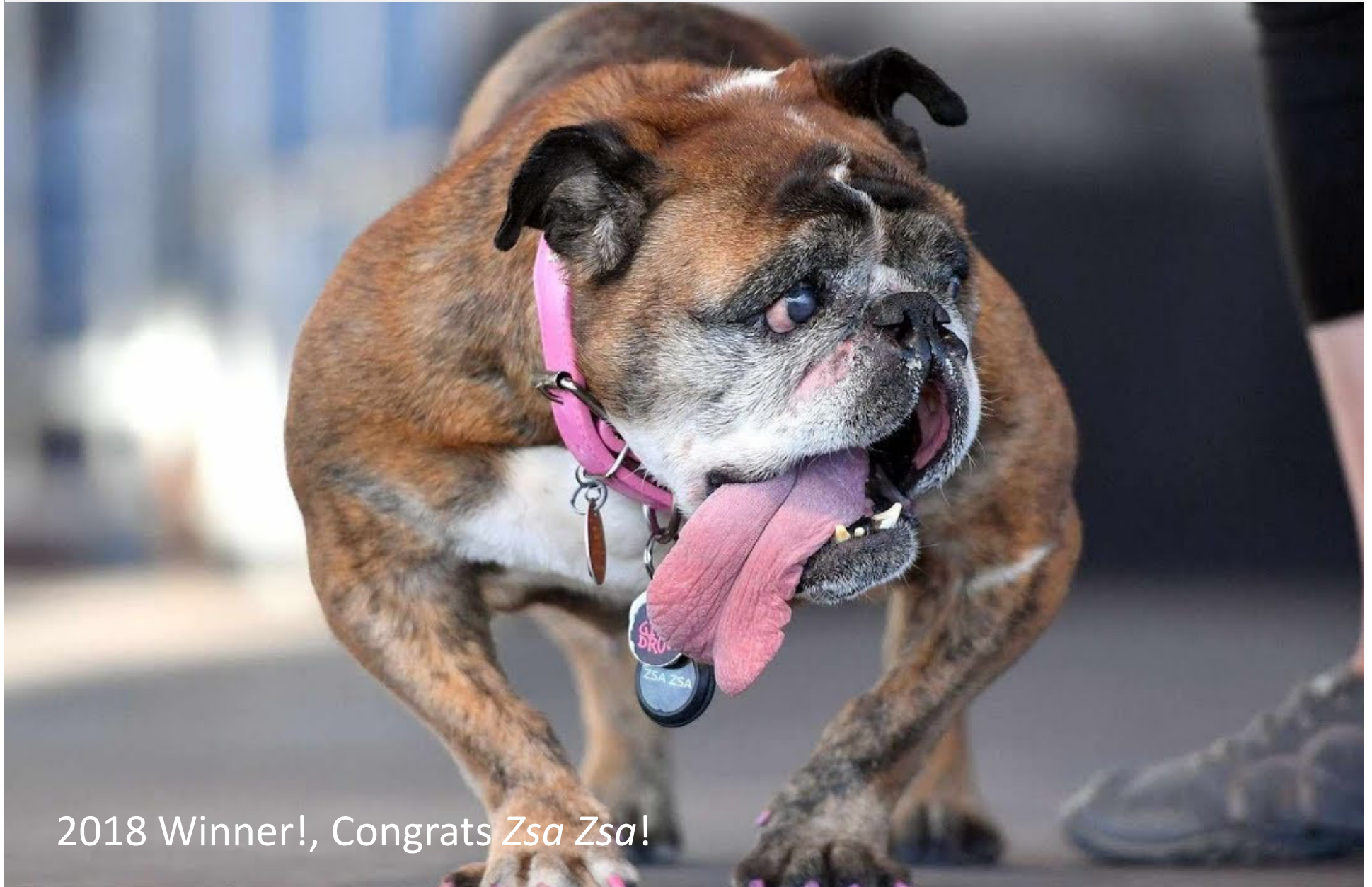


## 人間・建築を中心とした環境概論8: 2021/05/23, 15:20-16:05

- 自己紹介を兼ねた研究のお話し

## World's Ugliest Dogs



2018 Winner!, Congrats *Zsa Zsa!*

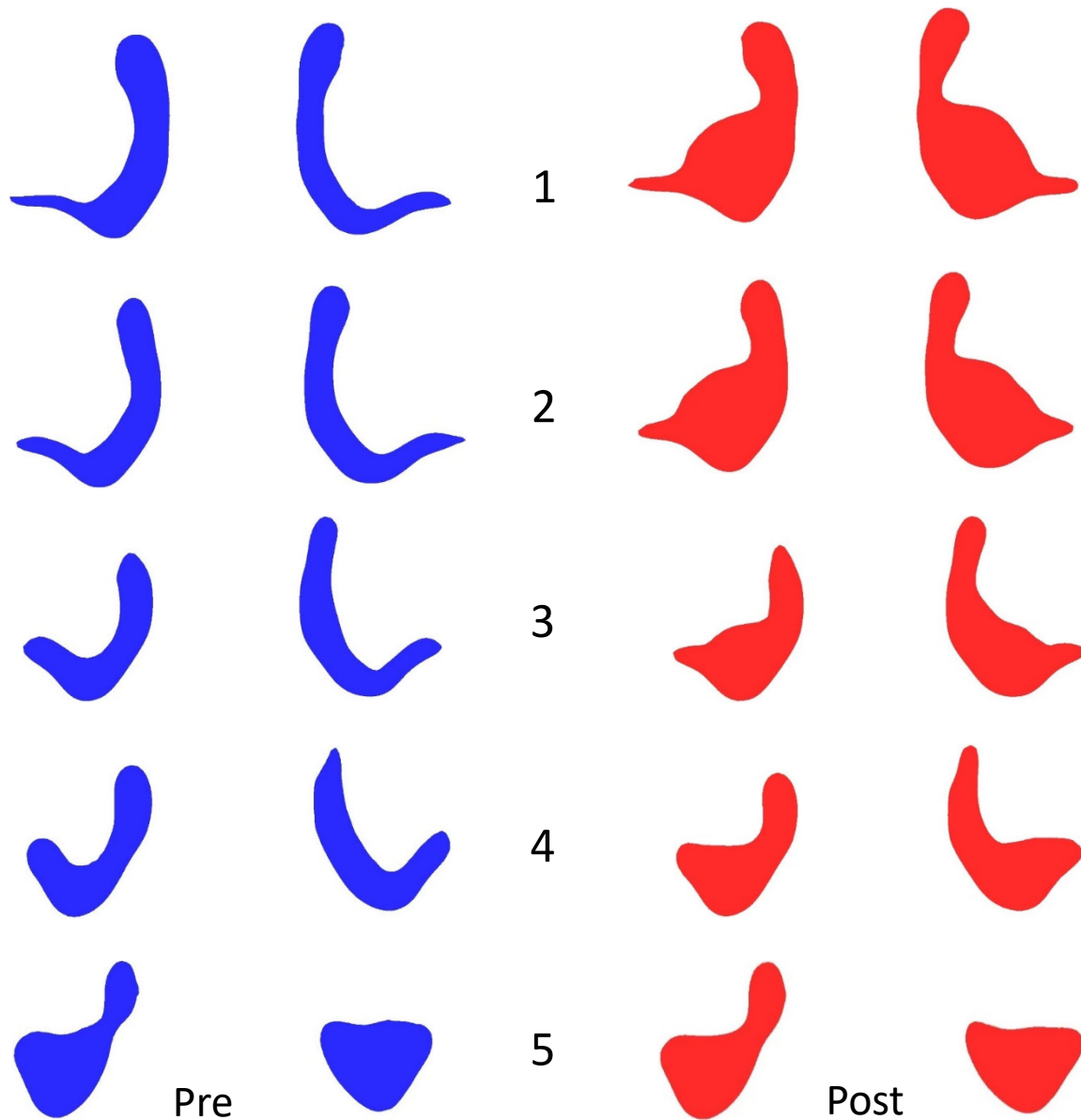
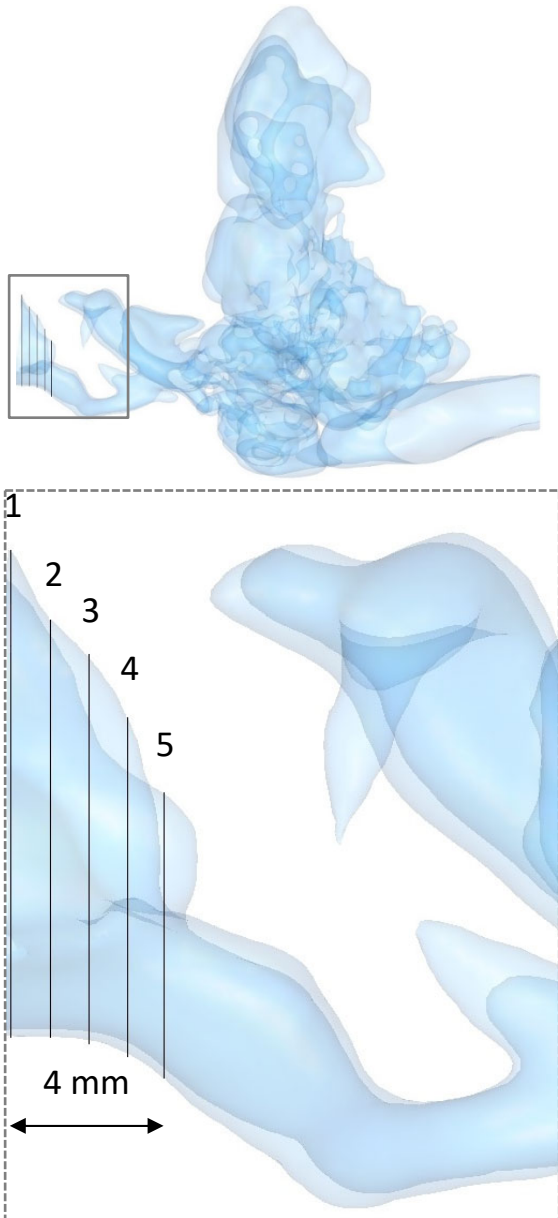
## 短頭種氣道症候群：外鼻孔狹窄



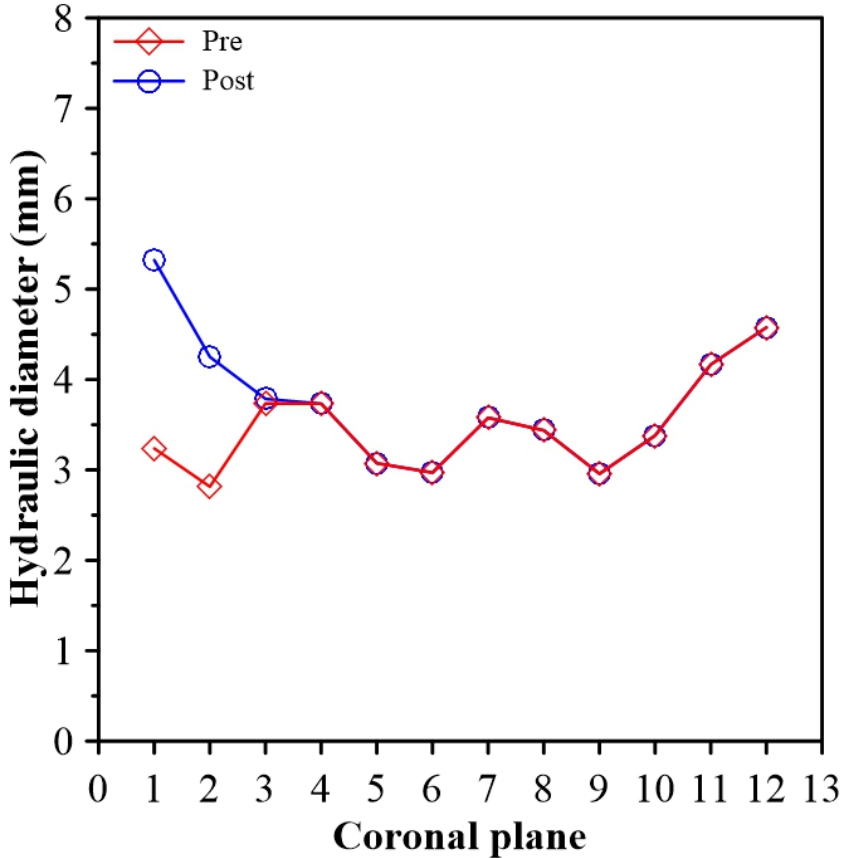
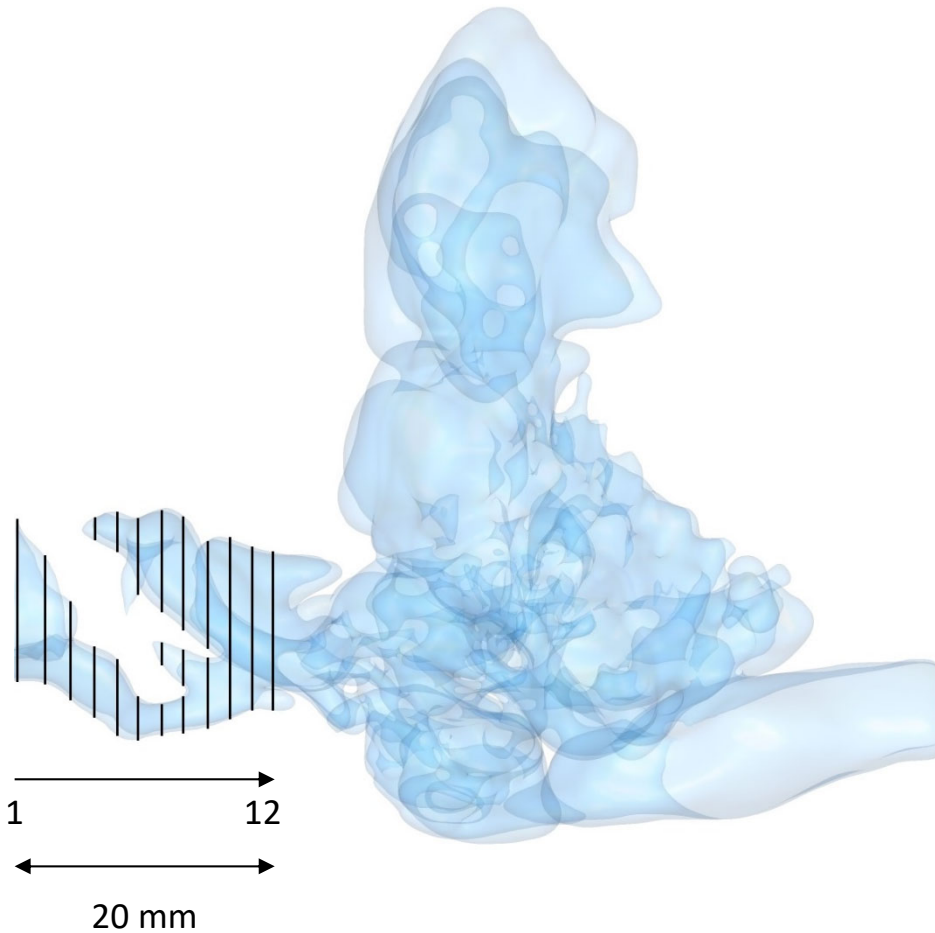
## 外鼻孔狭窄の外科治療: 垂直楔形切除術



# 外鼻孔開口部の拡大措置



# Change in Hydraulic Diameter



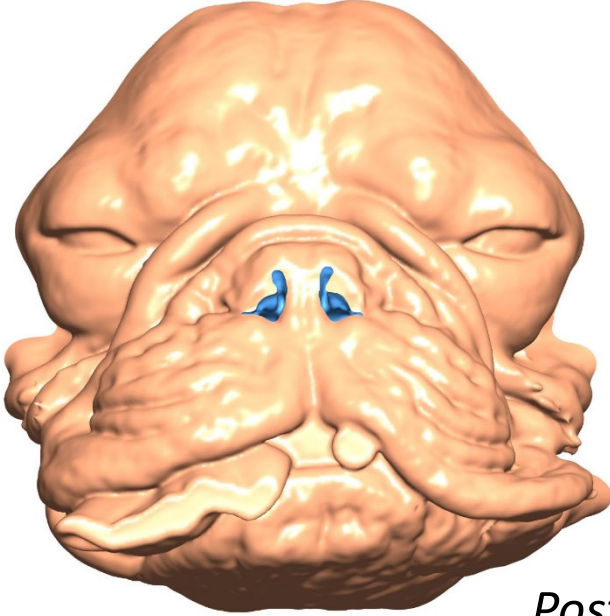
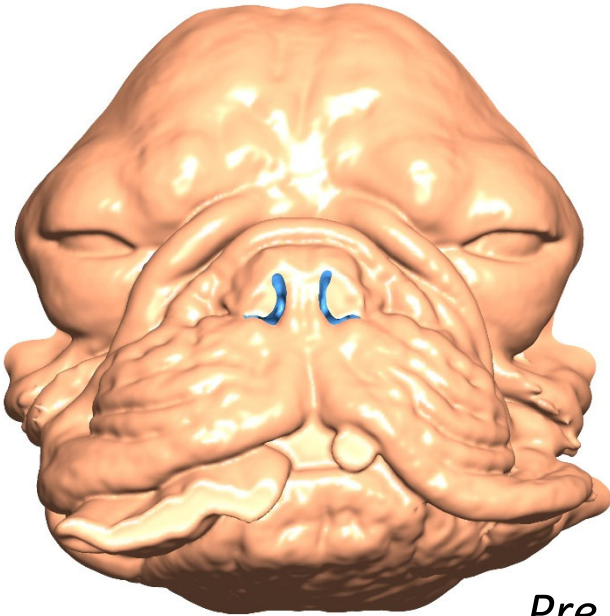
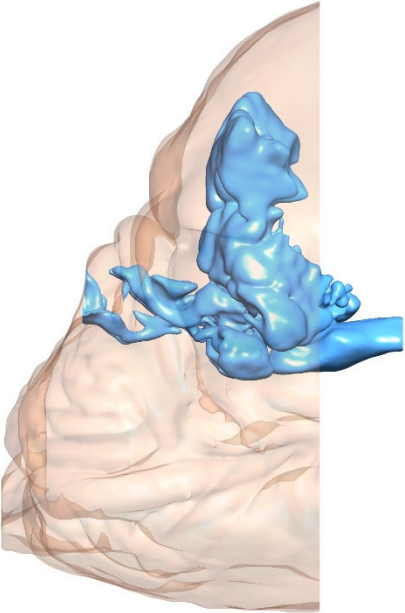
| Average hydraulic diameter (mm) |     |
|---------------------------------|-----|
| Pre                             | 3.4 |
| Post                            | 3.8 |

# Computational Fluid Dynamics and Visualization

$$\nabla \cdot \mathbf{u} = 0$$

$$\frac{\partial \mathbf{u}}{\partial t} + (\mathbf{u} \cdot \nabla) \mathbf{u} = -\frac{1}{\rho} \nabla p + \nu \nabla^2 \mathbf{u}$$

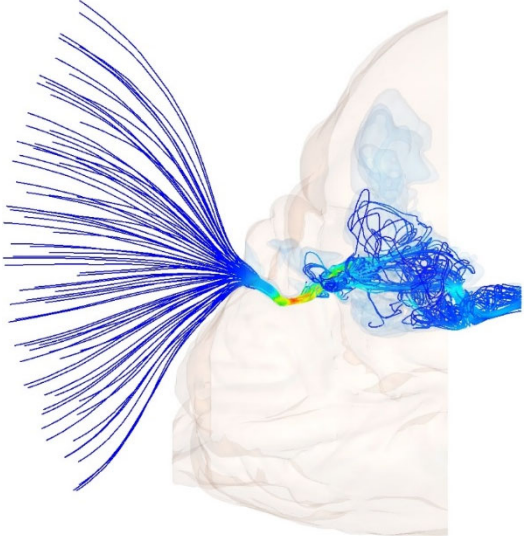
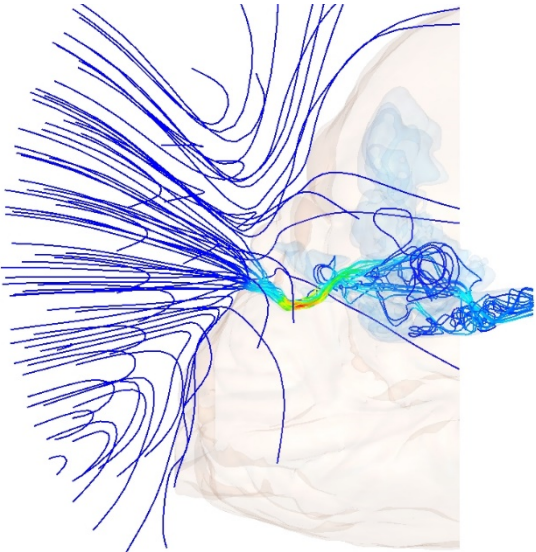
# Brachycephalic Airway Syndrome / Naris Enlargement



*Pre*

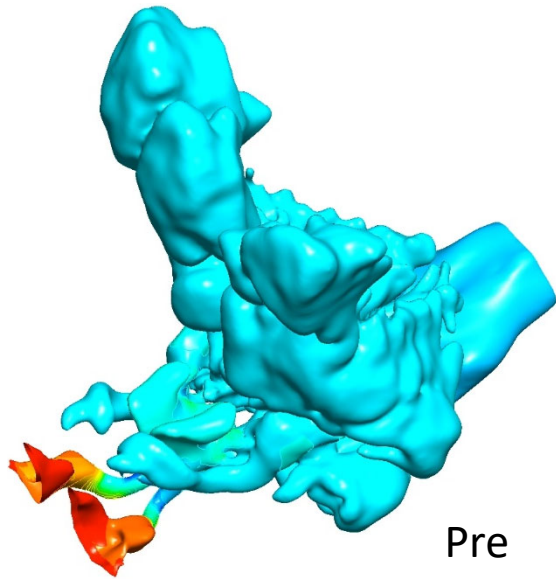
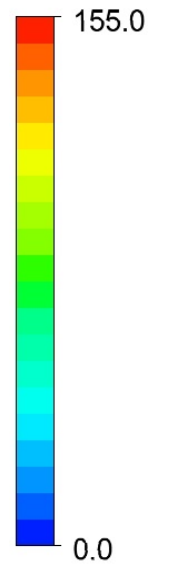
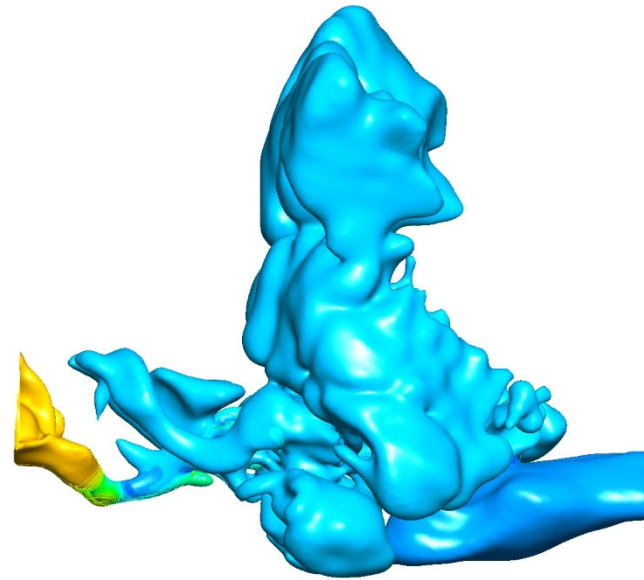
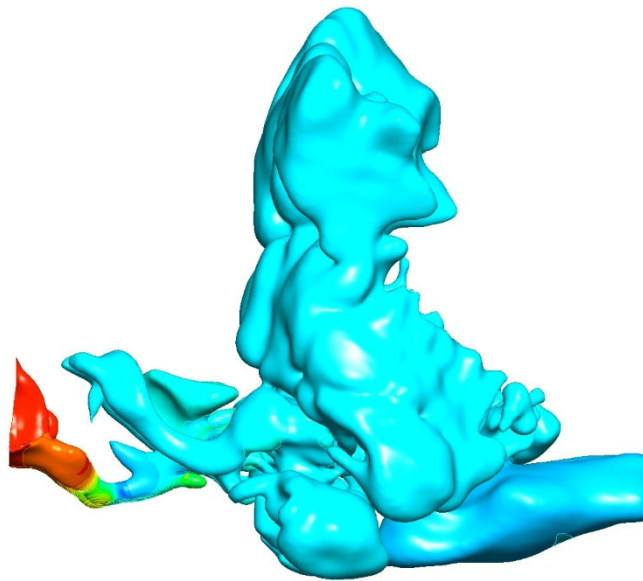
*Post*

Stream lines in and around the skull and in nasal passages

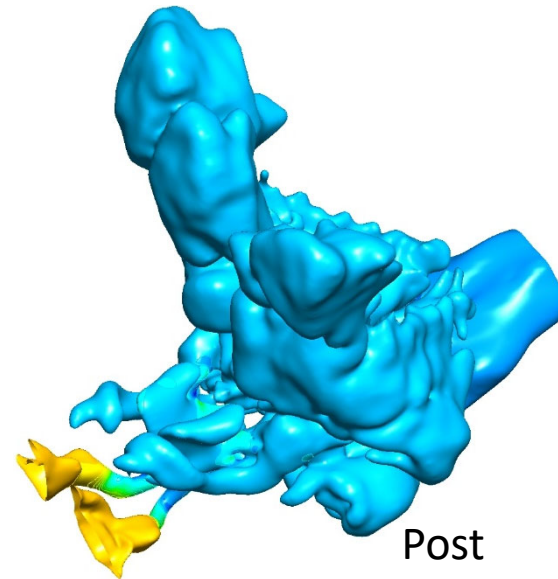




# Surface Static Pressure Distributions

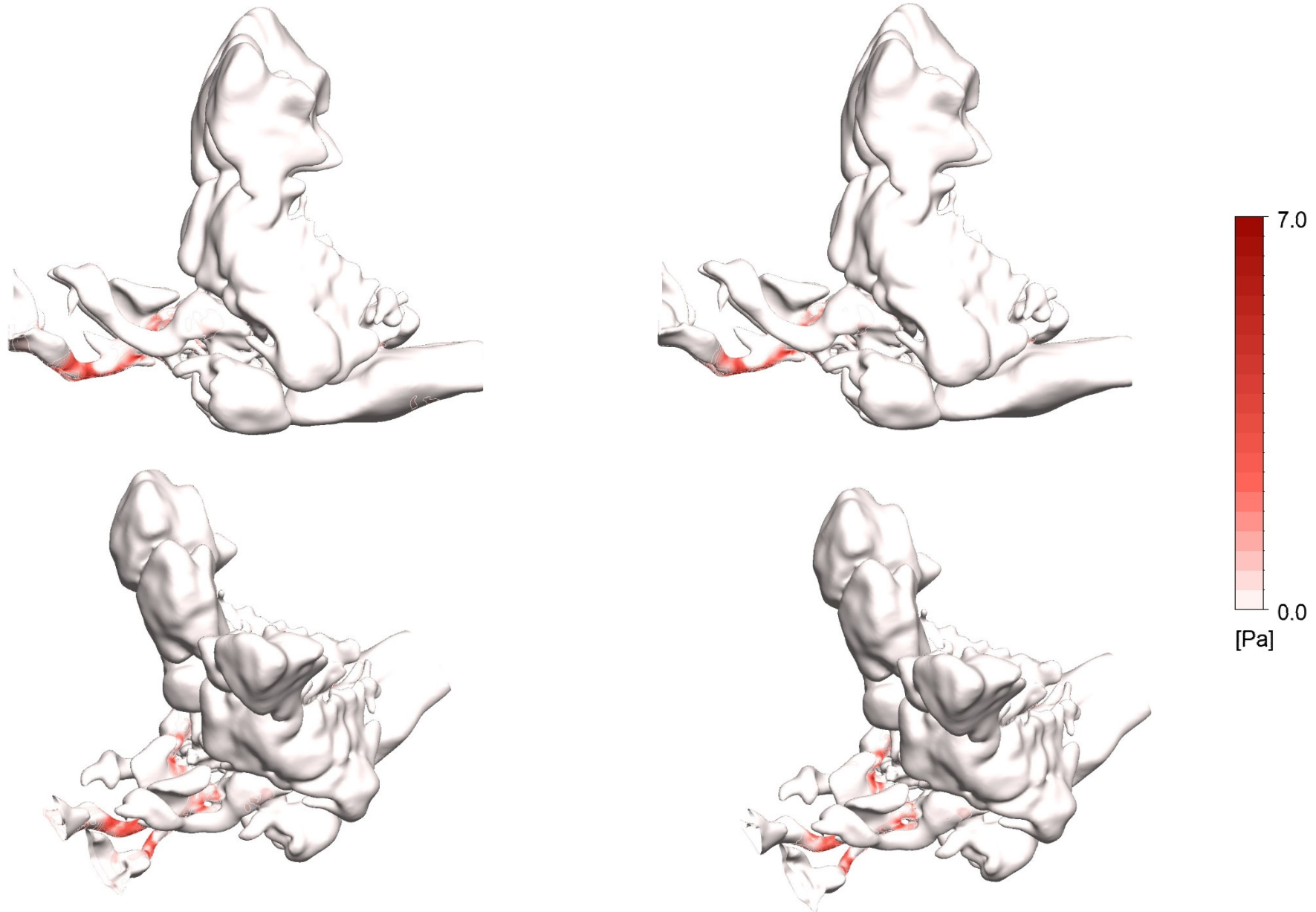


Pre

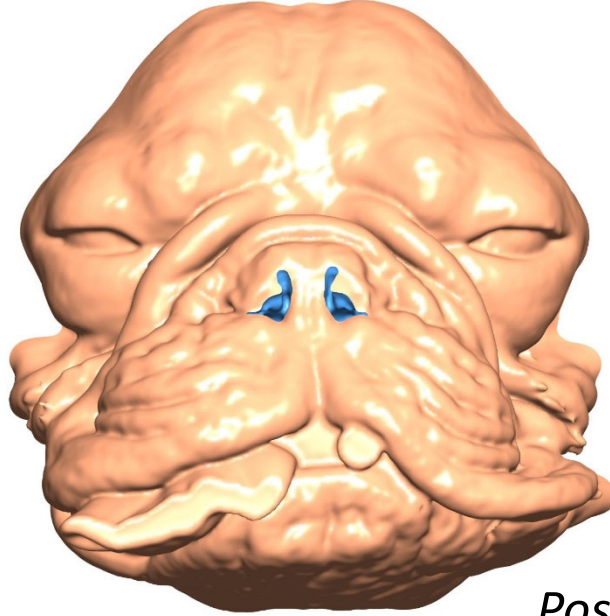
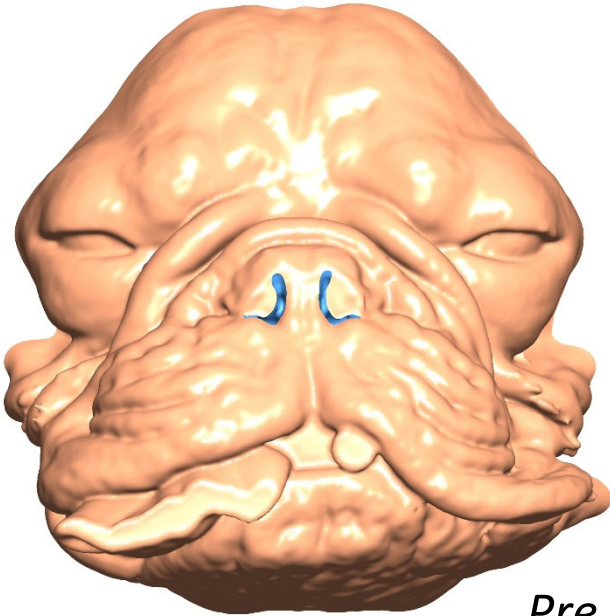
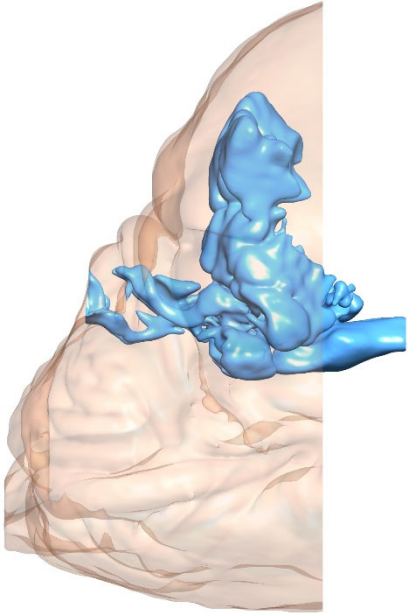


Post

# Wall Shear Stress Distributions



# Brachycephalic Airway Syndrome / Naris Enlargement

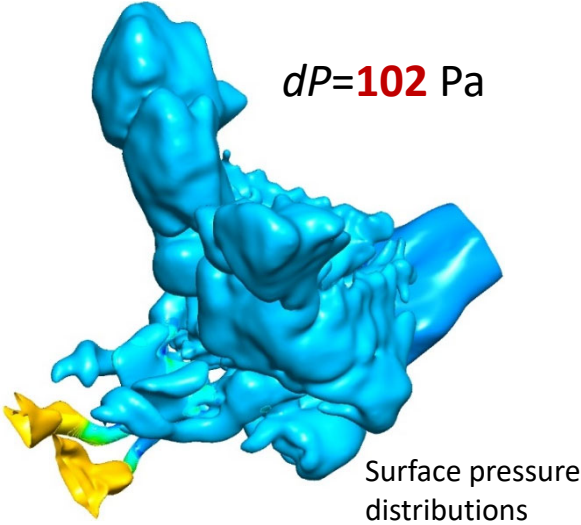
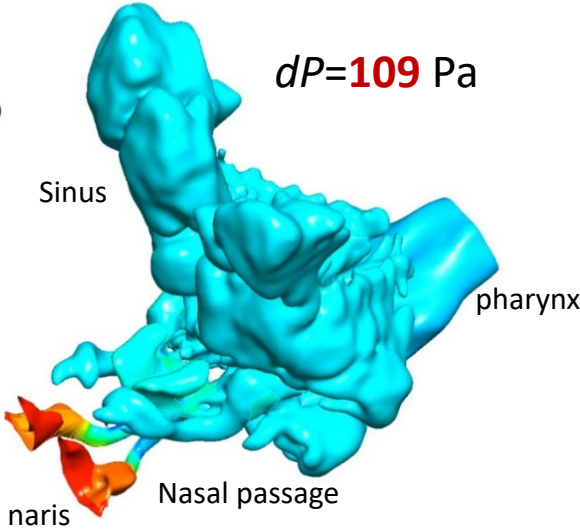
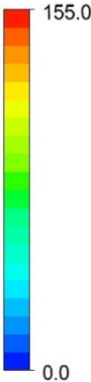


Pre

Post

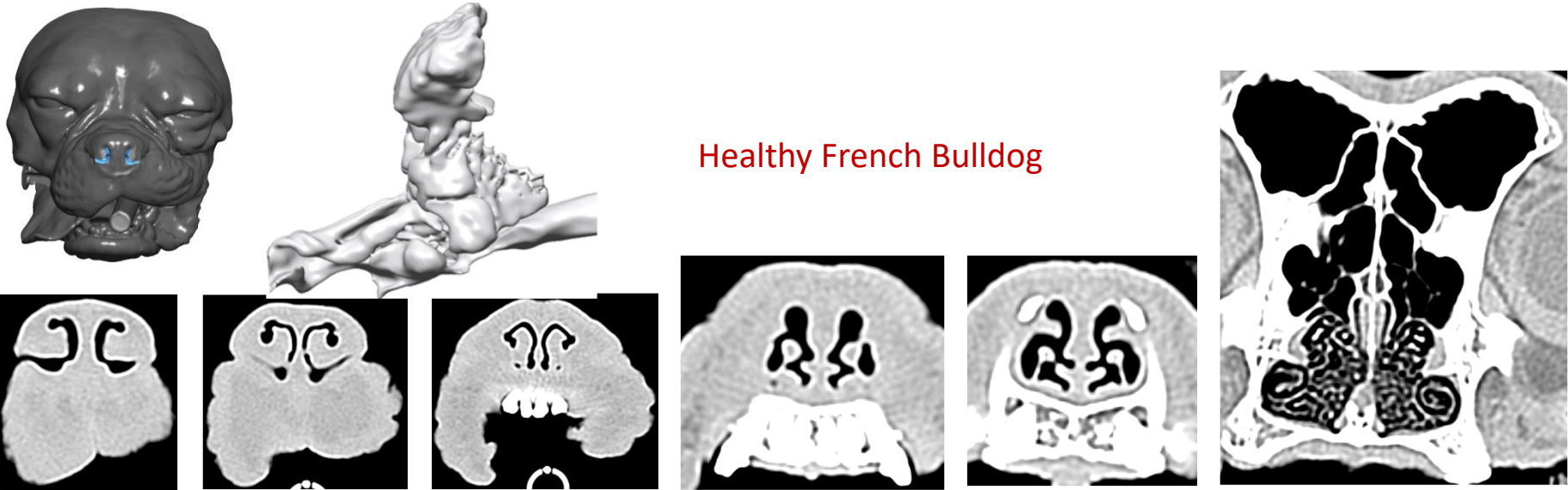
$dP=109$  Pa

$dP=102$  Pa



**7%** improvement  
in terms of Pressure drop

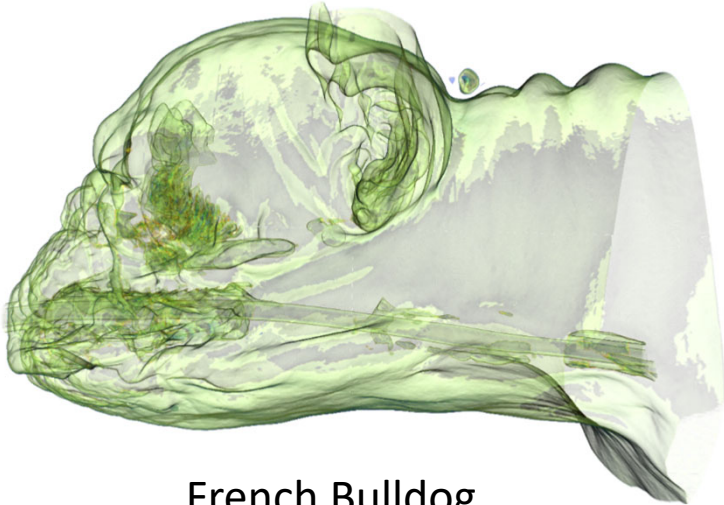
# Computer Tomography (CT) Images of Upper Airway



← Naris      Nasal passage      Frontal sinus →

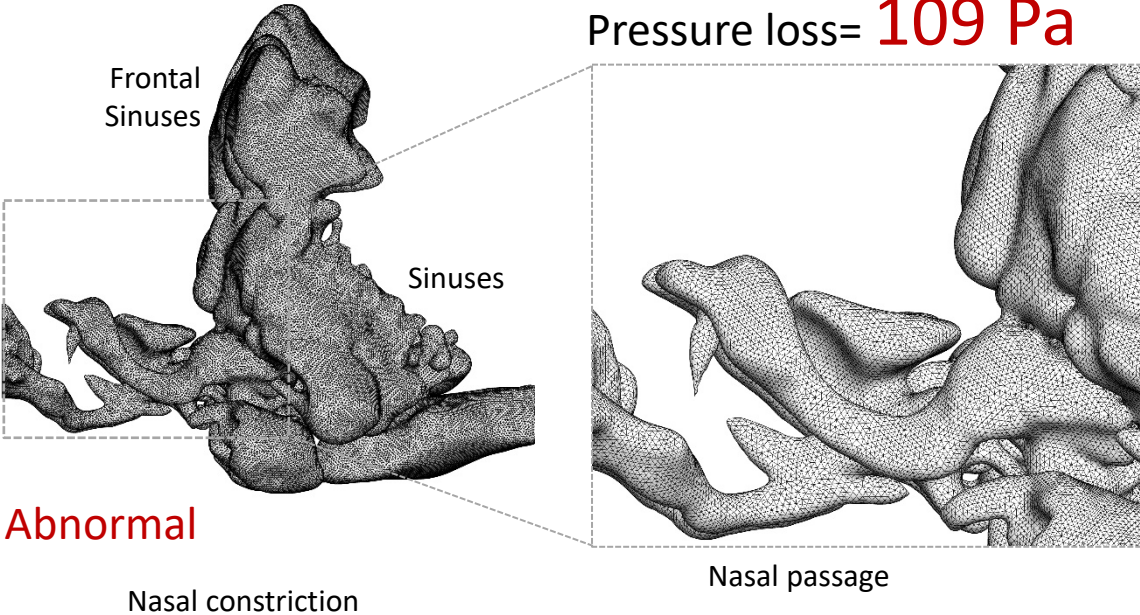
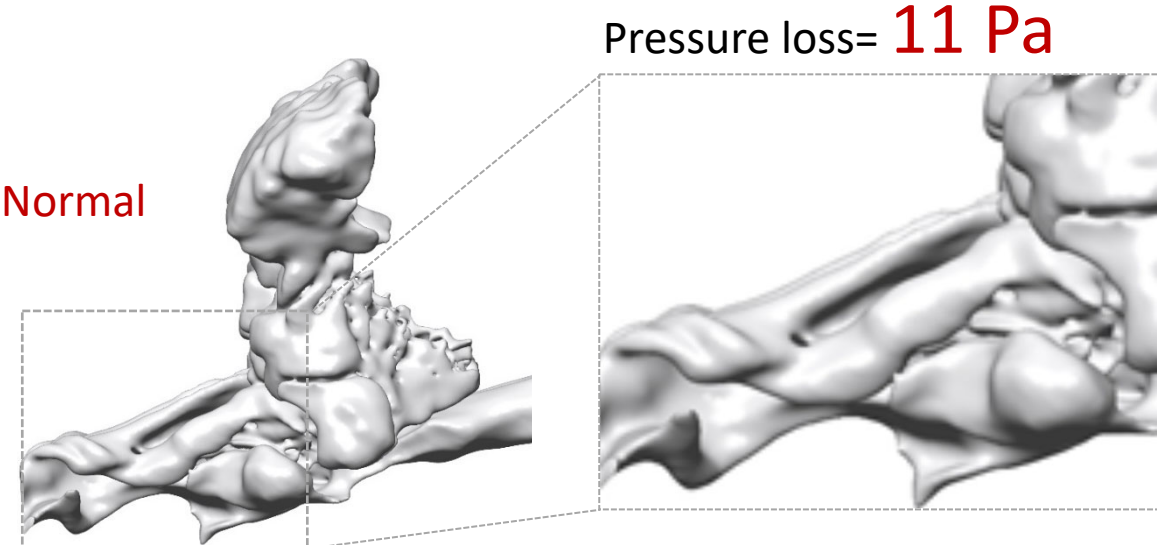


# Respiratory Tract of Bulldog



French Bulldog

still **10 times** differences in terms of Pressure drop



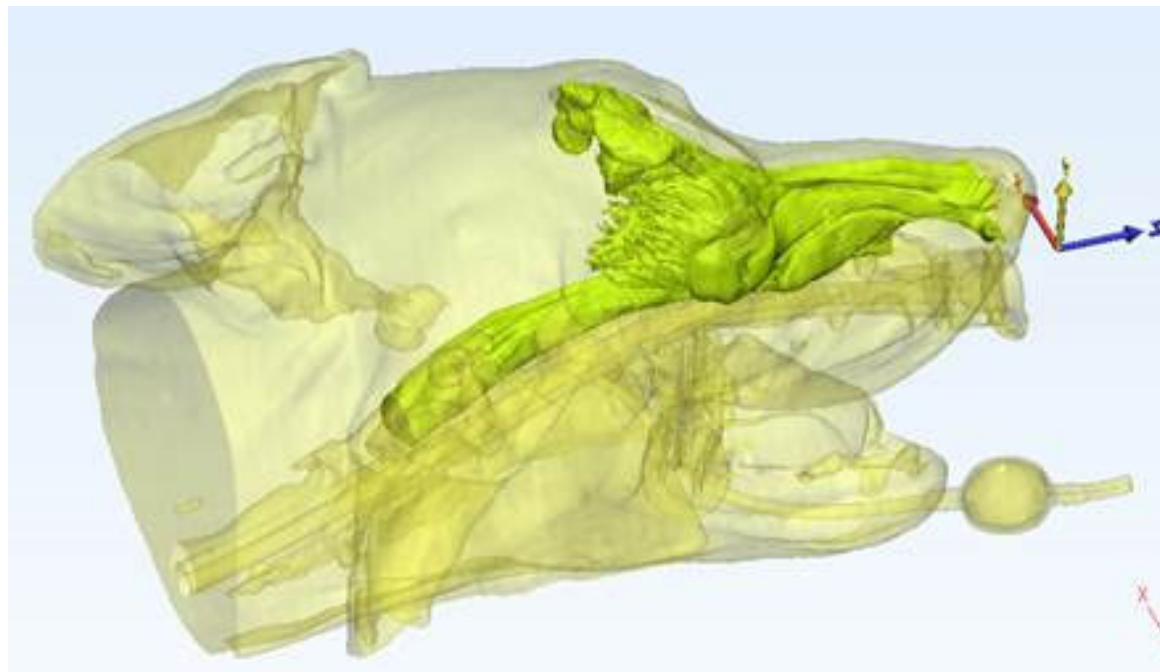
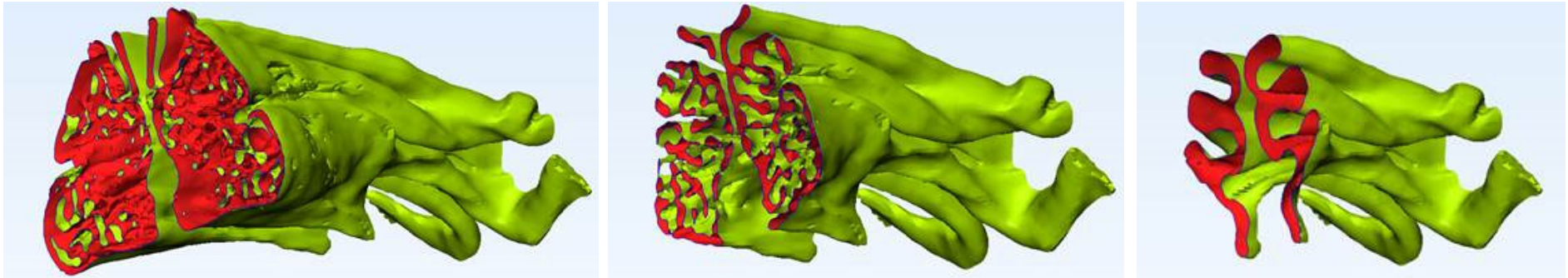
## What We Can Do for Bulldog



How about Beagle Dog?



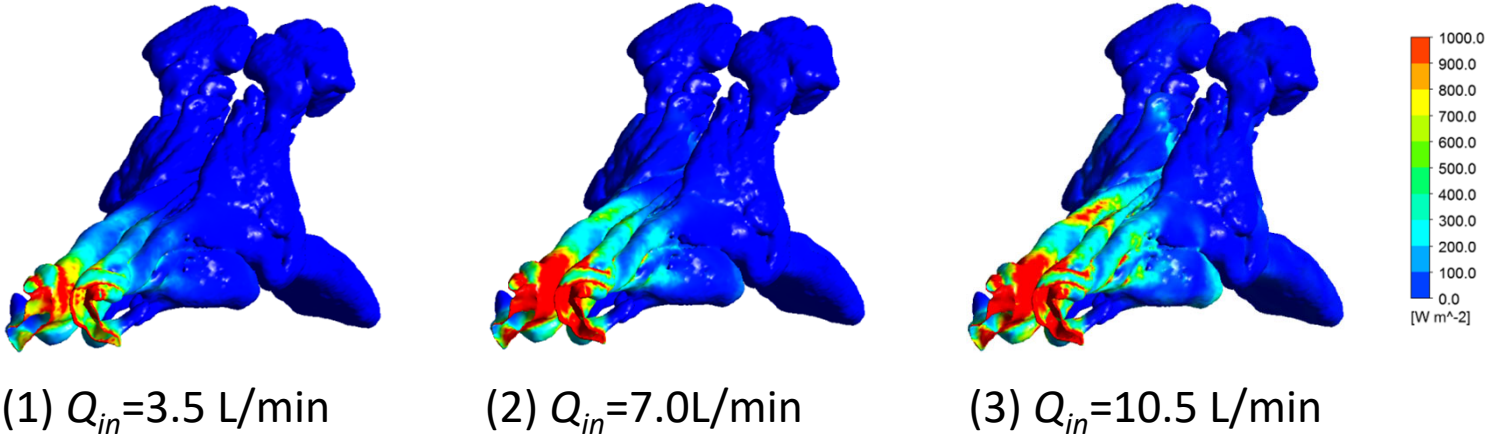
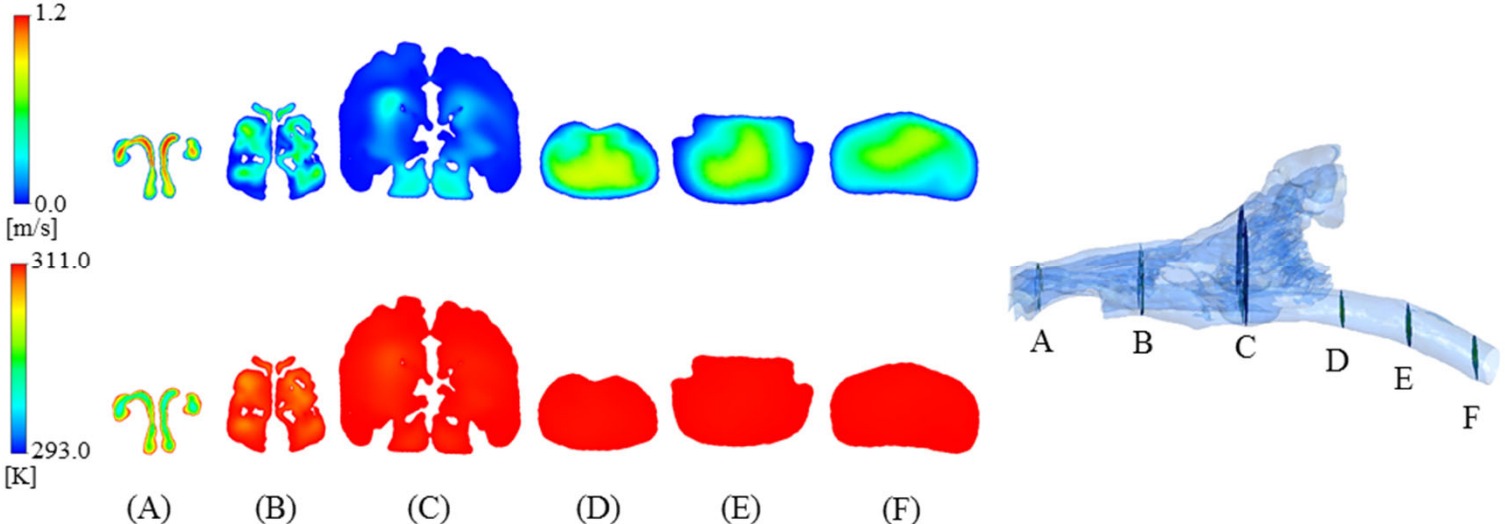
# CT Images of Upper Airway - Beagle Dog



Pressure loss= 5 Pa



# Beagle Dog

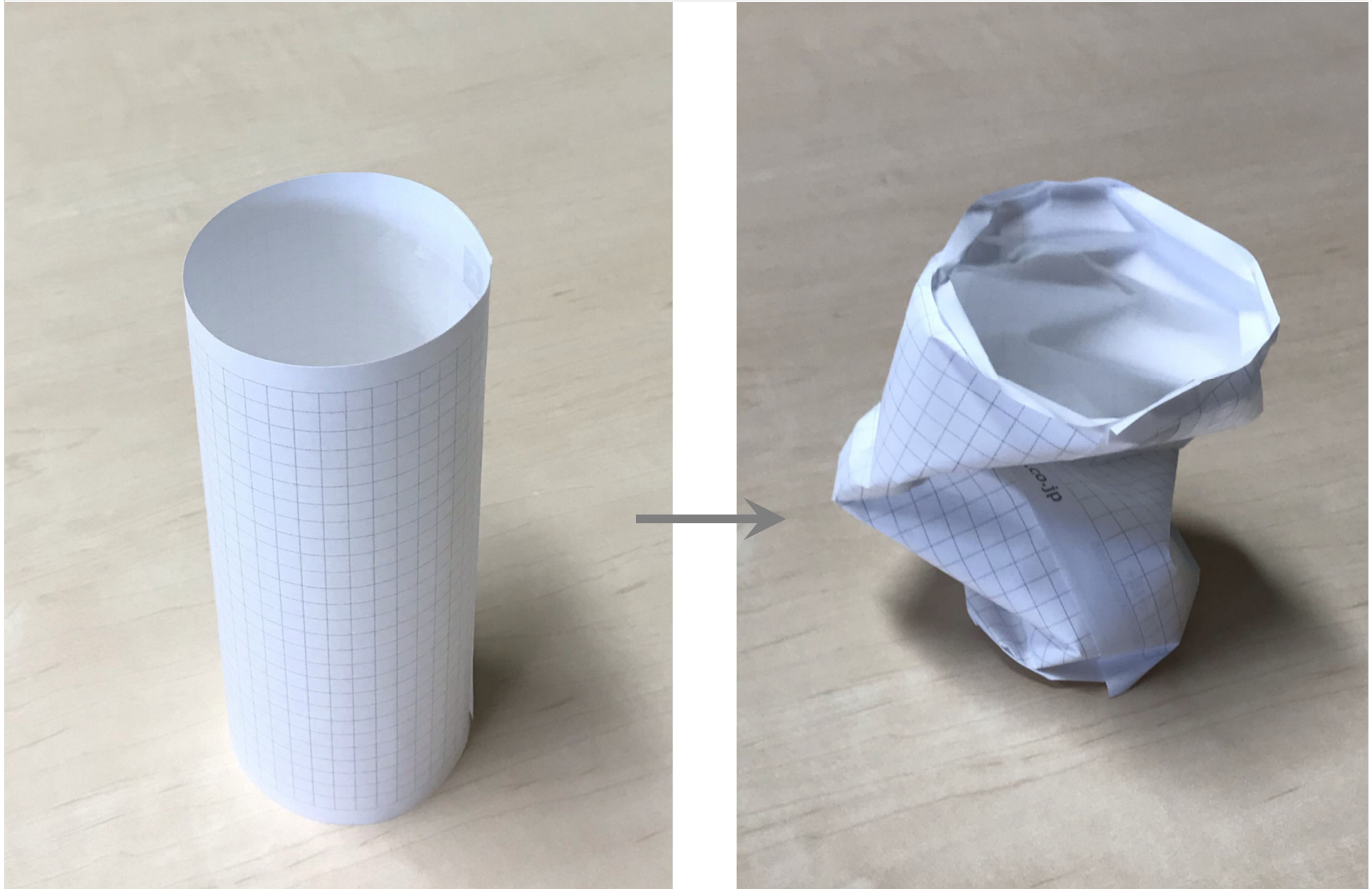


Convective heat flux distributions on the upper airway surfaces of the dog

# Olde English Bulldogge



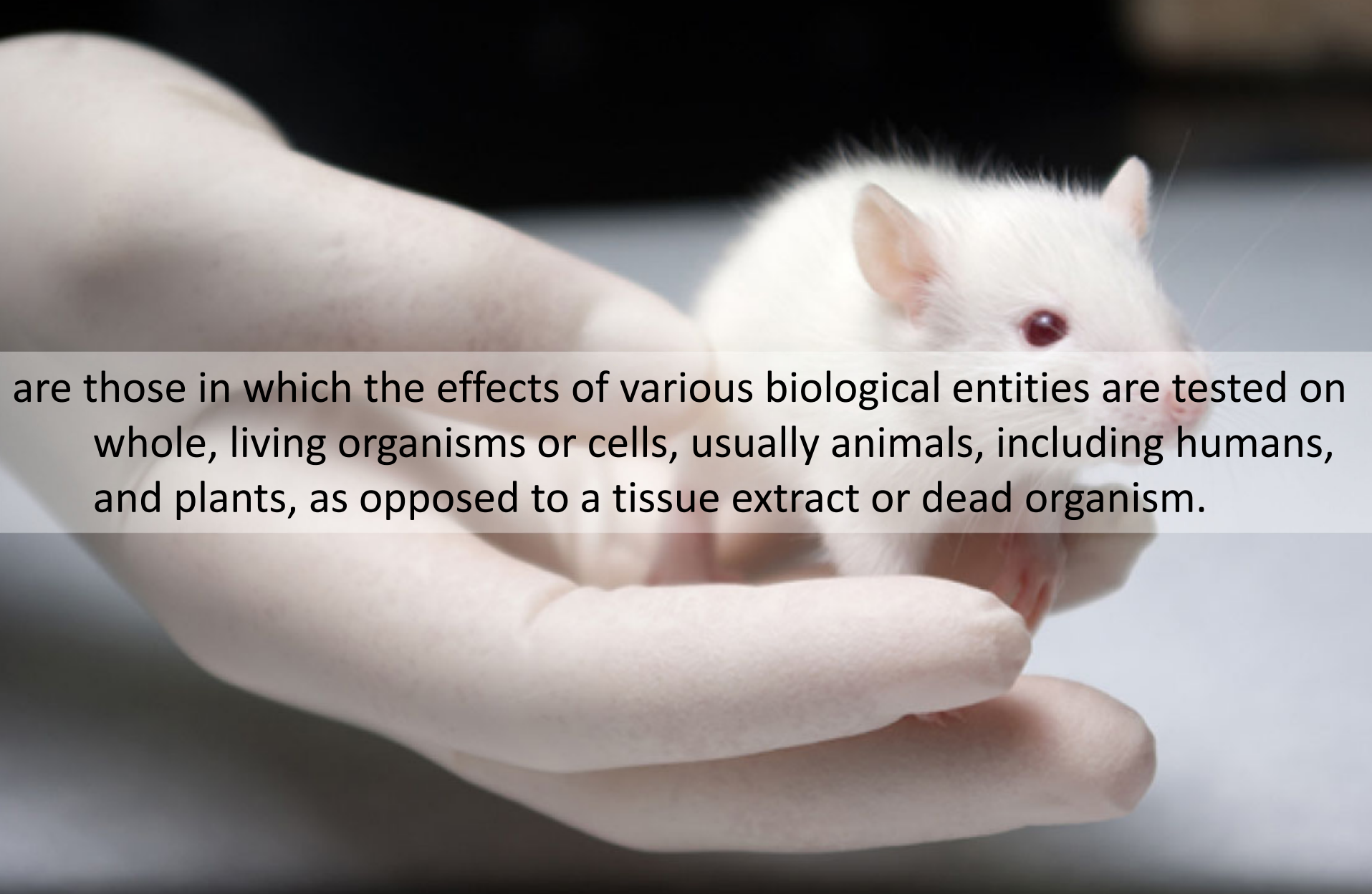
# Conclusion (so far)



A photograph showing a large number of white mice, likely used for research or as pets, in a cage. The mice are densely packed and appear to be in a state of activity. The background is slightly blurred, focusing attention on the mice in the foreground.

**3,200,000** /year (in Japan, 2017)

*In vivo* (Latin for "within the living")

A close-up photograph of a person's hand holding a small white mouse with red eyes. The mouse is being held gently in the palm of the hand, with its head facing right. The background is dark and out of focus.

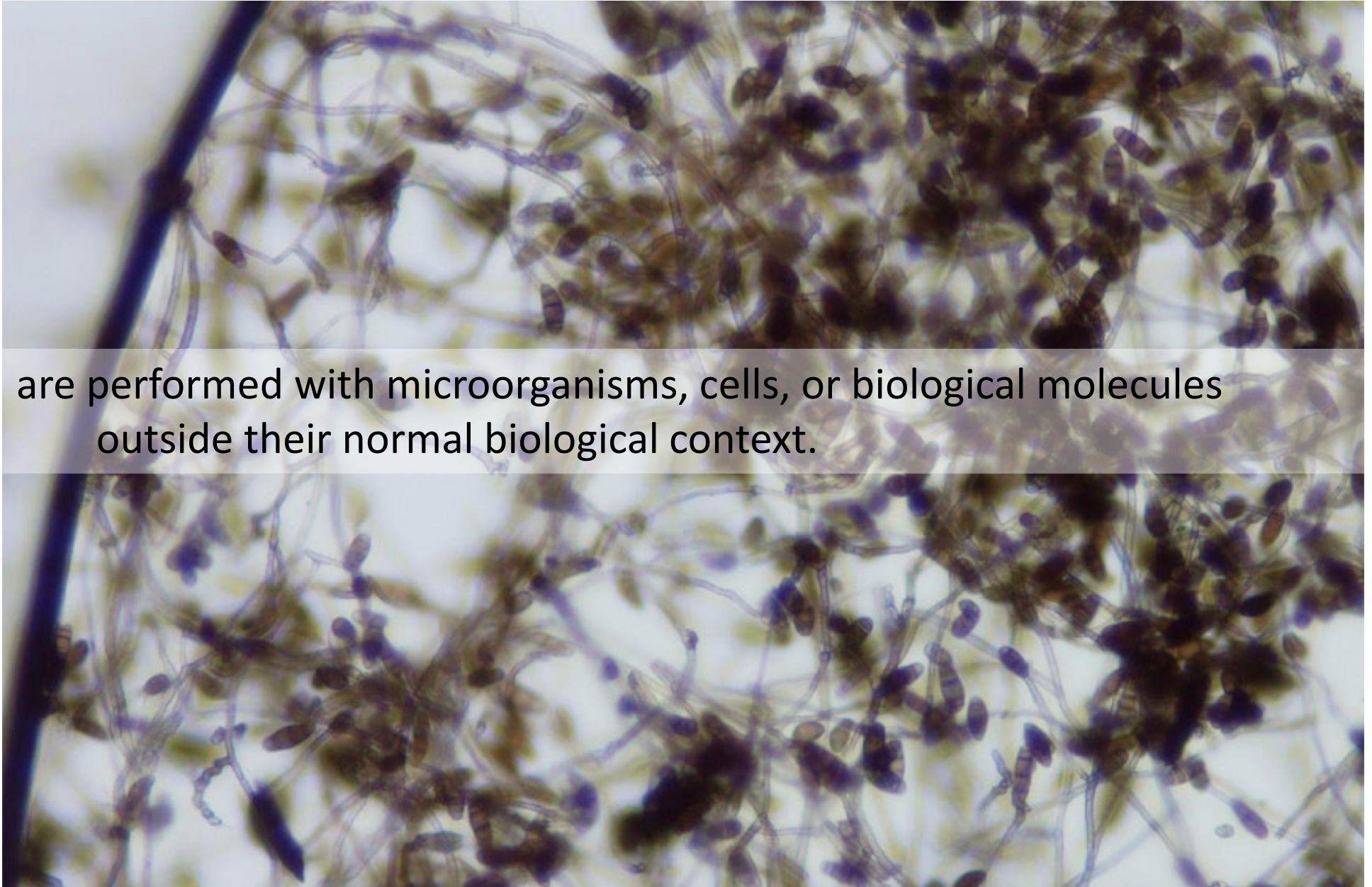
are those in which the effects of various biological entities are tested on whole, living organisms or cells, usually animals, including humans, and plants, as opposed to a tissue extract or dead organism.

*In vivo*

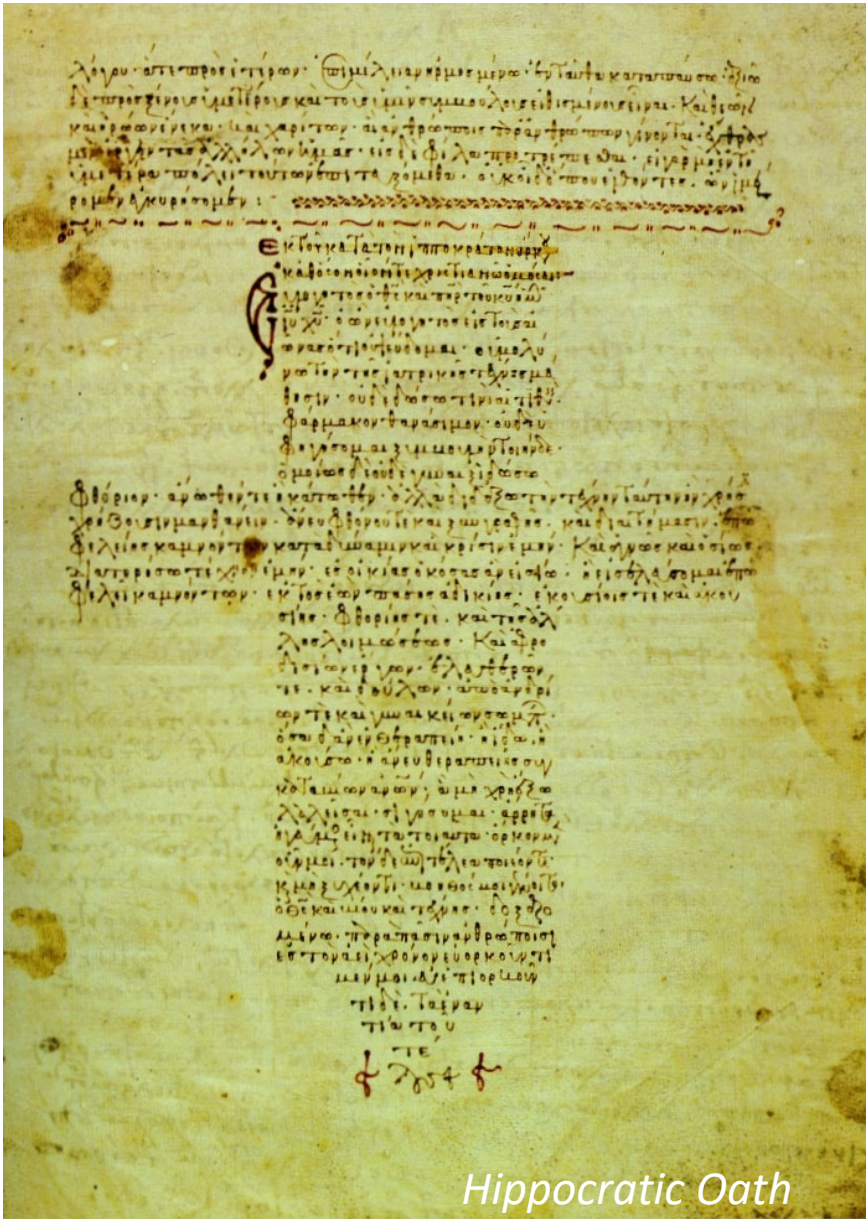
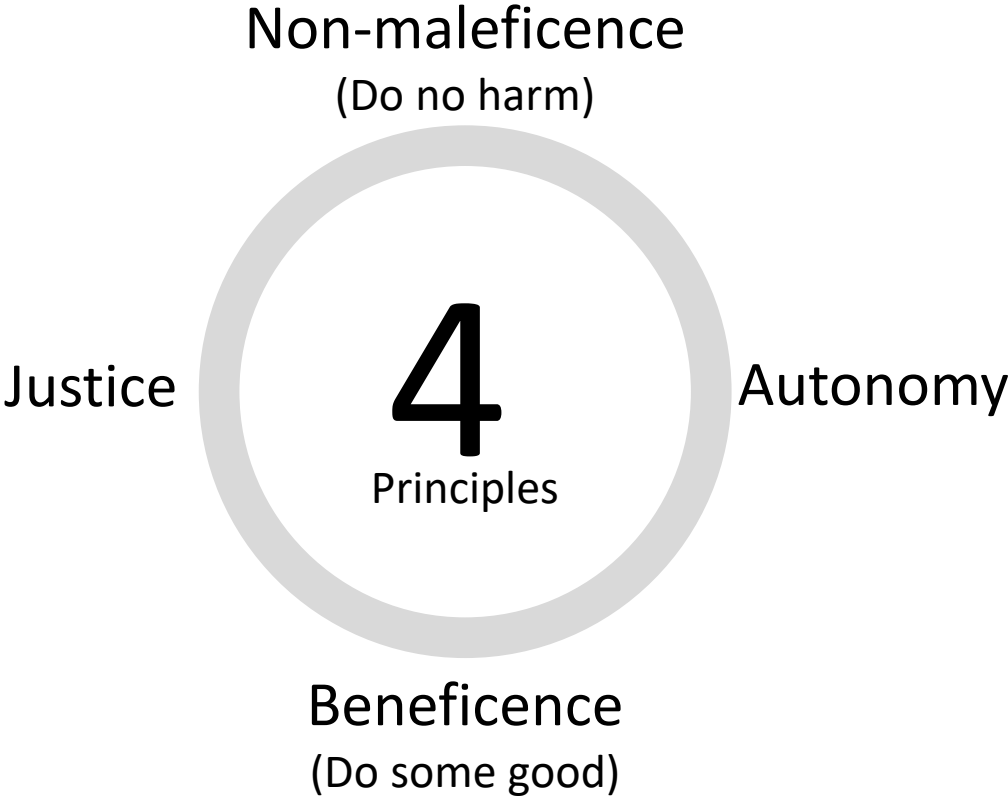


*In vitro* (Latin for “within the glass” or “In the test tube”)

are performed with microorganisms, cells, or biological molecules outside their normal biological context.



# Medical Ethics *Prohibition of “unethical” human experiment*





Bioethics

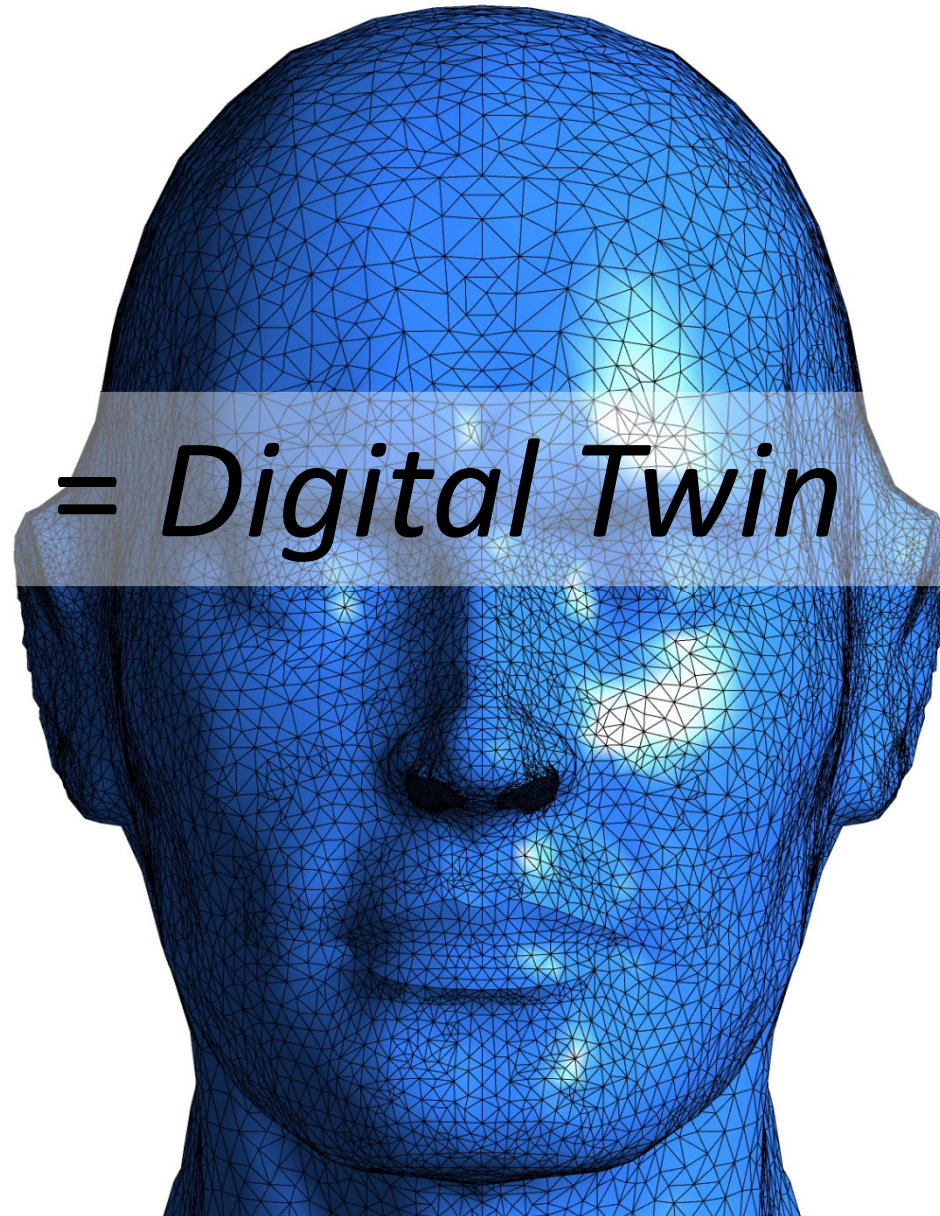
*Restrictions on Animal Tests*

A photograph of a beagle dog sitting inside a metal wire cage. The dog is looking directly at the camera with a calm expression. The cage is made of vertical and horizontal metal bars. The background is a plain, light-colored wall.

Not only for Human, but also animals

Essential tests at a minimum cost/sacrifice

*In silico* (Latin for "in silicon, for semiconductor computer chips")



## レポート課題

- 今回の講義内容に関連させ、試験問題を1題つくりなさい
- 模範解答も作成せよ
  
- 出題者→解答者(今回の講師である伊藤)