



CARTELERA N° 371/25

CURSOS DE POSGRADO

**“Digestión y metabolismo de nutrientes en rumiantes:
aproximaciones metodológicas para su estudio”**

Coordinador: Analía Pérez Ruchel

Créditos: 4

Horas: 60

Cupos: 15

Modalidad de dictado: Presencial

Período de dictado: 03/10/2025-24/10/2025

Período de inscripción: * 09/09/2025-26/09/2025

Exclusivamente a través del SGAE* Les dejamos un [instructivo](#) de apoyo

Docentes Nacionales

- Martín Fraga (PhD, Plataforma Nacional de Investigación en Salud Animal, INIA Estanzuela).
- Alejandro Britos (PhD, UA de Nutrición Animal, FVET).
- Analía Pérez Ruchel (PhD, UA de Nutrición Animal, FVET).

Docente Extranjero

- Gilberto Vilmar Kozloski (PhD, Universidade Federal de Santa María - Brasil

Programa del curso

Viernes 3/10/2025 – 9:00 a 16:00h - IPAV (Ruta 1, km 42.5)

Introducción. Digestión de los alimentos en rumiantes. Metodologías para el estudio de la digestibilidad in vivo. Analía Pérez Ruchel

Ecosistema ruminal. Características de la microbiota y factores que la afectan.

Manipulación de la microbiota. Métodos para el estudio. Martín Fraga

Ambiente ruminal y sincronización de nutrientes. Síntesis de proteína microbiana en el rumen. Manejo de la alimentación. Analía Pérez Ruchel

Distribución de Trabajos para Talleres.

Jueves 16/10/2025 – 9:00 a 16:00h – Sede Central de FVET (Ruta 8, km 18)

Utilización de los nutrientes a nivel post-ruminal. Metodologías para estimar el flujo de digesta y proteína microbiana a nivel intestinal. Gilberto Kozloski

Metabolismo de los productos finales de la digestión en rumiantes. Uso de animales multicateterizados. Gilberto Kozloski

Viernes 17/10/2025 – 9:00 a 16:00h - IPAV (Ruta 1, km 42.5)

Métodos de medición de digestibilidad in vitro. Alcance y limitantes para su estudio.

Alejandro Britos

Modelos nutricionales. Técnicas in vitro e in situ para obtener parámetros necesarios para su utilización. Gilberto Kozloski

Talleres grupales. Discusión con el equipo docente.

Viernes 24/10 – hora a definir. Sede Central de FVET (Ruta 8, km 18)

Prueba individual, cuestionario..

Bibliografía Complementaria:

- Amaral, G.A., Kozloski, G.V., Santos, A.B., Castagnino, D.S., Fluck, A.C., Farenzena, R., Alves, T.P., Mesquita, F.R. 2011. Metabolizable protein and energy supply in lambs fed annual ryegrass (*Lolium multiflorum* Lam.) supplemented with sources of protein and energy Journal of Agricultural Science, 149, 519–527. doi:10.1017/S002185961000122X.
- Ávila, S.C., Kozloski, G.V., Orlandi, T., Mezzomo, M.P., Stefanello, S. 2015. Impact of a tannin extract on digestibility, ruminal fermentation and duodenal flow of amino acids in steers fed maize silage and concentrate containing soybean meal or canola meal as protein source. Journal of Agricultural Science, 153, 943–953. doi:10.1017/S0021859615000064. de Menezes, L.F.G., Kozloski, G.V., Restle, J., Brondani, I.L., Pazdiora, R.D., Cattelam, J. 2010. Profile of ingested fatty acids and in the duodenal digest of steers fed different diets. R. Bras. Zootec., 39 (11),2502-2511.
- Farenzena, R., Kozloski, G. V., Gindri, M., Stefanello, S. 2017. Minimum length of the adaptation and collection period in digestibility trials with sheep fed ad libitum only forage or forage plus concentrante. Journal of Animal Physiology and Animal Nutrition 101, 1057-1066. DOI: 10.1111/jpn.12550.



- Félix, A., Repetto, J.L., Hernández, N., Pérez-Ruchel, A., Cajarville, C. 2017. Restricting the time of access to fresh forage reduces intake and energy balance but does not affect the digestive utilization of nutrients in beef heifers. *Animal Feed Science and Technology*, 226, 103-112, DOI: 10.1016/j.anifeedsci.2017.02.016.
- Fernandez-Turren, G., Arroyo, J.M., Pérez-Ruchel, A., Urioste, M.J., Kozloski, G.V., Repetto, J.L., Cajarville, C. 2023. Nutrient utilization and ingestive behavior by lambs fed a partial mixed ration consisting of different carbohydrate sources combined with fresh alfalfa. *Livestock Science*, 271, 105215, <https://doi.org/10.1016/j.livsci.2023.105215>.
- Fraga, M., Fernández, S., Perelmanter, K., Pomiés, N., Cajarville, C., Zunino, P. 2018. The use of Prevotella bryantii 3C5 for modulation of the ruminal environment in an ovine model. *Brazilian Journal of Microbiology*, 49 (1), 101-106. <https://doi.org/10.1016/j.bjm.2018.07.004>.
- Fraga, M., Perelmanter, K., Valencia, M.J., Martínez, M, Abin-Carriquiry, A., Cajarville, C., Zunino, P. 2014. Evaluation of native potential probiotic bacteria using an in vitro ruminal fermentation system. *Annals of Microbiology*, 64 (3), 1149-1156.
- Fraga, M., Perelmanter, K., Valencia, M., Cajarville, C., Zunino, P. 2013. Caracterización de la microbiota bacteriana ruminal de un bovino a pastoreo mediante técnicas clásicas e independientes del cultivo. *Veterinaria (Montevideo)*, 49, 189: 40 – 55.
- Hentz, F., Kozloski, G.V., Zeni, D., Brun, M.V., Stefanello, S. 2017. Relationship between level of forage intake, blood flow and oxygen consumption by splanchnic tissues of sheep fed a tropical grass forage.
- *Journal of Animal Physiology and Animal Nutrition*, 101, 121–126. DOI: 10.1111/jpn.12519. Hentz, F., Zeni, D.S., Stefanello, S., Kozloski, G.V. 2018. Oxygen consumption by splanchnic tissues of sheep under mesenteric load of N compounds. *Small Ruminant Research*, 169, 140–142. <https://doi.org/10.1016/j.smallrumres.2018.08.017>
- Kozloski, G.V., de Lima, L.D., Ruggia Chiesa, A.P., de Oliveira, L., Fiorentini, G., Härter, C.J. 2009. Fluxo portal e visceral líquido de metabólitos em ovinos alimentados com feno de capim-arroz cortado com diferentes idades de rebrota. *R. Bras. Zootec.*, 38(6), 1114-1120.
- Kozloski, G.V., Fiorentini, G., Härter, C.J., Bonnecarrère Sanchez, L.M. 2005. Uso da creatinina como indicador da excreção urinária em ovinos. *Ciência Rural*, 35 (1), 98-102.
- Kozloski, G.V., Mesquita, F.R., Alves, T.P., Castagnino, D.S., Stefanello, C.M., Bonnecarrère Sanchez, L.M. 2009. Avaliação do uso de frações indigestíveis do alimento como indicadores internos de digestibilidade em ovinos. *R. Bras. Zootec.*, 38 (9), 1819-1823.
- Kozloski, G.V., Perottoni, J., Ciocca, M.L.S. , Rocha, J.B.T., Raiser, A.G., Sanchez L.M.B. 2003. Potential nutritional assessment of dwarf elephant grass (*Pennisetum purpureum* Schum. cv. Mott) by chemical composition, digestion and net portal flux of oxygen in cattle. *Animal Feed Science and Technology*, 104, 29–40. doi:10.1016/S0377-8401(02)00328-0.



- Kozloski, G.V., Perottoni, J., Sanchez, L.M.B. 2005. Influence of regrowth age on the nutritive value of dwarf elephant grass hay (*Pennisetum purpureum* Schum. cv. Mott) consumed by lambs. *Animal Feed Science and Technology*, 119, 1–11. doi:10.1016/j.anifeedsci.2004.12.012.
- Kozloski, G.V., Stefanello, C.M., Mesquita, F.R., Alves, T.P., Ribeiro Filho, H.M.N., Almeida, J.G.R., Moraes Genro, T.C. 2013. Technical note: Evaluation of markers for estimating duodenal digesta Flow and ruminal digestibility: Acid detergent fiber, sulfuric acid detergent lignin, and n-alkanes. *J. Dairy Sci.* 97, 1730–1735. <http://dx.doi.org/10.3168/jds.2013-7414>.
- Kozloski, G.V., Stefanello, C.M., Oliveira, L., Ribeiro Filho, H.M.N., Klopfenstein, T.J. 2017. Technical note: Evaluation of urinary purine derivatives in comparison with duodenal purines for estimating rumen microbial protein supply in sheep. *J. Anim. Sci.* 95:884–891. doi:10.2527/jas2016.0840.
- Lima, L.D., Kozloski, G.V., Bonnecarr`ere Sanchez, L.M. Ruggia Chiesa, A.P., Härtter, C.J., Fiorentini, G., Oliveira, L., Cadorin Jr., R.L. 2008. Effect of harvesting period on the nutritive value of rice Grass (*Echinochloa* sp.) hay given as sole diet to lambs. *Small Ruminant Research*, 75, 217–225. doi:10.1016/j.smallrumres.2007.11.005.
- Orlandi, T., Kozloski, G.V., Alves, T.P., Mesquita, F.R., Ávila, S.C. 2015. Digestibility, ruminal fermentation and duodenal flux of amino acids in steers fed grass forage plus concentrate containing increasing levels of *Acacia mearnsii* tannin extract. *Animal Feed Science and Technology*, 210, 37–45. <http://dx.doi.org/10.1016/j.anifeedsci.2015.09.012>.
- Orlandi, T., Stefanello, S., Mezzomo, M.P., Pozo, C.A., Kozloski, G.V. 2020. Impact of a tannin extract on digestibility and net flux of metabolites across splanchnic tissues of sheep. *Animal Feed Science and Technology* 261, v114384. <https://doi.org/10.1016/j.anifeedsci.2019.114384>.
- Pérez-Ruchel, A., Britos, A., Alvarado, A., Fernandez-Ciganda, S., Gadeyne, F., Bustos, M., Zunino, P., Cajarville, C. 2023. Impact of adding tannins or medium-chain fatty acids in a dairy cow diet on variables of in vitro fermentation using a rumen simulation technique (RUSITEC) system. *Animal Feed Science and Technology*, 305, <https://doi.org/10.1016/j.anifeedsci.2023.115763>.
- Pérez-Ruchel, A., Repetto, J.L., Cajarville, C. 2017. Supplementing high quality fresh forage to growing lambs fed a total mixed ration diet led to higher intake without altering nutrient utilization. *Animal*, 11:12, 2175–2183, doi:10.1017/S1751731117000933.
- Pérez-Ruchel, A., Repetto, J.L., Cajarville, C. 2023. Supplementation of high-quality fresh forage to lambs fed a total mixed ration increased in vitro ruminal fermentation and digestibility. *Frontiers in Animal Science*, 4, 1032527, <https://doi:10.3389/fanim.2023.1032527>.
- Pérez-Ruchel, A., Repetto, J.L., Cajarville, C., Mezzomo, M.P., Kozloski, G.V. Feed intake, microbial adherence and fibrolytic activity in residues of forage samples incubated in the rumen of sheep fed Grass forages and/or a total mixed ration. 2024. *The Journal of Agricultural Science*, 161, 871-876, <https://doi.org/10.1017/S0021859624000017>.



- Pérez-Ruchel, A.; Repetto, J.L.; Cajarville, C. 2013. Suitability of live yeast addition to alleviate the adverse effects due to the restriction of the time of access to feed in sheep fed only pasture. *Journal of Animal Physiology and Animal Nutrition*, 97, 1043 – 1050, DOI: 10.1111/jpn.12008.
- Pérez-Ruchel, A.; Repetto, J.L.; Cajarville, C. 2014. Use of NaHCO₃ and MgO as additives for sheep fed only pasture for a restricted period of time per day: effects on intake, digestion and the rumen environment. *Journal of Animal Physiology and Animal Nutrition*, 98, 1068–1074, DOI: 10.1111/jpn.12173.
- Pozo, C.A., Kozloski, G.V., Cuffia, M., Repetto, J.L., Cajarville, C. 2022. Changing the grazing session from morning to afternoon or including tannins in the diet was effective in decreasing the urinary nitrogen of dairy cows fed a total mixed ration and herbage. *J. Dairy Sci.*, 105. <https://doi.org/10.3168/jds.2021-21149>.
- Pozo, C.A., Kozloski, G.V., Ribeiro-Filho, H.M.N., Pires Silveira V.C. 2023. Evaluation of the Pampa Corte model for predicting dry matter intake and digestibility by sheep fed tropical forages. *Livestock Science*, 267, 105147. <https://doi.org/10.1016/j.livsci.2022.105147>
- Pozo, C.A., Mezzomo, M.P., Frasson, J., Leonardi, L.E., Christmann, C.M., Rösler, D.C., Kozloski, G.V. 2022. Relationship between intake and faecal excretion of indigestible fractions in trials with sheep: impact of the method of analysis, diet and trial. *The Journal of Agricultural Science* 160, 270–277. <https://doi.org/10.1017/S0021859622000181>.
- Raiser, A.G., Da Silva, A., Kozloski, G.V., Correia, C. 1997. Técnica Operatória de Fistulação do duodeno proximal em terneiros. *Pesq. Agropec. Bras.*, Brasilia, 32 (7), 747-751.
- Rodrigues Silva, A., Pires Silveira, V.C., Pozo, C.A., Moraes Genro, T.C., Castro Kuinchtnner, B., Kozloski, G.V. 2025. In situ digestibility method as an input-source in the context of the Pampa Corte model: predicting average daily gain by free-ranging cattle. *Ciência Rural*, Santa Maria, 55 (7), e20240096. <http://doi.org/10.1590/0103-8478cr20240096>.
- Ruggia Chiesa, A.P., Kozloski, G.V., Bonnecarre`re Sanchez, L.M., Lima, L.D., Oliveira, L., Ha'iter, C.J., Fiorentini, G., Cadorin Jr., R.L. 2008. Age of regrowth as a factor affecting the nutritive value of hay of kikuyu grass (*Pennisetum clandestinum*) offered to lambs. *Grass and Forage Science*, 63, 193–201.
- Stefanello, S., Mezzomo, M.P., Zeni, D., Ebling, R.C., Soares, A.V., Kozloski, G.V. 2018. Oxygen uptake and net flux of metabolites by splanchnic tissues of sheep in response to short-term mesenteric infusion of nitrogenous compounds. *J Anim Physiol Anim Nutr.*, 102, 853–860. DOI: 10.1111/jpn.12899.

