

# **Human health consequences of long term exposure to gaseous emissions produced by Sargassum seaweed decomposition**

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# Rationale

## In the past two years,

- ▶ 200 patients seen at CHU Martinique for clinical symptoms potentially associated with exposure to gaseous emissions issuing from sargassum decomposition
- ▶ Most frequent clinical signs & symptoms
  - ▶ General reddening and irritation to the skin and eyes, mucous membrane irritation
  - ▶ Upper respiratory tract irritation with cough and wheezing
  - ▶ Headache, moderate abdominal pain and intestinal transit disorders
- ▶ Patients originating from geographical areas neighbouring massive sargassum stranding sites
- ▶ Sargassum invasion episodes associated with concomitant increase in the number of medical visits at CHU Martinique

## What we know

- ▶ Acute high dose H<sub>2</sub>S exposure is lethal
  - ▶ Professionals (industries)
  - ▶ Inhabitants in geothermically area

## What we don't . . .

- ▶ What do we know about low dose and repeated exposures ?
- ▶ Sargassum emissions : cocktail of gases not limited to H<sub>2</sub>S

# Overarching Goal

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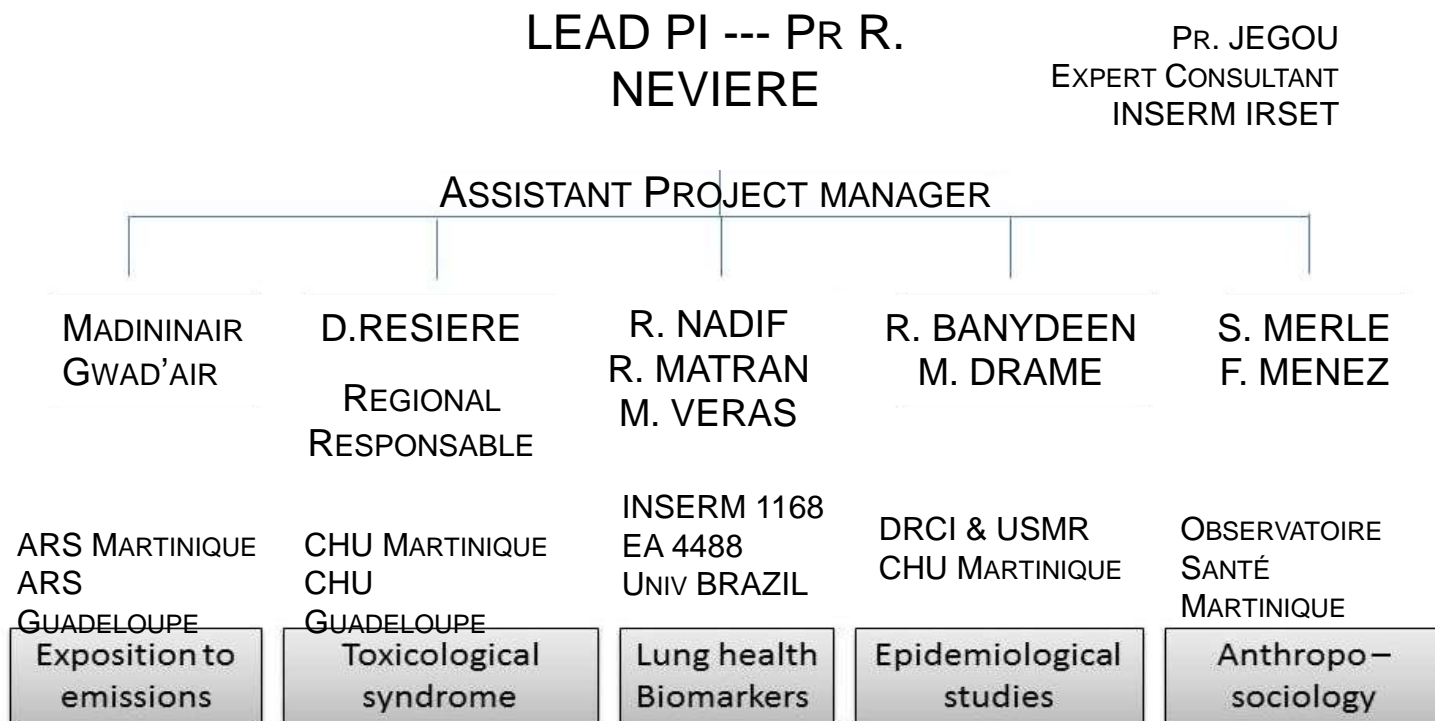
- ▶ Conduct a detailed study of the clinical, biological, functional and socio-anthropological consequences of gaseous emissions produced by decomposing sargassum seaweed in the Caribbean



# The consortium

- ▶ EA7525 Cardiovascular research team, Université des Antilles
- ▶ Multidisciplinary team, CHU Martinique
- ▶ Multidisciplinary team, CHU Guadeloupe
- ▶ Observatoire Santé Martinique (OSM)
- ▶ INSERM UMR 1168 “Aging and chronic diseases Epidemiological and public health approaches”, Université Paris-Versailles
- ▶ Laboratory of Experimental Air Pollution University of Sao Paulo, Brazil

# Project management outline



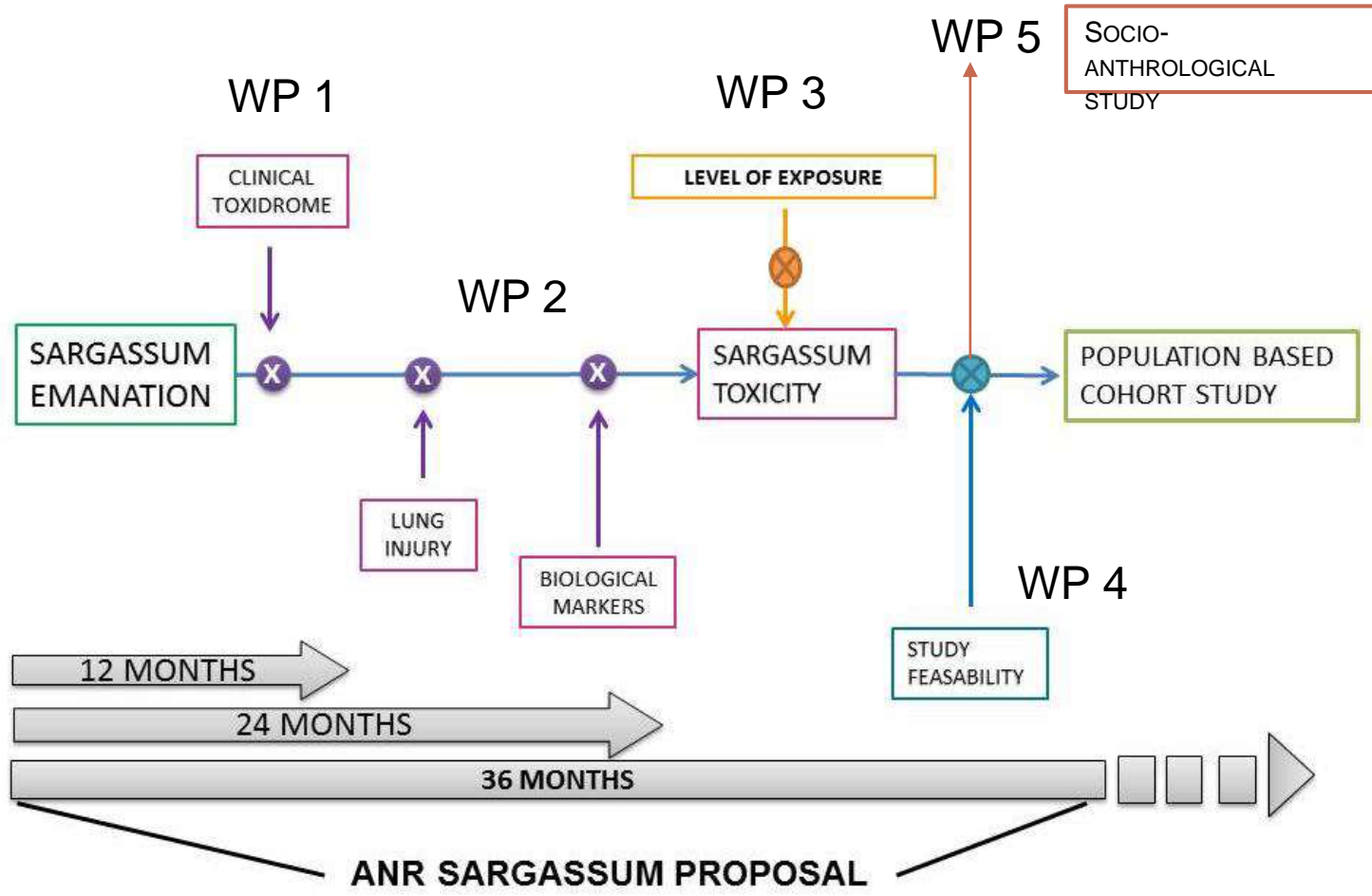
# General objectives

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- ▶ Characterize the toxicological syndrome induced by decomposing sargassum gaseous emissions
- ▶ Investigate the associations between exposure levels to gaseous emissions and the toxicological syndrome
- ▶ Assess via an anthropo-sociological approach, the knowledge, belief and practices of populations confronted with the problem of sargassum invasion in the French Caribbean islands (Martinique, Guadeloupe) and Mexico



# WP outline





# Specific research questions (1)

- ▶ **First study** evaluating the cumulative health effect of prolonged and repeated exposure in real life conditions
- ▶ Precise insight into the short, mid- and long-term health effects of exposure to decomposing Sargassum algae emissions in populations of the French Caribbean islands of Martinique and Guadeloupe
- ▶ Comparison of exposed and non exposed individuals to gaseous emissions according to geographical zones and fixed ambient H<sub>2</sub>S and NH<sub>3</sub> sensors (2 year fo



## Specific research questions (2)

- ▶ Determination of ambient  $\text{H}_2\text{S}$  and  $\text{NH}_3$  exposure metrics
  - ▶ Continuously measured daily  $\text{H}_2\text{S}$  concentration levels by fixed sensors (MADININAIR, GWAD'AIR) will be used as a surrogate of global gaseous emissions from decomposing sargassum
  - ▶ Exposure metrics will be based on use of dispersion models and time-series models, which are routinely used to provide reliable estimates of air pollutant concentrations over wide timescales and areas.



CHU de Martinique



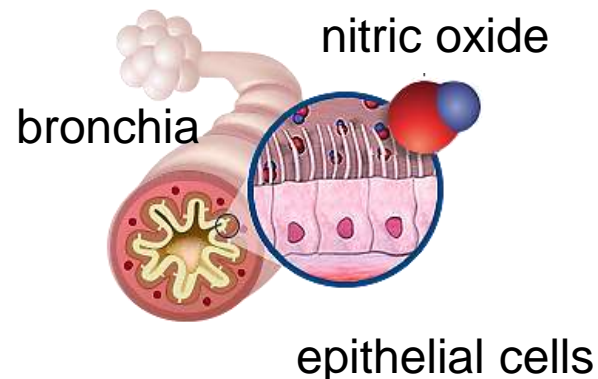
# Specific research questions (3)

- ▶ Air–lung interface determines oxidative stress and inflammatory lung injury

## Lung function tests

### Exhaled nitric oxide NO (FeNO)

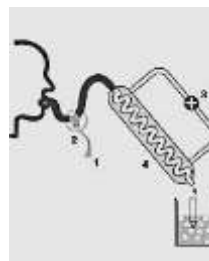
Bronchial production of nitric oxide (NO)



### Exhaled breath condensate

non volatile organic compounds including

- nitrite-nitrate
- 8-isoprostanes
- 3-nitrotyrosine
- cytokines



Cooling system



Université Versailles



# Specific research questions (4)

- ▶ Lung–blood interface allows peripheral mononuclear cell PBMC priming

- ▶ Plasma biomarkers
- ▶ Human PBMC



INFLAMMATION  
 STRESS OXYDANT  
 MITOCHONDRIAL DYSFUNCTION

**Oxygraph-2k and O2k  
 MultiSensor system**



Respiration, membrane potential, ROS production

H<sub>2</sub>S alters mitochondrial respiration

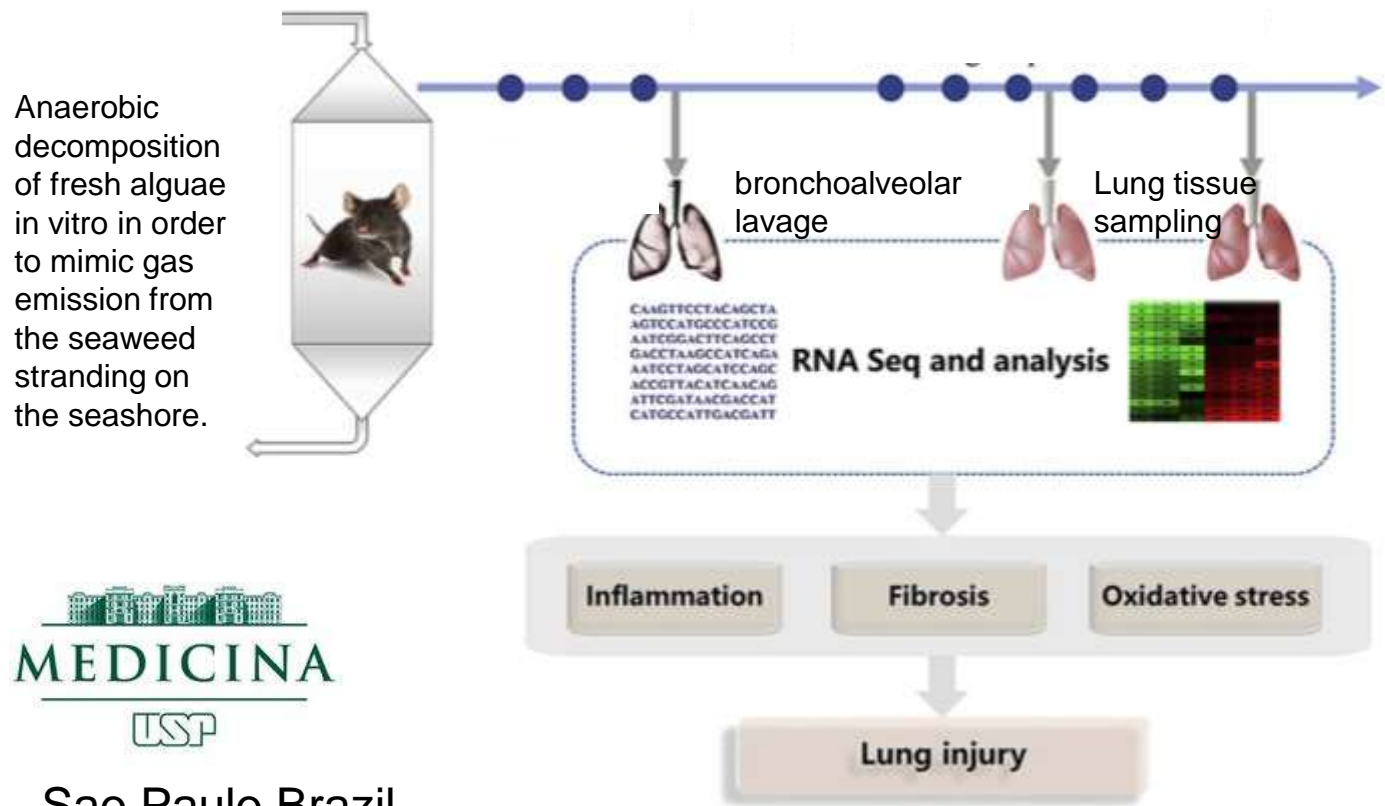
- ↓ by complex IV inhibition
- ↑ by soluble GC (AMPC) activation

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# Specific research questions (5)

- ▶ Specific insights into the molecular mechanisms of lung injury induced by gaseous exposure in mice



Sao Paulo Brazil

# Expected results

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## BRIDGING knowledge gaps

- ▶ Precise **novel information** pertaining to the **human health** consequences of long term exposure to gaseous emissions produced by sargassum seaweed decomposition
- ▶ Description of knowledge, beliefs and **perceptions of health risks** related to sargassum stranding in impacted populations
- ▶ Laying the scientific foundations advising targeted **public health/preventive measures** taking into account the specificities of impacted territories and populations
- ▶ Preconization of medical guidelines and protocols for **vulnerable populations** such as asthmatic children, the elderly and pregnant women.



# Dissemination/perspective for development

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- ▶ Project consortium members are opinion leaders in their respective fields
- ▶ Scientific publications
- ▶ Optimized large-scale dissemination of vulgarized scientific knowledge to impacted populations
- ▶ Set up of an international scientific collaboration platform for worldwide health-related research associated with algae stranding

# Acknowledgements

## Sargassum Working Group



Guadeloupe  
Martinique



**THANK YOU  
FOR YOUR  
ATTENTION**

