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Research Laboratory and Immunoregulation Mechanisms - LIMIR
Environmental, Occupational Toxicology, and Cancer Surveillance Laboratory - LABTOX
Center for the Study of Worker's Health and Human Ecology (CESTEH)
Sérgio Arouca National School of Health – FIOCRUZ (ENSP)

VECTOR CONTROL WORKERS OCCUPATIONALLY EXPOSED TO PESTICIDES SHOWED A DECREASE IN CELL NUMBER AND NITRIC OXIDE PRODUCTION IN PBMC CULTURES

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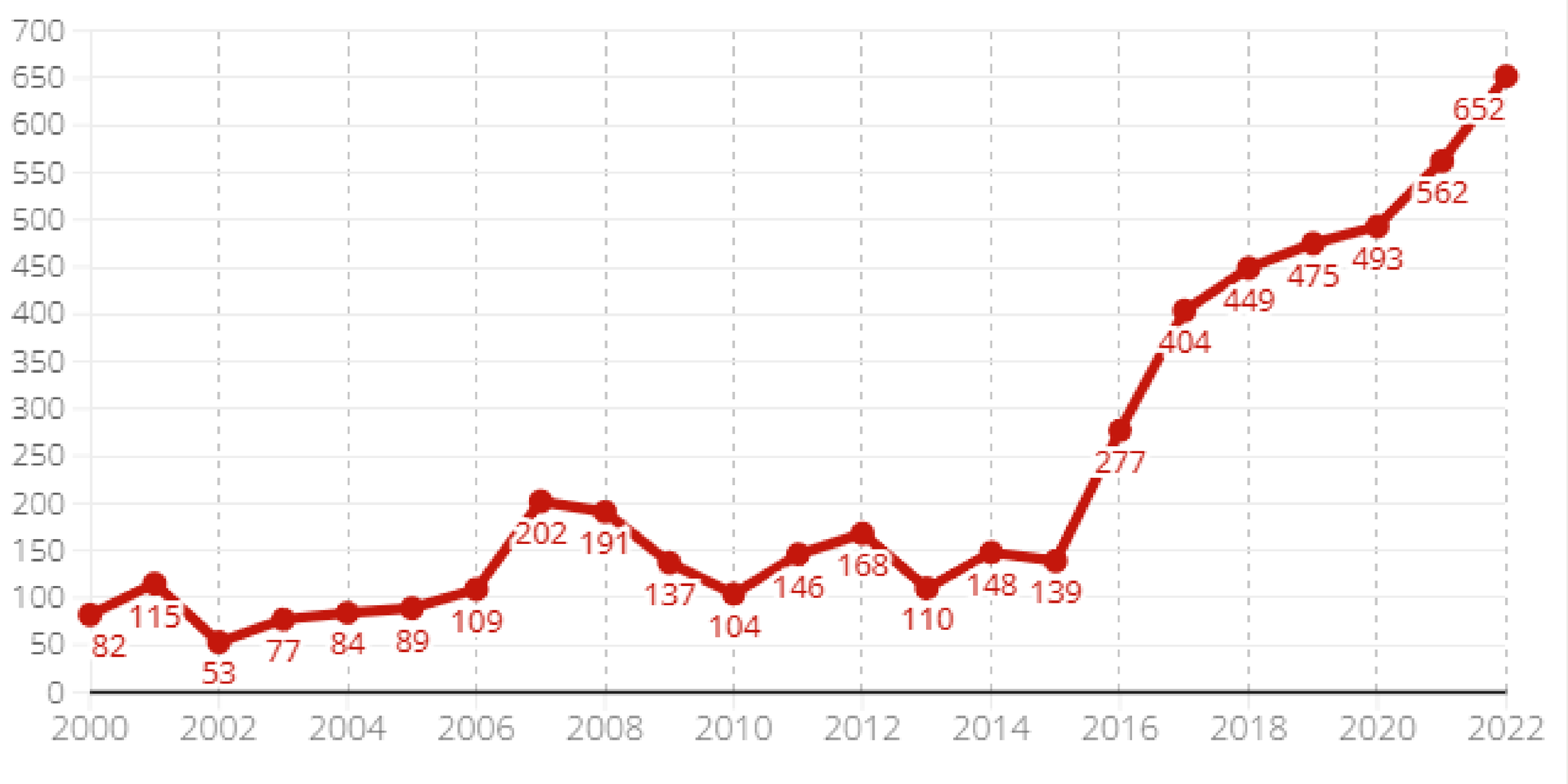
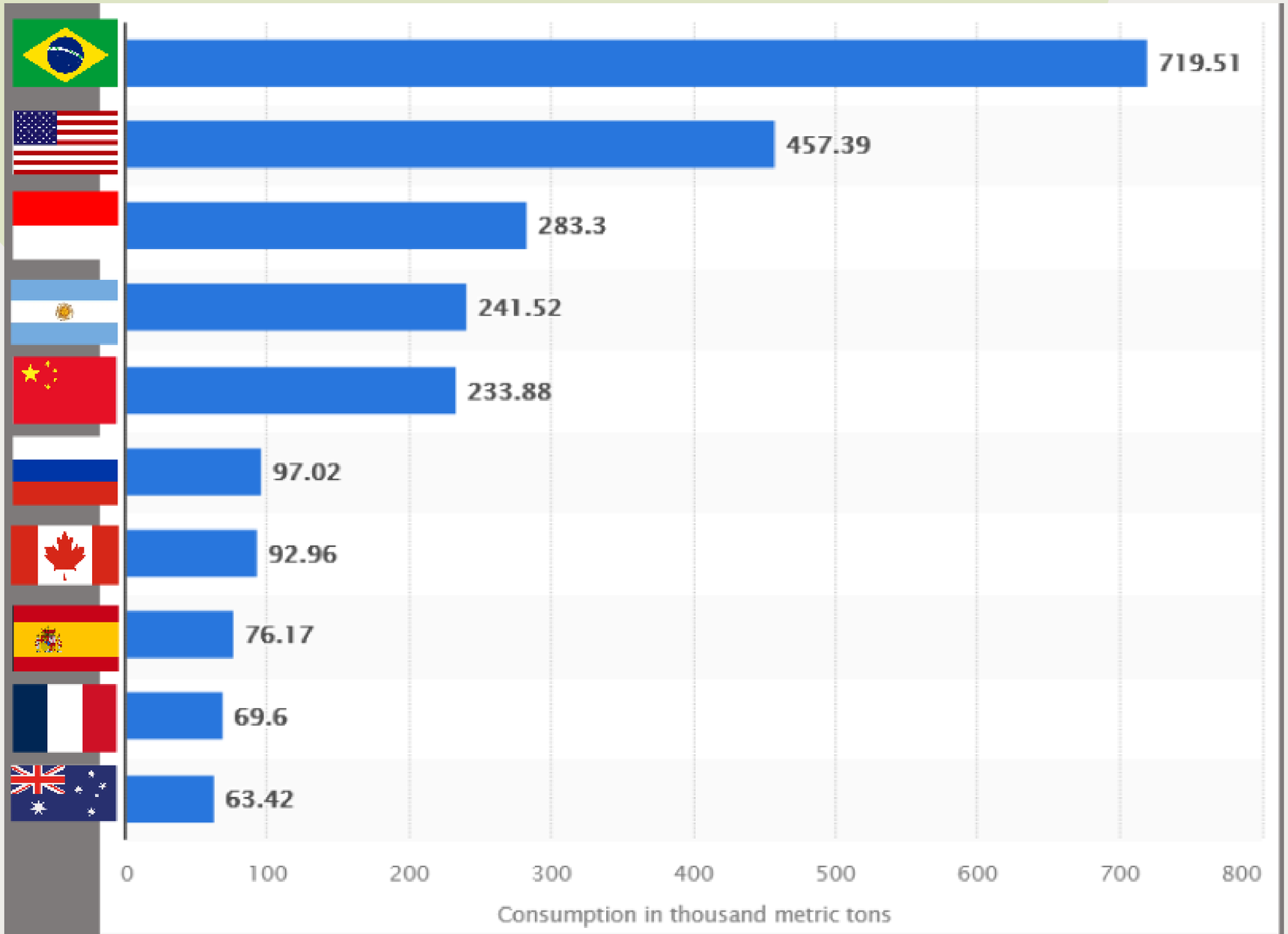
1- Approval of pesticide use in Brazil



General Coordination of Pesticides and Related Products (CGAA) of the Ministry of Agriculture

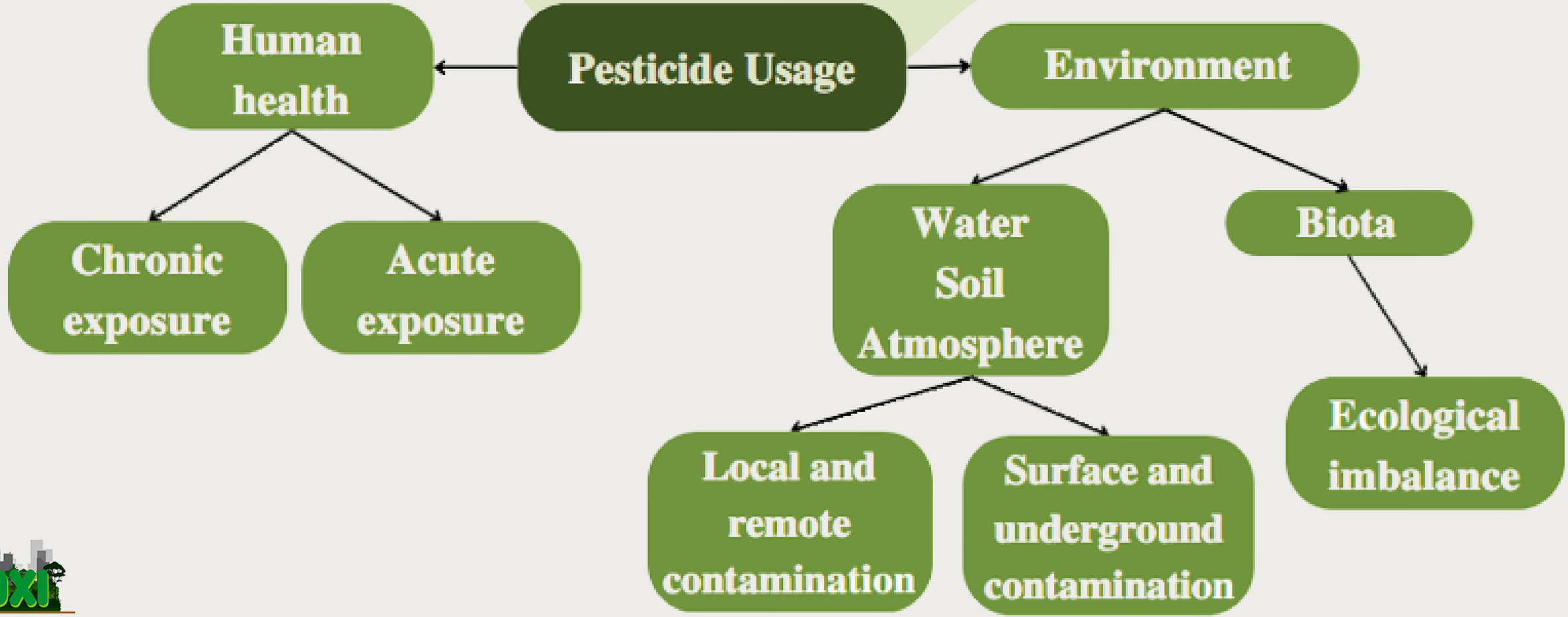
In 2022, 652 pesticides were approved, representing an increase of 16% compared to 2021

2- Leading countries in agricultural consumption of pesticides worldwide in 2021 (in 1,000 metric tons)



Adapted from Statista (2023)

3- Association between pesticides and health and environmental damage



Adapted from Soares e Porto (2007)

4 - Work routine of Vector Control Workers

Prevent and control endemic diseases by identifying vector outbreaks and subsequently eradicating them

Malaria

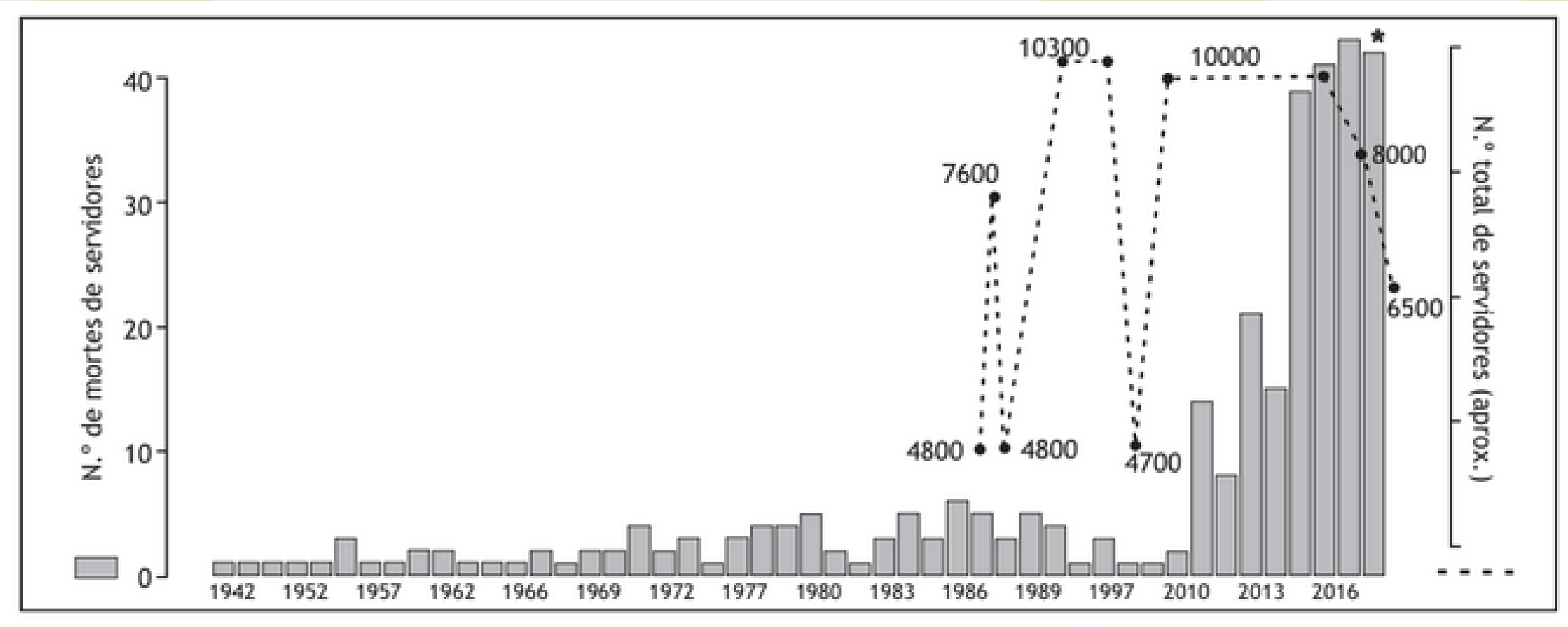
Dengue

LARENTIS, et al. (2021)

Garça em Foco (2022)

Prefeitura de Marabá (2020)

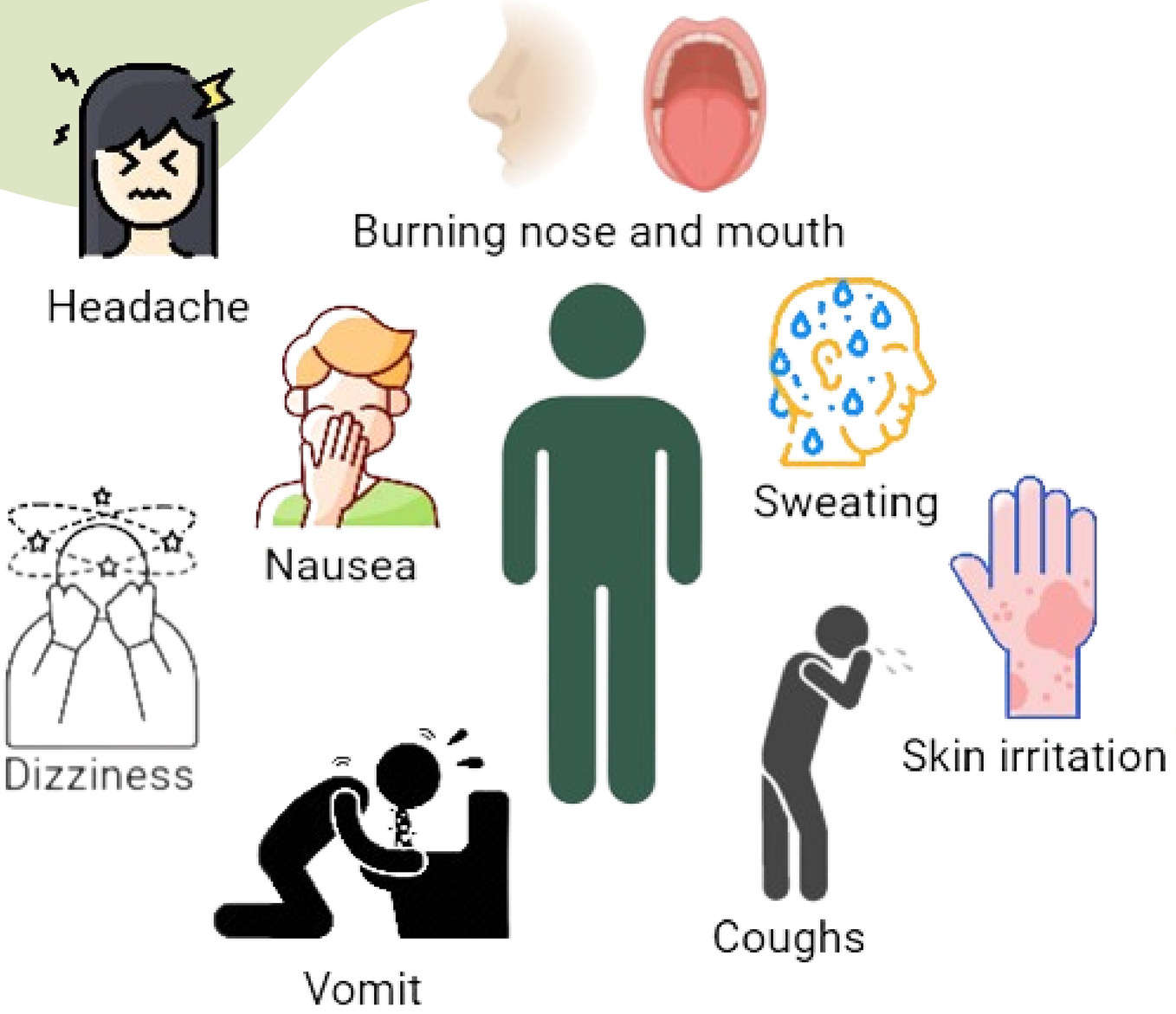
5 - Deaths of federal civil servants working in the state of Rio de Janeiro in different public positions (health agent, public health agent, endemic disease control agent and endemic disease guard) from 1942 to October 2018



Source: Death data provided by NERJ/MS from the Personnel Administration System (SIAPE) and total number of workers by the unions. System (SIAPE) and the total number of workers from the unions. Note: fluctuations in the number of workers are due to dismissals and judicial reinstatements, as well as retirements and deaths.

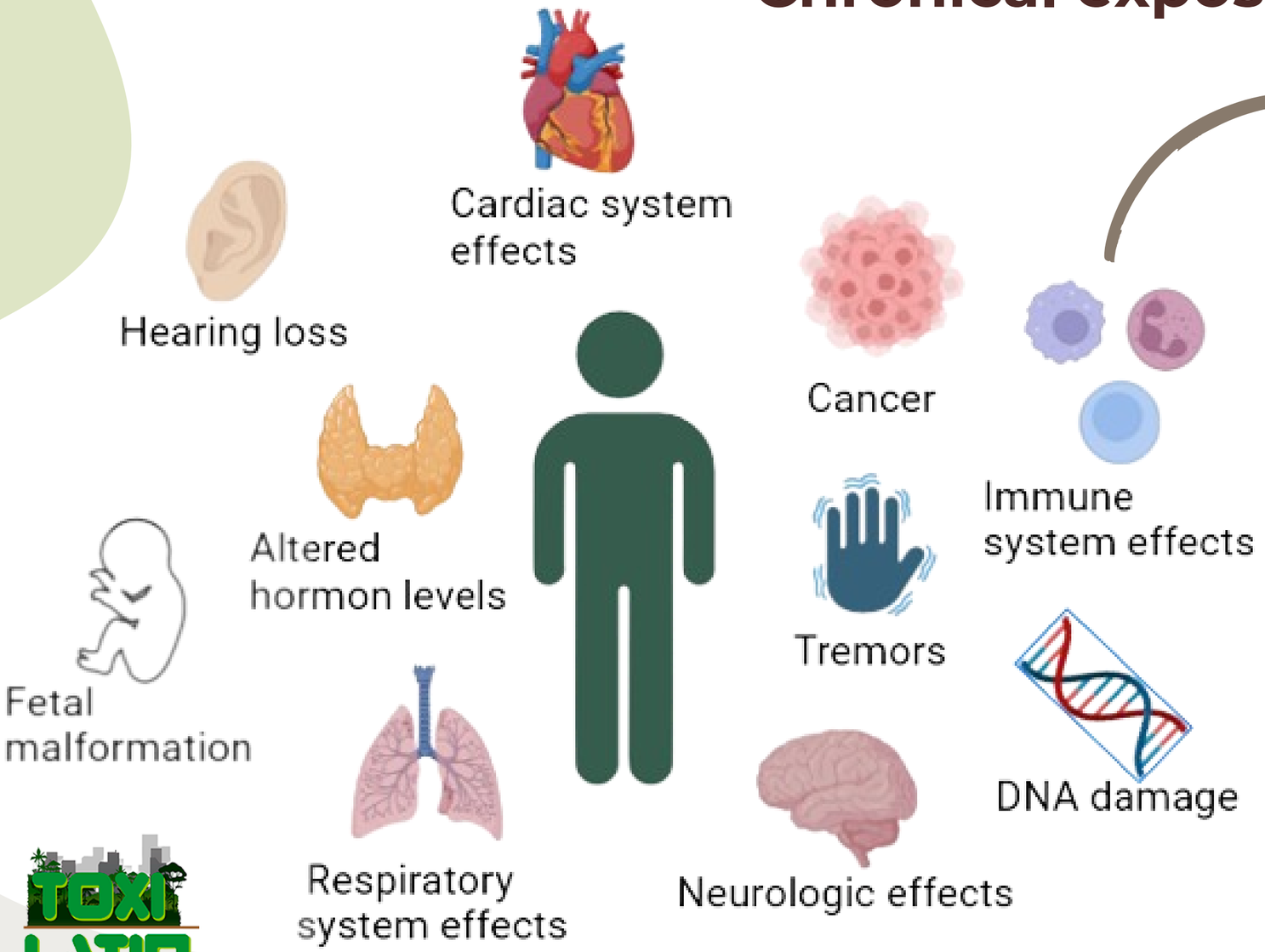
Pesticide consequence’s exposure

Acute exposure:

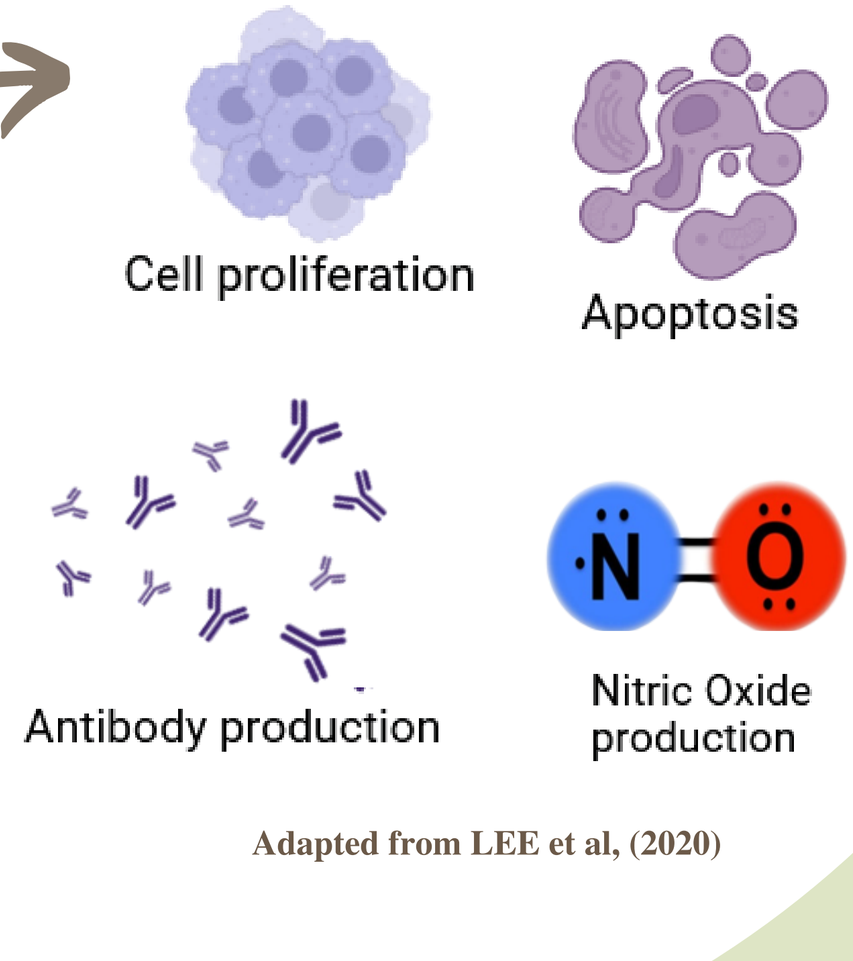


Pesticide consequence's exposure

Chronical exposure:



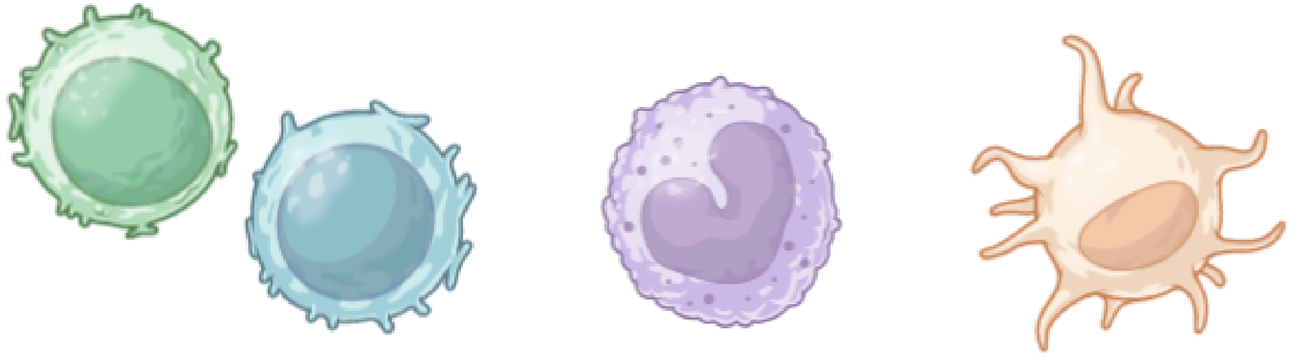
Deregulation of :



Adapted from LEE et al, (2020)

Peripheral blood mononuclear cells (PBMCs)

Ability to coordinate the immune response by playing specific roles such as antibody production, phagocytosis of pathogens and activation of other immune cells

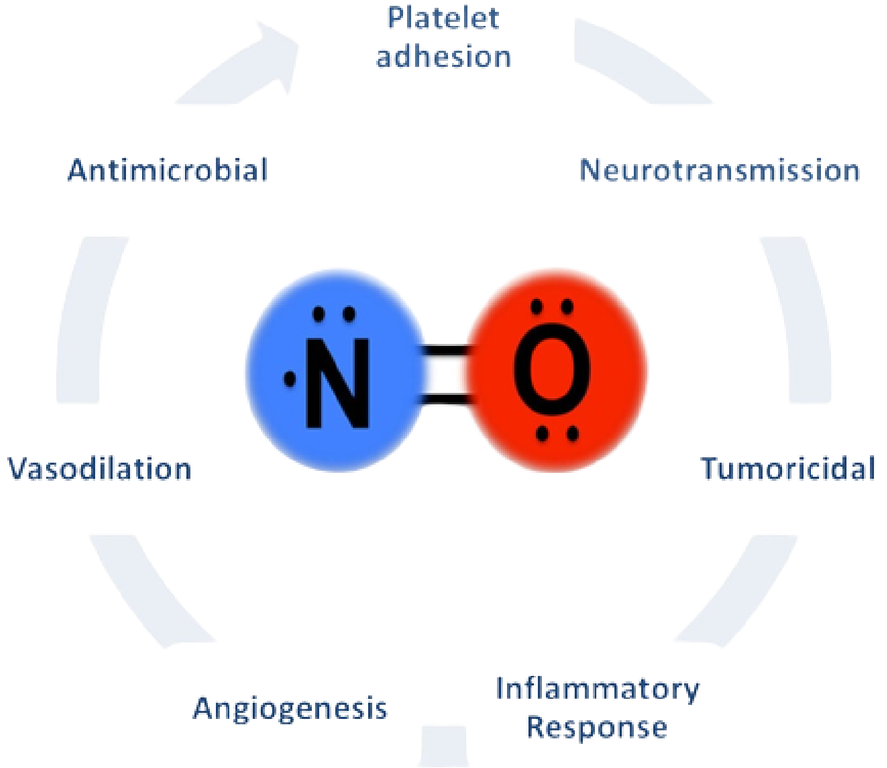


Lymphocytes Monocytes Dendritic Cells

Detection, destruction and immunological memory against pathogens and foreign substances

Nitric oxide (NO)

Acting in the modulation of various immunological mechanisms for the defense of the organism against pathogens and the regulation of inflammation



Objective:

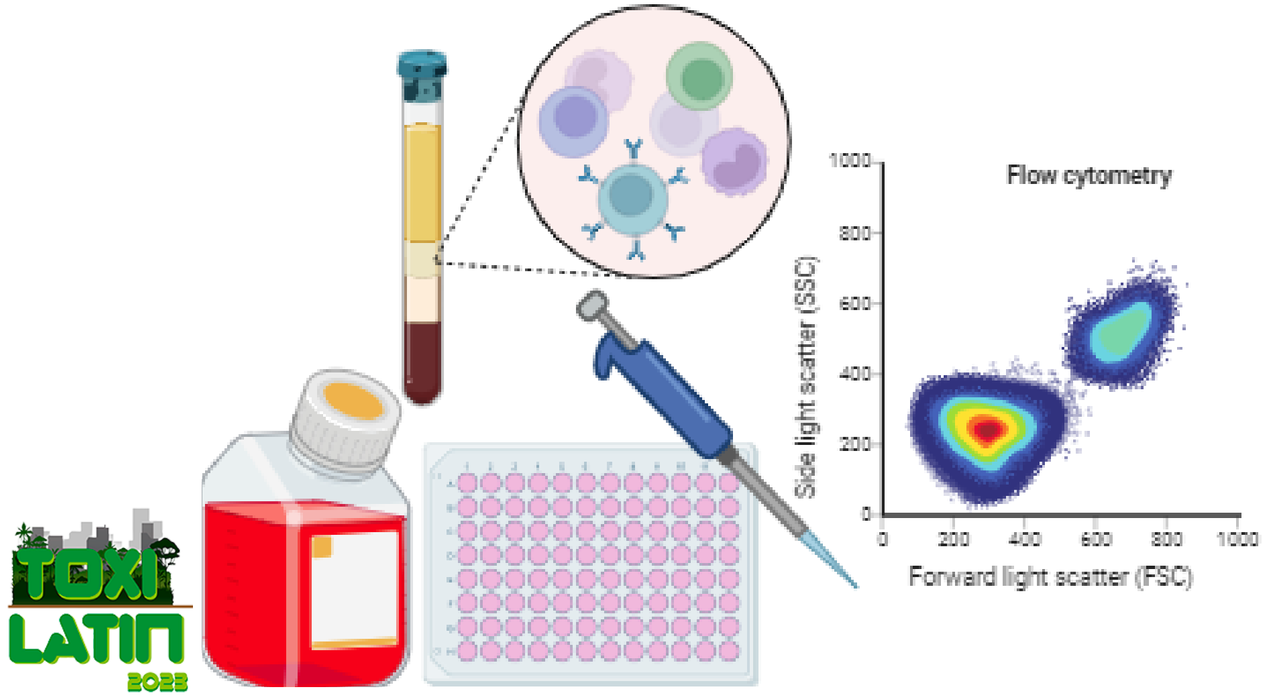
- Quantifying the number of mononucleated cells and the production of nitric oxide of Vector Control Workers occupationally exposed to pesticides in the state of Rio de Janeiro

Methodology

- **Descriptive observational cross-sectional study**

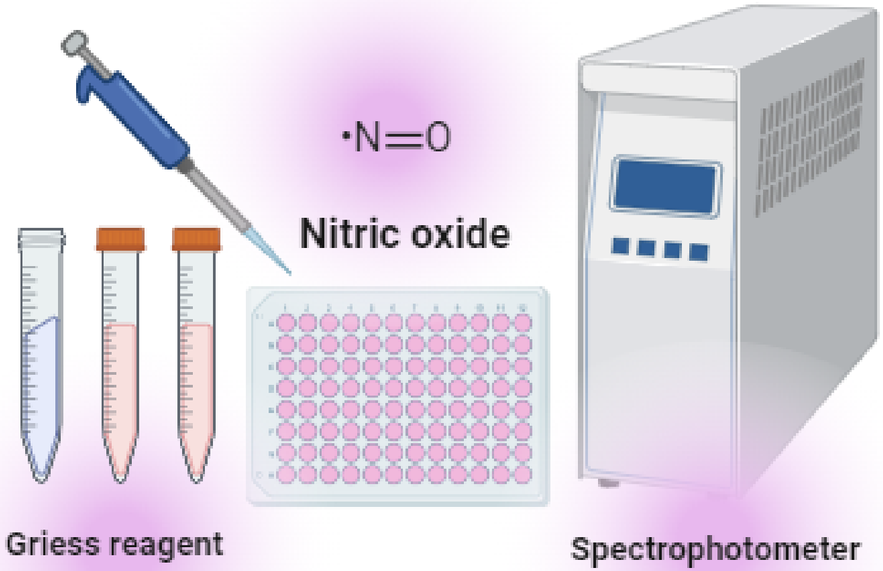
Separation of peripheral blood mononuclear cells (PBMC) by density gradient and cell quantification

- Isolation and Culture of PBMCs
- Sample Collection
- Analysis



Quantification of nitric oxide (NO)

Performed using the Griess reagent technique to measure nitrite levels in the supernatants of PBMC cultures.



Sociodemographic data

Table 1 - Delineation of the study population

	EXPOSED = 74	REMOVED = 25
	n (%)	n (%)
Use of PPE (Personal Protective Equipment)		
Yes	45 (62,50)	15 (62,50)
No	27 (37,50)	9 (37,50)
Years of service		
1 - 9	12 (16,66)	7 (29,16)
10 - 19	20 (27,77)	5 (20,83)
20 - 29	18 (25,00)	3 (12,50)
30 - 34	18 (25,00)	8 (33,33)
35 +	4 (5,55)	1 (4,16)

Study population design regarding the use of personal protective equipment (PPE) and exposure time of the groups: Exposed VCW (n) = 74, Removed VCW (n) = 25.

Sociodemographic data

Table 2 - Delineation of the study population

	EXPOSED = 74	REMOVED = 25
	n (%)	n (%)
Skin in contact with pesticide		
Yes	65 (87,84)	16 (64,00)
No	9 (12,16)	9 (36)
Received training		
Yes	48 (66,66)	13 (54,16)
No	24 (33,33)	11 (45,83)

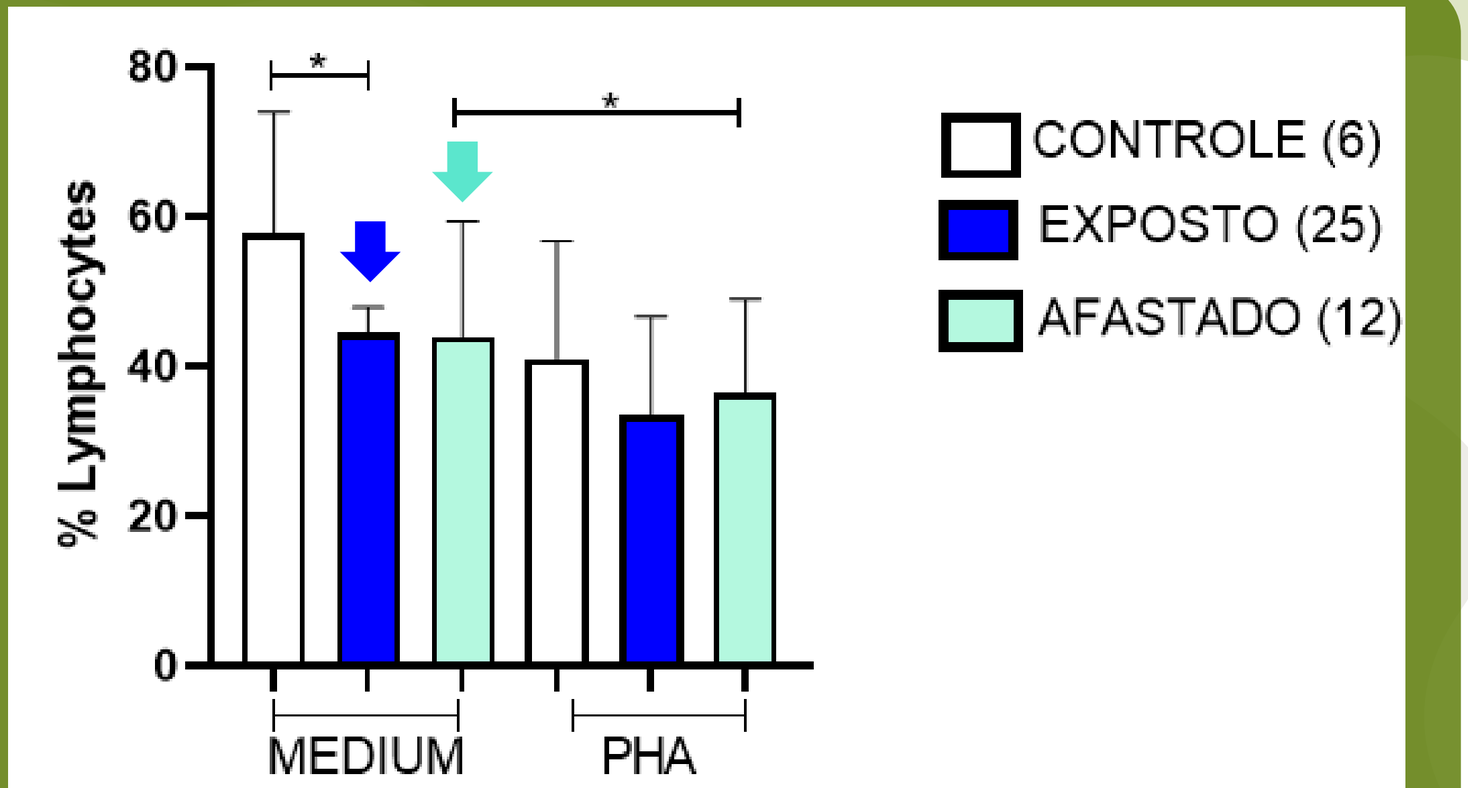
Study population design regarding the skin contact with pesticides and training for pesticide contact of the groups: Exposed VCW (n) = 74, Removed VCW (n) = 25.

- ARE WORKERS EXPOSED TO PESTICIDES HEALTHY?

- HOW IS THE IMMUNE SYSTEM OF THIS WORKERS?

Results

Figure 1 - Quantification of lymphocytes in Exposed and Removed Vector Control Workers and Comparison group for 72 hours

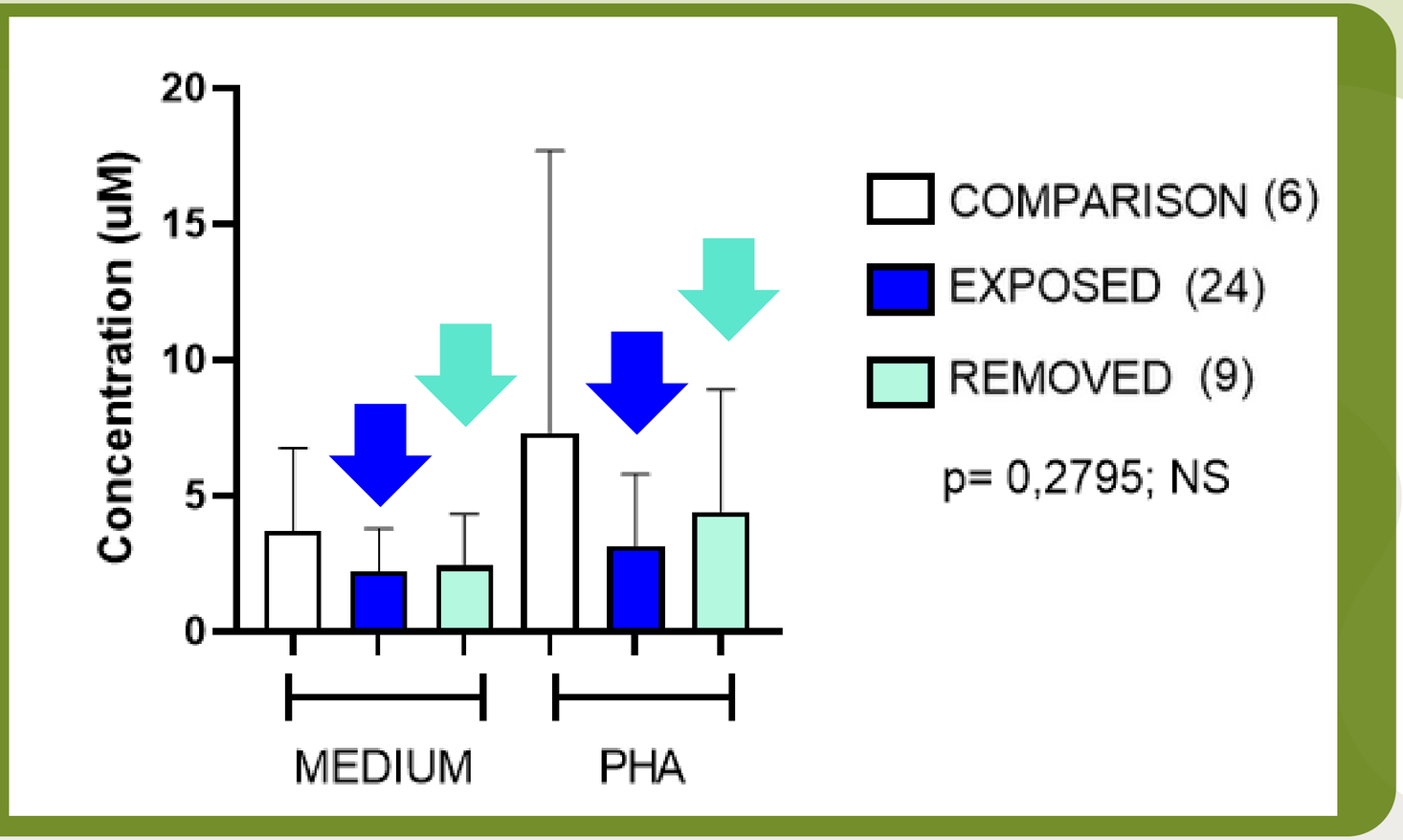


Vector Control Workers cells in the Exposed and Removed group showed a reduction in the number of cells in culture in MEDIUM

Quantification and analysis of the percentage of lymphocytes in cells cultured with medium only and with a activation stimulus (PHA). 1x10^6 cells/ml were cultured in the presence of MEDIUM or PHA at a concentration of 5ug/mL. Paired analysis of the percentage (%) of total lymphocytes: Urban Safety Agents (n=6), Exposed VCW Group (n=25), and Removed VCW Group (n=12). *p < 0.05.

Results

Figure 2 - Nitric oxide production of Exposed and Removed workers and Comparison group



Vector Control Workers cells in the Exposed and Removed groups showed a decrease in Nitric Oxide production in cultures with both situations compared to the Comparison group

Unpaired analysis of the concentration (µM) of Nitric Oxide produced by PBMCs in cells cultured with MEDIUM only and with a activation stimulus (PHA). 1x10^6 cells/ml were cultured at a PHA concentration of 5ug/mL. Cells were exposed to either MEDIUM or PHA for all groups. Urban Safety Agents Group (comparison) (n) = 6; Exposed VCW Group (n) = 24; Removed VCW Group (n) = 9; p = NS

Conclusions

The analysis of PBMC culture showed :

- Significant reduction in the number of cells in the exposed and removed groups when there was no activation stimulus and a decrease in nitric oxide production, although it didn't reach statistical significance

Urgent need to:

- Train people involved in handling pesticides during their work activities and improve supervision with regard to the provision and proper use of personal protective equipment (PPE).

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Pesticide handling during work activities impairs humoral and cellular immune function with adverse health consequences.

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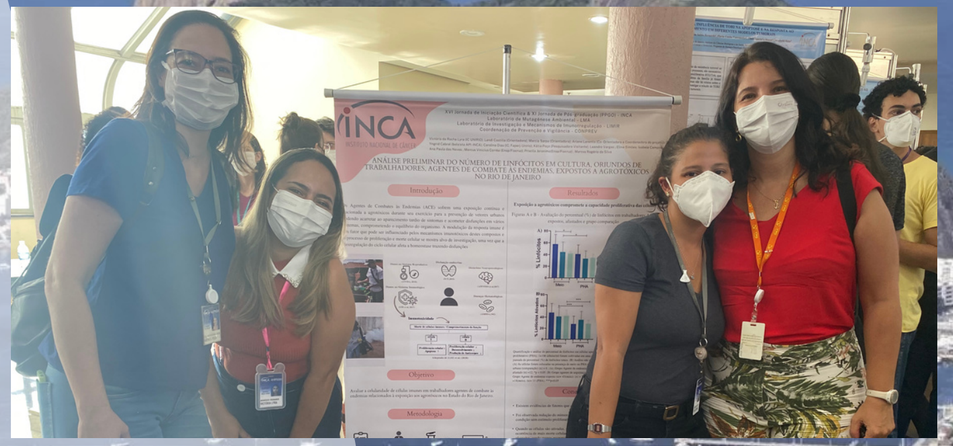
- **Endemic Disease Agents and Urban Security Zone Guards**



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Thank you!

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