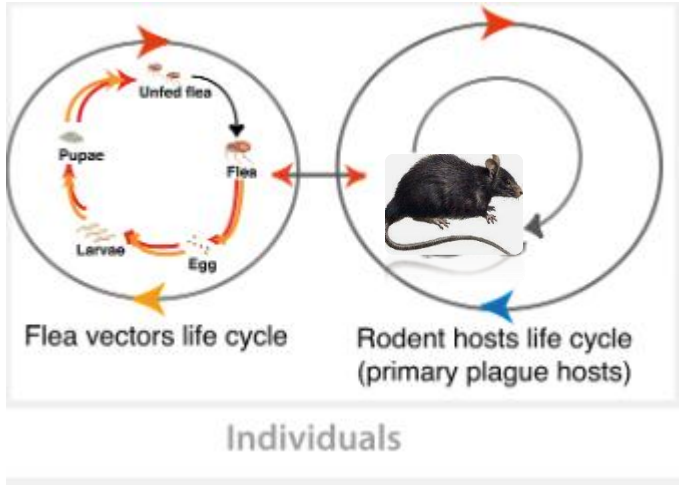
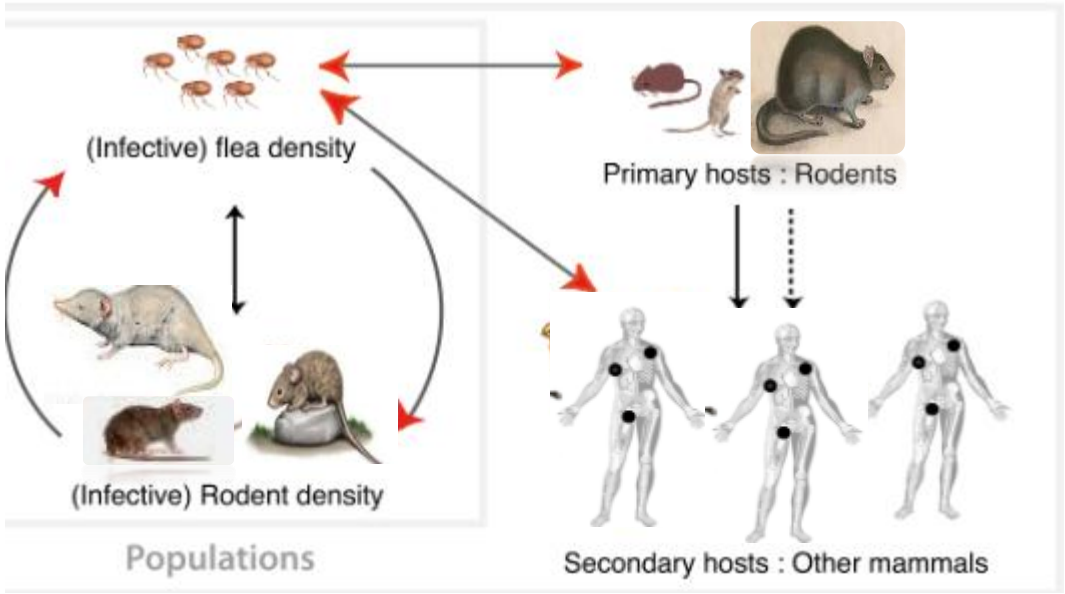
The circulation of plague in endemic areas of Madagascar requires the implementation of monitoring of rodent and fleas populations implicated in the transmission of the disease to predict the risk of transmission to human.





(1) Statistical model question:

What is the Relationship between flea density, rodent abondance, rodent species, mass of rodent and transmission season of plague?

(2) Dynamical model question :

How is plague maintened in rodent population of Madagascar?

What is the Relationship between flea density, rodent abondance, rodent species, mass of rodent and transmission season of plague?

- **Response varibale** : fleas_density_per_rodent
- **Predictors variable**: rodent_abundance, rodent_mass, rodent_species, site, season_transmission
- **Distribution** : anormal, poisson , **Link** : natural log
- **R fonction** : `glmer()`

A	B	C	D	E	F	G	H
ID	site	collect_date	mois	rodent_species	no_flea	rodent_mass	saison
IK01	Ambohitsitonoina	../../2012	Octobre	Rattus rattus	11	190	high
IK02	Ambohitsitonoina	../../2012	Octobre	Rattus norvegicus	3	300	high
IK03	Ambohitsitonoina	../../2012	Mai	Mus musculus	1	15	low
...	...	../../2012	...	...	...	...	
IK130	Tsiako	../../2012	Juin	Suncus murinus	4	40	low

H_0 : Flea density is predicted by rodents abundance in both transmission seasons of plague

```
glmer(flea_density_per_rodent ~ rodent_abundance + season +
rodent_abundance * season + rodent_species + rodent_mass + (1 | site),
family = "poisson")
```

How is plague maintained in rodent populations of Madagascar?

H_0 : Rodent species tolerance to plague facilitates maintenance of plague in endemic areas in Madagascar.

Populations :

Rattus rattus, Rattus norvegicus, Suncus murinus

States:

S: susceptible

I: infected

Processes:

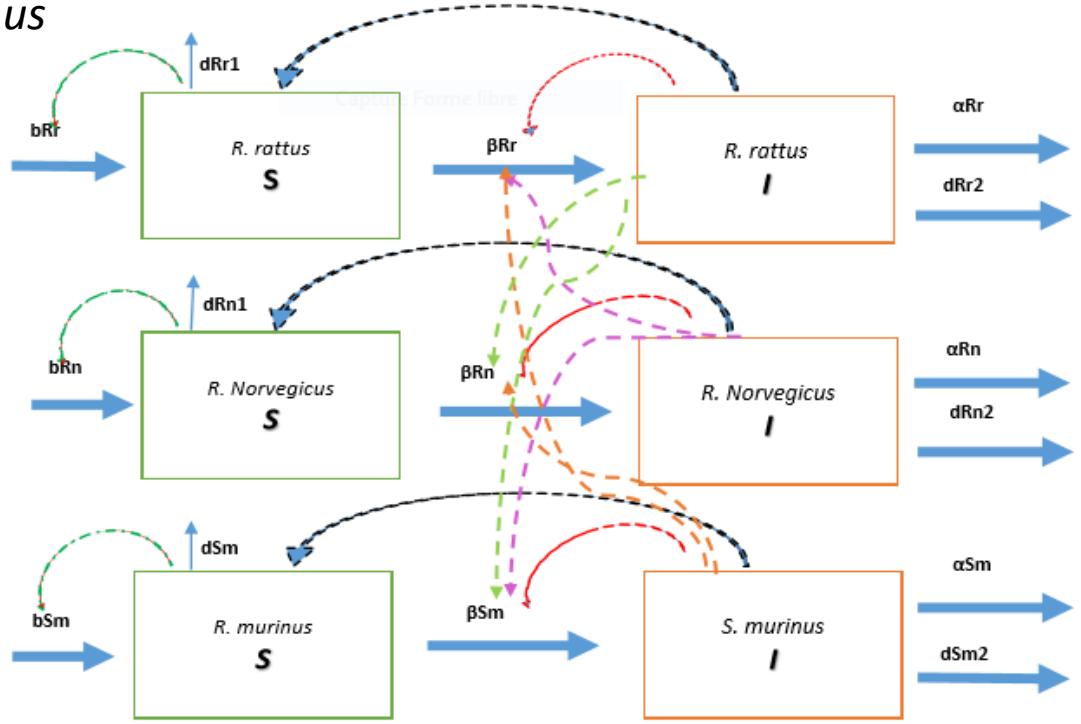
b: birth rate

β: transmission coefficient

α : rate of survival of infected

d1: death rate in susceptible population

d2: death rate in infected population



$\frac{dS_{RR}}{dt}$

$\frac{dI_{RR}}{dt}$

$\frac{dS_{RN}}{dt}$

$\frac{dI_{RN}}{dt}$

$\frac{dS_{Sm}}{dt}$

$\frac{dI_{Sm}}{dt}$

- Continue to train with R and review all E2M2 courses
- Read more publications related to this study
- Try to write research frame and field protocols …
- Collect data in choosing sites

… Mankasitraka!!
Thanks !! …