

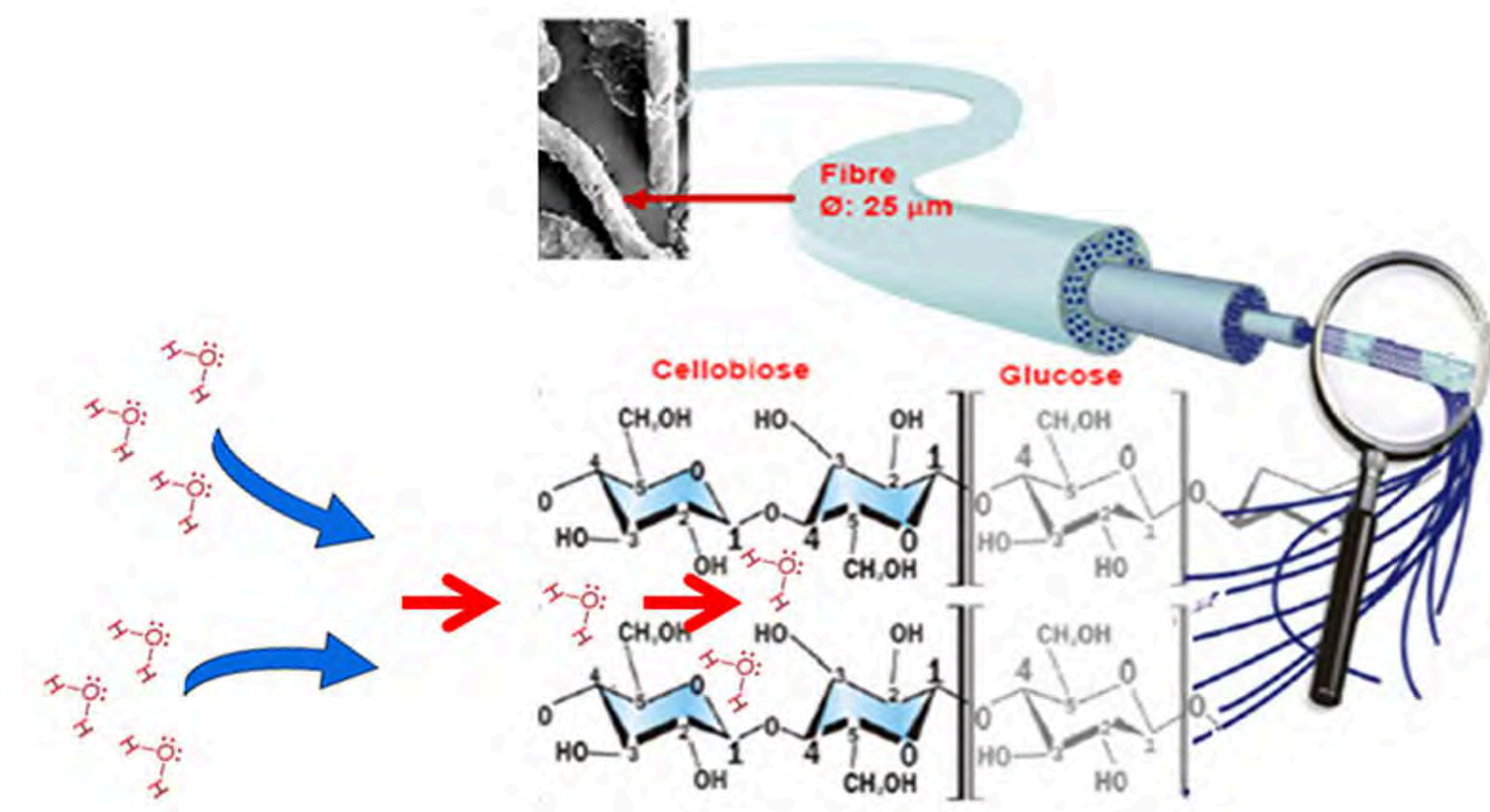
# Cellulose pellets bedding: Animal Welfare and Efficiency together

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## Introduction

The Animal Welfare Unit from the AWSHEL-IAS Research Group of the University of Alcalá (Spain) directed by Professor Dr Jorge Pérez Serrano, Director of the Centre for the supporting of Medical and Biological Research, to which the Animal Research Experimentation Centre is attached, was created in order to study and improve animal welfare by objective quality control testing. Research with animals requires very high quality standards, but unlike other elements related to animal welfare (for example feed or cages) regarding bedding there is insufficient information about animal preference, the impact on their welfare and its efficiency, even though bedding is the only element in direct and permanent physical contact with the animal. On the other hand any attempt to improve quality often means increased economic costs due to the complexity of the equipment, the health status, the required animal welfare and the quality standards, and therefore experimental animal absorbs a good deal of research resources.



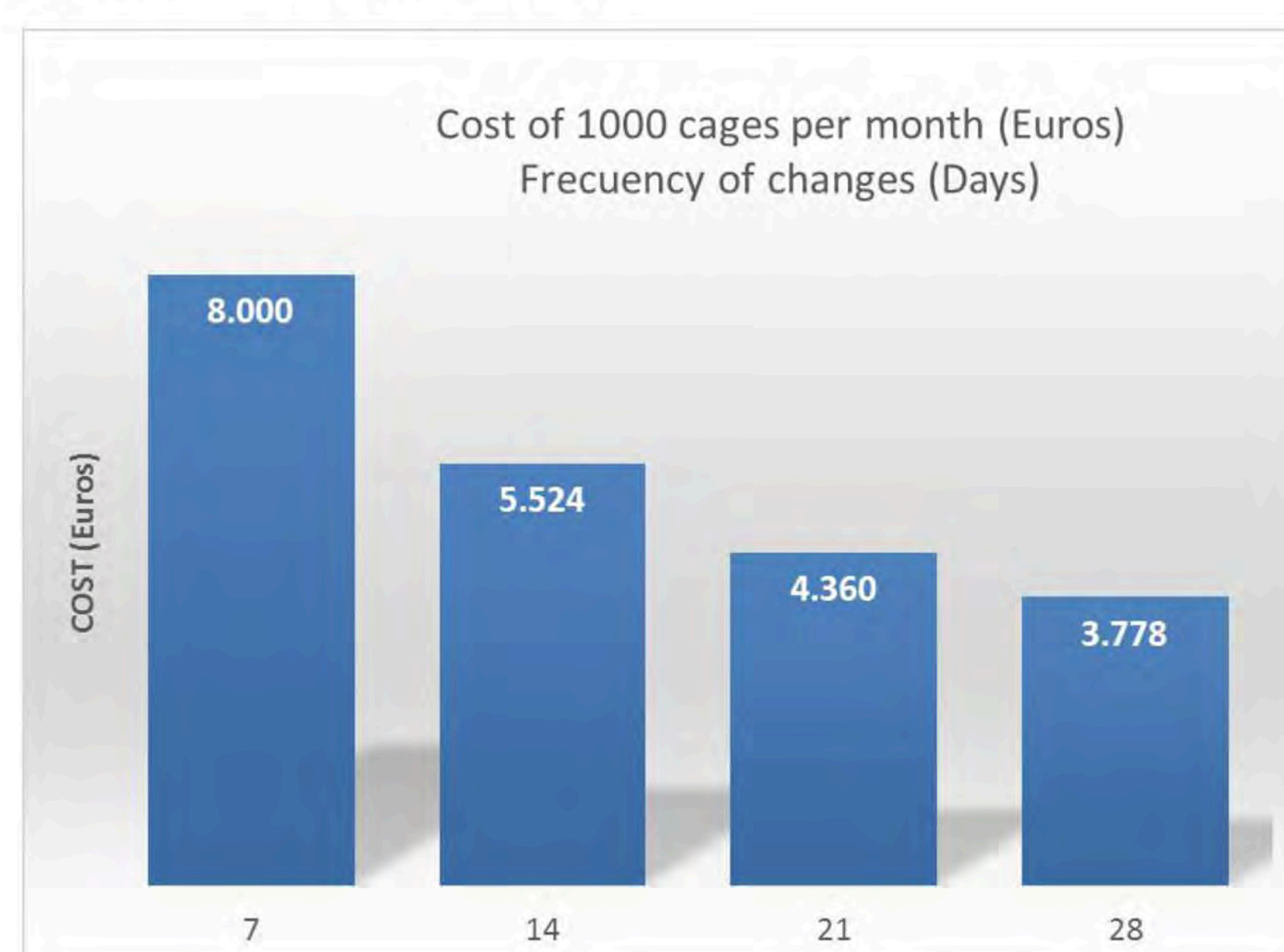
The internal structure of cellulose only allows water to circulate through it; for simple reasons of space, no other organic or inorganic molecule can penetrate its structure.

## Results

The cellulose pellets bedding complied with the following requirements:

**Longer cage life with no need of changes:** A minimum of fourteen days were reached. It has a relevant significance for:

- More time availability for the technicians and caretakers in order to carry out the legally established the animal welfare daily follow-up.
- Environmental sustainability.
- Reduction of cage's maintenance costs.



### Lower animal stress.

Avoiding that animals be faced frequently to a "new environment" and letting them stay more time with no undesirable stressful changes.

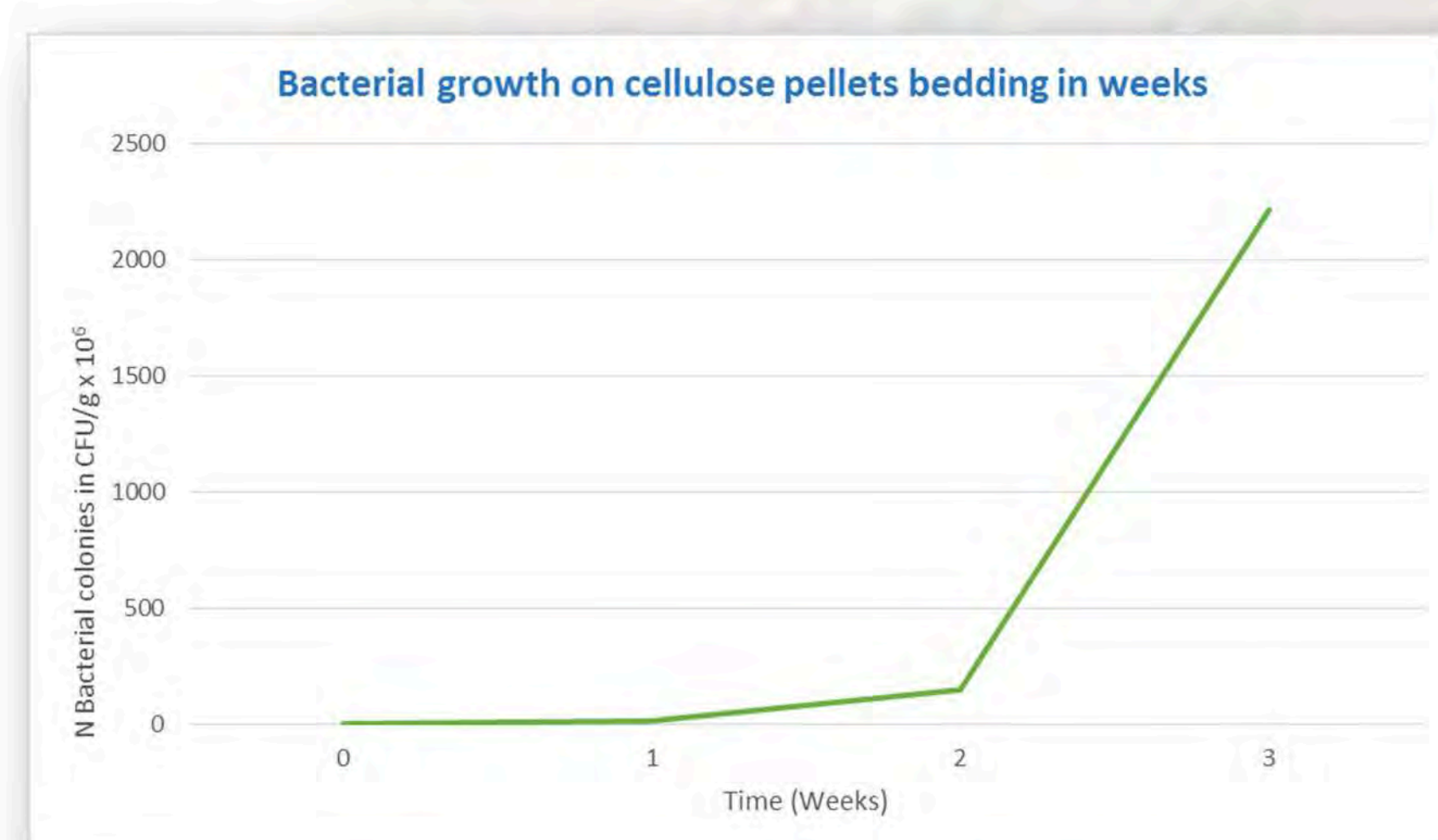
### High absorption efficiency vs lower volume of bedding

0.4 g of cellulose pellets bedding per cm<sup>2</sup> of cage surface were considered as suitable to preserve animal welfare in order to obtain an enough thick layer of bedding (1.5-2.0 cm high). Taking into account that we have demonstrated that 100 g of cellulose pellets bedding absorbs 220 ml of water, even the smallest cage for mice that meet legal requirements be able to absorb all water from the bottle of 250 ml in case of accident (330 cm<sup>2</sup> of cage surface is equivalent to 132 g of bedding that absorbs 286 ml of water).

### Bacteriostatic ability that limits the growth of microorganisms. Dramatic reduction in bacterial colonies

The cellulose pellet bedding was monitored during three weeks, showing a gradual increasing in the number of bacterial colonies, and it was much more significant since the second to the third week, although it was not relevant for animal health.

Nevertheless, the values obtained for the cellulose pellet bedding were far below other studies carried out with wooden-based bedding at our own facility and in comparison with other authors (Babu A. 2013. Evaluation of micro-environment and microbiological monitoring of various bedding materials for laboratory rodents).



### Faeces are displaced to the bottom of the cage beneath the bedding

A novel property of cellulose pellets bedding is the decantation or sedimentation of excrements to the floor of the cage, which means an improvement on animal welfare because:

- Animals are only just in contact with few faeces
- Lower level of bacterial colonies and ammonia in contact with animals

### Lower levels of ammonia

During two first weeks all cages with cellulose pellets bedding showed lower level of ammonia than 25 ppm.

Non-recommended ammonia levels might be frequently found at animal facilities, but they are usually unnoticed since the smell of ammonia, although is perceptible, is not disgusting in concentrations of around 30-40 ppm, which can be found even in not particularly dirty bedding.

25 ppm is the ammonia level limit established by the research group in order to consider a dirty cage non suitable to the animal welfare. That is the maximum limit of exposure permitted for humans on 8 hours of a working day, according to the guidelines from the ACHIH (American Conference on Governmental Industrial Hygienists) considering that animals are exposed to this ammonia 24 hours per day.

## Objective of the study: Improving welfare reducing costs

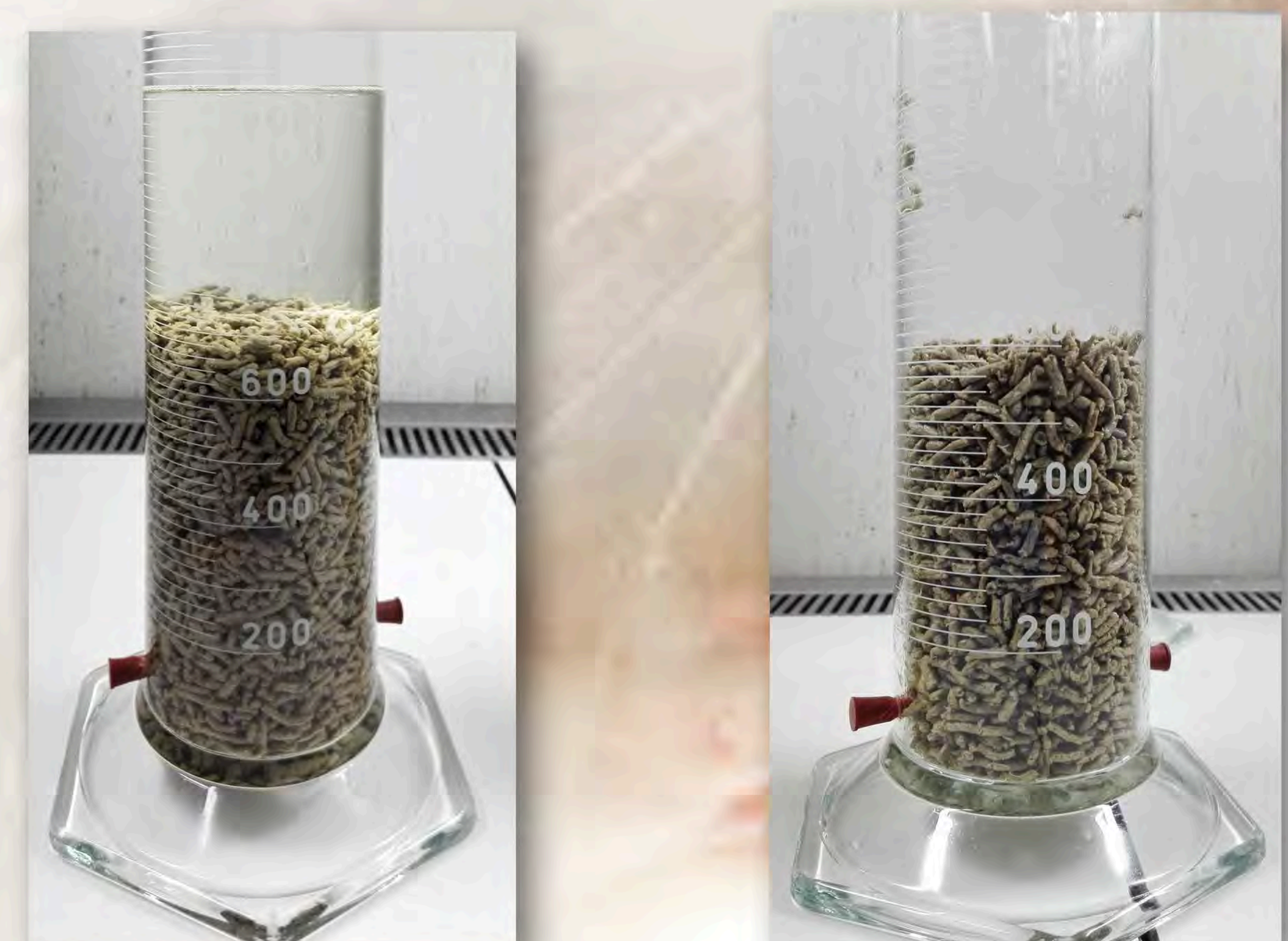
In order to improve animal welfare decreasing costs, a study was carried out on cellulose (pellets) bedding for rodents.

## Methodology

175 of Individual Ventilated Cages (Tecniplast SLIM-LINE) with mice were studied. 25 of them were more specifically controlled with the highest occupancy permitted by law (Directive 2010/63/EU) and the rest with the real number of animals housed during experimental procedures.

The evaluation was undertaken under room environmental conditions like 50 to 65 % of HR, 21 to 26° C, 10-15 air renovations per hour in the room and 70-75 air renovations per hour inside the ventilated cages.

Not only all cages were daily observed at least during two weeks, but also the 25 control cages were monitored periodically by physical, chemical and bacteriological methods, like ammonia levels (never higher than 25 ppm) bacteriological cultures and imaging systems.



### Upper view



Cellulose pellets Wood



### Lower view

## Acknowledgements

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