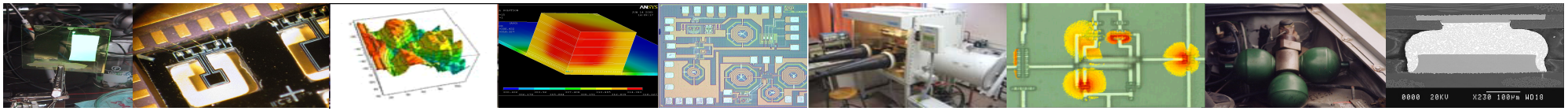

Projet MAALS

Role of 50 Hz- magnetic fields on amyotrophic lateral sclerosis development

Financement ANR 24 mois - 2005

Programme Santé-Environnement et Santé-Travail

Responsable de projet: Isabelle Lagroye

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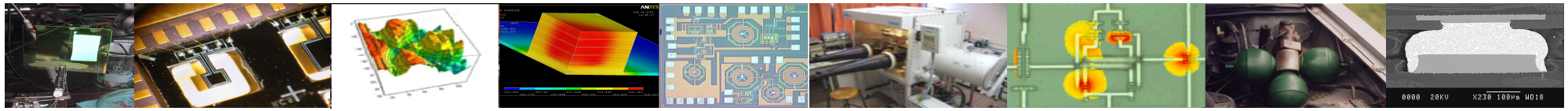
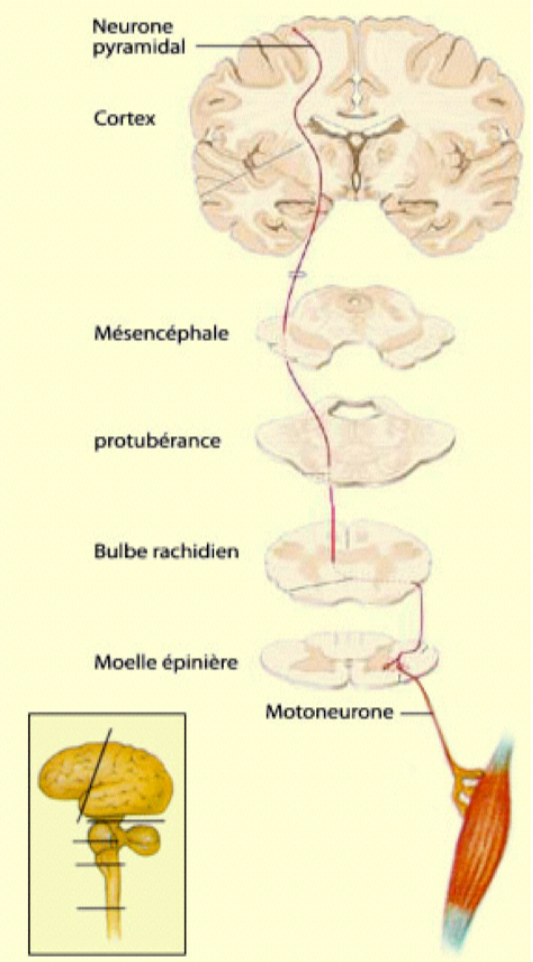
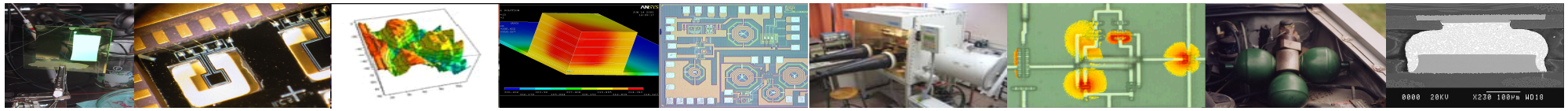


La Sclérose Latérale Amyotrophique…

- Dégénérescence progressive des motoneurones
- Décès 2 à 5 ans après diagnostic
- Personnes de 30-50 ans
- Prévalence: 8 à 10 000 cas en France
- Incidence: 2000 cas/an

- Etiologie inconnue
- 90-95 %: forme sporadique
- 5-10 %: forme familiale (mutation gène SOD-1)

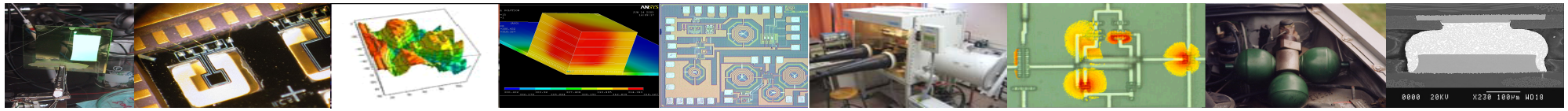




Sclérose Latérale Amyotrophique et 50 Hz …

Données épidémiologiques

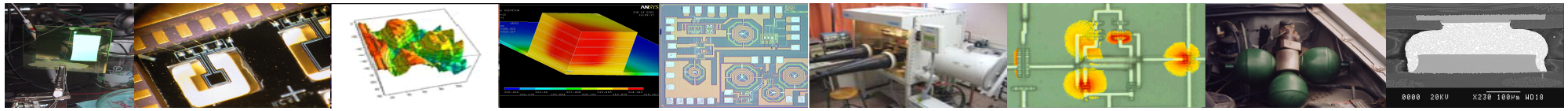
Professionnels en contact avec CEM 50 Hz et chocs électriques auraient un risque augmenté de développer une SLA ?



Epidémiologie… *Kheifets et al., 2009*

Table 1 Main characteristics and findings of epidemiologic studies of exposure to occupational electric and magnetic fields and risk of amyotrophic lateral sclerosis (ALS)

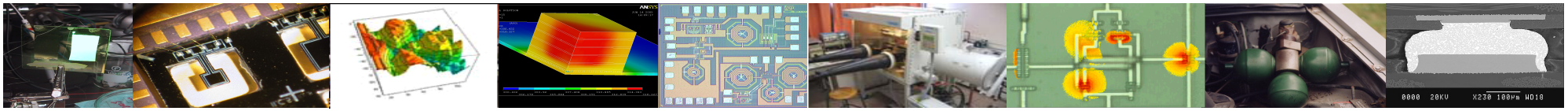
Author	Year	Study Population (Location)	Exposure Assessment	Covariates	Exposure Group	RR (95% CI); obs*
Deapen and Henderson[58]	1986	518 ALS cases identified from ALS Society 1977-79, 518 friend controls (United States)	Exposure defined as "electrical occupations"		Electrical occupation	3.8 (1.4-13.0); 19
Gunnarsson et al.[59]	1991	1961 deaths from ALS in Swedish population 1970-83, 2245 population-based controls (Sweden)	Occupational categories	Age, men only	Electricity worker	1.5 (0.9-2.6); 32
Gunnarsson et al.[60]	1992	92 prevalent cases of motor neuron disease at hospitals in central and southern Sweden, 372 population-based controls (Sweden)	Occupational categories	Age, men only	Electricity work	6.7 (1.0-32.1); 4
Davanipour et al.[57]	1997	28 clinic-based prevalent cases of ALS, 32 relatives controls (United States)	Occupations classified by industrial hygienist as electrical (high or medium) or non-electrical	Sex	Average lifetime occupational exposure, 75th percentile	2.3 (0.8-6.6)
Savitz et al.[4]	1998	Cohort of 139 905 men working at five US electric utility companies 1950-86. Mortality compared to the general population, and internal comparisons within cohort; 33 ALS cases identified (United States)	Used work-shift measurements of extremely low frequency fields in a sample of workers to categorize occupations	Age, calendar year, race, social class, work status, polychlorinated biphenyl and solvent exposure	Employment in exposed occupation, years 0-<5 5-<20 ≥20	 1.0; 22 1.8 (0.7-4.7); 18 2.4 (0.8-6.7); 16
Savitz et al.[42]	1998	114 deaths from ALS 1985-91, matched controls selected among persons who died from other causes not related to electric and magnetic fields (United States)	Occupations classified according to work in "electrical occupations"	Age, social class, men only	Electrical occupation	1.3 (1.1-1.6); 114
Johansen and Olsen†[61]	1998	Cohort of 26 135 men working in an electric utility company 1900-93; 14 deaths from ALS identified. Mortality compared to national mortality rates (Denmark)	Job-exposure matrix; categorized workers into high, medium, low, or background magnetic field exposure	Age, duration of employment, men only	Medium to high exposure (≥0.3 μT)	2.5 (1.1-4.8); 9
Noonan et al.[44]	2002	312 deaths from ALS 1987-96 in Colorado, 1248 matched controls among other causes of death (United States)	Three methods: 1. primary occupation classified as electrical or non-electrical, 2. combination of occupation and industry codes classified into four exposure categories,	Age, race, occupational grouping, men only	Electrical occupation No exposure Possible exposure Definite or probable exp.	2.3 (1.29-4.09); 19 1.0; 242 1.18 (0.83-1.67); 285 1.75 (1.00-3.06); 19



Notre objectif…

Utiliser, pour la première fois, un modèle animal de SLA (souris SOD-1) pour déterminer si l'exposition à un CEM 50 Hz est capable d'accélérer la progression de la SLA.

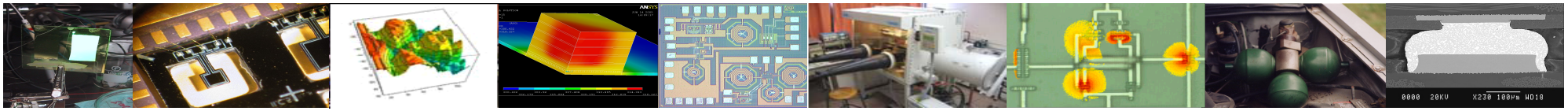
Expositions contrôlées



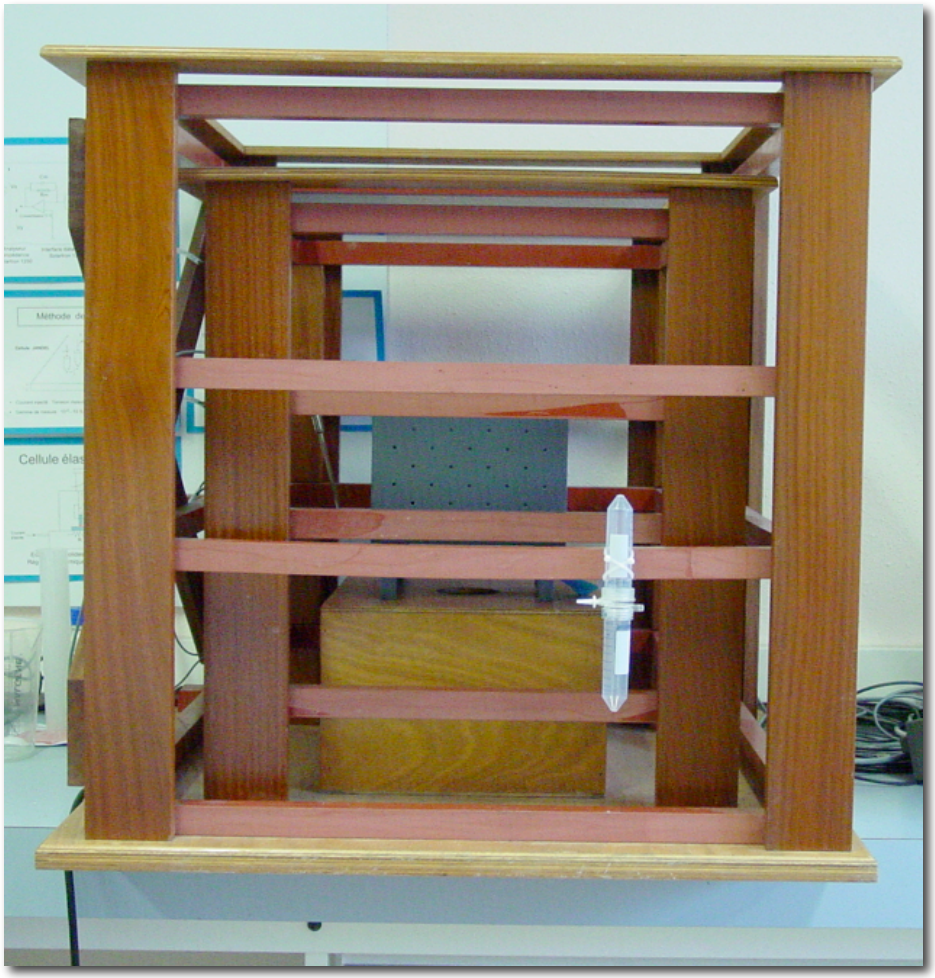
Notre protocole…

- 7 souris SOD-1 / groupe (Jackson Laboratories)
  - Sham
  - 100 µT
  - 1000 µT

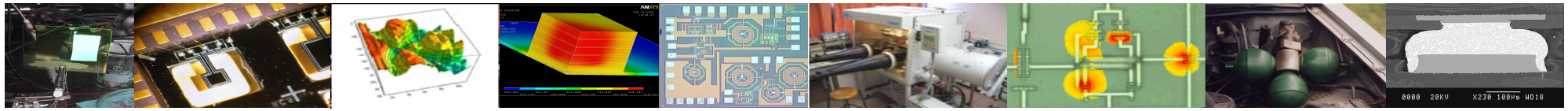
- 2 h/ jour, 5 j / semaine, 7 sem (à partir de la 10ème semaine, avant apparition des symptômes)



Système d'exposition

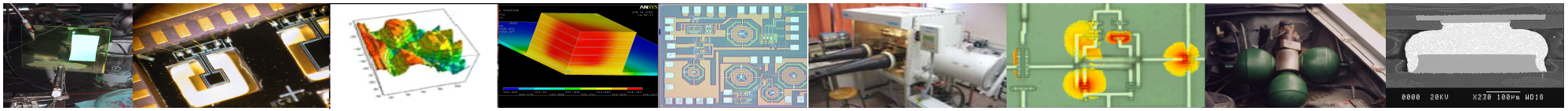


Bobines de Merritt

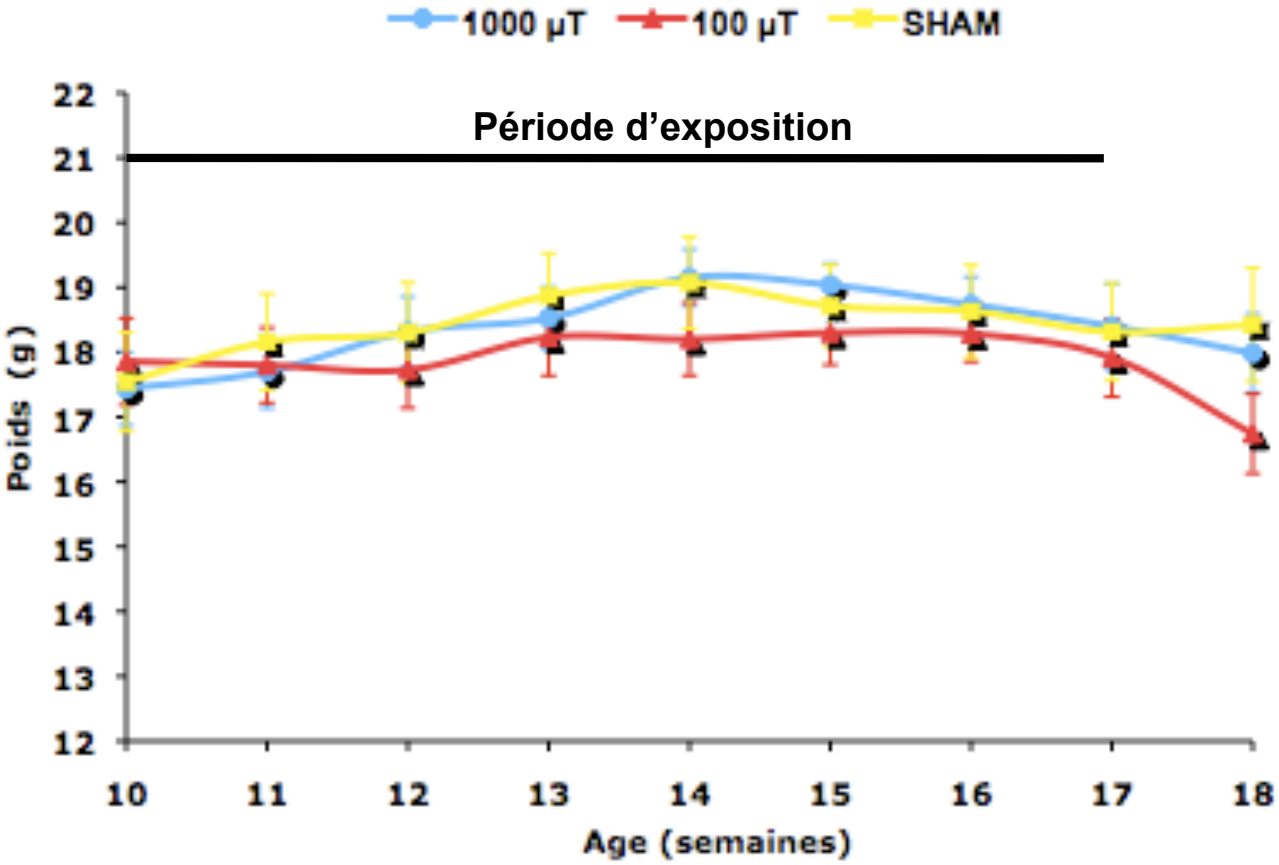


Paramètres suivis

- Poids
- Rotarod
- Survie

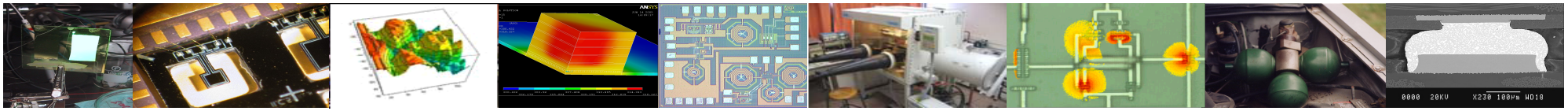


Poids

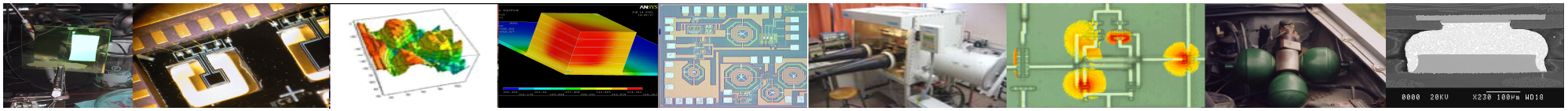


Une fois/ semaine

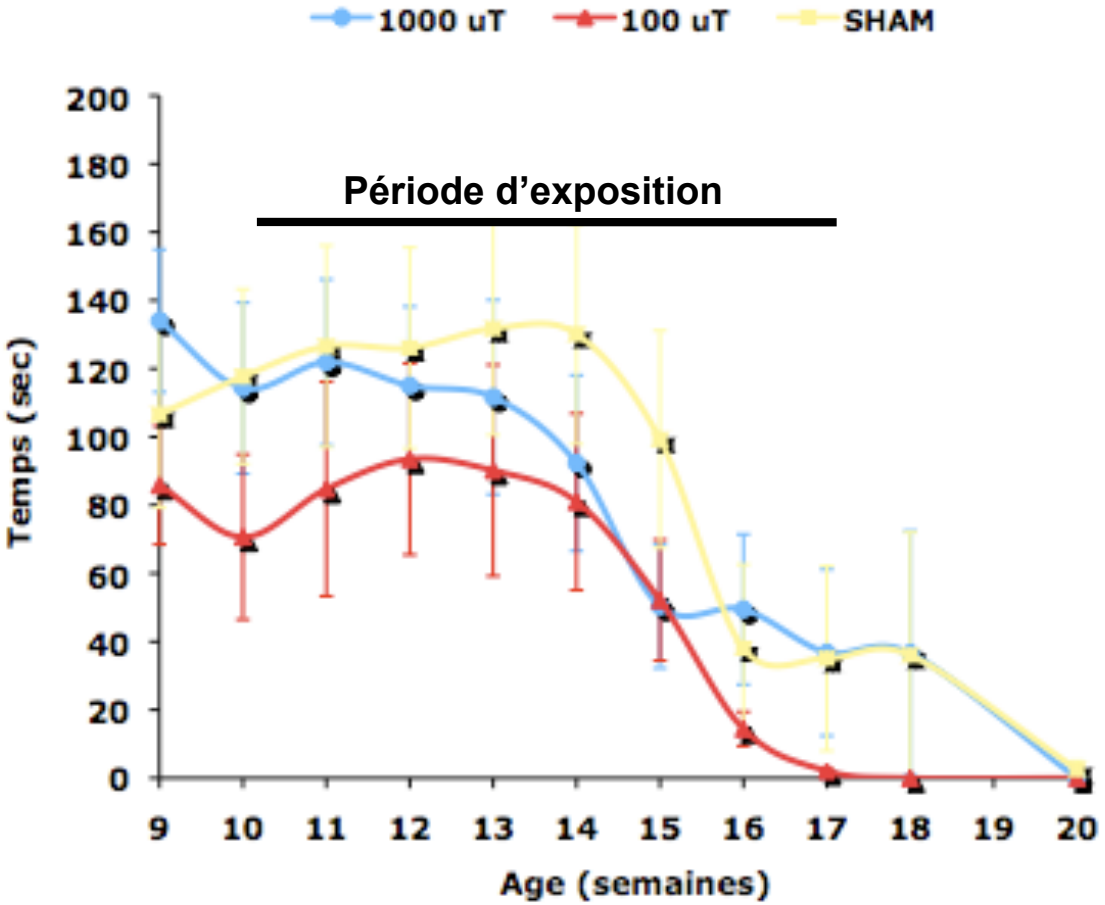
Pas de différence



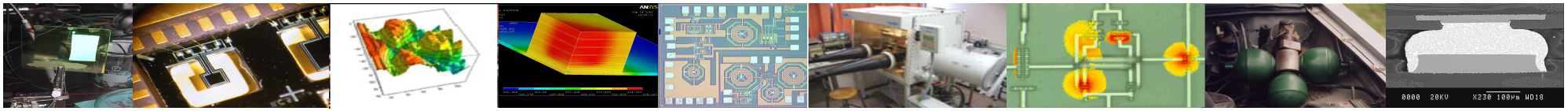
15 tpm,
180 sec
3 essais



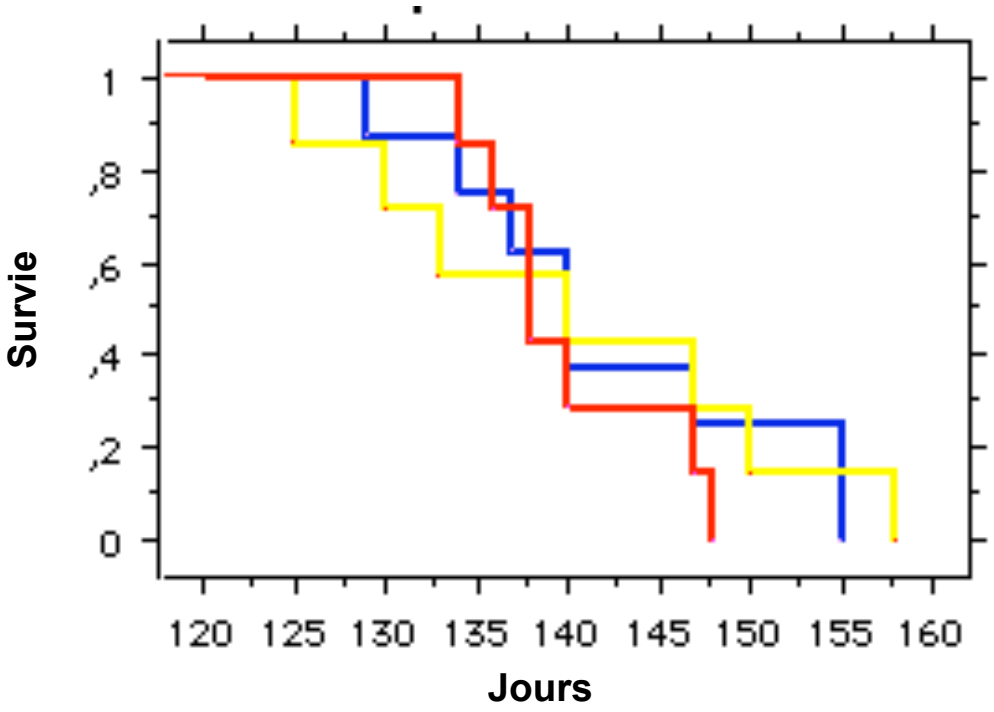
Rotarod



Pas de différence

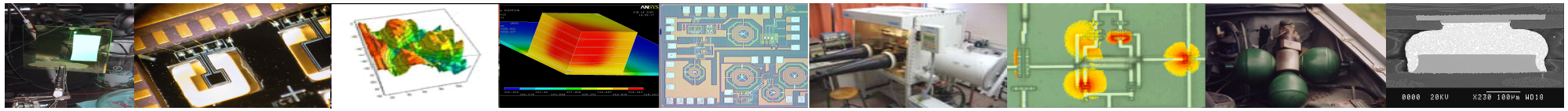


Survie



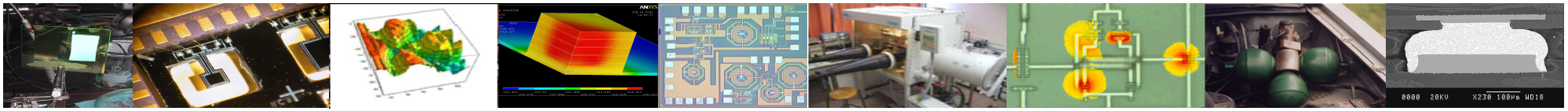
Pas de différence

	Survie moyenne ± SEM Jours
1000 µT	142,1 ± 3,3
100 µT	140,1 ± 2,0
SHAM	140,4 ± 4,5



Conclusions

- Nos résultats n'appuient pas l'hypothèse de l'existence d'un lien entre une exposition aux champs magnétiques 50 Hz et la SLA
- L'épidémiologie continue de suggérer une association avec "electrical occupation"
- Les chocs électriques doivent être testés comme facteur de risque



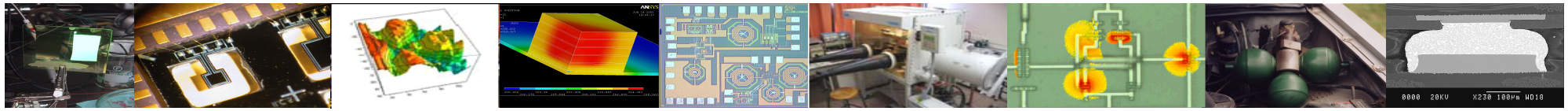
Publications

Article

Poulletier de Gannes F. et al. Amyotrophic Lateral Sclerosis (ALS) and extremely-low frequency (ELF) magnetic fields: a study in the SOD-1 transgenic mouse model. Amyotrophic Lateral Sclerosis, 1, 1-4 (2008)

2 Communications orales

3 Posters



Merci…

IMS:	**Florence Poulletier de Gannes** Annabelle Hurtier Murielle Taxile Emmanuelle Haro Bernard Billaudel Elodie Ladeveze Michel Geffard Renaud Charlet de Sauvage Bernard Veyret
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