

ABSTRACT

This R&D project consisted in the development of different hygiene products for pets (dogs and cats), through an approach similar to “quality by design”, assuring the efficacy for pets and safety for both pets and owners. Throughout the development process different current market trends were considered and followed.

OBJETIVE

The objective of this R&D project was to develop hygiene products for pets, using the experience and knowledge created with human cosmetics products, supporting the creative process in trends like natural ingredients and environmentally friendly production.

METHODS

The different hygiene products were developed following the steps described bellow.

Benchmark products evaluation

- Ingredients used;
- Package;
- Content net;
- Claims.



Product Development

- Selection of functional ingredients, know to be safe and efficient;
- Prioritisation of natural or naturally derived ingredients;
- Prioritisation of cold process production method;
- Minimalist approach, excluding unnecessary ingredients;
- pH adjustment to correspond to dogs and cats' skin pH value.



Product safety evaluation (theoretical)

- Safety evaluation model for veterinary products based on the margin of safety (MoS) calculation used for human cosmetic products, with adaptations based on pets characteristics (weigh and area of exposure);
- Consideration of worst-case scenario of product exposure (pet vs owner).



Product safety evaluation (in vitro)

- *In vitro* skin irritation test using reconstructed human epidermis (RHE);
- *In vitro* eye irritation test - Hen's Egg Test (HET) Chorioallantoic Membrane (CAM).

Skin Irritation_[1] in vitro – OCDE TG439

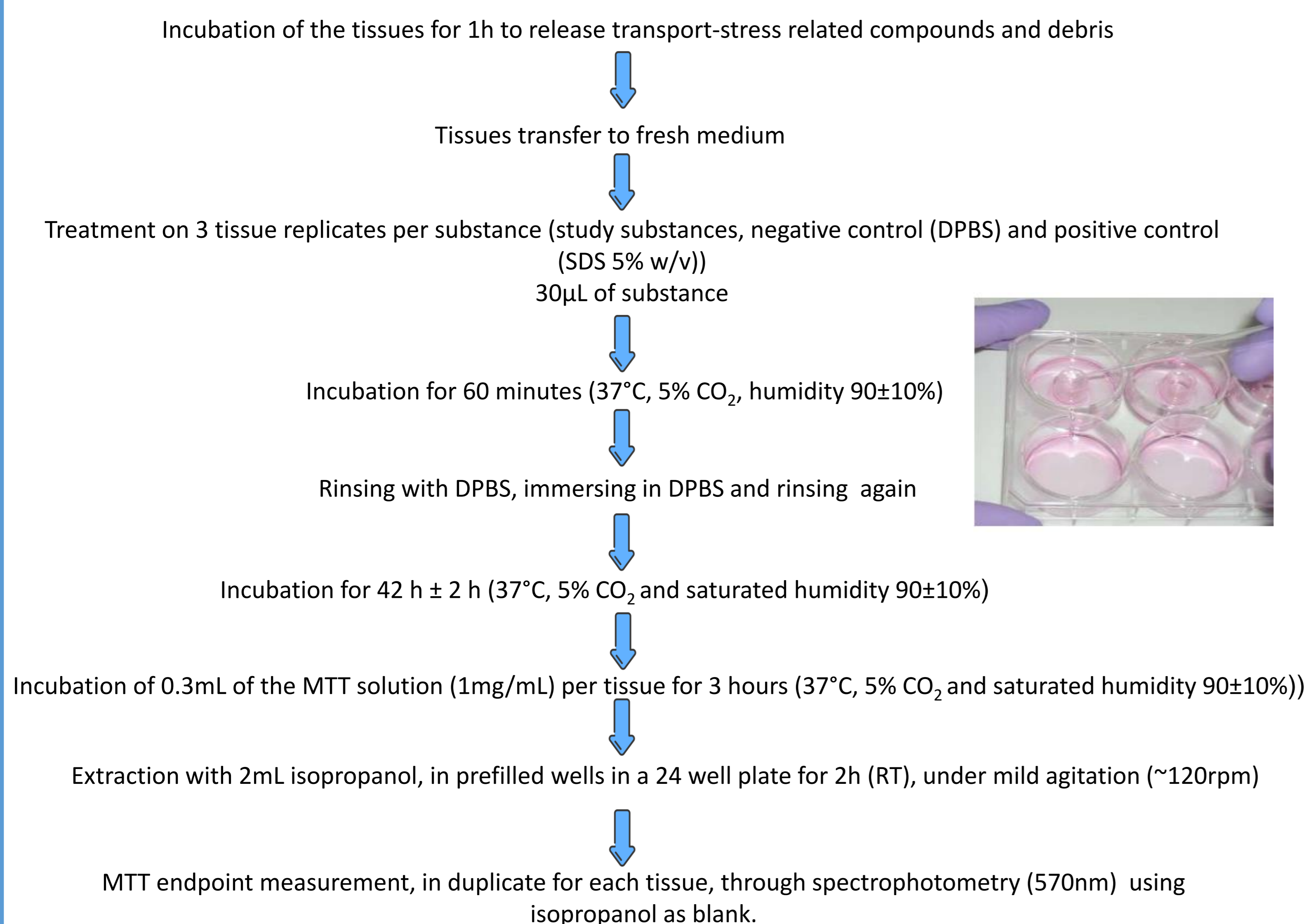


Table 1 – Classification of the test substance regarding its irritancy based on the Prediction Model of the OECD TG 439

In vitro results on mean tissue cell viability	In vivo prediction
≤ 50%	Irritant
> 50%	Non-irritant

In vitro eye irritation test – Hen's Egg Test Chorioallantoic Membrane (HET-CAM) Test_[2] – ICCVAM

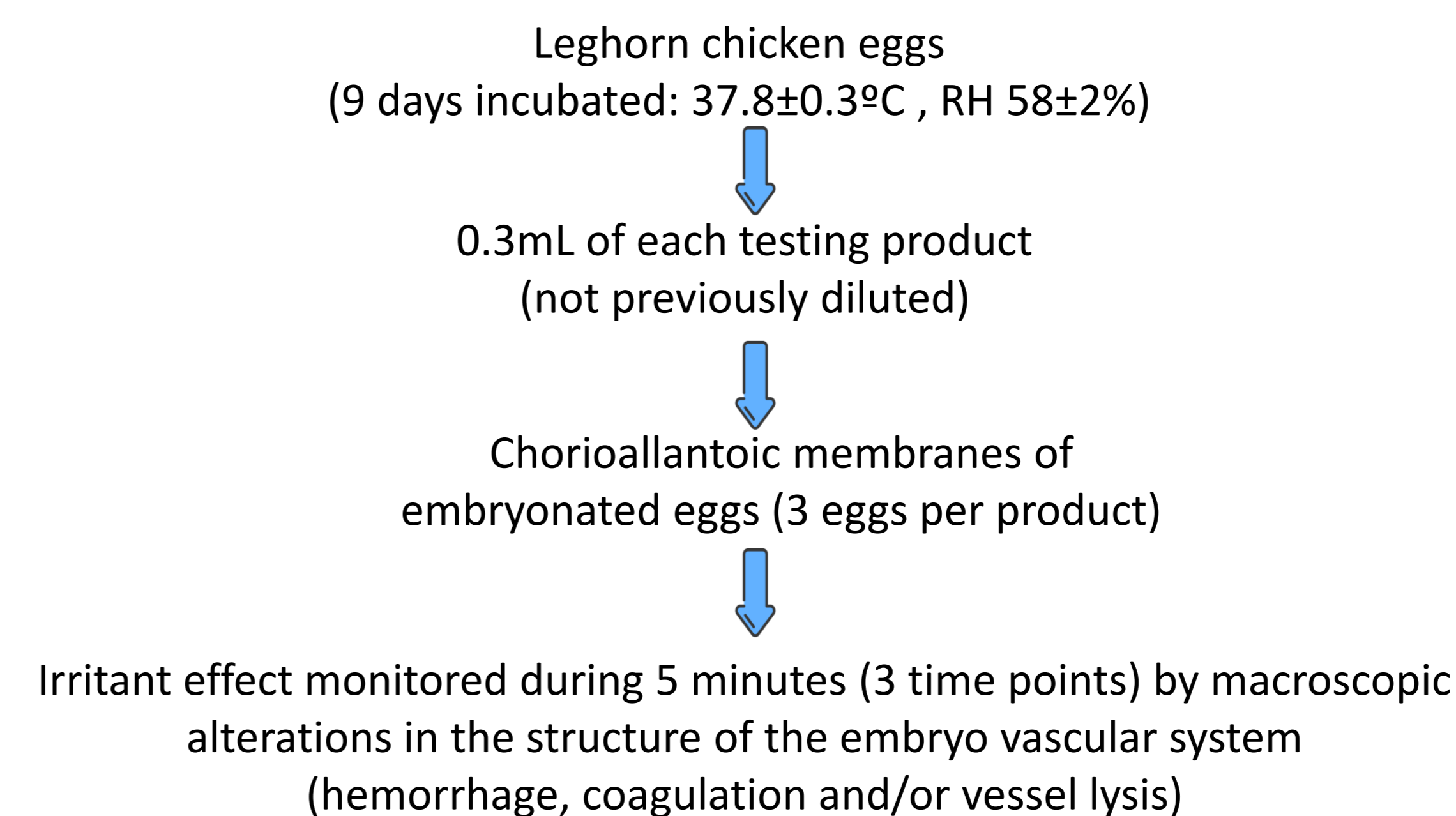


Table 2 - Scoring scheme for irritation testing with the HET-CAM test method

Reactions	Scoring		
	0.5 min	2 min	5 min
Vascular Lysis	5	3	1
Hemorrhage	7	5	3
Coagulation	9	7	5

Table 3 - Classification of the test substance with the HET-CAM test method.

Results	Classification
≤9	Non-severely irritating
>9	Severely irritating

Results

- Seven hygiene products for pets (cats and dogs) were developed: three shampoos, one leave-on spray conditioner, two wet wipes and one ear solution. These products include in their composition different natural ingredients such as *Pelvetia canalicula* extract, an ingredient with hydrating properties derived from the brown seaweed know as channeled wrack and an extract from *Cistus ladanifer*, an endemic Portuguese plant.

Table 4 – Results of *in vitro* safety evaluation

	Skin Irritation	HET-CAM
Leave-on spray conditioner	Non-irritant	ND
Wet wipes for fur and paws hygiene	Non-irritant	ND
Wet wipes for periorbital and eyelid hygiene	Non-irritant	Non-severely irritating
Ear solution	Non-irritant	ND

Legend: ND - Not determined

All of these products present a pH value similar to the pH presented by dogs and cats' skin (pH 6-7.5);

Four of the seven products are produced using a completely cold processable method, and the remaining three are produced using minimal heat (maximum 45°C for 10 minutes), allowing the reduction of energetic impact; The products were all considered safe with MoS >100 for all the ingredients, with results obtained from both RHE and HET-CAM supporting that safety (table 4).

Conclusions

This project allowed the development of seven, safe and efficient hygiene products for pets, based on trends of the market like natural ingredients, minimalism, safety, environment friend industrial process.

References

- [1] Test Guideline No. 439: In Vitro Skin Irritation: Reconstructed Human Epidermis Test Methods,” 2021. [Online]. Available: <http://www.oecd.org/termsandconditions/>.
[2] ICCVAM-Recommended Test Method Protocol: Hen's Egg Test-Chorioallantoic Membrane (HET-CAM) Test Method.” [Online]. Available: <http://iccvam.niehs.nih.gov/methods/ocutox/MildMod-TMER.htm>;

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