



HAL
open science

New CT imaging method for adipose tissue analysis in mouse model of obesity

Sylvain Ordureau, Arnaud Marchadier, Roger Lédée, Catherine Vidal,
Jean-Pierre Tafani, Christophe Léger

► **To cite this version:**

Sylvain Ordureau, Arnaud Marchadier, Roger Lédée, Catherine Vidal, Jean-Pierre Tafani, et al.. New CT imaging method for adipose tissue analysis in mouse model of obesity. Radiological Society of North America, Nov 2009, Chicago, United States. hal-00608661

HAL Id: hal-00608661

<https://hal.science/hal-00608661v1>

Submitted on 18 Jul 2011

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

New CT imaging method for adipose tissue analysis in mouse model of obesity

SYLVAIN ORDUREAU³, ARNAUD MARCHADIER^{1,3}, ROGER LEDEE¹, CATHERINE VIDAL², JEAN-PIERRE TAFANI⁴,
CHRISTOPHE LEGER¹

¹ Institut PRISME, UPRES EA n°4229, 12 rue de Blois, 45067 Orléans, France

² Laboratoire de cellules souches, Signalisation et prions, INSERM U747 et Institut Pasteur, 45 rue des Saints Pères, 75006 Paris

³ UsefulProgress, 23 rue d'Anjou, 75008 Paris, France

⁴ APCIS, 14 avenue du Général Leclerc, 94700 Maisons Alfort

Purpose :

In humans CT imaging is a validated method for the study of adipose tissue distribution and for quantification of visceral and subcutaneous fat. Equivalent methods adapted to murine models of obesity are still lacking. Indeed most attempts to quantify fat tissues *in vivo*, using dedicated small animal micro-CT, involve long-term X-ray exposure which limits longitudinal studies. We have overcome this limitation by using a human clinical CT which allows very fast 3D imaging and minimal radiation exposure for the study of adipose tissue distribution in mice *in vivo*. Moreover, we have developed an automatic image analysis method for the segmentation of Hounsfield units of adipose tissues and for the localization of abdominal regions of interest.

Materials and Methods :

For each mice, 1000 slices were acquired in 2 sec using a Toshiba medical CT (135 kV and 400mAs). The slice thickness was 100µm with a resolution of 160 µm.

A Gaussian mixture model of the Hounsfield curve of 2D slices was computed with the Expectation Maximization algorithm. The identification of each Gaussian part allowed the automatic classification of adipose tissue voxels. The abdominal region of interest (umbilical) was defined as the slice showing the highest ratio of the Gaussian proportion between adipose and lean tissues.

Results :

Three Gaussians allowed to discriminate adipose from lean tissues in the subpart [-500 HU; 500 HU] of the Hounsfield curve. Gaussian models of adipose tissue showed a larger window of Hounsfield densities in control mice [-221;-37] as compared to obese mice [-206;-32]. The resulting computed volumes of fat tissue were respectively 4756 and 5978 mm³.

Conclusion :

Our results show that the medical CT imaging combined with automatic image analysis provide precise and reproducible quantification of adipose tissue in mice *in vivo* allowing repetitive examinations for longitudinal studies.

Clinical relevance/application:

The application of human clinical CT to mice is a promising approach for the study of obesity, allowing valuable comparison between species using the same imaging materials and software analysis.