People's Democratic Republic of Algeria

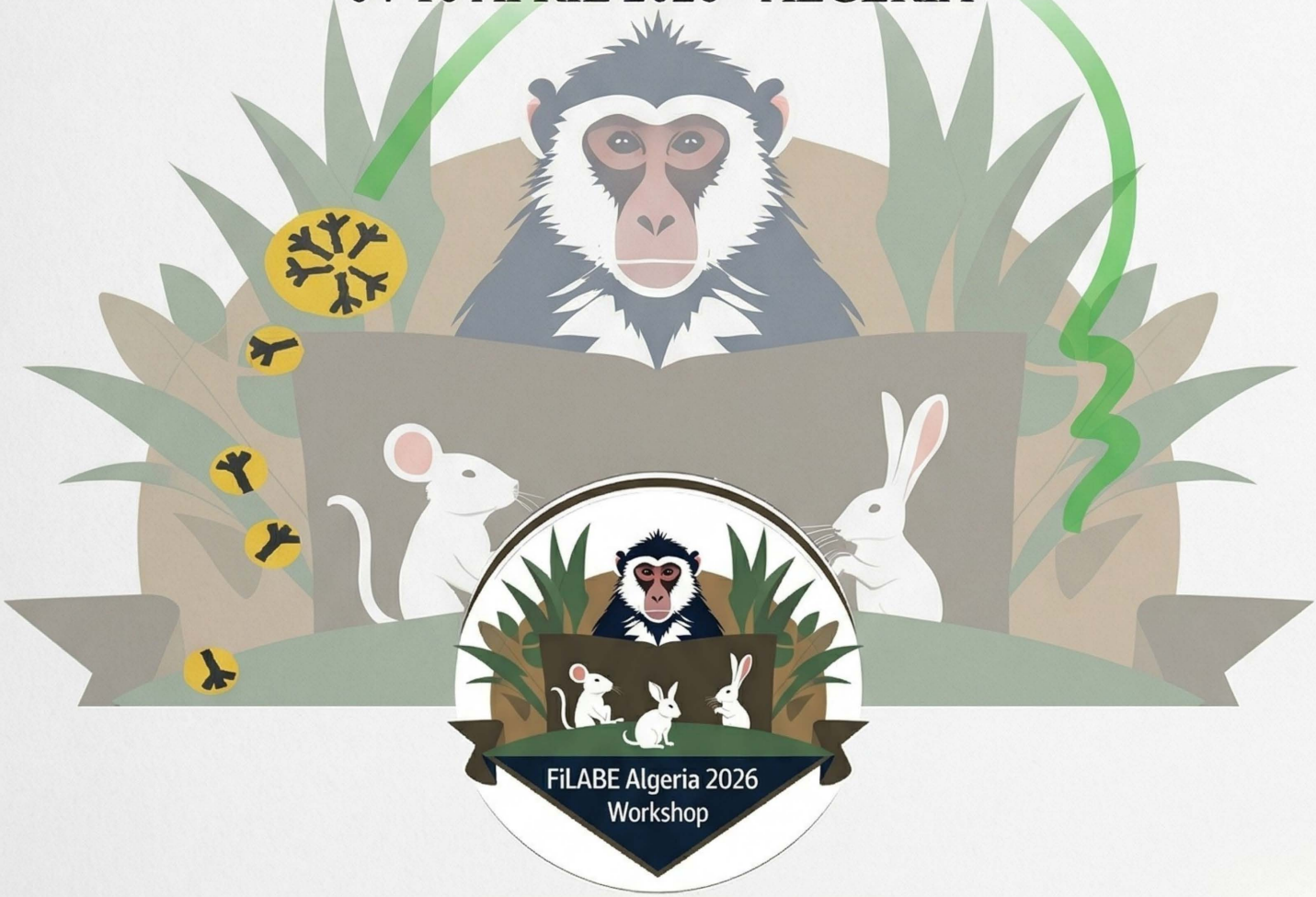
Ministry of Higher Education and Scientific Research

# ABSTRACTS OF WORKSHOP PRESENTATIONS

## FIRST INTERNATIONAL WORKSHOP IN ALGERIA ON BREEDING LABORATORY ANIMAL MODELS AND PRESERVATION OF THE BARBARY MACAQUE

## FILABE'26

04-10 APRIL 2026 • ALGERIA




FILABE 2026

**First International Workshop in Algeria on Breeding, Laboratory Animal Models and the Preservation of the Barbary Macaque (FILABE'26)**

*04-10 April 2026*

---

Honorary President

**Pr Kamel BADDARI**

Minister of Higher Education and Scientific Research

Workshop President

**Pr. Yahia CHEBLOUNE**

Research Director PAVAL Lab. INRAE/UGA

**First International Workshop in Algeria on Breeding, Laboratory Animal Models and the Preservation of the Barbary Macaque (FILABE'26)**

*04-10 April 2026*

---

Honorary Guest

## Pr. Mohamed Elhadi LATRECHE

Rector of UFA Setif 1

Honorary Guest

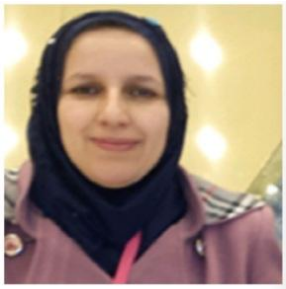
## Pr. Zohir DIBI

Rector of UMK Biskra

Honorary Guest

## Pr Ahmed BOUDA

Rector of UMM Tizi Ouzou



President of Tizi-Ouzou organizing committee

## Pr. Nadia LARDJANE

Université de Tizi-Ouzou

President of Sétif organizing committee

## Dr. Ahmed EDDINE

Université Ferhat Abbas Sétif 1

President of ENSV organizing committee

## Pr Sonia BESSALEM

Ecole Nationale Supérieure Vétérinaire, Alger

President of Biskra organizing committee

## Dr Mohamed TITAOUINE

Université de Biskra

**First International Workshop in Algeria on Breeding,**
**Laboratory Animal Models and the Preservation of the Barbary Macaque**
**(FILABE'26)**
***04-10 April 2026***

---

# Scientific and organizing committees

**First International Workshop in Algeria on Breeding, Laboratory Animal Models and the Preservation of the Barbary Macaque (FILABE'26)**

*04-10 April 2026*

---

# Scientific committee

- Pr Bessalem Sonia - Ecole Nationale Supérieure Vétérinaire, Alger
- Dr Lounes Nedjma - Ecole Nationale Supérieure Vétérinaire, Alger
- Dr Ainouz Lynda - Ecole Nationale Supérieure Vétérinaire, Alger
- Pr Lamara Ali - Ecole Nationale Supérieure Vétérinaire, Alger
- Pr Souames Samir - Ecole Nationale Supérieure Vétérinaire, Alger
- Dr Benatallah Amel - Ecole Nationale Supérieure Vétérinaire, Alger
- Pr Moussi Abdelhamide - Université Mohamed Khider, Biskra
- Pr Messai Ahmed - Université Mohamed Khider, Biskra
- Pr Titaouine Mohammed - Université Mohamed Khider, Biskra
- Pr Gherissi Djellel Eddine - Université Mohamed Khider, Biskra
- Dr. Trabsa Hayet - Université Mohamed Khider, Biskra
- Pr Deghnouche Kahramane - Université Mohamed Khider, Biskra
- Dr. Laamraoui Ramzi - Université Mohamed Khider, Biskra
- Dr. Ferroudj Sanna - Université Mohamed Khider, Biskra
- Dr. Mohamdi Nabile - Université Mohamed Khider, Biskra
- Pr Farhi kamelia - Université Mohamed Khider, Biskra
- Pr Benaissa Mohamed hocine - Université Mohamed Khider, Biskra
- Pr Khennouf Saddik - Université Ferhat Abbas Sétif 1
- Pr. Beldjazia Amina - Université Ferhat Abbas Sétif 1
- Dr. Eddine Ahmed - Université Ferhat Abbas Sétif 1
- Dr. Missaoui Khaled - Université Ferhat Abbas Sétif 1
- Pr. Ayadi Ouarda - Université Ferhat Abbas Sétif 1
- Dr Hocine Yezid - Université Mouloud MAMMERI, Tizi Ouzou
- Pr Madjid Akkou - Université Mouloud MAMMERI, Tizi Ouzou
- Pr Nacira Daoudi - Université Mouloud MAMMERI, Tizi Ouzou
- Dr Mohammed Oudahmane - Université Mouloud MAMMERI, Tizi Ouzou
- Dr Yacine Titouche - Université Mouloud MAMMERI, Tizi Ouzou
- Mr Messaoud Bensidhoum - Université Mouloud MAMMERI, Tizi Ouzou

**First International Workshop in Algeria on Breeding, Laboratory Animal Models and the Preservation of the Barbary Macaque (FILABE'26)**

*04-10 April 2026*

# Organizing committee

- Pr Bessalem Sonia - Ecole Nationale Supérieure Vétérinaire, Alger
- Dr Lounes Nedjma - Ecole Nationale Supérieure Vétérinaire, Alger
- Dr Ainouz Lynda - Ecole Nationale Supérieure Vétérinaire, Alger
- Pr Lamara Ali - Ecole Nationale Supérieure Vétérinaire, Alger
- Pr Souames Samir - Ecole Nationale Supérieure Vétérinaire, Alger
- Dr Benatallah Amel - Ecole Nationale Supérieure Vétérinaire, Alger
- Pr Djerroud Kahina - Ecole Nationale Supérieure Vétérinaire, Alger
- Dr Bouhamed Radia - Ecole Nationale Supérieure Vétérinaire, Alger
- Dr Sahraoui Lynda - Ecole Nationale Supérieure Vétérinaire, Alger
- Dr Hachemi Amina - Ecole Nationale Supérieure Vétérinaire, Alger
- Dr Benali Nadia - Ecole Nationale Supérieure Vétérinaire, Alger
- Dr Hamza Chahnez - Ecole Nationale Supérieure Vétérinaire, Alger
- Dr Aouane Nedjma - Ecole Nationale Supérieure Vétérinaire, Alger
- Dr Kechih Yasmine - Ecole Nationale Supérieure Vétérinaire, Alger
- Mme Mehennaoui Souhila - Ecole Nationale Supérieure Vétérinaire, Alger
- M Gacem Oussama - Ecole Nationale Supérieure Vétérinaire, Alger
- M Rahli Abdelhakim - Ecole Nationale Supérieure Vétérinaire, Alger
- M Mazouzi Mawloud - Ecole Nationale Supérieure Vétérinaire, Alger
- Melle Benmouma Nihal - Ecole Nationale Supérieure Vétérinaire, Alger
- Pr. Benmeddour Tarek - Université Mohamed Khider, Biskra
- Pr Guimeur Kamel - Université Mohamed Khider, Biskra
- Dr. Foughali Asmaamina - Université Mohamed Khider, Biskra
- Dr. Belabed Hana Nedjma - Université Mohamed Khider, Biskra
- Dr. Benharzallah Naouel - Université Mohamed Khider, Biskra
- Dr.Chekara Bouziani Mohammed - Université Mohamed Khider, Biskra
- Pr Merabti Ibrahim - Université Mohamed Khider, Biskra
- Pr Mehaoua Mohamed Seghir - Université Mohamed Khider, Biskra
- Dr. Mebrek Naima - Université Mohamed Khider, Biskra
- Dr. Bedjaoui Hanane - Université Mohamed Khider, Biskra
- Pr Hadjeb Ayoub - Université Mohamed Khider, Biskra
- Pr Attir Badreddine - Université Mohamed Khider, Biskra
- Pr Mammeri Adel - Université Mohamed Khider, Biskra
- Pr Messai Ahmed - Université Mohamed Khider, Biskra

- Dr. Yasri Nabila - Université Mohamed Khider, Biskra
- Dr. Harkat Hamza - Université Mohamed Khider, Biskra
- Dr. Torki Soumia - Université Mohamed Khider, Biskra
- Dr.Alloui Rafika - Université Mohamed Khider, Biskra
- Dr. Ayoun Manel - Université Mohamed Khider, Biskra
- Dr. Benrezak Sara - Université Mohamed Khider, Biskra
- Pr Moussi Abdelhamid - Université Mohamed Khider, Biskra
- Pr Zeroual Samir - Université Mohamed Khider, Biskra
- Pr Farhi Kamilia - Université Mohamed Khider, Biskra
- Pr Debilou Abderrazak - Université Mohamed Khider, Biskra
- Pr Debla Fateh - Université Mohamed Khider, Biskra
- Dr. Beribeche khadidja - Université Mohamed Khider, Biskra
- Dr Karim Laabassi - Université Mohamed Khider, Biskra
- Pr Djeffal Abdelhamid - Université Mohamed Khider, Biskra
- Dr Eddine Ahmed - Université Ferhat Abbas Sétif 1
- Dr Kout Akram - Université Ferhat Abbas Sétif 1
- Dr Harrag Nassir - Université Ferhat Abbas Sétif 1
- Pr Ouarda Ayadi - Université Ferhat Abbas Sétif 1
- Dr Bouchama Badreddine - Université Ferhat Abbas Sétif 1
- Dr Moughli Aymen - Université Ferhat Abbas Sétif 1
- Dr Ounoughi Abdelkader - Université Ferhat Abbas Sétif 1
- Mr Benmorsly Assil - Université Ferhat Abbas Sétif 1
- Dr Bensebaa Fethi - Université Ferhat Abbas Sétif 1
- Dr Missaoui Khaled - Université Ferhat Abbas Sétif 1
- Dr Haichour Rima - Université Ferhat Abbas Sétif 1
- Dr Nouioua Wafa - Université Ferhat Abbas Sétif 1
- Dr Boucheala Meriem - Université Ferhat Abbas Sétif 1
- Dr Khaznadar Mona - Université Ferhat Abbas Sétif 1
- Mr Brahim ZAROUR - Université Ferhat Abbas Sétif 1
- Pr Nadia Lardjane - Université Mouloud MAMMERI, Tizi Ouzou
- Dr Hocine Yezid - Université Mouloud MAMMERI, Tizi Ouzou
- Mr Rachid Smail - Université Mouloud MAMMERI, Tizi Ouzou
- Mr Larbi Khifer - Université Mouloud MAMMERI, Tizi Ouzou
- Dr Abdelkrim Limane - Université Mouloud MAMMERI, Tizi Ouzou
- Dr Djamel Medjebeur - Université Mouloud MAMMERI, Tizi Ouzou
- Mme Samia Ouali - Université Mouloud MAMMERI, Tizi Ouzou
- Mme Naoual Berrouane - Université Mouloud MAMMERI, Tizi Ouzou
- Mr Rachid Aissaoui - Université Mouloud MAMMERI, Tizi Ouzou
- Dr Mohamed Yamine Larbi - Université Mouloud MAMMERI, Tizi Ouzou

**First International Workshop in Algeria on Breeding,**
**Laboratory Animal Models and the Preservation of the Barbary Macaque**
**(FILABE'26)**
***04-10 April 2026***

---

# SPONSORS and PARTNERS

**First International Workshop in Algeria on Breeding,**
**Laboratory Animal Models and the Preservation of the Barbary Macaque**
**(FILABE'26)**
***04-10 April 2026***

---

# SPONSORS and PARTNERS

SARL NUTRI MEDIC VET
IMPORTATION DES PRODUITS
VETERINAIRES

SARL EQUILAB
Equipements et matériels de laboratoires

SARL GAOOZEBIOTECH

**First International Workshop in Algeria on Breeding,**
**Laboratory Animal Models and the Preservation of the Barbary Macaque**
**(FILABE'26)**
***04-10 April 2026***

---

# About FILABE'2026

We are pleased and honored to announce the first international workshop on animal experimentation, including non-human primates, and the preservation of the Barbary macaque in Algeria from April 4 to 11, 2026. This inter-university event is the result of collaboration between three Algerian universities: Mohammed Khider University in Biskra, Ferhat Abbas University in Setif, and Mouloud Mammeri University in Tizi-Ouzou, and the Higher National Veterinary School of Algiers (ENSV), under the auspices of the Directorate General for Scientific Research and Technological Development (DGRSDT) of the Ministry of Higher Education and Scientific Research: MESRS.

The aim of this event is to strengthen scientific research and biodiversity conservation. It provides a privileged platform for cooperation between experts, researchers, students, and professionals in the fields of biosciences and biohealth, using animal experimentation in accordance with ethical standards, and the implementation of studies for the preservation of the Barbary macaque, an emblematic species of Algeria's natural heritage. This meeting aims to promote concrete and coordinated actions in favor of sustainable development and the preservation of national ecosystems.

Preliminary program and topics :

**ENSV Algiers (Arrival- visit and transfer to TiziOuzou) (April 4th)**

- Arrival to Algiers: transfer to ENSV
- Welcome to ENSV and visit
- Transport from ENSV to TiziOuzou

**TIZI-OUZOU (1 day of activities + 2 days for welcome and visit) (April 4th-6th)**

1. Management of Barbary macaque populations and conservation strategies
    - Studies of primate populations and their preservation
    - Captive breeding and conservation in the field (in situ)
    - Health, health risks, and welfare of non-human primates

**SETIF (1 day of activities + 2 days for welcome and visits) (April 6th -April 8th)**

2. Macaque breeding and use in scientific research
    - Role of macaques in biomedical research
    - Macaque breeding management and development prospects
    - Feeding, ethology, reproduction, health monitoring, and management of macaques in breeding programs

**BISKRA (1 day of activities + 2 days for reception and visits) (April 8th-April 10th)**

3. Contribution of animal models in biosciences and biohealth
    - Animal models, ethics, and biosafety in animal experimentation
    - Breeding, experimental practices, alternative methods, and scientific quality of research
    - Animal experimentation and preclinical studies in biosciences and biohealth

**First International Workshop in Algeria on Breeding,**
**Laboratory Animal Models and the Preservation of the Barbary Macaque**
**(FILABE'26)**
*04-10 April 2026*

---

# Keynote speakers Abstracts

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Veterinary perspectives of housing NHP in the Netherlands

Dr Jaco BAKKER

*DVM, PhD*
*Biomedical Primate Research Centre (BPRC),*
*Lange Kleiweg 161, 2288GJ, Rijswijk,*
*The Netherlands*

**ABSTRACT**

NHPs are accommodated in varied housing configurations, primarily based on facility goals. Producers have housing adapted to breeding and rearing offspring, often outdoors in conditions in or close to the natural origin of the animals. Sites focused on research may house animals exclusively indoors. Housing is influenced by national and international regulations linked to use and transport of NHPs, as well as welfare concerns, animals' social and physical needs, disease and injury prevention, protection from extremes of environment, and health and safety of animals and people. This presentation will compare and contrast NHP housing and veterinary care in the Netherlands versus the general accepted laboratory housing and veterinary care of NHPs.

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Morphine potentiates Neuropathogenesis in SIV infection by neuroimmune dysregulation

Pr Shilpa BUCH

*Professor, UNMC Department of Pharmacology and Experimental Neuroscience*
*Director, UNMC Center for Substance Abuse Research*

**Background**: Opioid abuse is a significant comorbidity in people living with HIV and is associated with increased risk of HIV-associated neurocognitive disorders. However, the mechanisms by which opioids exacerbate viral neuropathogenesis remain incompletely understood. Using the simian immunodeficiency virus (SIV)-infected rhesus macaque model, we investigated how chronic morphine exposure modulates peripheral and central immune responses to influence disease progression.

**Methods**: Rhesus macaques were administered chronic morphine followed by SIV infection. Viral load, disease progression, and immune cell trafficking were assessed. Peripheral immune responses were evaluated using immunological assays, while CNS effects were examined through histopathological analyses and transcriptomic profiling of brain myeloid cells, including microglia and infiltrating macrophages.

**Results**: Morphine-treated SIV-infected macaques exhibited enhanced viral replication and accelerated disease progression compared to saline. Increased trafficking of monocytes/macrophages into the CNS was observed, correlating with exacerbated neuropathology. Morphine also suppressed peripheral immune responses, suggesting impaired antiviral defense. Transcriptomic analyses of brain myeloid cells revealed significant reprogramming toward a pro-neuropathogenic phenotype, characterized by dysregulated inflammatory signaling, reduced antiviral pathways, and increased expression of genes associated with neurotoxicity.

**Conclusions**: Our findings demonstrate that morphine exacerbates SIV neuropathogenesis through a dual mechanism involving peripheral immunosuppression and central immune activation. This coordinated dysregulation promotes viral persistence and neuroinflammation, ultimately contributing to neuronal injury. Targeting opioid-mediated neuroimmune alterations may represent a promising strategy to mitigate HAND in opioid-using populations.

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Tecniplast Solutions for Animal Facilities

Eng. Carlo DEMALDÈ

*Sales Area Manager – Eastern Europe, Middle East, Africa and Latin America*
*Tecniplast Group, ITALY*
*Via I Maggio, 6*
*21020 Buguggiate (VA) - ITALY*
*www.tecniplast.it*
*Mobile +39 366 8304244*
*carlo.demalde@tecniplast.it*

## ABSTRACT

Tecniplast is a global leader in the design and manufacture of high quality equipment for animal facilities. With decades of experience and a strong commitment to innovation, the company provides integrated solutions that enhance animal welfare, improve ergonomics for facility staff, and ensure operational efficiency and compliance with the highest international standards.

This presentation will highlight Tecniplast's comprehensive portfolio of products and technologies for rodent and primate facilities, including state of the art housing systems, automated washing and decontamination equipment.

Through a combination of engineering excellence, validated performance, and close collaboration with the scientific community, Tecniplast continues to shape the future of modern vivarium design, supporting research institutions worldwide in achieving the highest levels of quality, safety, and reproducibility.

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Suggestions for Animal Facility Planning and Correct Workflows

Eng. Marco GEROSA

*Tecniplast Group, ITALY*
*Via I Maggio, 6*
*21020 Buguggiate (VA) - ITALY*
*www.tecniplast.it*

**ABSTRACT**

The planning of an animal facility requires careful evaluation of operational workflows, biosafety considerations, and regulatory constraints. This presentation examines key elements to consider when designing or reorganizing a laboratory animal environment, including spatial layout, functional zoning, and the logical sequencing of activities involving animals, staff, and materials.

Attention will be given to the relationship between architecture, equipment placement, and biosecurity, as well as to workflow models that help reduce cross contamination risks and improve daily efficiency. Practical examples will be used to illustrate approaches that align with current standards and support consistent facility.

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Modeling the role of transdisciplinary research in community-based conservation projects of primates and their habitats: a case study from Côte-d'Ivoire, West Africa

Dr Inza KONE

*Centre Suisse de Recherches Scientifiques en Côte-d'Ivoire (CSRS), and
Department of Biological Sciences, Université Félix Houphouët-Boigny (UFHB), Côte d'Ivoire,
01 BP 1303 Abidjan 01, Côte d'Ivoire*

## ABSTRACT

If it is widely established that scientific research informs decision-making for the sustainable management of natural resources, the mechanisms for transforming research results into conservation actions are only partially documented. This presentation aims to describe a model that establishes links between different types of scientific research and the main management functions of protected areas. The community conservation program of the Tanoé-Ehy Swamp Forest (FMTE) in southeastern Côte d'Ivoire will serve as a case study. This 11,000-hectare swamp forest has been identified as a highly prioritized site for primate conservation in West Africa. Launched in 2006, the FMTE community conservation program involves 11 neighboring villages. In this program, transdisciplinary research guides various actions and vice versa in an iterative process. Biological, social, and economic sciences are used to inform management decisions and conservation actions. This model has contributed to the success of the program, which is increasingly regarded as a model for empowering rural communities for the sustainability of conservation of sites and primate species threatened with extinction. It can be adapted to any type of conservation program.

**Key words**: *community-based conservation; community empowerment; primate conservation*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Barbary Macaque Health and Conservation: A Veterinary Perspective

Dr Lyes MOHAMMEDI[1], Dr Amel BENATALLAH[1,2]

[1] *Higher National Veterinary School RABIE BOUCHAMA (ENSV), Issad Abbes Street 16111, Oued Smar, Algiers, Algeria*
[2] *Research Laboratory of Food Hygiene and Quality Insurance System (HASAQ), Issad Abbes Street 16111, Oued Smar, Algiers-Algeria*

## ABSTRACT

The Barbary macaque (Macaca sylvanus), the only non-human primate in North Africa, is an endangered species occurring in Algeria. This study adopts an integrated "One Health" approach to investigate the interactions between ecology, behavior, diet, health, and conservation of this species. The analyses revealed the presence of 12 species of gastrointestinal endoparasites, some of which have zoonotic potential, including Balantidium spp, Entamoeba spp., Ascaris spp., and Ancylostoma spp. In parallel, dietary assessment highlights a shift from natural feeding (fruits, leaves, seeds) to anthropogenic food sources, leading to nutritional imbalances and increased health risks, including parasitic infections, metabolic disorders, and potential viral threats. In environments such as the Taza National Park (TNP), anthropogenic pressure also affects macaque behavior by altering feeding strategies and social interactions. These changes may increase stress levels, negatively impact animal welfare, and enhance pathogen transmission. These findings highlight the strong interconnection between ecology, behavior, and health in Macaca sylvanus, emphasizing the need to integrate these dimensions into conservation strategies. A holistic approach is essential to ensure the long-term sustainability of populations in the face of increasing environmental pressures.

**Key words**: *Macaca sylvanus, Endoparasites, One Health, Behavior, Conservation, Diet / Nutrition*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# GESTION D'UN CENTRE DE REPRODUCTION ET DE CONSERVATION DE PRIMATES MENACES

Mr Thierry TSOUMBOU

*Chef de service du Centre de Primatologie*
*Centre International de Recherches Médicales de Franceville (CIRMF)*
*B.P 769 Franceville – Gabon*
*www.thierry.tsoumbou@cirmf.ga*
*Tel : 00241 02 52 12 40/ 00241 06 12 93 22/ 00241 07 77 66 13*

## ABSTRACT

Le déclin alarmant des populations de primate et la destruction de leurs habitats au profit de l'expansion des activités humaines ; sont autant de motifs qui poussent de plus en plus de pays et d'organismes internationaux à mettre en place des mesures spécifiques de conservation de ces espèces. De plus, leurs aptitudes biologiques, physiologiques et cognitives ainsi que leur proximité génétique avec l'espèce humaine, en font, une espèce particulière pour nous dont la conservation nécessite notre plus grande attention.

Au Gabon, le Centre International de Recherches Médicales de Franceville (CIRMF) au travers de son centre de primatologie, s'est engagé dans ce processus de conservation pour les grands singes et ses espèces endémiques de primate. Nous procédons à la saisie de primate en captivité dans les foyers domestiques pour les réintroduire dans des aires protégées au travers d'un processus de quarantaine et de réhabilitation.

Fort de cette expérience dans le domaine de la conservation et avec les indications de l'UICN, nous présentons ici, quelques recommandations sur l'organisation, le mode de gestion, l'alimentation et la gestion sanitaire du centre et de ses pensionnaires.

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# The Organization of the Use of Animals for Scientific Purposes in France: The INRAE model

Dr Muriel VAYSSIER-TAUSSAT

*PhD, HDR, Research Director and Head of Animal Health Department INRAE*
*Director of the National Program (PEPR) Sustainable Livestock*
*Director of the "Carnot France Futur Elevage"*
*National Delegate for Animal Experimentation INRAE*
*147 rue de l'université, 75 007 PARIS*
*Mob : +33 6 70 21 06 18*

## ABSTRACT

The organization of animal experimentation in France is governed by a European directive dating from 2010; this directive was transposed into French law in 2013. It specifies the conditions under which animal experimentation must be conducted: animals must be housed in facilities that have received official approval, individuals working with these animals must undergo continuous training throughout their careers, and research projects involving animals must receive an assessment from an ethics committee for animal experimentation. This committee ensures that the 3Rs principle—Replacement, Reduction, and Refinement—is properly applied. Following this review, the Ministry of Research grants, or does not grant, authorization to carry out the project.

At INRAE (the National Research Institute for Agriculture, Food and Environment), our work focuses on improving farming systems in terms of animal welfare, preserving animal health (particularly with regard to infectious diseases), adapting to and mitigating climate change, as well as economic profitability and social acceptability. This presentation will provide an overview of how INRAE is organized to meet regulatory requirements regarding the use of animals for scientific purposes, the results obtained through animal experimentation, and the alternatives to animal experimentation that we are developing in order to limit their use as much as possible and comply with the 3Rs principles.

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Nonhuman Primate use in Research: mRNA based arming the mucosa against pathogens

Pr Francois VILLINGER

*DVM, PhD, Professor*
*Michale Keeling Center for Comparative Medicine and Research,*
*UT MD Anderson Cancer Center, Bastrop, TX. Fjvillinger@mdanderson.org*

**ABSTRACT -** Nonhuman primates (NHPs) represent a critical preclinical model for moving novel drugs and therapies from the bench to the clinic. In addition, given their close evolutionary proximity to man, they represent unique models of human health issues, including aging, neurodegeneration, metabolic diseases, susceptibility to specific pathogens and more. However the costs of raising and using NHPs in research dictates a high level of optimization of the models of disease and therapy studied as well as ethical sound care and use. The recent COVID19 pandemic exemplified the urgent and wide need of NHPs for rapid testing of vaccines and treatments, even though while NHPs are sensitive to infection with beta corona viruses, pathogenicity was limited. Nevertheless, their immune responses and testing of novel experimental protection mechanisms were critical in the containment of the disease. Along these lines, several pathogens are transmitted via mucosal routes, primarily through the respiratory, gastrointestinal or sexual routes. While immunity at these vast portals of pathogen entry are critical, inducing protective barriers at that level via immunization has proven challenging for many recent viral and bacterial infections, e.g., flu, COVID, Ebola, dengue, HIV, HSV and many more. As an alternative prevention method for instances where either time is critical, for patients unable to mount robust immune responses or for infections against which no preventive vaccine currently exists, we have used mRNA formulated either in water or with polymers to generate local protective antibodies lining the mucosal surface in nonhuman primate models of infection. Indeed, polymer formulated mRNA delivered via nebulization lead to rapid transduction of pulmonary epithelia cells and protein production. Conversely, for the prevention of sexually transmitted disease, transduction of mucosal epithelium with mRNA coding for broadly neutralizing antibodies (bnAbs) to HIV has proven well tolerated and achieving complete protection from vaginal challenges with simian human immunodeficiency virus (SHIV) for up to 6 weeks after administration. Moreover, unlike systemic delivery, mucosal delivery of proteins allows for the design and transduction of synthetic bnAbs with enhanced bioactivity and affinity, without the risk of ADA, offering a highly flexible platform to design effective barriers to infection and even contraception devoid of hormonal and drug treatment. These results were critically demonstrated in the rhesus macaque model of HIV infection, potentially leading to a cost effective non toxic self administered protection from various infections.

**First International Workshop in Algeria on Breeding,**
**Laboratory Animal Models and the Preservation of the Barbary Macaque**
**(FILABE'26)**

*04-10 April 2026*

---

# Authors Abstracts

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Nouvelles données sur la répartitio nactuelle du macaque de Barbarie Macaca sylvanus (Mammalia: Cercopithecidae) en Algérie

Mourad Ahmim[1], Abed Labiod[2]
[1] *Faculté des sciences naturelles et de la vie, Université de Béjaïa, Béjaïa, Algérie. Email: mourad.ahmim@univ-bejaia.dz*
[2] *Parc national de Taza, Jijel, Algérie. Email: labiod.abed19@gmail.com*

[*] *( mourad.ahmim@univ-bejaia.dz) Email of the corresponding author*

## ABSTRACT

Le macaque de Barbarie, Macaca sylvanus (Linnaeus, 1758), est la seule espèce de primate non humain vivant au Maroc et en Algérie, en Afrique du Nord. Il estclassécommeespèceen danger sur la Liste rouge de l'UICN et inscrit à l'Annexe I de la Convention sur le commerce international des espèces de faune et de floresauvagesmenacéesd'extinction (CITES 2018). L'Algérieest un pays à la topographie particulièrement complexe. La végétation se répartiten trois zones qui correspondent aux trois grandes zones physiques : les montagnesboisées du Tell Atlas, les Hauts Plateaux et l'Atlassaharien. Le macaque de Barbarien'étaitprésent que dans la partienord-est des montagnesboisées du Tell Atlas, unevaste zone fortementdécoupéeenmontagnes, plaines et bassins. Sa population étaitfragmentéeenneuf petites sous-populations réparties dans trois régions (Chiffa, Grande Kabylie et Petite Kabylie), mais a disparu de six localités. La répartitiongéographique des trois sous-populations restantes, établiesen 1984, montre que leureffectifvarie de 3 400 à 5 100 individus. Cependant, cesdernièresannées, peu d'études sur la dynamique des populations et la répartition de l'espèceontétémenéesenAlgérie. Nous présentonsici des données actualisées qui montrent que le singe tend à se déplacerd'ouestenest (probablementenfonction de la disponibilitéalimentaireou des incendiesrépétés) depuis Chiffa (36°44'9680''N 2°74'0872''E) dans leparc national de Chrea jusqu'à la localité de Salah Bouchaour (36°59'8668''N-6°85'3913''E) dans la wilaya de Skikda. La population estiméevarie de 3 229 à 3 888 individus dans les parcs nationaux et de 186 à 200 individus dans les nouvelleslocalitésétudiées. Un meilleursuivi des populations de cetteespèceemblématique, et notamment de sesdéplacements, estfortementrecommandé car, en occupant de nouvellesrégions, ellespourraientêtrevictimesd'attaques de la part des habitants, d'autant plus que lesinge se nourrit de leurs cultures et de leurs vergers.

***Keywords:*** *Algérie; conservation; Macaque de Barbarie; Macaca sylvanus; répartition géographique*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Contribution of animal models to physiological and toxicological assessment of natural substances: experimental and ethical perspectives

Zineb Chetouh*, Moumen Yasmina, Trouche Hadjar, Haya Aya Malak, Fellah Besma
*Laboratory of Ecobiology and Animal Physiology, Faculty of Exact Sciences and Natural and Life Sciences, University of Oum El Bouaghi, 04000, Algeria*

*( mourad.ahmim@univ-bejaia.dz) Email of the corresponding author*

## ABSTRACT

Animal models remain a cornerstone of experimental biology and biomedical research, particularly in the evaluation of physiological responses and potential toxicological effects of bioactive natural substances. Their appropriate use is essential for generating reliable preclinical data while ensuring compliance with ethical standards in animal experimentation. The present work aims to highlight an experimental approach based on the use of animal models to assess physiological, behavioral, and general health parameters following controlled exposure to natural substances. Key monitored indicators include body weight evolution, general behavior, and selected biological markers relevant to physiological and toxicological assessment. Particular emphasis is placed on animal breeding conditions, experimental design, and standardization of protocols to ensure reproducibility and scientific validity of the findings. Ethical considerations constitute a central aspect of this work, with strict adherence to international guidelines on animal welfare, housing, handling, and experimental procedures. The study illustrates how well-designed animal experimentation contributes not only to the understanding of biological mechanisms but also to the development of responsible and ethically sound research practices. This contribution directly aligns with the objectives of the FILABE'2026 workshop by emphasizing the role of animal breeding, experimental models, and ethical frameworks in advancing biological and bioscience research. The outcomes of this approach provide a relevant basis for future investigations and continuous improvement of experimental methodologies in animal-based research.

***Keywords:*** *Animal experimentation; animal models; ethical standards;physiology; toxicology*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Epidemiological situation and incidence of human cutaneous leishmaniasis in Algeria: a retrospective study (2010 - 2019)

Asma Amina FOUGHALI[1], Razika BOUKERT[2,3], Sameh BAGHEZZA[4], Hadjer BOUKABACHE[5]

[1] *Département des Sciences Vétérinaires, Faculté des Sciences de la Nature et de la Vie et Sciences de la Terre et de l'Univers, Université Mohamed Khider, 07000 Biskra, Algérie*

[2] *Laboratory of Biotechnologies related to Animal Reproduction, Institute of Veterinary Sciences, University of Blida-1, Route de Soumâa, BP 270, 09000, Blida, Algeria*

[3] *Institute of Veterinary Sciences, University of Blida-1, Blida, Algeria*

[4] *Institute of Veterinary Sciences, University of Constantine 1, El-Khroub, Constantine 1, El-Khroub, Constantine 25100, Algeria*

[5] *Laboratoire d'environnement, sante et production animale (LESPA), Institut des Sciences Vétérinaires et des Sciences Agronomiques, Université de Batna 1-El-Hadj Lakhdar, 05000 Batna, Algeria*

[*] *( Asma Amina FOUGHALI) the corresponding author*

## ABSTRACT

A retrospective study was conducted using data from the National Institute of Public Health (NIPH) to estimate the number and annual incidence of human cutaneous leishmaniasis across 48 provinces of Algeria over a ten-year period (2010 – 2019).

All human cutaneous leishmaniases clinical cases officially notified between 2010 and 2019 were gathered from the annual report of the National Institute of Public Health (NIPH), Algeria.

Between 2010 and 2019, a total number of 93,838 human cutaneous leishmaniasis cases were reported in 48 provinces of Algeria. The peak annual incidence was recorded in 2010 with 59.77 per 100,000 humans, followed by 46.32 per 100,000 humans in 2011. However, the lowest incidence rate occurred in 2012 at 0.16 per 100,000 humans. The annual incidence rates showed an increase again in 2013 (16.67) and 2017 (29.74) This study showed that cutaneous leishmaniasis is endemic in many provinces of Algeria, with the majority of cases concentrated in M'Sila, Biskra, El Oued, and Béchar. These findings highlight the need for strengthened surveillance and targeted control measures in high-risk areas.

***Keywords:*** *Algeria; Cutaneous; Human; Incidence; Leishmaniasis*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Modulation of Oxidative Stress and Hepatic Damage by a Methanolic Cytisus.sp Extract in a Cyclophosphamide-Induced Toxicity Model in rats

BOUDRAA Keltoum[*1], BOUBEKRI Nassima[1,2], SARRI Djamel[3], CHERIET Thamere[1], SEGHIRI Ramdane[1]

[1] *1 Unité de Recherche: Valorisation Des Ressources Naturelles, Molécules Bioactives Et Analyses Physicochimiques Et Biologiques (VARENBIOMOL), Université Frères Mentouri Constantine 1, Route d'Ain El Bey, 25000 Constantine, Algérie, keltoum.boudraa@doc.umc.edu.dz*. Phone Number: 0798626258*

*2 Département de Biologie Animale, Faculté Des Sciences de La Nature Et de La Vie, Université Frères Mentouri Constantine 1, Route d'Ain El Bey, 25000 Constantine, Algérie*

*3 Département des Sciences de la Nature et de la Vie, Faculté des Sciences, Université de Msila, Algérie*

[*] *( keltoum.boudraa@doc.umc.edu.dz) Email of the corresponding author*

## ABSTRACT

Cyclophosphamide is a widely used antineoplastic agent whose therapeutic efficacy is often limited by severe hepatotoxicity, primarily mediated by oxidative stress. This has prompted growing interest in natural compounds with antioxidant and cytoprotective properties that can mitigate these adverse effects. The present study aimed to evaluate the hepatoprotective and antioxidant potential of a methanolic extract obtained from the aerial parts of a Cytisus sp. plant in a rat model of cyclophosphamide-induced liver toxicity.

Male Wistar rats were administered cyclophosphamide (200 mg/kg, i.p.) to induce hepatic injury, while the extract (50 mg/kg) was given orally by gavage for six consecutive days. Biochemical analyses of plasma and liver tissues revealed that cyclophosphamide induced a significant elevation in hepatic injury biomarkers (ALT, AST, cholesterol, and triglycerides), along with a marked increase in lipid peroxidation (MDA). Simultaneously, endogenous antioxidant defenses, including reduced glutathione (GSH) and glutathione peroxidase (GPx), were significantly depleted.

Co-administration of the methanolic extract significantly attenuated these alterations, as evidenced by reduced hepatic injury markers, lower oxidative stress, and partial restoration of antioxidant activity. Histopathological examination further supported these biochemical findings, showing improved hepatic architecture and reduced tissue deterioration in extract-treated animals.

Overall, the study demonstrates that the extract possesses significant antioxidant and hepatoprotective effects, effectively reducing the functional and structural liver damage induced by cyclophosphamide. These findings highlight its potential as a natural adjuvant to limit chemotherapy-induced hepatotoxicity.

***Keywords:*** *Cyclophosphamide; Cytisus sp.; Hepatotoxicity; Oxidative stress*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Design and Implementation of a Blood Donation Management System

V.Aravinda Rajan, Ravi Shyam Singh, K.Sudhir, S.Madhurima, Sonu Kumar
*Department of CSE Kalasalingam Academy of Research and Education Anand Nagar, Krishnankoil- 626126, Tamilnadu, India.*

*(v.aravindarajan@klu.ac.in) Email of the corresponding author*

## ABSTRACT

Modern Online Blood Donation Management Systems (OBDMS) are transforming how blood supply operations are managed in healthcare. These systems aim to resolve persistent challenges like donor-recipient mismatches and shortages. By integrating both web and mobile platforms, OBDMS connect donors, hospitals, and blood banks efficiently. Agile software development ensures flexibility and continuous improvement. ERPbased architectures enhance system scalability and data integration. The client-server model allows real-time synchronization of blood inventory and donor data. Donor registration and tracking modules simplify management and record-keeping. Secure communication channels protect sensitive medical data. Advanced privacy frameworks ensure compliance with healthcare standards. Research shows these systems increase donor participation and response times. Usability studies reflect improved hospital coordination and trust. OBDMS enhance healthcare efficiency through intelligent, technologydriven solutions.

***Keywords:*** *Online Blood Donation Management System, OBDMS, healthcare technology, blood supply management, donor-recipient matching, Python , web application, ERP architecture, client-server model, realtime synchronization, donor registration, emergency response, secure communication, data privacy, healthcare compliance, predictive analytics, blood inventory, hospital coordination, donor participation, agile development, system scalability, data integration, healthcare efficiency*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# The Barbary Macaque Macaca sylvanus in the trophic diet of three carnivores: The Golden Jackal Canis lupaster, the Common Genet Genetta genetta, and the Egyptian Mongoose Herpestes ichneumon in the Darna forest (Djurdjura National Park).

Abdelkrim Limane, Messaoud BENSIDHOUM, Larbi KHIFER, Ania BEN AMMAR and Lylia AMROUCHE

*Mouloud Mammeri University*

*( abdelkrim.limane@ummto.dz) Email of the corresponding author*

## ABSTRACT

The trophic ecology of three mesocarnivores: The Golden wolf Canis lupaster, the Common Genet Genetta genetta, and the Egyptian Mongoose Herpestes ichneumon was studied in the Darna forest (Djurdjura National Park). The study site is subject to a humid Mediterranean climatic influence and is mainly composed of a Holm oak (Quercus ilex) forest with a canopy cover ranging from 60 to 80%. Several villages and orchards also surround our area; the significant trophic potential of these environments attracts Barbary macaques to these zones in search of food resources and water, leading to conflicts with villagers, who in some cases shoot them.

Scat analyses of these three mesocarnivores (wet method) showed a very broad dietary spectrum; however, mammals constitute the essential energy intake in all seasons. The Barbary macaque (and the wild boar) account for more than 25% of the frequencies of occurrence in the wolf's diet and 0.69% in the genet's, but 0% in the mongoose'. The presence of the macaque in the menus of these carnivores originates from its high availability in our study site and its periphery, as this macaque maintains a thriving and growing population, distributed into about thirty groups. Predation on the macaque remains possible, particularly by the wolf, but the numerous carcasses of individuals that died for various reasons remain, however, the main source of Barbary macaque meat for our carnivores.

The overall results obtained during this work highlight the complexity of the relationships between these carnivores, their prey, and their habitats, but especially with the villagers.

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Nutri Care: A Location-Aware Personalized Nutrition App for Orphanages

Rajveer Singh, Nikhil Raj, Ritika Kumari, S.Reshni
*Department of CSE*
*Kalasalingam Academy of Research and Education*
*Anand Nagar, Krishnankoil-626126, Tamil Nadu*

*(dr0176634@gmail.com) Email of the corresponding author*

## ABSTRACT

Malnutrition in orphanage children is still a serious issue, especially in resource-poor settings where food is cooked using limited and available ingredients. This project proposes a nutrition-conscious, content-driven recommendation system that aims to recommend appropriate recipes for children in orphanages aged 5-15 years in Tamil Nadu. A formatted dataset with 20,000 entries was created based on nutritional values and regional food habits. Ingredient details were represented using multi-label binarization, and cosine similarity was used to calculate relevance between available ingredients and recipes. The system also includes age-group filtering and nutritional deficiency prioritization for health-conscious recommendations. To test the model, the recommendation problem was reformulated as a binary suitability classification problem, allowing accuracy, precision, recall, F1-score, and Precision@K metrics to be used for evaluation. The proposed method was successfully implemented as a Streamlit web application, enabling caregivers to receive real-time, nutritionally optimized recipe recommendations. The outcome shows that the system is efficient, interpretable, and ready for real-world implementation in orphanage nutrition planning.

***Keywords:*** *Nutrition Recommendation System, Content-Based Recommendation, Cosine Similarity, Orphanage Nutrition, Nutritional Deficiency, Machine Learning, Precision@K, Streamlit Application, Data Science*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Étude comparative de la démographie des populations et de la stratégie trophique chez le magot (Macaca sylvanus) dans le parc national de Djurdjura et le parc national de Gouraya

Yasmina MAIBECHE[1], Aissa MOAL[1], YAHI Nassima[2], NELLY Menard[3]
[1]*Laboratoire de l'écologie et environnement, Faculté de Science de la nature et de la vie, Université de Bejaia Abderrahmane Mira.*
[2]*Professeur; Faculté de Science et la Nature et de la vie, Université d'USTHB d'Alger,Professeur*
[3]*Station biologique de Paimpont, F- 35380 PAIMPONT -France ,Directrice de recherche*

[*]*(maibsemouma77@gmail.com) Email of the corresponding author*

## ABSTRACT

Le magot d'Afrique du Nord est un exemple parfait de l'approvisionnement des animaux sauvages par l'homme.L'objectif de notre étude est d'évaluer la structure démographique du magot et de déterminer l'impact de la pression humaine sur le statut démographique de la population de magot a fin de réaliser une meilleure conservation des populations de cette espèce dans deux réserves de biosphère de Djurdjura et Gouraya . Cette étude s'étale de février 2008 à mars 2012

Cette recherche est focalisée sur le groupe de Tikjda qui est composé de 54 à74 individus et sur les groupe de Gouraya, les oliviers composés de 31 à 25 individus et celui de Cap carbon qui est varié de 54 à74 individus. Nous avons appliqué La méthode de scan et focus d'Altman (1974) pour l'étude de budget temps et le régime alimentaire et la méthode de dénombrement après l'identification complète des individus de groupe pour l.e suivi démographique. (Ménard,2008 en personne ).

D'après nos résultats les aliments délivrés par l'homme dépassent 14 % du total des aliments consommés par le groupe du Cap carbon et le groupe de Tikjda ainsi dépasse 20% pour le groupe des Oliviers. La dynamique du groupe des Oliviers se résume par 5 naissances en 2010, 5 naissances en 2011 et 5 cas de mortalité infantile et 14 cas de mortalité dont 12 mortalité dans un mois, tandis que le groupe du Cap Carbon est remarqué par la disparition des bébés (10 cas) et l'émigration de 3 mâles adultes en 2010. Le groupe de Tikjda est peu stable, il y a eu plusieurs naissances,12 nouveau-nés en 2010 et 14 en 2011 et plusieurs cas de disparition (2 mâles adultes et 3 enfants mâle sont disparu en 2010 s'ajoutant à deux cas de mortalité (une femelle adulte et un mâle adulte).

Une bonne gestion contribue à la propreté de la nature, à la protection de l'habitat et la conservation des espèces végétales et animales notamment les populations sauvages. Sous la pression humaine, certains groupes de magot commencent à coloniser l'habitat urbain, causant des nuisances potentiellement associées à des risques de transmission de maladies singe /homme.

***Keywords:*** *approvisionnement; démographie; habitat; régime alimentaire.*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# The current status of the welfare of animal used for scientific and educational purposes in Algeria

Abdelouafi Benmouloud[1,2], Salima Charallah[1,3], Adel Ghoul[4], Farida Khammar[1,3]

*[(1)] University of Sciences and Technology Houari Boumediene (USTHB), Faculty of Biological Sciences, LRZA, El Alia, Algiers, Algeria.*
*[(2)] University of M'hamed Bougara Boumerdes (UMBB), Faculty of Sciences, Boumerdes, Algeria.*
*[(3)]University of Algiers 1 Benyoucef Benkhedda, Algiers, Algeria.*
*[(4)] Laboratory of Cellular and Molecular Biology Tamayouz, Biochemistry and Remodeling of the Extracellular Matrix Team, FSB, USTHB, Algiers, Algeria*

*[*](a_ouafibenmouloud@yahoo.fr) Email of the corresponding author*

## ABSTRACT

Animal welfare education promotes knowledge, understanding, skills, attitudes and values related to human involvement in the lives of animals. It includes the effects on animals' abilities to satisfy their needs, and human responsibilities as a result. The aim of this study is to implement action plans through the provision of teaching and education tools in the field of laboratory animal sciences in Algeria. Also, it describes the main laboratory animal science training events including courses, lectures and trainings that have taken place in Algeria between 2017 and 2025, in order to suggest and implement a plan for the sustainability of laboratory animal science capacity, teaching and educational tools. Sharing between 10 universities, high schools and the Pasteur Institute of Algiers, more than 700 participants have encompassed theoretico-practical training, technical skills related to the use of laboratory animals. The animals used were mostly mammals in particular rodents and some farm animals. However, in Algeria the wide use of wild animals in research and education is a subject of discussion to establish a specific number of regulations, policies, and guidelines under the supervision of the Algerian Association of Experimental Animal Sciences (AASEA), which is charged to ensure the ethical and appropriate use of these animals. Moreover, actually we report the establishment of several local institutional ethics committees throughout the country, coordinated by a working group led by AASEA. It is important that animal welfare training becomes an essential part of the professional development of any person planning to work with animals or in animal policy. Finally, some actions have already been taken in Algeria to promote the ethical use of animals but many more sustainable actions are needed which require cooperation, harmonization of policies and the establishment of regional and international networks for the exchange of experiences.

***Keywords:*** *Algeria; Animal experimentation; Animal welfare; Education; Scientific research.*

**First International Workshop in Algeria on Breeding, Laboratory Animal Models and the Preservation of the Barbary Macaque (FILABE'26)**

*04-10 April 2026*

# Tourist Provisioning as a Driver of Fecal Microbiota Shift in Wild Barbary Macaques (Macaca sylvanus): Implications for Species Conservation in Algeria

Mourad Boumenir[1,2]*, Jean-Luc Hornick[1,2], Bernard Taminiau[2,3], Georges Daube [2,3], Fany Brotcorne[4], Mokrane Iguer-Ouada[5]* and Nassim Moula[2,6,7]

[1]*Department of Veterinary Management of Animal Resources, Faculty of Veterinary Medicine, University of Liege, Liege, Belgium;*
[2] *Fundamental and Applied Research for Animal and Health (FARAH), University of Liege, Liege, Belgium;*
[3] *Food Microbiology, Department of Food Sciences, Faculty of Veterinary Medicine, University of Liege, Liege, Belgium;*
[4] *Behaviour Biology Lab, Research Unit SPHERES, Department of Biology, Ecology, and Evolution, Faculty of Sciences, University of Liège, Liege, Belgium;*
[5] *Associated Laboratory in Marine Ecosystems and Aquaculture, Department of Biological Sciences of the Environment, Faculty of Nature and Life Sciences, University of Bejaia, Bejaia, Algeria;*
[6] *GIGA Animal Facilities, Liege University, Liege, Belgium;*
[7] *Department of Animal Production, Faculty of Veterinary Medicine, Liege University, Liege, Belgium.*

[*]*(Mourad.Boumenir@uliege.be) Email of the corresponding author*

## ABSTRACT

The Barbary macaque (Macaca sylvanus) is the only African macaque and is currently classified as "Endangered" by the IUCN. Algeria remains a stronghold for the species, with an estimated population of over 9,000 individuals concentrated in national parks such as Djurdjura, Gouraya, and Chréa. However, these populations face severe anthropogenic pressures, including habitat fragmentation, illegal trade, and road mortality. Among these threats, tourism pressure involving food provisioning has been reported as a major factor disturbing the ecology and health of wild primate populations. The present study investigates the impact of tourist provisioning on the fecal microbiota of wild Barbary macaques. To this end, we collected a total of 12 fecal samples from two groups of M. sylvanus in the Bejaia region, Algeria. The first group (tourist-provisioned) was located in the tourist area of the Gouraya National Park, while the second group (wild-feeding) was located in the Akfadou forest. Following DNA extraction, fecal microbiota composition was analyzed using 16S rRNA gene sequencing. Additionally, behavioral monitoring was conducted to assess the proportion of time allocated to the consumption of anthropogenic food by the tourist-provisioned group. Statistical analyses were performed to compare alpha and beta diversity, and Non-metric Multidimensional Scaling (NMDS) was applied to visualize differences in microbial community structure between groups. Our results revealed the presence of 209 bacterial genera belonging to 17 phyla. Firmicutes was the most abundant phylum, followed by Bacteroidetes and Verrucomicrobia. Significant differences in fecal microbiota composition were detected between the two groups. Notably, a marked reduction in Ruminococcaceae, bacteria essential for the fermentation of natural plant fibers, was observed in the tourist-provisioned group. Analysis of Molecular Variance (AMOVA) showed a significant difference in community structure between the wild-feeding and tourist-provisioned groups, whereas alpha diversity and homogeneity of molecular variance (HOMOVA) showed no significant differences. Behavioral analysis further indicated that 60% of feeding time in the tourist-provisioned group was devoted to anthropogenic food consumption (primarily sugar-rich and high-energy items). Such an alteration in diet and gut microbiota composition may negatively affect health status by increasing the risk of obesity and disease. This study provides evidence-based data supporting conservation measures aimed at reducing provisioning in tourist areas to safeguard the long-term ecological and physiological resilience of M. sylvanus.

***Keywords:*** *Anthropogenic food subsidies; Barbary macaque; Conservation biology; Gut microbiota; Wildlife monitoring.*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Etude des lactoprotéines produites par deux types génétiques de lapines de la région de Tizi Ouzou

AMROUN THILALI THANUNA, Daoudi Zerrouki Nacira, MADIA CHARLIER, GUY MIRANDA and PATRICE MARTIN

*Mouloud Mammeri University*
*( thilali.amroun@ummto.dz) Email of the corresponding author*

## ABSTRACT

L'objectif de ce travail consiste à étudier la fraction protéique majeure du lait de deux types génétiques de lapines, élevées dans la région de Tizi Ouzou (Algérie) : la population blanche (PB n= 30 femelles) et la souche « synthétique » (SS n= 30 femelles). Les échantillons de lait collectés au 10e jour de lactation dans les deux populations ont été analysés par chromatographie en phase liquide couplée à un spectromètre de masse (LC-MS). Nous avons ainsi pu identifier et caractériser les lactoprotéines majeures des deux types génétiques ainsi que leurs principales isoformes de modifications post-traductionnelles. Les caséines αs1 et β sont majoritaires (50% des protéines totales) ; la caséine αs2-like représente 13,5% et les caséines αs2 et κ respectivement 4 et 2,7%. Parmi les protéines sériques, la WAP (Whey Acidic Protein) est majoritaire (14,5%) et la lactoferrine représente 10% des lactoprotéines. L'analyse des profils chromatographiques a permis d'observer majoritairement une similarité de l'ensemble des pics correspondant aux lactoprotéines majeures. Les deux types génétiques ne présentent pas de différence significative lorsqu'on compare les moyennes des proportions relatives de chacune des lactoprotéines majeures. Cependant, une minorité de profils chromatographiques atypiques mettent en évidence un polymorphisme des caséines αs1 et αs2, qui est particulièrement marqué dans le lait PB. Deux nouveaux variantes ont été identifiés pour la caséine αs2 (variantes B et C) et un nouveau variant pour la caséine αs1 (variante B). De plus, les analyses poussées en LC-MS ont permis de déterminer les masses moléculaires respectives par rapport aux variants naturels.

***Keywords:*** *lapin, lactorpotéine, nouveau variant, PB, SS, αs1 et αs2.*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Responsible Animal Experimentation: Fundamentals, Ethics and Good Practices for Quality Science

Adel GHOUL[1,2], Abdelouafi Benmouloud[2,3,4], Salima CHARALLAH[2,3], Khammar Farida[2,3]
[1] *USTHB-FSB. Laboratoire BCM, Biochimie et Remodelage de la Matrice Extracellulaire. BP 32 Bab Ezzouar. El Alia. 16111. Alger. Algérie.*
[2] *Algerian Association for Sciences in Animal Experimentation (AASEA)*
[3] *USTHB-FSB. Laboratoire de Recherches sur les Zones Arides (LRZA)*
[4] *UMBB-FS.*

[*](Adel GHOUL*) Email of the corresponding author*

## ABSTRACT

Animal experimentation is still essential for biomedical research, but it imposes a significant ethical responsibility. Good practices are based on the fundamental principle that the quality of scientific data is inseparable from animal welfare. Stressed or suffering animals produce biased and non-reproducible results. Animal experimentation is a common practice that is strictly regulated by law today. The purpose of this work is to provide information on biology, ethics and regulation to inform consideration on the legitimacy of animal experimentation. Researchers must demonstrate the necessity and validity of any experiment on animals, and to conscientiously examine whether it is ethically justifiable by rigorously weighing up the interests at stake. In this context we would also like to highlight the efforts of the Algerian Association for Sciences in Animal Experimentation (AASEA) in supporting Algerian researchers to comply with animal welfare requirements. Since its establishment in 2014, AASEA has play an active role in this cause by organizing numerous national training courses, intended for university doctoral students. These courses aim to provide with the knowledge and skills necessary to work in ethical and regulatory compliance.

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Pisciculture intégrée en milieu saharien : caractérisation de l'élevage du tilapia rouge (Oreochromis niloticus) dans la région de Biskra

**OUZZIR Lamya** ; ADOUANE Asma

*Département des Sciences Agronomiques, Université de Biskra, BP 145, Biskra 07000, Algérie.*
**(webmaster@univ-biskra.dz) Email of the corresponding author*

## ABSTRACT

En zones arides, la rareté des ressources hydriques et les sols pauvres impose des stratégies d'optimisation basées sur l'économie circulaire. La pisciculture en Algérie, particulièrement dans la wilaya de Biskra, s'est développée comme une activité complémentaire à l'agriculture oasienne. L'élevage du tilapia (*Oreochromis niloticus* « Tilapia rouge ») y est privilégié pour sa robustesse, adaptée à ces conditions environnementales en raison de sa tolérance aux variations de température, de salinité et de qualité de l'eau, ainsi que de sa croissance rapide et de sa facilité d'élevage (**ElSayed, 2006 ; FAO, 2020**). Cette intégration repose sur le concept de « l'eau fertilisante », où les effluents piscicoles, riches en nutriments organiques (azote et phosphore), sont valorisés pour l'irrigation, réduisant ainsi la dépendance aux engrais chimiques. Dans ce contexte, la pisciculture en zone aride joue un rôle important dans la diversification des activités agricoles et l'amélioration de la productivité des exploitations.

Cette étude analyse les caractéristiques technico-économiques de 22 exploitations aquacoles dans la wilaya de Biskra. Les résultats révèlent une dynamique socioprofessionnelle marquée par une forte implication des agriculteurs (50 %) et un niveau d'instruction universitaire notable (36,3 %). Le système de production prédominant est le semi-intensif ouvert, alimenté majoritairement par les eaux de forage (55 %). Une synergie totale est observée : 100 % des exploitations pratiquent l'intégration agriculture-aquaculture (IAA), où les effluents piscicoles riches en nutriments sont intégralement valorisés pour l'irrigation, principalement en arboriculture (79 %).

Bien que la production de biomasse reste modeste (60 % des fermes produisent moins d'une tonne par an), une spécialisation en amont de la filière émerge, avec 12 écloseries capables de produire annuellement jusqu'à 800 000 alevins. Sur le plan de la gestion zootechnique, 82 % des pisciculteurs assurent un suivi de croissance, tandis que 57 % optimisent les coûts opératoires par l'incorporation de sous-produits agroindustriels locaux dans l'alimentation.

Malgré un marché porteur (91 % de perception positive de la demande), le secteur se heurte à des contraintes structurelles : le coût élevé des intrants (32 %) et un besoin pressant en formation technique (23 %). Cette recherche démontre que la pisciculture à Biskra constitue un levier stratégique de résilience oasienne et de sécurité alimentaire. Pour transformer ce potentiel en filière durable, le renforcement de l'encadrement technique et l'organisation des circuits de commercialisation s'avèrent impératifs.

***Keywords:*** *Aquaculture intégrée ; Biskra ; Tilapia ; Zone aride ; Réutilisation de l'eau*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Population Status and Distribution of the Barbary Macaque (Macaca sylvanus) in Algeria

Mohamed Benrabah

*Wade Consultants*

*(mlbenrabah@gmail.com) Email of the corresponding author

## ABSTRACT

The Barbary macaque (Macaca sylvanus) is an endangered primate and the only macaque species native to North Africa. Although historically widespread, the species now survives in fragmented forest habitats in Morocco and Algeria. Despite its conservation importance, few recent population surveys have been conducted in Algeria. This study reassessed the population size, spatial distribution, and anthropogenic pressures affecting Barbary macaques across their Algerian range. Field surveys were conducted across 22 sites using line-transect surveys, home-range observations, and GIS-based spatial analysis. Evidence of human disturbance was recorded during transects to evaluate pressures on habitat. Results indicate a significant population decline compared with historical estimates from the late twentieth century. Current population size is estimated at approximately 1,500–3,100 individuals, representing a decline of roughly 35–45%. Human disturbance was recorded in 71% of transects surveyed. These findings highlight the need for strengthened conservation strategies, habitat protection, and long-term monitoring of Barbary macaque populations in Algeria.

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Genetic Diversity and Phylogeography of Barbary Macaques in North Africa

Mohamed Benrabah, Francelly Martínez Sosa

*Wade Consultants*

*(mlbenrabah@gmail.com) Email of the corresponding author

## ABSTRACT

The Barbary macaque (Macaca sylvanus) is a critically endangered primate with a fragmented distribution across Morocco and Algeria. Understanding its genetic structure is essential for effective conservation management. This study investigates the phylogeographic relationships and genetic diversity of Barbary macaque populations using mitochondrial DNA (mtDNA) from the hypervariable control region. DNA extracted from fecal and hair samples from wild and captive individuals was analyzed and combined with previously published genetic datasets. The results reveal high genetic diversity within Algerian populations and indicate that they contain greater variability than Moroccan populations. Phylogenetic analyses suggest that Moroccan populations diversified after becoming isolated from Algerian populations. Captive populations were found to represent only a subset of the species' overall genetic diversity, primarily reflecting Moroccan lineages. These findings highlight the importance of conserving Algerian populations as key reservoirs of genetic diversity and emphasize the need to maintain habitat connectivity to support gene flow among fragmented populations.

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# An overview of the Animal Ethics Commitees in Algeria : Establishment, progress and challenges

Abdelouafi Benmouloud[1,2,3,4], Salima Charallah[1,3,4], Farida Khammar[1,3,4]

[(1)] *University of Sciences and Technology Houari Boumediene (USTHB), Faculty of Biological Sciences, LRZA, El Alia, Algiers, Algeria.*
[(2)] *University of M'hamed Bougara Boumerdes (UMBB), Faculty of Sciences, Boumerdes, Algeria.*
[(3)] *University of Algiers 1 Benyoucef Benkhedda, Algiers, Algeria.*
[(4)] *Algerian Association of Animal Experimentation Sciences (AASEA), Faculty of Biological Sciences, El Alia, Algiers, Algeria.*

[*] *(a_ouafibenmouloud@yahoo.fr) Email of the corresponding author*

## ABSTRACT

In Algeria, as in other countries, ethical committee approval is mandatory for all animal experimentation. The Institutional Animal Care and Use Committee (IACUC) plays a crucial part in monitoring and organising the humane use of animals in scientific investigation. Investigators are widely conscious of the requirement of ethical review prior to animal experimentation to ensure the quality of research and animal welfare. Thus, the aim of this overview is to investigate the ethical evaluations of animal research proposals by local ethics committees and to help scientists to understand the action of the Algerian-IACUC in the current approval process and its role in animal welfare. Here, we reported the USTHB-IACUC activities, including committee establishment, protocol review, and post-approval monitoring of protocols, which the IACUC has carried out in the last years. To assess the issue, fourty four hypothetical projects were reviewed from january 2023 to february 2026, using laboratory, domesticated and wild animals for biomedical research and safety testing. The most of protocols were approved and research papers and Doctorat thesis research protocols constituted the majority of the total reviewed protocols. The analysis revealed challenges in the evaluation of projects requiring project-based approval, those involving regulated procedures, species-specific considerations, wild species and procedures performed outside laboratories, multi-center studies, and animal tissues. Indeed, the ethical and regulatory oversight and advancements were also discussed, and the limited number of committees and the lack of IACUC policy in Algeria were examined. The increased establishment of reliable ethical review procedures and appropriately functioning animal ethics committees will improve animal well-being, enhance research quality and culture and strengthen standards of animal care and participate in sustainable socio-economic development.

***Keywords:*** *Animal ethics; Algeria; animal protocol review; approval monitoring; IACUC.*

**First International Workshop in Algeria on Breeding, Laboratory Animal Models and the Preservation of the Barbary Macaque (FILABE'26)**
*04-10 April 2026*

# Seed dispersal by Barbary macaque ( Macaca sylvanus ) at Gouraya National Park, Algeria: handling methods, germination rates, and dispersal quantity

BRAHMI Bochera[1], KEDDOUH Nadjet[1], BOUMENIR Mourad[2,3] , IGEROUADA Mokrane[1]

[1] *Associated Laboratory in Marine Ecosystems and Aquaculture, Department of Biological Sciences of the Environment, Faculty of Nature and Life Sciences, University of Bejaia, 06000 Bejaia, Algeria;*
[2] *Department of Veterinary Management of Animal Resources, Faculty of Veterinary Medi-cine, University of Liege, 4000 Liege, Belgium;*
[3] *Fundamental and Applied Research for Animal and Health (FARAH), University of Liege, 4000 Liege, Belgium (B.M).*

[*] *(brahmibouchra17@gmail.com) Email of the corresponding author*

## ABSTRACT

Seed dispersal is a key ecological process that contributes to plant regeneration and the maintenance of biodiversity. Previous studies have demonstrated that several primate species play an important role as seed dispersers. However, the contribution of the Barbary macaque (Macaca sylvanus) to this ecological function remained unexplored. The present study investigates, for the first time, the potential role of the Barbary macaques as seed disperser. Fieldwork was conducted on two habituated groups in Gouraya National Park between April and June 2021. Behavioral observations were performed using 20-minute focal sampling to determine handling methods. In addition, 69 dry and fresh fecal samples were collected, to detect the potential seed presence, seed quantity and species. A germination test was then performed to assess the effect of gut passage and feces on germination parameters. Our results indicate that Barbary macaques use four seed handling methods including swallow, spit out, drop, and destroy. The seed destruction method was the most common. Interestingly, feces analyses revealed the presence of 1446 intact seeds in 56 fresh fecal samples. These seeds belonged to eight species. Rhamnus alaternus and Opuntia stricta were the most abundant species. Finally, the germination tests were made only on Opuntia stricta seeds. The germination rate of the seeds recovered from dry (62%) and fresh (54.31%) feces was significantly higher than control seeds. Furthermore, the latency period of dry feces was lower (17 days) compared to other categories (28 days). Based on the results of our study, we suggest that Barbary macaques can disperse seeds of some species and enhance the germination of defecated cactus seeds. As our study was limited in time and space, it would be interesting to pursue the study over a period covering the four seasons of the year and in different habitats of the Barbary macaques.

***Keywords:*** *seed dispersal, Barbary macaque, germination, handling methods, Gouraya national park.*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Le Macaque de Berbérie (*Macaca sylvanus*) et la biodiversité dans le Parc National du Djurdjura. Algérie

M. OUDAHMANE

*Département d'Ecologie et environnement*
*Faculté des Sciences biologiques et des sciences agronomiques*
*Université Mouloud Mammeri de Tizi-Ouzou*
*Tizi-Ouzou*
*Algérie*

*(mohammed.oudahmane@ummto.dz) Email of the corresponding author*

## ABSTRACT

Le Parc National du Djurdjura (PND) fait face a d'innombrables contraintes de gestion. Parmi elles, une très forte pression pastorale. En effet, l'élevage extensif de bétail, et de surcroit en divagation, provoque des dégradations des habitats, suite au tassement du sol et au piétinement de la végétation. Le singe magot (*Macaca sylvanus*), qui très souvent partage le même habitat avec le bétail, voit son régime alimentaire perturbé et son domaine vital menacé.

Le singe magot, espèce endémique de l'Algérie et du Maroc, et qui est le seul représentant du genre Macaca en dehors de l'Asie, s'avère être justement un bioindicateur intéressant de l'état de la biodiversité dans le PND.

A l'instar de plusieurs espèces de primates, le singe magot joue un rôle primordial dans le maintien de la structure et de la dynamique des habitats qu'il fréquente. De par son régime alimentaire varié, et essentiellement folivore-frugivore, il contribue ainsi au maintien des espèces végétales qu'il consomme, en disséminant les graine. De façon plus explicite, Macaca sylvanus compte dans son régime alimentaire près de 45% de plantes zoochores. En consommant ces dernières, le singe participe à la dispersion des graines de nombreuses plantes endémiques et médicinales et assure par conséquent leur germination. Ces mêmes plantes endémiques et plantes médicinales qui font partie intégrante

de la richesse de la biodiversité du PND, sont potentiellement menacées, suite aux changements dans les domaines vitaux des différents groupes de magots. La justification de la protection du singe magot, victime de plusieurs délits, n'est plus à démontrer

***Keywords:*** *biodiversité, bioindicateur, Djurdjura, Macaca sylvanus, zoochores*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# La gerbille saharienne, modèle expérimental de choix pour l'étude des interrelations endocrino-métaboliques : relations biochimiques et hématologiques

Zatra Yamina[1,2], Aknoun-Sail Naouel[2], Kheddache Arezki[2,3], Benmouloud Abdelouafi[1,4], Chakhma Asma[1,2], Khammar Farida[2], Charallah Salima[2] et Amirat Zaina[2]

[1] *Département de Biologie, Faculté des Sciences de la nature et de la vie, Université de Blida1, 09000, Algérie*
[2] *Département de Biologie et physiologie des organismes, Faculté des Sciences Biologiques, Laboratoire de Recherche sur les Zones Arides (LRZA) Université des Sciences et de la Technologie Houari Boumediene USTHB, 16111, Alger, Algérie*
[3] *Université Mouloud Mammeri, Faculté des Sciences Biologiques et des Sciences Agronomiques, Département de Biologie, 15000 Tizi-Ouzou*
[4] *Département de Biologie, Faculté des Sciences, Université M'hamed Bougara de Boumerdès (UMBB), Boumerdès, Algérie*

[*] *(yaminazatra@gmail.com) Email of the corresponding author*

## ABSTRACT

L'étude des interrelations glandulaires permet une meilleure connaissance de la régulation des principales fonctions de l'organisme. Chez les rongeurs déserticoles, les paramètres biochimiques sont connus pour présenter des modifications adaptatives importantes assurant la survie en zones arides. Il nous a dès lors paru intéressant d'apprécier la modulation de ces paramètres par les androgènes chez la gerbille. Cette étude est menée par des expériences de castration suivie de traitement hormonal substitutif en saison sexuelle. Des gerbilles mâles adultes sont réparties en trois lots expérimentaux de 8 individus : un lot témoin, un lot castré et un lot castré traité à la testostérone. Les gerbilles sont anesthésiées par injection intrapéritonéale de 10 mg/kg de chlorhydrate de kétamine associée d'un analgésique (10 mg/kg de xylazine). Chez le lot castré, 16 mâles subissent une castration bilatérale après ligature des artères spermatiques. Huit gerbilles castrées depuis 30 jours sont traitées pendant sept jours par injection intramusculaire biquotidienne de 75µg d'oenanthate de testostérone/40µl d'huile de sésame. Les lots témoins et castrés ont reçu l'huile de sésame. Les animaux sont pesés avant l'euthanasie, pratiquée sous anesthésie profonde le lendemain de la dernière injection chez le lot traité à la testostérone. Les résultats de la castration montrent que les hormones thyroïdiennes, la glycémie, la créatinine, l'urée, les triglycérides, les transaminases (ALAT, PAL), et les électrolytes plasmatiques diminuent alors que le cortisol, le cholestérol et l'ASAT augmentent. Aussi, les taux des globules rouges, de l'hémoglobine, de l'hématocrite, du VGM, de la CCMH et du TGMH sont réduits. Toutefois, les globules blancs augmentent suite à celles des monocytes et des granulocytes. Pour conclure, chez la gerbille la testostérone module les paramètres biochimiques afin de maintenir l'homéostasie nécessaire à la survie de cette espèce en milieu aride.

***Keywords:*** *Castration ; Gerbillus tarabuli ; Hormones sexuelles ; Paramètre biochimiques ; Hématologiques.*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Algerian Bee Products: Examination Of The Anti-Hyperglycemic Properties Of Bee Venom, Bee Pollen, And Royal Jelly In Diabetic Mice Induced By Alloxan « In Vivo Study »

Moussa Abderrazak BAMBRA, Yamina BOUATROUS

*Department of Nature and Life Sciences, Faculty of Exact Sciences and Nature and Life Sciences, Mohamed khider University, Biskra, Algeria, zip code: 07000*

*( y.bouatrous@univ-biskra.dz) Email of the corresponding author*

## ABSTRACT

Diabetes mellitus is a prevalent endocrine disorder marked by elevated blood glucose levels and disturbances in the metabolism of fats, carbohydrates, and proteins. It is also linked to a heightened risk of complications, especially vascular diseases. Recent studies have concentrated on investigating bioactive compounds from natural sources for their possible therapeutic benefits. This research aimed to assess the anti-diabetic properties of Algerian bee products—bee venom (ABV), royal jelly (AJR), and bee pollen (ABP)—in vivo using mice with alloxan-induced diabetes. Male and female Swiss albino mice (20-30 g) were subjected to alloxan injections to induce diabetes and subsequently treated for one week with either high or low dosages of the bee products. The control group was given a saline solution, whereas the diabetic group received a single administration of alloxan (140 mg/kg). The bee products were delivered orally through gavage for royal jelly and bee pollen, and administered intraperitoneally for bee venom. Additionally, metformin (100 mg/kg) served as a reference treatment for oral hypoglycemia. Blood glucose levels were assessed before and following treatment using a glucometer. The results indicated that treatment with Algerian bee products significantly decreased hyperglycemia in diabetic mice. Furthermore, these products contributed to normalizing biochemical and histological issues related to diabetes. These results imply that Algerian bee products may have promising therapeutic benefits in the management of diabetes and its related complications.

***Keywords:*** *Algerian bee pollen ; Algerian bee venom ; Algerian royal jelly ; Alloxane ; Anti-diabetic ; Hyperglycemia ; In vivo.*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Résistance aux antibiotiques chez le singe magot (Macaca sylvanus) en Algérie : rôle de la faune sauvage comme réservoir de bactéries multirésistantes

Taous Bachiri, Chafiaa Medboua, Donia Mechoub, Naila Maizi

*Département de Biologie- Faculté des Sciences de la Nature et de la Vie et des Sciences de la Terre,
Universite Akli Mohand Oulhadj – Bouira*

*( t.bachiri@univ-bouira.dz) Email of the corresponding author*

## ABSTRACT

L'émergence et la dissémination des bactéries résistantes aux antibiotiques constituent un problème majeur de santé publique mondiale. Le rôle de la faune sauvage dans la circulation de ces bactéries entre différents écosystèmes reste encore insuffisamment étudié. Cette étude vise à évaluer la résistance aux antibiotiques chez des entérobactéries isolées à partir du singe magot (*Macaca sylvanus*), une espèce emblématique de la faune sauvage en Afrique du Nord.

Des échantillons fécaux ont été collectés dans différentes zones forestières de la région de Bejaia (Algérie). Les entérobactéries isolées ont été identifiées par des méthodes bactériologiques conventionnelles et par spectrométrie de masse MALDI-TOF. La sensibilité aux antibiotiques a été évaluée par la méthode de diffusion sur gélose Mueller-Hinton selon les recommandations de l'EUCAST. Les β-lactamases à spectre étendu (BLSE) ont été recherchées par des tests phénotypiques, tandis que les gènes de résistance ont été caractérisés par PCR et séquençage. La clonalité des souches a été étudiée par typage MLST.

Au total, 51 souches d'entérobactéries ont été isolées à partir de 380 prélèvements fécaux, dont 47 souches productrices de BLSE de type CTX-M-15. Plusieurs gènes de résistance ont été détectés, notamment qnrA associé à la résistance aux quinolones et aac(6')-Ib impliqué dans la résistance aux aminosides. Le typage moléculaire a révélé la présence de clones internationaux d'*Escherichia coli*, notamment ST131, ST405 et ST648. De plus, le gène mcr-1, responsable de la résistance à la colistine, a été identifié chez une souche d'*E. coli* associée aux gènes blaCTX-M-15, blaTEM-1 et qnrB19.

Ces résultats montrent que le singe magot peut constituer un réservoir de bactéries multirésistantes d'importance clinique et contribuer à la dissémination de gènes de résistance dans l'environnement. Cette étude souligne l'importance d'intégrer la faune sauvage dans les stratégies de surveillance de l'antibiorésistance selon l'approche One Health.

***Keywords:*** *antibiorésistance, entérobactéries, Macaca sylvanus, BLSE, mcr-1, faune sauvage, Algérie.*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Environmental *Cryptosporidium* spp. and Non-Human Primate Health: Emerging Conservation and Biosafety Concerns

Oumaima Rouidi, Amel Benatallah

*Research Laboratory of Food Hygiene and Quality Insurance System (HASAQ) ),
Higher National Veterinary School RABIE BOUCHAMA , Issad Abbes Street 16111, Oued Smar, Algiers-Algeria*

*(o.rouidi@etud.ensv.dz) Email of the corresponding author*

## ABSTRACT

Cryptosporidiosis, caused by *Cryptosporidium*, is a parasitic disease of major public health and veterinary importance, affecting humans, domestic animals and wildlife. While its role in livestock systems and water contamination is well documented, its potential impact on non-human primates remains insufficiently explored, particularly in contexts where agricultural activities, shared water resources and wild populations coexist. In Algeria, the lack of specific data on primate exposure to waterborne protozoa raises questions about health risks and conservation implications.

This review aims to analyse the environmental transmission routes of *Cryptosporidium* spp., synthesize the available data on infections in non-human primates, and assess the potential risks. A bibliographic search was conducted using PubMed, Scopus, Web of Science and Google Scholar databases, selecting studies reporting *Cryptosporidium* infections in non-human primates, environmental contamination and inter-species transmission. The diagnostic methods described include microscopy, immunoenzymatic tests and molecular approaches, enabling accurate identification of species and subtypes. International data highlight the presence of several zoonotic species, particularly *C. parvum* and *C. hominis*, in different primate species. Close interactions between humans, livestock and wildlife, combined with contamination of water resources, promote complex transmission dynamics at the human-animal-environment interface. These findings suggest that waterborne protozoan pathogens may constitute an underrecognized risk factor for primate health and conservation.

In conclusion, integrating environmental surveillance of protozoan pathogens into conservation and health monitoring programs for non-human primates appears essential. A One Health approach, linking animal health, public health, and ecosystem management, would strengthen biosafety measures and support sustainable biodiversity preservation strategies.

***Keywords:*** *Cryptosporidium spp., non-human primates, environmental transmission, One Health, conservation.*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Importance des animaux de laboratoire dans l'évaluation de la toxicité reproductive : étude de l'effet du propineb chez le lapin mâle Oryctolagus cuniculus

Taguig Assia[1]*; Baba Ahmed Fedia[2]; Boubsil Soumaya[3*]

[1] *Université Batna 2-Mostefa Ben Boulaid, Département de biologie des organismes, Batna 5000, Algérie*
[2] *Université Chadli Ben Djedid, Département de biologie, El Taref 36000, Algérie*
[3] *Université Mohamed Chérif Messaidia, Département de biologie, Souk Ahras 41000, Algérie*
[*] *Laboratoire de recherche en écophysiologie animale, Département de biologie, Faculté des sciences, Université Badji Mokhtar Annaba 23000, Algérie*

[*]*(a.taguig@univ-batna2.dz) Email of the corresponding author*

## ABSTRACT

L'utilisation d'animaux de laboratoire est un outil fondamental en toxicologie et en biologie de la reproduction, permettant d'évaluer les effets des substances chimiques sur l'organisme et d'identifier les risques potentiels pour la santé. Le lapin domestique (Oryctolagus cuniculus) est un modèle particulièrement adapté à l'étude de la fonction reproductive masculine, en raison de la bonne caractérisation de sa physiologie.

Notre étude a porté sur l'impact du propineb, un fongicide largement utilisé, sur les paramètres reproducteurs des lapins mâles. Les animaux exposés ont été comparés à un groupe témoin non traité. Les analyses ont porté sur le taux sérique de testostérone, le poids des testicules, ainsi que sur des paramètres biochimiques sanguins tels que le cholestérol et la glycémie.

Par rapport aux témoins, les lapins exposés au propineb présentaient une diminution significative du taux de testostérone et du poids testiculaire. Sur le plan biochimique, une augmentation notable du cholestérol et de la glycémie a été observée, ce qui indique un déséquilibre hormonal et métabolique. Ces perturbations suggèrent que le propineb a un effet reprotoxique sur le mâle, ce qui peut compromettre la fertilité.

Cette étude illustre l'importance des animaux de laboratoire pour la détection précoce des effets toxiques, la compréhension des mécanismes de perturbation et la protection de la santé publique face aux pesticides.

***Keywords:*** *Cholestérol ; Lapin (Oryctolagus cuniculus) ; Testostérone ;Toxicité ;reproductive*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Beneficial Effects of Fluoxetine on Obesity-Induced Lipid Dysmetabolism, Oxidative Stress, and Depressive Behaviors in Wistar Rat Models

Salsabil MEBARKI [*a] , Sara SEBTI[a] , Redouane REBAI[a c], Fethi BENBELAID[b]

**Laboratory for Promoting Innovation in Agriculture in Arid Regions (PIARA), University of Biskra, 07000 Biskra, Algeria*
*[a]Department of Natural and Life Sciences, University of Biskra, 07000 Biskra, Algeria*

*[b]LAMAABE Laboratory, Abou Bekr Belkaid University of Tlemcen, Tlemcen, Algeria*
*[c]Laboratory of Biotechnology, National Higher School of Biotechnology, Constantine, Algeria*

*[*](mebarkisalsabile@email.com) Email of the corresponding author*

## ABSTRACT

The aim of this study is to investigate the beneficial effects of fluoxetine on obesity-induced lipid metabolism disorders and brain oxidative stress markers related to depressive behaviors in rats. For this purpose, rats of Wistar strain were used as experimental animals. Obesity was induced in rats using a rich diet (RC), and the obese rats were then subjected to fluoxetine treatment for 4 weeks at a certain dose. The behavioral studies conducted in rats included the open field test (OFT) for anxiety and the forced swimming test (FST) for depressive behaviors. After 24 hours of behavioral studies, blood samples were collected for glucose, lipid profile, and oxidative stress studies, and brain tissues from prefrontal cortex and hippocampal regions were subjected to antioxidant status studies.

The results showed that fluoxetine exhibited significant anxiolytic effects in OFT and antidepressant effects in FST in obese rats. It also showed hypoglycemic activities and lipid profile normalization (reduced triglyceride and cholesterol levels) and increased antioxidant capacity in the brain areas involved in the pathophysiology of depression.

This Wistar rat model highlights fluoxetine's therapeutic potential in comorbid obesity-depression, underscoring the value of rodent models in biohealth research.

***Keywords:*** *Animal models, Depression, Fluoxetine, Lipid profile, Obesity, Oxidative stress Wistar rats*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Impact of environmental enrichment on the behaviour of the desert rodent *Meriones Libycus*

Kassouri-Maouche S[1*], Kheddache A[1,2] Boustila AEK, Hadji L[1], Mahmoudi R[1], Sami Y [1] and Raache R[3]

[1] *University of Sciences and Technology Houari Boumediene (USTHB), Faculty of Biological Sciences (FSB), Laboratory of Research on Arid Lands (LRZA), Algeria.*
[2] *Universitéy Mouloud Mammeri, Faculty of biological Sciences Agronomic Sciences, Department of Biology, 15000. Tizi-Ouzou, Algeria.*
[3] *University of Sciences and Technology Houari Boumediene (USTHB), Laboratory of Biology Cellular and Molecular (LBCM) FSB-USTHB*

[*]*(kassourisara@gmail.com) Email of the corresponding author*

## ABSTRACT

Animal welfare has become an important issue in scientific research in recent years and has demonstrated its impact on the reproducibility of results. The 3Rs principle, more specifically refinement, is based on enriching the environment of laboratory animals. The objective of our work is to study the impact of environmental enrichment and manipulation on the behaviour of a Saharan rodent (Meriones Libycus). Our study was carried out on 18 adult female Meriones Libycus. Adult captured in the Béni Abbès area (30° 07' N, 2° 10' W) then transported to the were housed in the . After an adaptation period, they were housed in pairs and reared in appropriate cages under controlled conditions (food, water, lightning, temperature, humidity, bedding/nesting). The assessment of affective states for the evaluation of animal welfare before and after adaptation was based on grimace scale founded on five facial features (ear position, eye closing, cheek bulging, whisker position, and nose bulging. After an adaptation period, behavioural tests of 5 min such as Open Field Maze (OFM) and Novel Object Recognition (NOR) were performed with tunnel handling, using the behaviour video tracking software "Any-Maze V7.20". The time, the distance in central and peripheral zones and the discrimination index were evaluated. Our results demonstrate that changes in fascial expression provides a means of assessing pain in Meriones Libycus and was classified into not present, moderatly and obviously present signs. After adaptation period, the results of the OFM test showed a high locomotors activity and reduced anxiety of all rats; the NOR test revealed a high expression of exploratory behaviour in this species. We noticed a non-significant increase ($p>0.05$) in the exploratory behaviour in males compared to females. In conclusion, the environmental enrichment improves well-being by reducing the pain sensation, anxiety and promoting the exploratory behaviour in Meriones Lybicus. These results plead for the implementation of refined manipulation policies which may include handling and enrichment in breeding.

***Keywords:*** *Well-being, handling, Enrichment, Behaviour, Meriones Libycus.*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Pharmacological evaluation of the anti-inflammatory and analgesic effects of Ammoides verticillata essential oil

Imene Derardja[1,2], Redouane Rebai[1,3]
[1] *Department of biology, Faculty of Exact Sciences and Natural Life Sciences, Mohamed Khider University, PO Box 145 RP, 07000 Biskra, Algeria.*
[2] *Laboratory Promotion of Innovation in Agriculture in Arid Regions (PIARA), Department of biology, Faculty of Exact Sciences and Natural Life Sciences, Mohamed Khider University, PO Box 145 RP, 07000 Biskra, Algeria*
[3] *Laboratory of Biotechnology, National Higher School of Biotechnology, Constantine 25000, Algeria*

[*] *( Imene Derardja) the corresponding author*

## ABSTRACT

The search for safer anti-inflammatory and analgesic agents remains a major challenge due to the adverse effects associated with conventional therapies. Natural products, particularly essential oils rich in bioactive terpenoids, represent promising source of bioactive compounds with therapeutic potential. This study investigated the chemical composition and preclinical anti-inflammatory and analgesic activities of *Ammoides verticillata* essential oil (AVEO) using complementary in vitro and in vivo experimental approaches.

GC-MS analysis revealed a monoterpene-rich composition dominated by carvacrol (32.51%). The anti-inflammatory potential of AVEO was evaluated through cyclooxygenase inhibition assays and a carrageenan-induced paw edema model in rats. AVEO produced a significant inhibition of paw edema, reaching 52.23% at 200 mg/kg, which was comparable to diclofenac (60.86%). Consistently, AVEO demonstrated strong COX-2 inhibitory activity with an $IC_{50}$ value of 1.51 ± 0.20 µg/mL and a selectivity index of 5.56, indicating preferential inhibition of COX-2 compared with COX-1 and showing comparable activity to diclofenac. Analgesic activity was assessed using tail-immersion and acetic acid-induced writhing tests. AVEO produced significant dose-dependent analgesic effects. At 200 mg/kg, the essential oil significantly prolonged tail-withdrawal latency (14.00 ± 1.45 s) compared with tramadol and markedly reduced abdominal constrictions relative to diclofenac.

These findings provide preclinical evidence that *A. verticillata* essential oil possesses significant anti-inflammatory and analgesic properties, highlighting its potential as a natural source of bioactive compounds for managing inflammatory pain.

***Keywords:*** *Ammoides verticillata essential oil; anti-inflammatory; analgesic activity; COX-2.*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Conservation and Management of the Barbary macaque: Population Monitoring, Health Risks, and Integrated Conservation Strategies

Hannani Hania[1,2*], Hannani Amira[1]
[1] *Departement of Veterinary Sciences, faculty of Natural and Life Sciences Faculty, Chadli Bendjedid university-El-Tarf.*
[2] *PABIOS Reserach Laboratory, ISAV Taoura, Mohamed Cherif Messaadia University-Souk Ahras.*

[*]*( h.hannani@univ-el-tarf.dz) Email of the corresponding author*

## ABSTRACT

The Barbary macaque is the only non-human primate found in North Africa. The species has historically occupied the entire Mediterranean region; however, the species is now found mainly in mountainous forest habitats in Algeria. The estimated population varies between 8,000 and 10,000 individuals, with the majority being found in protected forests such as Djurdjura National Park, Chréa National Park, and Gouraya National Park.The Barbary macaque is listed as Endangered on the IUCN list due to habitat destruction, illegal trade, and human-wildlife conflict.

This research is based on the compilation of ecological surveys, population monitoring schemes, and veterinary health studies carried out across the main Barbary macaques habitats in North Africa. The analysis has particularly focused on the population density, structure, habitat fragmentation, and health of the Barbary macaques in the wild as well as in captivity through conservation schemes and breeding programs in zoos and rescue centers.

Studies on the Barbary macaques' populations have indicated average number per group varying between 10 and 40 individuals, with the density being between 5 and 30 individuals per km² depending on the quality of the habitat. The fragmentation of the habitat and the consequent deforestation have reduced the quality and quantity of the forest habitats, and the illegal animal trade has remained a threat to the young macaques. In addition, increased interaction with the human population in the tourist areas has increased the risk of zoonotic infections such as gastrointestinal parasites, respiratory infections, and viruses.

For the sustainable conservation of the Barbary macaques, the cooperation and interaction between conservation biologists and veterinarians is crucial to ensure the conservation and preservation of the species that has significant value and importance as part of the fauna in the wild and as a part of the natural heritage and history of the region.

***Keywords:*** *Barbary macaques, Endangered, Management, Preservation, Sustainable.*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Macaque Breeding and Use in Scientific Research: Colony Management and Biomedical Applications

Hannani Hania[1,2*], Hannani Amira[1]
[1] *Departement of Veterinary Sciences, faculty of Natural and Life Sciences Faculty, Chadli Bendjedid university-El-Tarf.*
[2] *PABIOS Reserach Laboratory, ISAV Taoura, Mohamed Cherif Messaadia University-Souk Ahras.*

[*]*( h.hannani@univ-el-tarf.dz) Email of the corresponding author*

## ABSTRACT

The Rhesus macaque and Crab-eating macaque are the most commonly used in laboratory research due to their close similarities to humans in terms of genetic, physiological, and neurological characteristics. According to the National Academies of Sciences, Engineering, and Medicine, a substantial population of non-human primates, specifically the Rhesus macaques, are used in various biomedical research activities.

In this study, data compiled from various sources of biomedical research programs, primate research centers, and animal care guidelines are used to assess the involvement of macaques in various scientific research activities, as well as the management of breeding colonies of macaques. Special attention is given to the feeding habits, ethological considerations, reproduction, and veterinary care of the macaques in primate research centers.

Special breeding programs have been implemented worldwide to provide a sustainable source of macaques for research purposes while minimizing the impact on the wild population. Domesticated macaque populations have been provided with management systems that include balanced diets, environmental enrichment strategies, social groupings, and reproductive studies. Rhesus macaques have a sexual maturity period of 3 to 5 years and a gestation period of about 165 days. This allows for the management of the population within the breeding colonies. In addition, it is critical to monitor the health of the macaques because they can be carriers of zoonotic diseases like the herpes B virus. Therefore, veterinary screening is implemented to ensure the safety of the animals and the people working with them.

Breeding and management of the macaque populations is critical in the maintenance of healthy populations of macaques for biomedical purposes while at the same time providing the animals with the best welfare conditions. Therefore, the 3Rs principle will be critical in the sustainable management of macaques in biomedical research.

***Keywords:*** *Macaques, Model, Preservation, zoonosis, Sustainable.*

**First International Workshop in Algeria on Breeding,
Laboratory Animal Models and the Preservation of the Barbary Macaque
(FILABE'26)**
*04-10 April 2026*

# Stratégie de la biologie de conservation du macaque de barbarie

ALILECHE Ahmed

*Conservateur général des forêts (Docteur d'Eta)*
*Au Parc National du Djurdjura*

*(Alileche_scout@yahoo.fr) Email of the corresponding author

## ABSTRACT

Dans le cadre de la conservation de la biodiversité dans le Parc National du Djurdjura (PND), une étude d'inventaire des troupes du singe magot (Macaca sylvanus) a été réalisée en 2014. L'objectif était de renforcer la biologie de la conservation de cette espèce d'intérêt communautaire menacée d'extinction, en raison de l'isolement géographique de son aire de répartition, la fragmentation de son habitat et de la réduction des effectifs de ses populations. L'approche de gestion du territoire du parc constitue une des mesures de conservation in-situ dont le minimum de population viable (MPV) et du seuil critique d'habitat (SCH) sont problématiques. Etant donné la tendance évolutive régressive actuelle de son habitat, son aire de répartition et les fluctuations de ses populations, une stratégie de gestion coordonnée entre les gestionnaires de l'aire protégée et les biologistes de la conservation est une nécessité absolue. Elle se traduira par l'élaboration d'un corpus de connaissances sur l'espèce, notamment son étho-écologie (écologie du mouvement, écologie du comportement, flexibilité comportementale), la mesure d'évaluation de son état de conservation, l'adoption de mesures conservatoires ou de restauration des domaines vitaux perturbés en mettant l'accent sur les zones prioritaires d'action et la cartographie systématique des sites potentiellement favorables.

***Keywords:*** *Biologie de la conservation ; Ethoécologie ; habitat critique ; population viable ; stratégie de gestion.*

**First International Workshop in Algeria on Breeding,**
**Laboratory Animal Models and the Preservation of the Barbary Macaque**
**(FILABE'26)**

*04-10 April 2026*

---

# Participants without presentation

**First International Workshop in Algeria on Breeding,**
**Laboratory Animal Models and the Preservation of the Barbary Macaque**
**(FILABE'26)**
*04-10 April 2026*

---

# Participants

- Aymane ZOUANE
- Somia LADJAL
- Elbia SELAMA
- Fatima zahra BOKRETA
- Mohammed Abdelmaoula ZARROUK
- Yassine FEZAZI
- Toufik CHARIF
- Asma BOUKNINE
- Safa AISSAOUI
- Nour Ikram DJEBROUNI
- Salima CHARALLAH
- Khedidja HOUTIA
- Naouel AMMALI
- Radhouane KARA
- Abdelouahab MEBARKI
- Hania HANNANI
- Samah HEBBAL
- Lamya OUZZIR
- Safa SMAIL
- Hayat AOURAGH
- Salma MEHAFDI
- Romaissa Kahlouch
- Asma BELKADI
- Yasmine Amimi
- Mouna Aoulmane
- Fatima Zohra SEKKAK
- Khaoula MENNI
- Badreddine ATTIR
- Ines LAMMARI
- Abdel Hakim HOUHOU
- Sarah BEN KHARBACHE
- Maroua SMAIL
- Selsabil HAMDI
- Fatima Zohra BEHAZ
- Djihane ABDELLI
- Loubna MIMOUNE
- Asma MAMMAR
- Hayat LAOUFI
- Fatiha MANSOURI
- Salsabil MEBARKI
- Imene GHORBAL
- Imene DERARDJA
- Fatima zohra HADJI
- Tesnim DEGHICHE
- Zakia DAHEUR
- Suliman Ramadan NAJAH
- Derbali Safia
- Nadra RECHIDI-SIDHOUM
- Badredine Bouchama
- Maria Benzarour
- Makhloufi Ahmed
- Hiba Hamza


FiLABE Algeria 2026
Workshop


Directorate-General for Scientific Research and Technological Development ALGERIA
DGRSDT
البحث العلمي في خدمة المواطن


جامعة محمد خيضر بسكرة
MOHAMED KHIDER UNIVERSITY OF BISKRA


ENSV
ECOLE NATIONALE SUPERIEURE VETERINAIRE
ALGER


جامعة سطيف ١ - فرحات عباس
Setif 1 University - Ferhat ABBAS