU UM



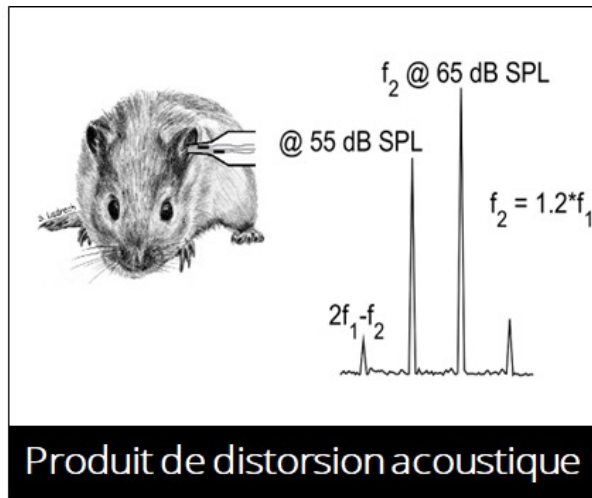
Artem Diuba  
postdoctorant

## Suivi durant 20 semaines

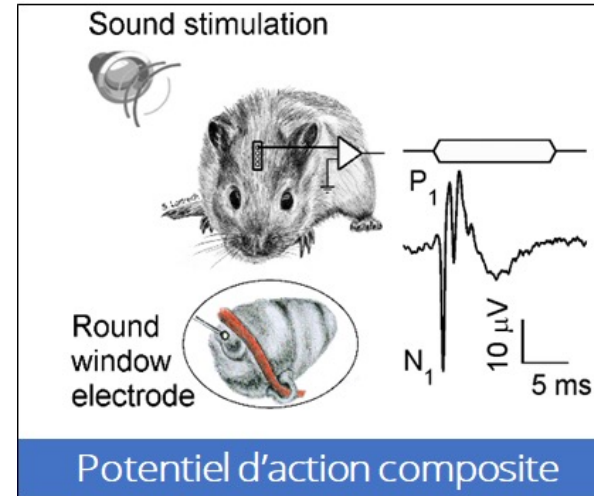
25 mM Kainate sur la fenêtre ronde



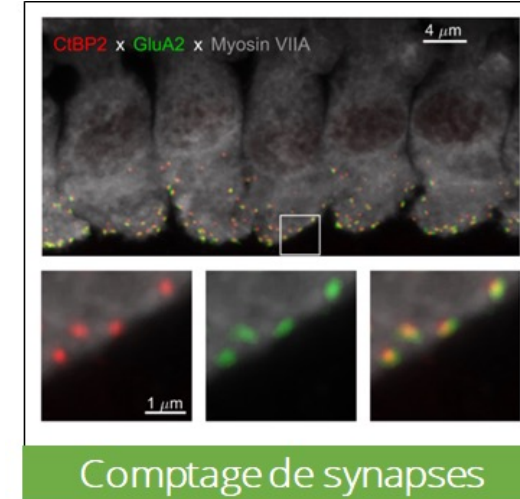
Protocole expérimental



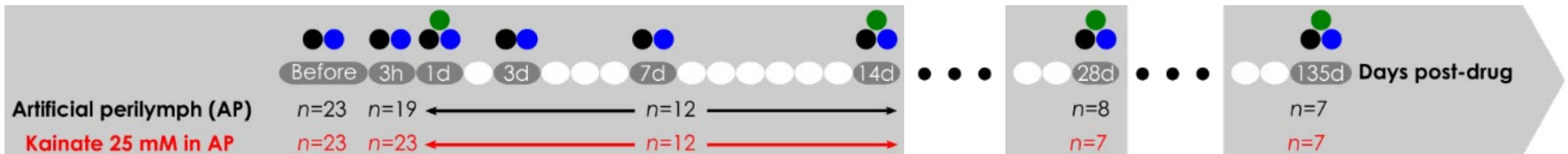
Produit de distorsion acoustique



Potentiel d'action composite



Comptage de synapses



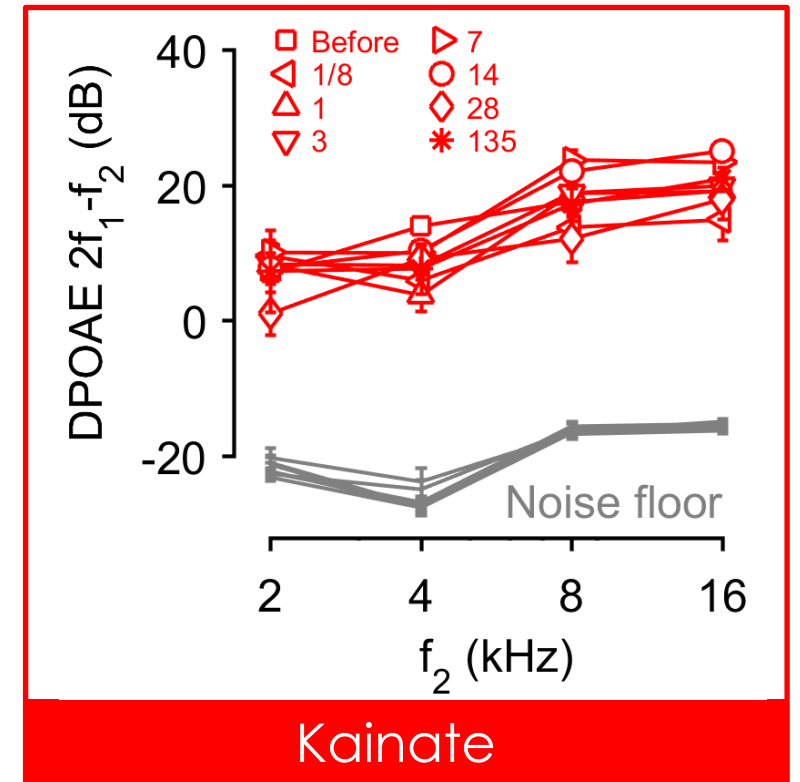
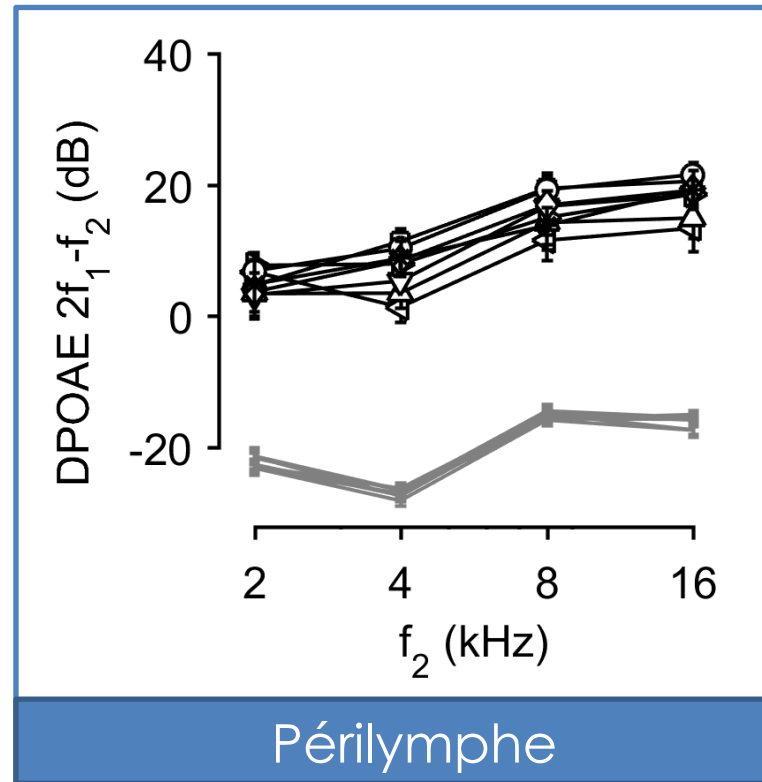
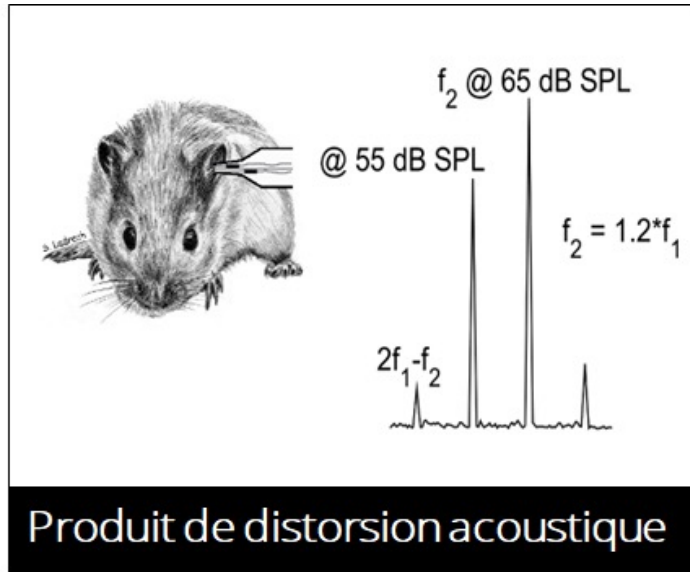


# GEORRIC 2026

Bordeaux 09 & 10 avril 2026

**L'excitotoxicité n'affecte pas les  
cellules ciliées externes**

# Enregistrement des otoémissions



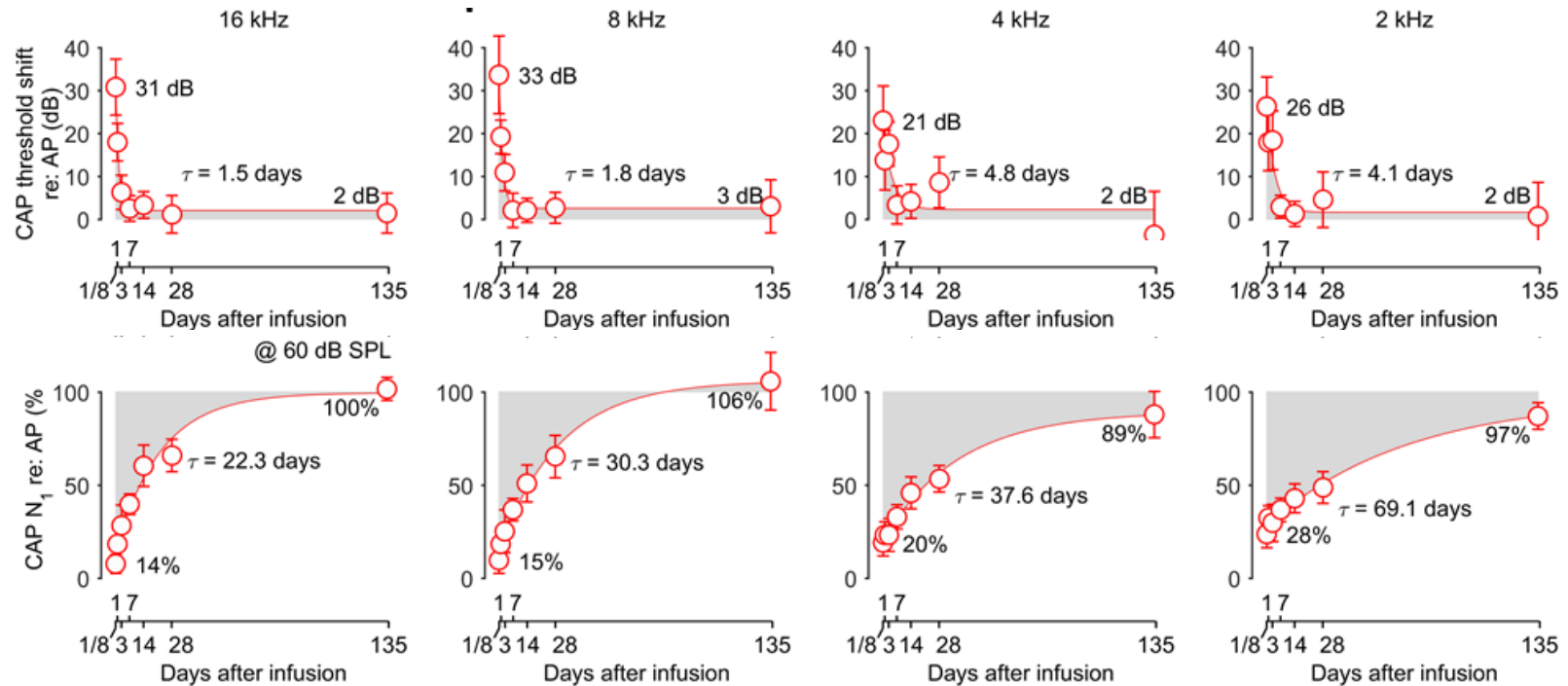
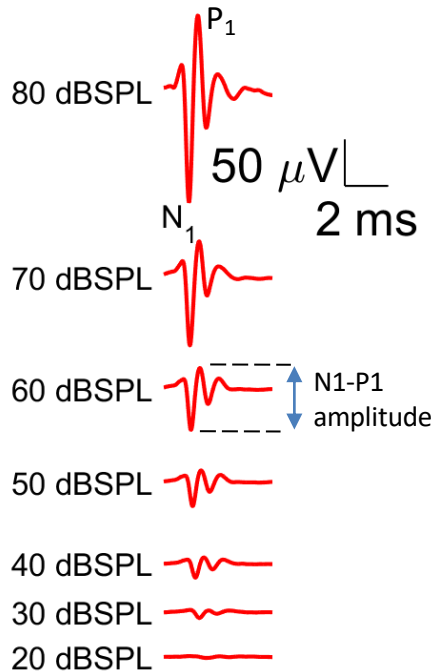
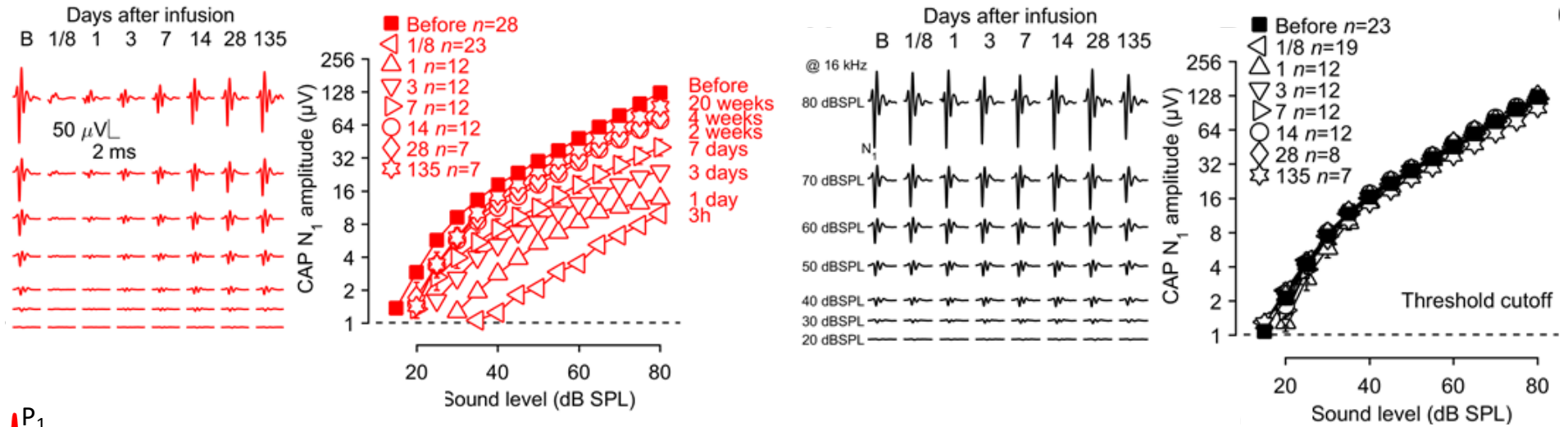


**GEORRIC 2026**

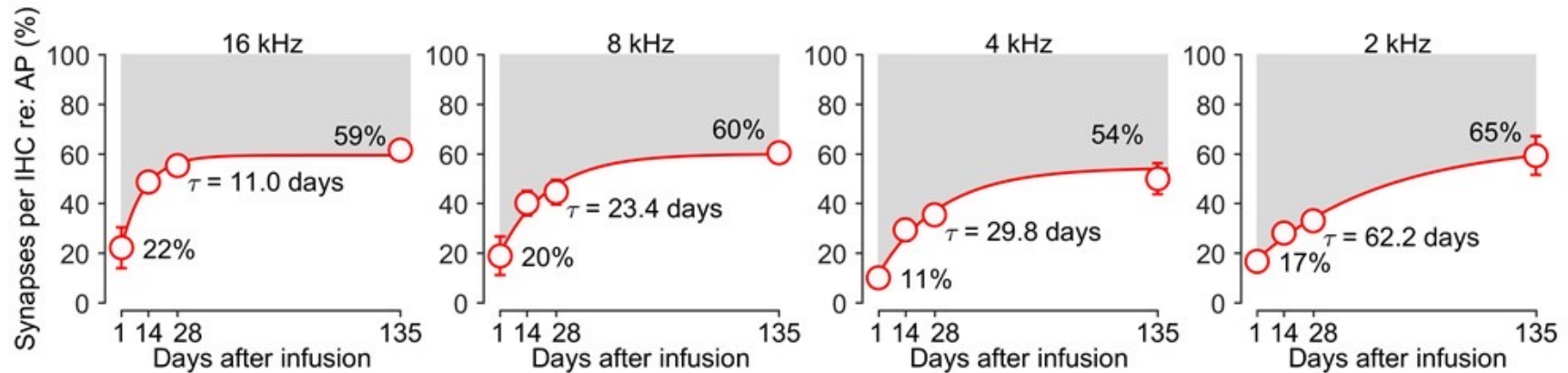
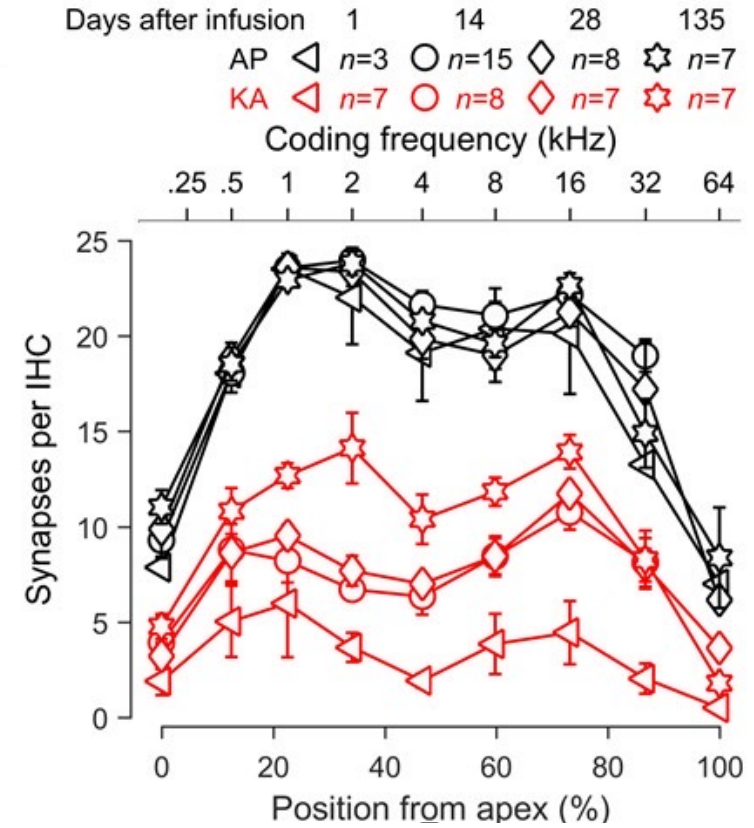
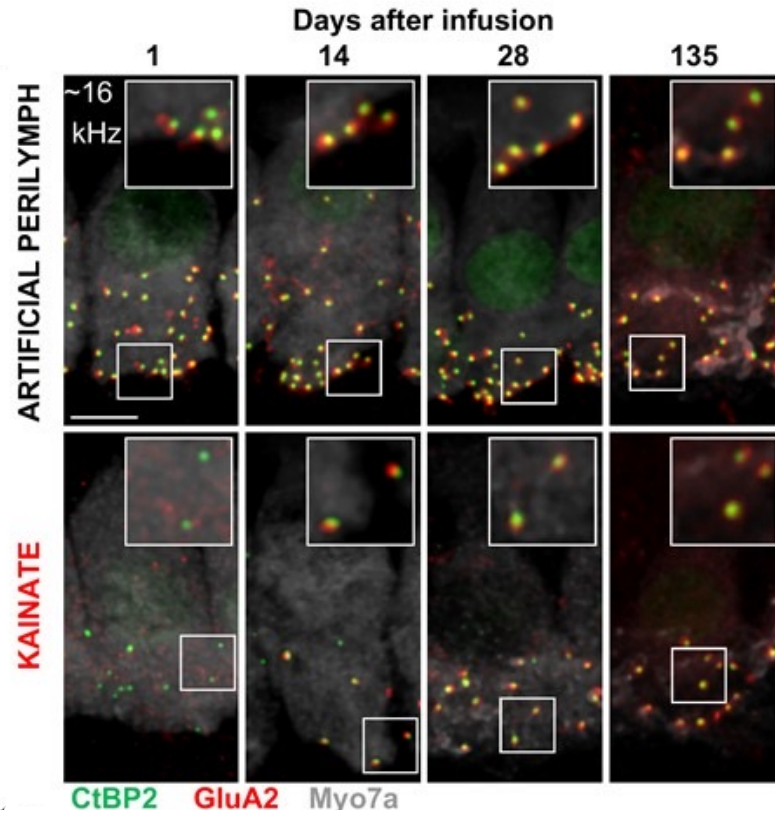
**Bordeaux 09 & 10 avril 2026**

**Impact de l'excitotoxicité sur l'activité  
du nerf auditif et des synapses en  
rubans**

# Enregistrement du potentiel d'action composite (PAC)



# Comptage des synapses





# **GEORRIC 2026**

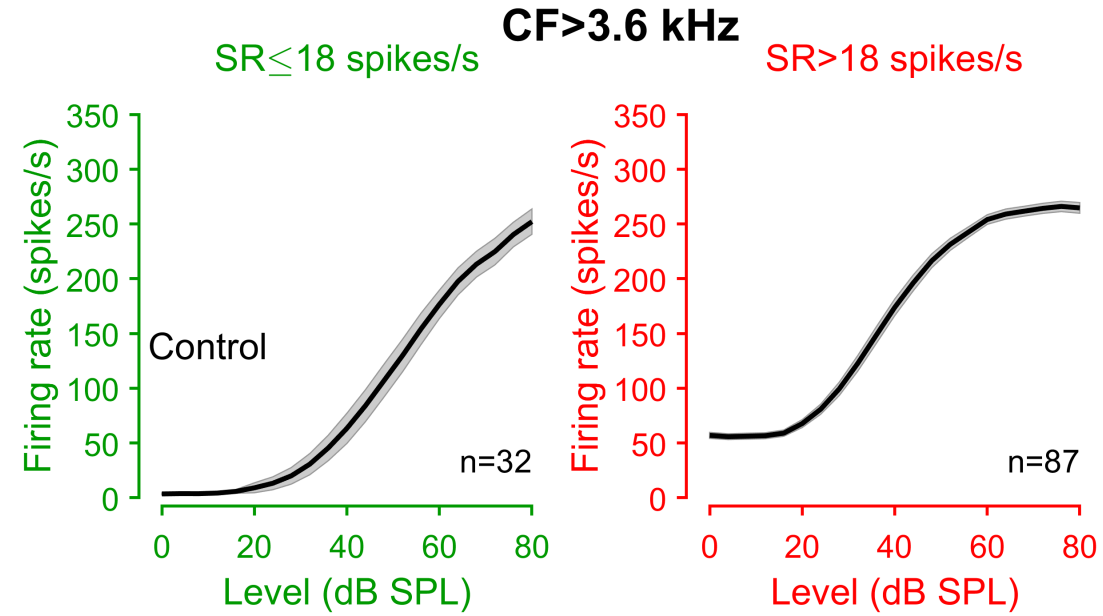
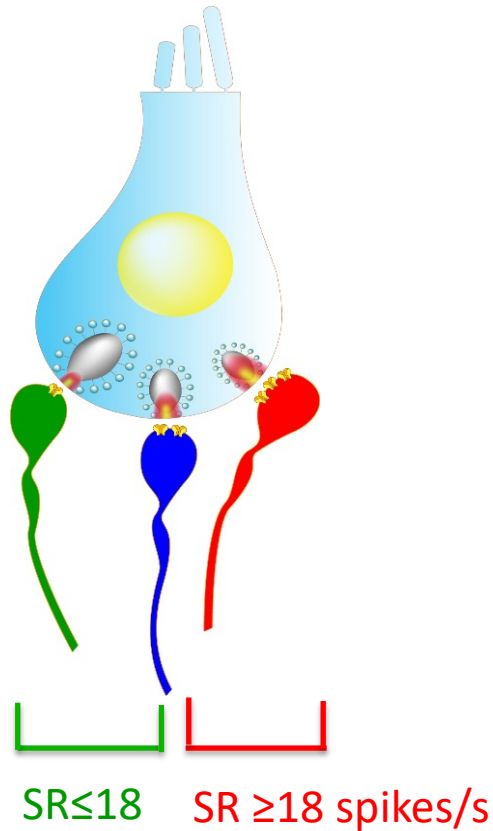
**Bordeaux 09 & 10 avril 2026**

**Le paradoxe:**

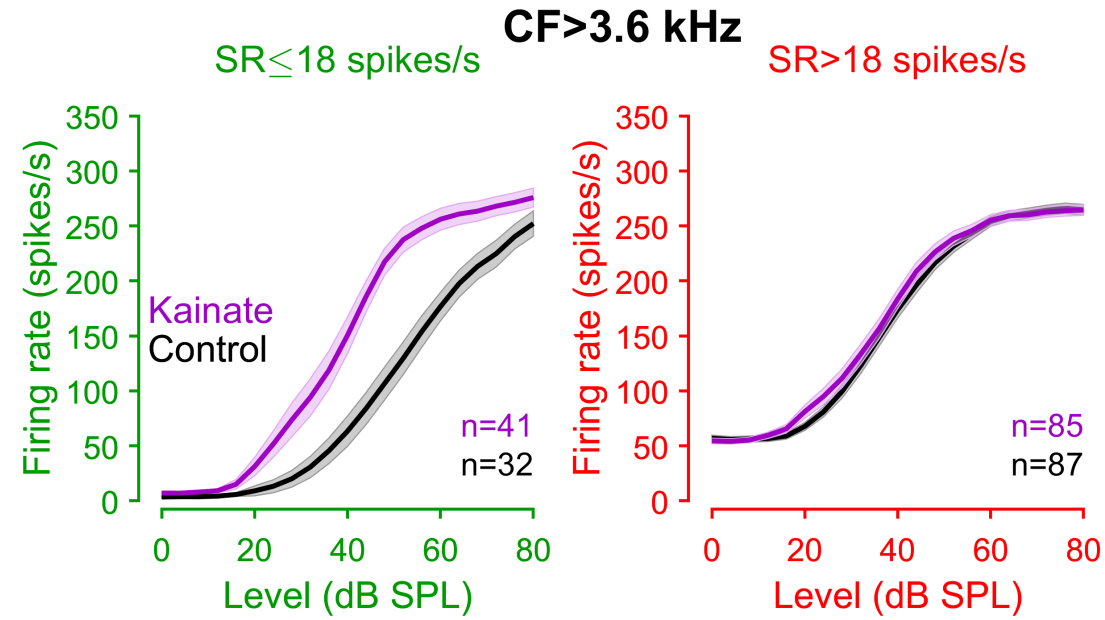
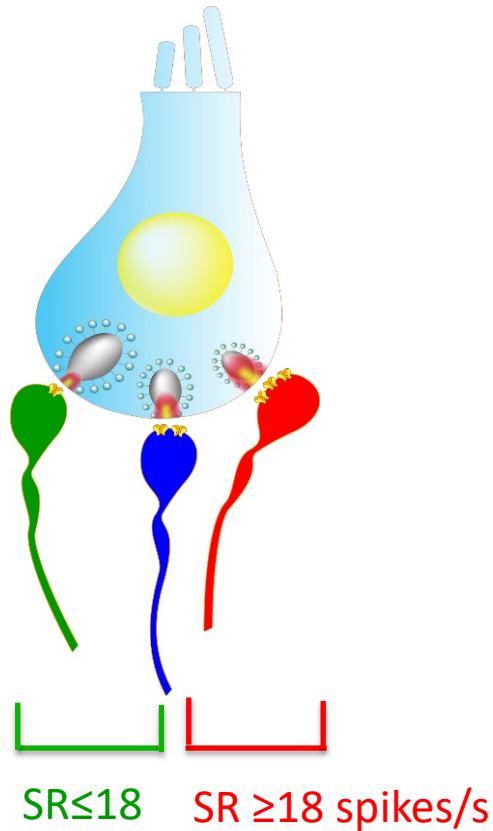
**40 % de perte de synapse**

**Potentiel d'action composite normal**

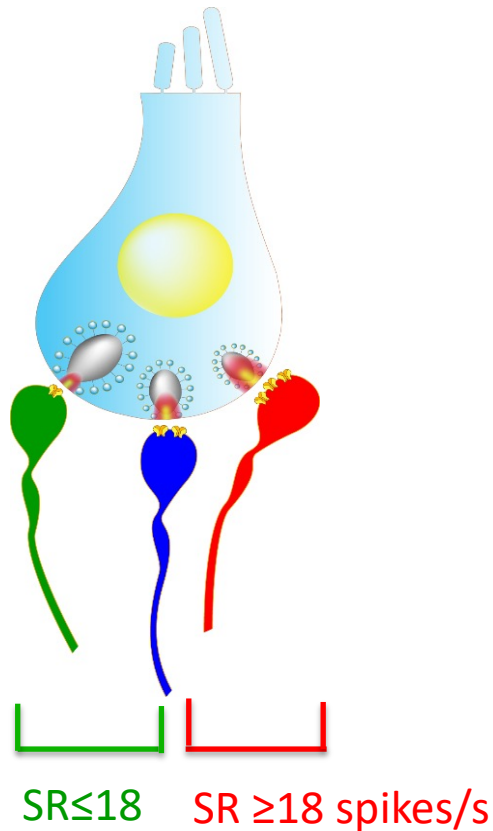
# Enregistrement unitaire des fibres du nerf auditif



# Enregistrement unitaire des fibres du nerf auditif



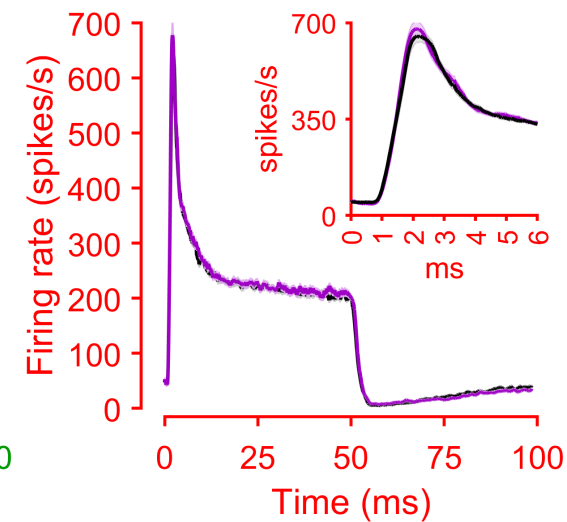
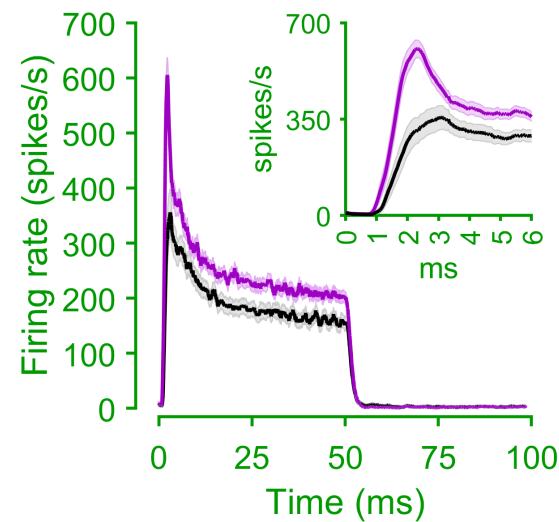
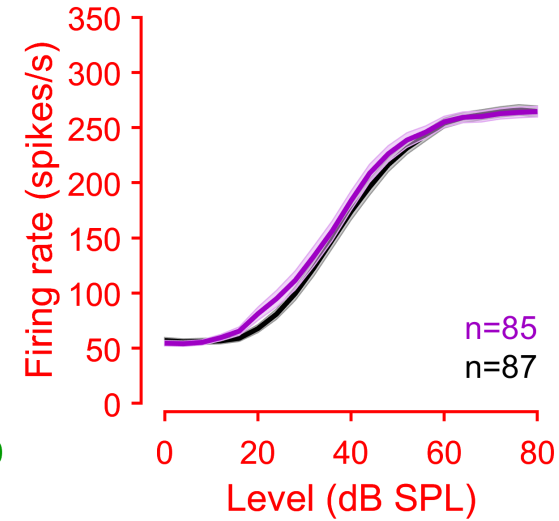
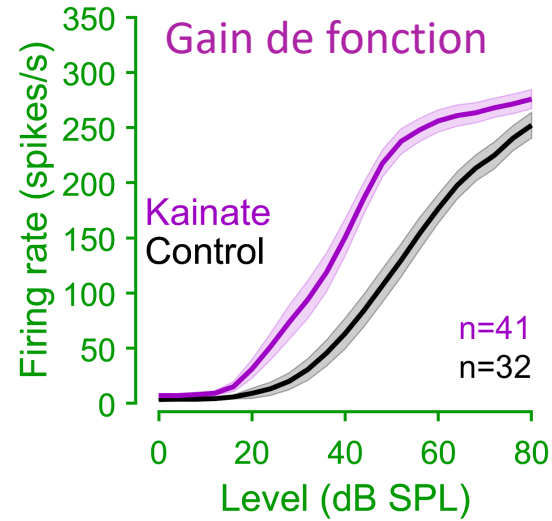
# Enregistrement unitaire des fibres du nerf auditif



CF > 3.6 kHz

SR  $\leq 18$  spikes/s

SR > 18 spikes/s





**GEORRIC 2026**

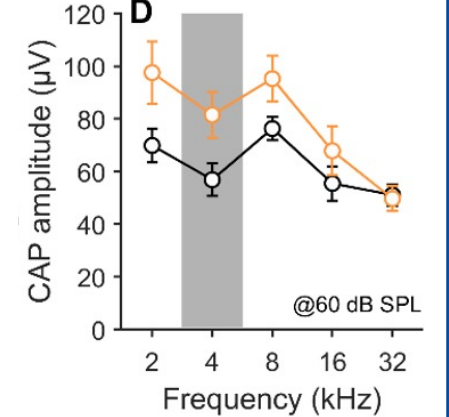
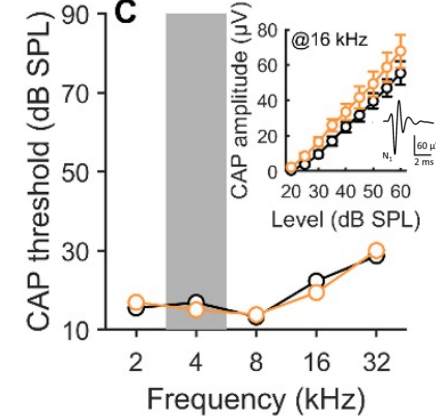
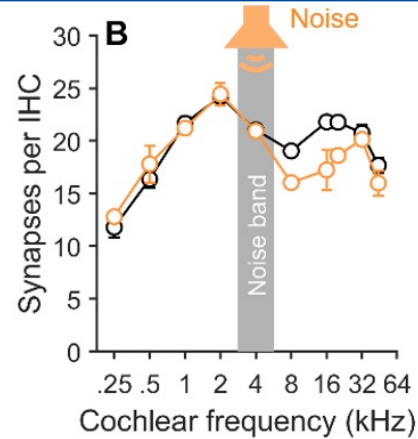
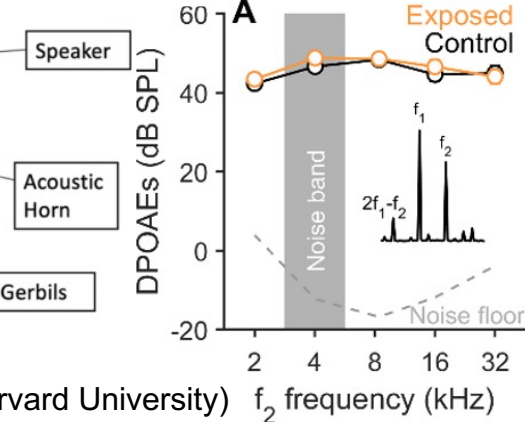
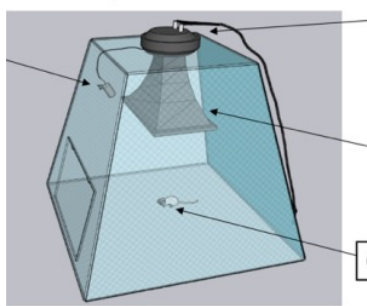
**Bordeaux 09 & 10 avril 2026**

**Gain de fonction des fibres du nerf  
auditif**

# Perspectives

## Modèle de traumatisme sonore

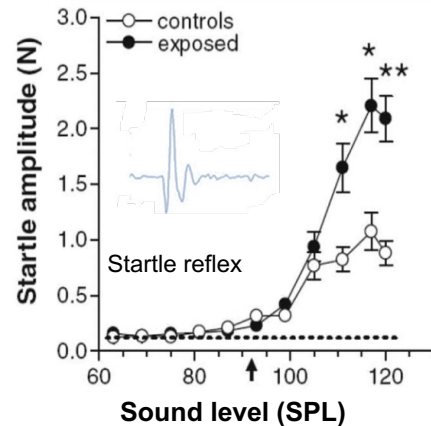
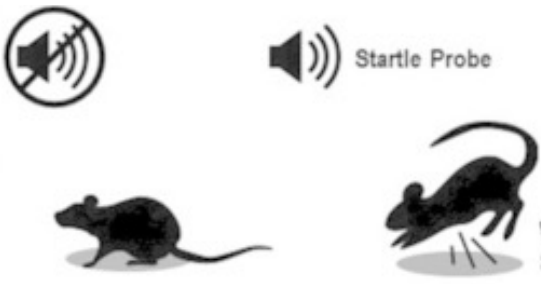
Noise exposure chamber



From Sharon Kujawa, Harvard University

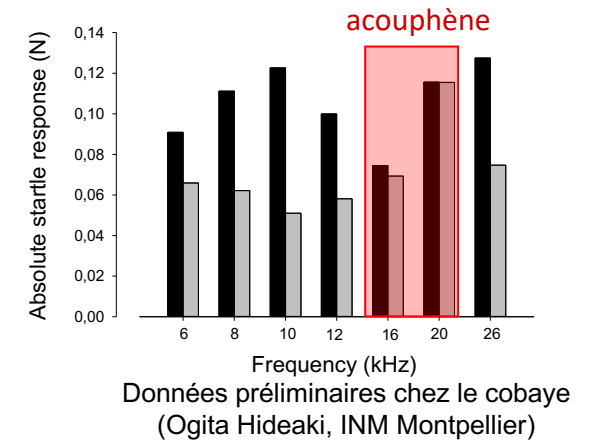
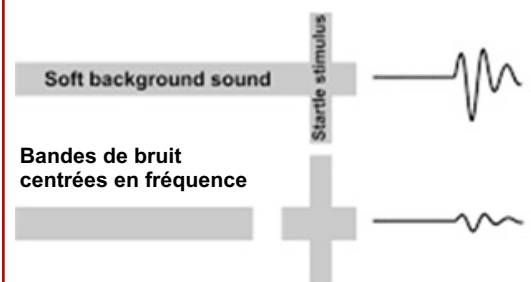
## Evaluation de l'hyperacousie

### Réponse de sursaut



Hayes et al. Front. Neurol. 2014, 5:179

## Présence d'acouphènes



Données préliminaires chez le cobaye (Ogita Hideaki, INM Montpellier)

## Logic of sound coding



**Régis Nouvian**, DR2



**A. Huet**  
CRCN Inserm



**J. Bourien**  
MCU, UM



**J-C. Ceccato**  
MCU, UM

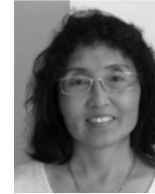


**L-M. Jaime Tobon**  
Post-doc



**D. Kiselev**  
Doctorant

## Auditory disorders therapy



**Jing Wang**, DR2



**N. Benkafadar**  
CRCN Inserm



**A. Bahloul**  
CRCN CNRS



**F. Francois**  
IE Inserm



**R. Saida**  
Doctorante



**J. Vecchi**  
Postdoc

## Translational research



CHU DE REIMS



CHU MONTPELLIER



**M. Mondain**  
PU/PH



**X. Dubernard**  
PU/PH



**F. Blanc**  
Chef de clinique



**C. Nicolas-Puel**  
Attaché Hosp



**A. Seidermann**  
Doctorant



**N. Graffaux**  
Doctorante