



## An Alternate, Egg-Free Radiolabeled Meal Formulation for Gastric-Emptying Scintigraphy

Philippe Garrigue, Aurore Bodin-Hullin, Sandra Gonzalez, Quentin Sala,  
Benjamin Guillet

### ► To cite this version:

Philippe Garrigue, Aurore Bodin-Hullin, Sandra Gonzalez, Quentin Sala, Benjamin Guillet. An Alternate, Egg-Free Radiolabeled Meal Formulation for Gastric-Emptying Scintigraphy. *Clinical Nuclear Medicine*, 2017, pp.540 - 541. 10.1097/RLU.0000000000001658 . hal-01774110

**HAL Id: hal-01774110**

**<https://amu.hal.science/hal-01774110>**

Submitted on 9 May 2018

**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.

## **An alternate, egg-free radiolabelled meal formulation for gastric emptying scintigraphy**

Philippe Garrigue<sup>1,2,3\*</sup>, Aurore Bodin-Hullin<sup>1</sup>, Sandra Gonzalez<sup>4</sup>, Quentin Sala<sup>4</sup>, Benjamin Guillet<sup>1,2,3</sup>

(1) APHM, Hôpital Nord, Service Radiopharmacie, Marseille, France.

(2) Aix-Marseille Université, Inserm, UMR\_S 1076, Marseille, France.

(3) Aix-Marseille Université, CERIMED, Marseille, France.

(4) APHM, Hôpital Nord, Service de Médecine Nucléaire, Marseille, France.

**\*Corresponding author:** Philippe Garrigue

Faculté de Pharmacie, 27 Boulevard Jean Moulin, 13005 Marseille, France.

Phone: +33-491-966-030 Fax: +33-491-835-602

[philippe.garrigue@univ-amu.fr](mailto:philippe.garrigue@univ-amu.fr)

**Conflicts of interest :** The authors have nothing to disclose.

**Short title :** Alternate egg-free meals for gastric emptying

**Word count: 478**

## **Abstract**

Tc-99m-radiolabelled scrambled eggs (SE) are most often used as the ingested solid phase for gastric emptying scintigraphy (GES), leading egg-reluctant patients to avoid the examination. We formulated and validated two egg-free alternate meals, in the absence of any commercialized formulation: chocolate mug-cake (MC) and scrambled tofu (ST).

Six healthy volunteers underwent GES after ingesting Tc-99m-radiolabelled MC, ST or SE. Images were acquired and interpreted resulting in the calculation of a gastric retention index that did not change significantly between formulations (% of overtime variation to SE: MC  $7.75\pm 7.1\%$ ; ST  $7.17\pm 5.8\%$ ;  $P=0.6618$ , *ns*), suggesting MC and ST as interesting egg-free alternatives.

**Keywords :** gastroparesis, gastric emptying scintigraphy, eggs alternative, Tc-99m.

## Figure 1 legend

The latest guidelines define gastric emptying scintigraphy (GES) as the gold standard for the diagnosis of gastroparesis (1). The Society of Nuclear Medicine recommends a standardized meal with radiolabeled scrambled eggs (SE) as solid-phase (2). Our services regularly encounter patients reluctant to classic egg-based radiolabeled formulations for gastric emptying scintigraphy, mainly due to new eating habits and sociocultural matters, leading to exam cancellations or non-interpretability. Alternatives have already been tested as Liquide Ensure<sup>®</sup> (3) or oatmeal (4) but not completely satisfying, the first being a liquid-phase and the latter being much less palatable for patients suffering of a loss of appetite. Per the absence of recommendation and poor literature for this purpose, we aimed at formulating two egg-free and soy-lecithin-based alternate radiolabelled meals: microwave-baked chocolate mug-cake (MC) and a scrambled tofu (ST), and we evaluated these meals in terms of 1) stability of the radiolabeled phase; 2) comparability of the results expressed as gastric retention index (GRI, %) for interpretation; 3) caloric profile; 4) palatability.

Six healthy volunteers (4 females aged  $25 \pm 2$  and 2 males aged  $27 \pm 3$ ) underwent GES after ingesting MC, ST and SE radiolabelled with 37MBq Tc-99m sulphur colloids, on 3 consecutive days. Meals were prepared by the same person during the study period. The subjects were fasted overnight and the meal was consumed in 10min. Radiochemical purity of Tc-99m sulphur colloids was  $\geq 95\%$ . Images were acquired 10min, 30min, 1h, 2h, 3h and 4h after ingestion and were interpreted independently by two experienced, blinded nuclear medicine physicians. A GRI was calculated for each time point using the Elashoff curve fit method, as previously described and commonly used for gastric emptying delay diagnosis (5). A two-way ANOVA test was used to compare GRI obtained with the three formulations. Spearman correlation test followed by linear regression were used between GRI obtained

respectively with MC or ST, and SE.  $P < 0.05$  indicated statistical significance.

**Fig. 1A** shows GRI did not change significantly between formulations (% of overtime variation to SE: MC  $7.75 \pm 7.1\%$ ; ST  $7.17 \pm 5.8$ ;  $P = 0.6618$ , *ns*, top). The corresponding GES images obtained in a representative healthy volunteer with both tested formulations were overall similar to the control meal (bottom).

**Fig. 1B** shows significant positive correlations between GRI as obtained with SE or MC (top,  $R^2 = 0.9969$ ,  $P = 0.0028$ ) and as obtained with SE or ST (bottom,  $R^2 = 0.9947$ ,  $P = 0.0028$ ).

The alternate meals were well tolerated by all volunteers, although the MC was largely preferred. SE and MC are equivalent in calories, although the ST is 33% fatter (respectively 422kcal, 425kcal and 653kcal). Both the superimposable GRI time-profiles and their correlations demonstrate MC and ST are interesting as solid phases, compared to liquid or other alternate test formulations that have been recently experimented (3,6,7). Still, MC was widely preferred in matters of taste, and its preparation advantageously relies on a reproducible, safe, and easy microwave-baking protocol, while SE preparation reproducibility is often decried (8).

## References

1. Camilleri M, Parkman HP, Shafi MA, et al. Clinical guideline: management of gastroparesis. *Am J Gastroenterol*. 2013;108:18-37; quiz 38.
2. Abell TL, Camilleri M, Donohoe K, et al. Consensus Recommendations for Gastric Emptying Scintigraphy: A Joint Report of the American Neurogastroenterology and Motility Society and the Society of Nuclear Medicine. *J Nucl Med Technol*. 2008;36:44-54.
3. Sachdeva P, Kantor S, Knight LC, Maurer AH, Fisher RS, Parkman HP. Use of a high caloric liquid meal as an alternative to a solid meal for gastric emptying scintigraphy. *Dig Dis Sci*. 2013;58(7):2001-2006. doi:10.1007/s10620-013-2665-2.

4. Somasundaram VH, Subramanyam P, Palaniswamy SS. A gluten-free vegan meal for gastric emptying scintigraphy: establishment of reference values and its utilization in the evaluation of diabetic gastroparesis. *Clin Nucl Med*. 2014;39:960-965.
5. Maurer AH. Advancing Gastric Emptying Studies: Standardization and New Parameters to Assess Gastric Motility and Function. *Semin Nucl Med*. 2012;42:101-112.
6. Currie GM, Wheat JM. Egg labeling for gastric-emptying studies. *J Nucl Med Off Publ Soc Nucl Med*. 2008;49:863; author reply 863-864.
7. Drubach LA, Kourmouzi V, Fahey FH. Cheese is a reliable alternative meal for solid-phase gastric emptying study. *Nucl Med Commun*. 2010;31:430-433.
8. Knight LC, Kantor S, Doma S, et al. Egg labeling methods for gastric emptying scintigraphy are not equivalent in producing a stable solid meal. *J Nucl Med Off Publ Soc Nucl Med*. 2007;48:1897-1900.