



Referencias

1. Lamy E, Mau M. Saliva proteomics as an emerging, non-invasive tool to study livestock physiology, nutrition and diseases. *J Proteome*. 2012;75:4251–4258. doi: 10.1016/J.JPROT.2012.05.007. [PubMed] [CrossRef] [Google Scholar]
2. Tvarijonavičiute A, Martínez-Subiela S, López-Jornet P, Lamy E. Saliva in health and disease the present and future of a unique sample for diagnosis. 2020. [Google Scholar]
3. Gröschl M. Current status of salivary hormone analysis. *Clin Chem*. 2008;54:1759–1769. doi: 10.1373/CLINCHEM.2008.108910. [PubMed] [CrossRef] [Google Scholar]
4. Pfaffe T, Cooper-White J, Beyerlein P, Kostner K, Punyadeera C. Diagnostic potential of saliva: current state and future applications. *Clin Chem*. 2011;57:675–687. doi: 10.1373/CLINCHEM.2010.153767. [PubMed] [CrossRef] [Google Scholar]
5. Merlot E, Mounier A, Prunier A. Endocrine response of gilts to various common stressors: a comparison of indicators and methods of analysis. *Physiol Behav*. 2011;102:259–265. doi: 10.1016/J.PHYSBEH.2010.11.009. [PubMed] [CrossRef] [Google Scholar]
6. Martínez-Miró S, Tecles F, Ramón M, Escribano D, Hernández F, Madrid J, et al. Causes, consequences and biomarkers of stress in swine: an update. *BMC Vet Res*. 2016;12. 10.1186/S12917-016-0791-8. [PMC free article] [PubMed]
7. Cerón J. Acute phase proteins, saliva and education in laboratory science: an update and some reflections. *BMC Vet Res*. 2019;15. 10.1186/S12917-019-1931-8. [PMC free article] [PubMed]
8. Cook NJ, Schaefer AL, Lepage P, Jones SM. Salivary vs. serum cortisol for the assessment of adrenal activity in swine. 2011. pp. 329–335. [Google Scholar]
9. Henao-Díaz A, Giménez-Lirola L, Baum D, Zimmerman J. Guidelines for oral fluid-based surveillance of viral pathogens in swine. *Porc Heal Manag*. 2020;6. 10.1186/S40813-020-00168-W. [PMC free article] [PubMed]
10. Escribano D, Fuentes-Rubio M, Cerón J. Validation of an automated chemiluminescent immunoassay for salivary cortisol measurements in pigs. *J Vet Diagn Investig*. 2012;24:918–923. doi: 10.1177/1040638712455171. [PubMed] [CrossRef] [Google Scholar]

11. Thomsson O, Ström-Holst B, Sjunnesson Y, Bergqvist A. Validation of an enzyme-linked immunosorbent assay developed for measuring cortisol concentration in human saliva and serum for its applicability to analyze cortisol in pig saliva. *Acta Vet Scand.* 2014;56:55. doi: 10.1186/S13028-014-0055-1. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
12. Rey-Salgueiro L, Martínez-Carballo E, Fajardo P, Chapela M, Espiñeira M, Simal-Gandara J. Meat quality in relation to swine well-being after transport and during lairage at the slaughterhouse. *Meat Sci.* 2018;142:38–43. doi: 10.1016/J.MEATSCI.2018.04.005. [PubMed] [CrossRef] [Google Scholar]
13. Ruis M, Te Brake J, Engel B, Ekkel E, Buist W, Blokhuis H, et al. The circadian rhythm of salivary cortisol in growing pigs: effects of age, gender, and stress. *Physiol Behav.* 1997;62:623–630. doi: 10.1016/S0031-9384(97)00177-7. [PubMed] [CrossRef] [Google Scholar]
14. Prims S, Vanden Hole C, Van Cruchten S, Van Ginneken C, Van Ostade X, Casteleyn C. Hair or salivary cortisol analysis to identify chronic stress in piglets? *Vet J.* 2019;252. 10.1016/J.TVJL.2019.105357. [PubMed]
15. Bahnsen I, Riddersholm K, de Knecht L, Bruun T, Amdi C. The effect of different feeding systems on salivary cortisol levels during gestation in sows on herd level. *Anim an open access J from MDPI.* 2021;11. 10.3390/ANI11041074. [PMC free article] [PubMed]
16. Deng J, Cheng C, Yu H, Huang S, Hao X, Chen J, et al. Inclusion of wheat aleurone in gestation diets improves postprandial satiety, stress status and stillbirth rate of sows. *Anim Nutr (Zhongguo xu mu shou yi xue hui)* 2021;7:412–420. doi: 10.1016/J.ANINU.2020.06.015. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
17. López-Arjona M, Tecles F, Mateo S, Contreras-Aguilar M, Martínez-Miró S, Cerón J, et al. Measurement of cortisol, cortisone and 11 β -hydroxysteroid dehydrogenase type 2 activity in hair of sows during different phases of the reproductive cycle. *Vet J.* 2020:259–60. 10.1016/J.TVJL.2020.105458. [PubMed]
18. Escribano D, Fuentes-Rubio M, Cerón J. Salivary testosterone measurements in growing pigs: validation of an automated chemiluminescent immunoassay and its possible use as an acute stress marker. *Res Vet Sci.* 2014;97:20–25. doi: 10.1016/J.RVSC.2014.04.001. [PubMed] [CrossRef] [Google Scholar]
19. Romero-Martínez A, González-Bono E, Lila M, Moya-Albiol L. Testosterone/cortisol ratio in response to acute stress: a possible marker of risk for marital violence. *Soc Neurosci.* 2013;8:240–247. doi: 10.1080/17470919.2013.772072. [PubMed] [CrossRef] [Google Scholar]
20. Contreras-Aguilar M, Escribano D, Martínez-Subiela S, Martínez-Miró S, Cerón J, Tecles F. Changes in alpha-amylase activity, concentration and isoforms in pigs after an experimental acute stress model: an exploratory study. *BMC Vet Res.* 2018;14. 10.1186/S12917-018-1581-2. [PMC free article] [PubMed]

21. Contreras-Aguilar M, Escribano D, Martínez-Subiela S, Martínez-Miró S, Rubio M, Tvarijonaviciute A, et al. Influence of the way of reporting alpha-amylase values in saliva in different naturalistic situations: a pilot study. *PLoS One*. 2017;12. 10.1371/JOURNAL.PONE.0180100. [PMC free article] [PubMed]
22. Escribano D, Soler L, Gutiérrez AM, Martínez-Subiela S, Cerón JJ. Measurement of chromogranin a in porcine saliva: validation of a time-resolved immunofluorometric assay and evaluation of its application as a marker of acute stress. *Animal*. 2013;7:640–647. doi: 10.1017/S1751731112002005. [PubMed] [CrossRef] [Google Scholar]
23. Fuentes M, Tecles F, Gutiérrez A, Otal J, Martínez-Subiela S, Cerón J. Validation of an automated method for salivary alpha-amylase measurements in pigs (*Sus scrofa domestica*) and its application as a stress biomarker. *J Vet Diagn Investig*. 2011;23:282–287. doi: 10.1177/104063871102300213. [PubMed] [CrossRef] [Google Scholar]
24. Huang Y, Liu Z, Liu W, Yin C, Ci L, Zhao R, et al. Short communication: salivary haptoglobin and chromogranin a as non-invasive markers during restraint stress in pigs. *Res Vet Sci*. 2017;114:27–30. doi: 10.1016/J.RVSC.2017.02.023. [PubMed] [CrossRef] [Google Scholar]
25. Escribano D, Ko H, Chong Q, Llonch L, Manteca X, Llonch P. Salivary biomarkers to monitor stress due to aggression after weaning in piglets. *Res Vet Sci*. 2019;123:178–183. doi: 10.1016/J.RVSC.2019.01.014. [PubMed] [CrossRef] [Google Scholar]
26. Escribano D, Gutiérrez A, Fuentes-Rubio M, Cerón J. Saliva chromogranin a in growing pigs: a study of circadian patterns during daytime and stability under different storage conditions. *Vet J*. 2014;199:355–359. doi: 10.1016/J.TVJL.2014.01.005. [PubMed] [CrossRef] [Google Scholar]
27. Contreras-Aguilar M, Escribano D, Martínez-Miró S, López-Arjona L, Rubio C, Martínez-Subiela S, et al. Application of a score for evaluation of pain, distress and discomfort in pigs with lameness and prolapses: correlation with saliva biomarkers and severity of the disease. *Res Vet Sci*. 2019;126:155–163. doi: 10.1016/J.RVSC.2019.08.004. [PubMed] [CrossRef] [Google Scholar]
28. Casal N, Manteca X, Escribano D, Cerón J, Fàbrega E. Effect of environmental enrichment and herbal compound supplementation on physiological stress indicators (chromogranin a, cortisol and tumour necrosis factor- α) in growing pigs. *Animal*. 2017;11:1228–1236. doi: 10.1017/S1751731116002561. [PubMed] [CrossRef] [Google Scholar]
29. Kaiser M, Jacobsen S, Andersen P, Bækbo P, Cerón J, Dahl J, et al. Hormonal and metabolic indicators before and after farrowing in sows affected with postpartum dysgalactia syndrome. *BMC Vet Res*. 2018;14. 10.1186/S12917-018-1649-Z. [PMC free article] [PubMed]

30. Tecles F, Contreras-Aguilar M, Martínez-Miró S, Tvarijonaviciute A, Martínez-Subiela S, Escribano D, et al. Total esterase measurement in saliva of pigs: validation of an automated assay, characterization and changes in stress and disease conditions. *Res Vet Sci.* 2017;114:170–176. doi: 10.1016/J.RVSC.2017.04.007. [PubMed] [CrossRef] [Google Scholar]
31. Sayer R, Law E, Connelly P, Breen K. Association of a salivary acetylcholinesterase with Alzheimer's disease and response to cholinesterase inhibitors. *Clin Biochem.* 2004;37:98–104. doi: 10.1016/J.CLINBIOCHEM.2003.10.007. [PubMed] [CrossRef] [Google Scholar]
32. Tecles F, Escribano D, Martínez-Miró S, Hernández F, Contreras MD, Cerón JJ. Cholinesterase in porcine saliva: analytical characterization and behavior after experimental stress. *Res Vet Sci.* 2016;106:23–28. doi: 10.1016/j.rvsc.2016.03.006. [PubMed] [CrossRef] [Google Scholar]
33. Ryhanen R, Narhi M, Puhakainen E, Hanninen O, Kontturi-Narhi V. Pseudocholinesterase activity and its origin in human Oral fluid. *J Dent Res.* 1983;62:20–23. doi: 10.1177/00220345830620010501. [PubMed] [CrossRef] [Google Scholar]
34. Fedorova T, Knudsen C, Mouridsen K, Nexø E, Borghammer P. Salivary acetylcholinesterase activity is increased in Parkinson's disease: a potential marker of parasympathetic dysfunction. *Parkinsons Dis.* 2015;2015. 10.1155/2015/156479. [PMC free article] [PubMed]
35. Lee PC, Purcell ES, Borysewicz R, Klein RM, Werlin SL. Developmental delay of lingual lipase expression after Guanethidine-induced Sympathectomy. *Proc Soc Exp Biol Med.* 1992;199:192–198. doi: 10.3181/00379727-199-43346. [PubMed] [CrossRef] [Google Scholar]
36. Henkin RI, Martin BM, Agarwal RP. Decreased parotid saliva Gustin/carbonic anhydrase VI secretion: an enzyme disorder manifested by gustatory and olfactory dysfunction. *Am J Med Sci.* 1999;318:380. doi: 10.1097/00000441-199912000-00005. [PubMed] [CrossRef] [Google Scholar]
37. Kivelä J, Parkkila S, Parkkila AK, Leinonen J, Rajaniemi H. Salivary carbonic anhydrase isoenzyme VI. *J Physiol.* 1999;520:315–320. doi: 10.1111/j.1469-7793.1999.t01-1-00315.x. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
38. López-Arjona M, Escribano D, Mateo SV, Contreras-Aguilar MD, Rubio CP, Tecles F, et al. Changes in oxytocin concentrations in saliva of pigs after a transport and during lairage at slaughterhouse. *Res Vet Sci.* 2020;133:26–30. doi: 10.1016/j.rvsc.2020.08.015. [PubMed] [CrossRef] [Google Scholar]
39. López-Arjona M, Mateo S, Manteca X, Escribano D, Cerón J, Martínez-Subiela S. Oxytocin in saliva of pigs: an assay for its measurement and changes after farrowing. *Domest Anim Endocrinol.* 2020;70. 10.1016/J.DOMANIEND.2019.106384. [PubMed]

40. Alaerts K, Steyaert J, Vanaudenaerde B, Wenderoth N, Bernaerts S. Changes in endogenous oxytocin levels after intranasal oxytocin treatment in adult men with autism: an exploratory study with long-term follow-up. *Eur Neuropsychopharmacol.* 2021;43:147–152. doi: 10.1016/J.EURONEURO.2020.11.014. [PubMed] [CrossRef] [Google Scholar]
41. MacLean E, Wilson S, Martin W, Davis J, Nazarloo H, Carter C. Challenges for measuring oxytocin: the blind men and the elephant? *Psychoneuroendocrinology.* 2019;107:225–231. doi: 10.1016/J.PSYNEUEN.2019.05.018. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
42. López-Arjona M, Mateo S, Escribano D, Tecles F, Cerón J, Martínez-Subiela S. Effect of reduction and alkylation treatment in three different assays used for the measurement of oxytocin in saliva of pigs. *Domest Anim Endocrinol.* 2021;74. 10.1016/J.DOMANIEND.2020.106498. [PubMed]
43. Lürzel S, Bückendorf L, Waiblinger S, Rault J. Salivary oxytocin in pigs, cattle, and goats during positive human-animal interactions. *Psychoneuroendocrinology.* 2020;115. 10.1016/J.PSYNEUEN.2020.104636. [PubMed]
44. MacLean E, Gesquiere L, Gee N, Levy K, Martin W, Carter C. Validation of salivary oxytocin and vasopressin as biomarkers in domestic dogs. *J Neurosci Methods.* 2018;293:67–76. doi: 10.1016/J.JNEUMETH.2017.08.033. [PubMed] [CrossRef] [Google Scholar]
45. López-Arjona M, Padilla L, Roca J, Cerón J, Martínez-Subiela S. Ejaculate collection influences the salivary oxytocin concentrations in breeding male pigs. *Anim an open access J from MDPI.* 2020;10:1–12. doi: 10.3390/ANI10081268. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
46. Contreras-Aguilar M, López-Arjona M, Martínez-Miró S, Escribano D, Hernández-Ruipérez F, Cerón J, et al. Changes in saliva analytes during pregnancy, farrowing and lactation in sows: a sialochemistry approach. *Vet J.* 2021;273. 10.1016/J.TVJL.2021.105679. [PubMed]
47. Mateo SV, Contreras-Aguilar MD, López-Jornet P, Jimenez-Reyes P, Ceron JJ, Tvarijonaviciute A, et al. Development and evaluation of a rapid and sensitive homogeneous assay for haptoglobin measurements in saliva. *Microchem J.* 2019;150.
48. Lin G, Küng E, Smajlhodzic M, Domazet S, Friedl H, Angerer J, et al. Directed transport of CRP across in vitro models of the blood-saliva barrier strengthens the feasibility of salivary CRP as biomarker for neonatal Sepsis. *Pharmaceutics.* 2021;13:1–17. doi: 10.3390/PHARMACEUTICS13020256. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
49. Escribano D, Campos P, Gutiérrez A, Le Floc'h N, Cerón J, Merlot E. Effect of repeated administration of lipopolysaccharide on inflammatory and stress markers in saliva of growing pigs. *Vet J.* 2014;200:393–397. doi: 10.1016/J.TVJL.2014.04.007. [PubMed] [CrossRef] [Google Scholar]

50. Ott S, Soler L, Moons C, Kashiha M, Bahr C, Vandermeulen J, et al. Different stressors elicit different responses in the salivary biomarkers cortisol, haptoglobin, and chromogranin a in pigs. *Res Vet Sci.* 2014;97:124–128. doi: 10.1016/J.RVSC.2014.06.002. [PubMed] [CrossRef] [Google Scholar]
51. Escribano D, Gutiérrez A, Tecles F, Cerón J. Changes in saliva biomarkers of stress and immunity in domestic pigs exposed to a psychosocial stressor. *Res Vet Sci.* 2015;102:38–44. doi: 10.1016/J.RVSC.2015.07.013. [PubMed] [CrossRef] [Google Scholar]
52. Tecles F, Fuentes P, Martínez Subiela S, Parra M, Muñoz A, Cerón J. Analytical validation of commercially available methods for acute phase proteins quantification in pigs. *Res Vet Sci.* 2007;83:133–139. doi: 10.1016/J.RVSC.2006.10.005. [PubMed] [CrossRef] [Google Scholar]
53. Murata H. Stress and acute phase protein response: an inconspicuous but essential linkage. *Vet J.* 2007;173:473–474. doi: 10.1016/J.TVJL.2006.05.008. [PubMed] [CrossRef] [Google Scholar]
54. Baganha M, Pêgo A, Lima M, Gaspar E, Cordeiro A. Serum and pleural adenosine deaminase. Correlation with lymphocytic populations. *Chest.* 1990;97:605–610. doi: 10.1378/CHEST.97.3.605. [PubMed] [CrossRef] [Google Scholar]
55. Mishra OP, Gupta BL, Ali Z, Nath G, Chandra L. Adenosine deaminase activity in typhoid fever. *Indian Pediatr.* 1994;31:1379–84. [PubMed]
56. Tecles F, Rubio C, Contreras-Aguilar M, López-Arjona M, Martínez-Miró S, Martínez-Subiela S, et al. Adenosine deaminase activity in pig saliva: analytical validation of two spectrophotometric assays. *J Vet Diagn Investig.* 2018;30:175–179. doi: 10.1177/1040638717742947. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
57. Contreras-Aguilar M, Tvarijonavičute A, Monkeviciene I, Martín-Cuervo M, González-Arostegui L, Franco-Martínez L, et al. Characterization of total adenosine deaminase activity (ADA) and its isoenzymes in saliva and serum in health and inflammatory conditions in four different species: an analytical and clinical validation pilot study. *BMC Vet Res.* 2020;16. 10.1186/S12917-020-02574-2. [PMC free article] [PubMed]
58. Escribano D, Gutiérrez A, Martínez Subiela S, Tecles F, Cerón J. Validation of three commercially available immunoassays for quantification of IgA, IgG, and IgM in porcine saliva samples. *Res Vet Sci.* 2012;93:682–687. doi: 10.1016/J.RVSC.2011.09.018. [PubMed] [CrossRef] [Google Scholar]
59. Muneta Y, Yoshikawa T, Minagawa Y, Shibahara T, Maeda R, Omata Y. Salivary IgA as a useful non-invasive marker for restraint stress in pigs. *J Vet Med Sci.* 2010;72:1295–1300. doi: 10.1292/JVMS.10-0009. [PubMed] [CrossRef] [Google Scholar]

60. Parry J, Perry K, Mortimer P. Sensitive assays for viral antibodies in saliva: an alternative to tests on serum. *Lancet (London, England)* 1987;2:72-75. doi: 10.1016/S0140-6736(87)92737-1. [PubMed] [CrossRef] [Google Scholar]
61. Brandtzaeg P. Secretory immunity with special reference to the oral cavity. *J Oral Microbiol.* 2013;5. 10.3402/JOM.V5I0.20401. [PMC free article] [PubMed]
62. Allgrove J, Gomes E, Hough J, Gleeson M. Effects of exercise intensity on salivary antimicrobial proteins and markers of stress in active men. *J Sports Sci.* 2008;26:653-661. doi: 10.1080/02640410701716790. [PubMed] [CrossRef] [Google Scholar]
63. Rubio C, Mainau E, Cerón J, Contreras-Aguilar M, Martínez-Subiela S, Navarro E, et al. Biomarkers of oxidative stress in saliva in pigs: analytical validation and changes in lactation. *BMC Vet Res.* 2019;15. 10.1186/S12917-019-1875-Z. [PMC free article] [PubMed]
64. Rivera-Gomis J, Rubio C, Martínez Conesa C, Otal Salaverri J, Cerón J, Escribano Tortosa D, et al. Effects of dietary supplementation of garlic and oregano essential oil on biomarkers of oxidative status, stress and inflammation in Postweaning piglets. *Anim an open access J from MDPI.* 2020;10:1-17. doi: 10.3390/ANI10112093. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
65. Escribano D, Contreras-Aguilar M, Tvarijonaviciute A, Martínez-Miró S, Martínez-Subiela S, Cerón J, et al. Stability of selected enzymes in saliva of pigs under different storage conditions: a pilot study. *J Vet Med Sci.* 2018;80:1657-1661. doi: 10.1292/JVMS.18-0346. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
66. Barranco T, Rubio C, Tvarijonaviciute A, Rubio M, Damia E, Lamy E, et al. Changes of salivary biomarkers under different storage conditions: effects of temperature and length of storage. *Biochem medica.* 2019;29. 10.11613/BM.2019.010706. [PMC free article] [PubMed]
67. Tvarijonaviciute A, Barranco T, Rubio M, Carrillo J, Martinez-Subiela S, Tecles F, et al. Measurement of Creatine kinase and aspartate aminotransferase in saliva of dogs: a pilot study. *BMC Vet Res.* 2017;13. 10.1186/S12917-017-1080-X. [PMC free article] [PubMed]
68. Escribano D, Horvatić A, Contreras-Aguilar MD, Guillemin N, Cerón JJ, Tecles F, et al. Changes in saliva proteins in two conditions of compromised welfare in pigs: an experimental induced stress by nose snaring and lameness. *Res Vet Sci.* 2019;125:227-234. doi: 10.1016/j.rvsc.2019.06.008. [PubMed] [CrossRef] [Google Scholar]
69. Tvarijonaviciute A, Pardo-Marin L, Tecles F, Carrillo J, Garcia-Martinez J, Bernal L, et al. Measurement of urea and creatinine in saliva of dogs: a pilot study. *BMC Vet Res.* 2018;14. 10.1186/S12917-018-1546-5. [PMC free article] [PubMed]
70. Porto-Mascarenhas EC, Assad DX, Chardin H, Gozal D, De Luca CG, Acevedo AC, et al. Salivary biomarkers in the diagnosis of breast cancer: a review. *Crit Rev Oncol Hematol.* 2017;110:62-73. doi: 10.1016/J.CRITREVO.2016.12.009. [PubMed] [CrossRef] [Google Scholar]