

# Effect of type of fiber, site of fermentation, and method of analysis on digestibility of soluble and insoluble fiber in rabbits<sup>1</sup>

R. Abad-Guamán, R. Carabaño, M. S. Gómez-Conde, and J. García<sup>2</sup>

Departamento de Producción Animal, E.T.S.I. Agrónomos,  
Universidad Politécnica de Madrid, Ciudad Universitaria, 28040 Madrid, Spain

**ABSTRACT:** The effect of type of fiber, site of fermentation, method for quantifying insoluble and soluble dietary fiber, and their correction for intestinal mucin on fiber digestibility were examined in rabbits. Three diets differing in soluble fiber were formulated (8.5% soluble fiber, on DM basis, in the low soluble fiber [LSF] diet; 10.2% in the medium soluble fiber [MSF] diet; and 14.5% in the high soluble fiber [HSF] diet). They were obtained by replacing half of the dehydrated alfalfa in the MSF diet with a mixture of beet and apple pulp (HSF diet) or with a mix of oat hulls and soybean protein (LSF diet). Thirty rabbits with ileal T-cannulas were used to determine ileal and fecal digestibility. Cecal digestibility was determined by difference between fecal and ileal digestibility. Insoluble fiber was measured as NDF, insoluble dietary fiber (IDF), and in vitro insoluble fiber, whereas soluble fiber was calculated as the difference between total dietary fiber (TDF) and NDF (TDF–NDF), IDF (TDF–IDF), and in vitro insoluble fiber (TDF–in vitro insoluble fiber). The intestinal mucin content was used to correct the TDF and soluble fiber digestibility. Ileal and fecal concentration of mucin increased from the LSF to the HSF diet group ( $P < 0.01$ ). Once corrected for intestinal mucin, ileal and fecal digestibility of

TDF and soluble fiber increased whereas cecal digestibility decreased ( $P < 0.01$ ). Ileal digestibility of TDF increased from the LSF to the HSF diet group (12.0 vs. 28.1%;  $P < 0.01$ ), with no difference in the cecum (26.4%), resulting in a higher fecal digestibility from the LSF to the HSF diet group ( $P < 0.01$ ). Ileal digestibility of insoluble fiber increased from the LSF to the HSF diet group (11.3 vs. 21.0%;  $P < 0.01$ ), with no difference in the cecum (13.9%) and no effect of fiber method, resulting in a higher fecal digestibility for rabbits fed the HSF diet compared with the MSF and LSF diet groups ( $P < 0.01$ ). Fecal digestibility of NDF was higher compared with IDF or in vitro insoluble fiber ( $P < 0.01$ ). Ileal soluble fiber digestibility was higher for the HSF than for the LSF diet group (43.6 vs. 14.5%;  $P < 0.01$ ) and fiber method did not affect it. Cecal soluble fiber digestibility decreased from the LSF to the HSF diet group (72.1 vs. 49.2%;  $P < 0.05$ ). The lowest cecal and fecal soluble fiber digestibility was measured using TDF–NDF ( $P < 0.01$ ). In conclusion, a correction for intestinal mucin is necessary for ileal TDF and soluble fiber digestibility whereas the selection of the fiber method has a minor relevance. The inclusion of sugar beet and apple pulp increased the amount of TDF fermented in the small intestine.

**Key words:** digestibility, insoluble dietary fiber, intestinal mucin, rabbit, soluble dietary fiber

© 2015 American Society of Animal Science. All rights reserved.

J. Anim. Sci. 2015.93  
doi:10.2527/jas2014-8767

## INTRODUCTION

Soluble fiber is not usually measured in rabbit diets in spite of its positive effect on rabbit health (Trocino et al., 2013). This circumstance is explained by the higher complexity of the available methodology for soluble fiber compared with that of insoluble fiber and the lack of agreement on the adequate methods, because most of the methods do not resemble the physiological conditions (Monro, 1993). Soluble dietary fiber can be

<sup>1</sup>We are grateful to the Comisión Interministerial de Ciencia y Tecnología (CICYT; projects AGL2001-2796 and AGL2008-00627) and Comunidad de Madrid (project S2009/AGR-1704) for the financial support and to the SENESCYT-Ecuador for the PhD grant obtained by Mr. Abad-Guamán.

<sup>2</sup>Corresponding author: javier.garcia@upm.es

Received November 28, 2014.

Accepted March 23, 2015.