High-throughput phenotyping of health biomarkers in *Crassostrea gigas* by magnetic resonance imaging

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**Context:** IMAGIGAS project aimed to explore a non-destructive and non-invasive approach by using magnetic resonance imaging (MRI) to monitor high-throughput health biomarkers of *Crassostrea gigas*, before and during infectious challenges by Ostreid Herpesvirus type 1 (OsHV-1).

**Health biomarker ?**

Global biomarker or specific of a physiological function? It depends on the physiopathological phenomenon that lead to a health trouble. Bibliographical study and comparison with others animal models show that fluctuations of body weight are often considered as gross signs in clinical studies.

**Acquisition method ?**

Weighting the body of *Crassostrea gigas* is complicated by the water in the pallæal cavity and the presence of a shell. Precision balance is often used to weight lyophilized flesh. To realize a non destructive measurement and to respect as possible the integrity of the mollusc, preliminar assays using MRI were completed in previous Irstea /Ifremer projects (analysis of grey levels of images). b,c

Increase of data acquisition (number of individuals and/or frequency of acquisitions) requires: a large study population, an identification system of individuals, an enclosure to maintain oysters in correct position, informatic tools to manage the data flow and extract the relevant information.

**High-throughput ?**

The estimation of body weight is based on a relation established between the sum of pixels whose grey level is greater than a particular value (threshold) in images taken by MRI and the weight of flesh of oysters measured by precision balance.

**Methodological development**

Pacific oysters sensitive to OsHV-1 and viral suspension / contaminated seawater were produced at Ifremer facilities. Experiments were conducted at PRISM platform of Irstea which provided a Siemens Avanto 1,5 T MRI. Processing of acquired data was realized using Scilab software.

- MRI parameters: T1-weighted Flash 3D sequence with TR=11ms TE=2.98 ms, FOV=480mm, Matrix=640, Acc=2, Thickness=1.5mm, Nb of sections=192, BP=240Hz/px and Flip=20°.

- Choice of the tunnel (body) antenna for the reception of the signal, withdrawal of the head antenna:

  - Extension of the volume of the measuring area
  - MRI Images are affected by geometric distortion, in particular for oysters far from the center of the magnet (not all the volume of the tunnel is usable),
  - There are also variations of signal intensity (grey levels) linked to the position of the oysters in the tunnel, which can be to a certain extent corrected by a so-called normalization approach.⁸

**First results and applications perspectives**

- Throughput of MRI images acquisition: 69 oysters / 45 minutes.
- Code elaborated on Scilab can easily generate body weight estimation whatever number of oysters are used
- Putting in to practice (in progress): OsHV-1 challenge and evolution of body weight during an infection

**Références**:


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