



**Informe final
Proyecto I+D y T**

**AWIN – Welfare Indicators
Cliente: Dirección de Innovación
e Industrias Agroalimentarias.**

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Ref. DMAPTAP:

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Acrónimo: AWIN – Welfare Indicators

Título: Development, integration and dissemination of animal-based welfare indicators, including pain, in commercially important husbandry species, with special emphasis on small ruminants, equidae & turkeys

Jefe de proyecto: Estevez, Ovejas Inmaculada

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Clasificación del proyecto:

Unidad de negocio: Innovación Agraria

Departamento: Producción Animal

Campos de aplicación: Optimización y Sostenibilidad de la Producción Animal

Área estratégica: Ovino, Avicultura

Línea: Bienestar animal

Tipo de proyecto: Innovación

Origen: FP7 Unión Europea

Palabras clave: Ovino, pavos indicadores, bienestar animal, comportamiento

Objeto: Ovino, Avicultura

Aspecto: Etología, Bienestar Animal

Finalidad: Protocolos, Indicadores

Objetivo: Desarrollar y validar indicadores de bienestar, incluyendo específicamente indicadores para el dolor, en ovejas de leche y pavos; Validar la viabilidad de los protocolos en la aplicación práctica de estos indicadores bajo condiciones comerciales; y determinar experimentalmente el efecto de variación de la densidad y el tamaño de grupo sobre el bienestar de las ovejas así como en sus efectos sobre las estrategias adaptativas y programación prenatal de las crías.

Objetivos específicos:

- Desarrollo y validación de indicadores de bienestar, incluyendo indicadores de dolor en ovejas y corderos
 - Desarrollo y validación de indicadores de bienestar, incluyendo indicadores de dolor en pavos
 - Efecto de la densidad y tamaño de grupo sobre el bienestar en ovejas, estrategias adaptativas y programación prenatal de las crías.
 - Publicación y difusión de resultados.
 - Realizar cursos de formación en evaluadores del bienestar
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Duración: 4 años

Fecha de inicio: 01/05/2011

Fecha final: 30/04/2015

1. Equipo participante de NEIKER - Tecnalia

Participantes de NEIKER - Tecnalia

Jefe de Proyecto: Inma Estevez,
Otros participantes: Roberto Ruiz
Ignacia Beltrán de Heredia
Xavier Averos
Joanna Marchewka
Josune Arranz

Otras entidades participantes o colaboradoras

- THE SCOTTISH AGRICULTURAL COLLEGE SAC United Kingdom
- UNIVERSITETET FOR MILJO OG BIOVITENSKAP UMB Norway
- UNIVERSITA DEGLI STUDI DI MILANO UMIL Italy
- CENTRO DE ESTUDOS SUPERIORES POSITIVO LTDA POSITIVO Brazil
- FACULDADE DE MEDICINA VETERINARIA- UNIVERSIDADE TECNICA DE LISBOA UTL Portugal
- THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF CAMBRIDGE UCAMB UK
- THE TRUSTEES OF INDIANA UNIVERSITY IU United States
- VYZKUMNY USTAV ZIVOCISNE VYROBY V.V.I. UHRINEVES IASPRAGUE Czech Republic
- TIERARZTLICHE KLINIK FUR PFERDE H. Equine clinic Germany

2. Informe sobre las actividades más destacadas de la investigación en el proyecto y resultados obtenidos

Neiker-Tecnalia, as an AWIN project beneficiary, was involved in Work Packages (WPs) 1 and 3. The activities implemented by the Neiker team are very briefly depicted in the following paragraphs. However, for detailed information of the whole project, the final report presented to the EU Commission can be accessed upon request to the IP of the project, Dr. Inma Estevez.

A) WP1: Welfare assessment, including pain

The main goal within WP1 was to work (in cooperation with SAC and UMIL) on the development of practical welfare assessment protocols for sheep and turkeys, and to adapt a final protocol to dairy sheep. These two goals were achieved by; a thorough literature review, discussion and agreement on the best practical indicators, and experimental work to validate the considered indicators.

Once the prototypes were developed, a second phase of the project included the development, testing, and validation of the proposed protocols and of the innovative sampling methodology to use for turkeys. The final protocols were designed to be a practical tool for welfare

assessment. Both, the produced turkey and sheep protocols are freely available at the following sites:

Turkey Protocol:

www.animal-welfare-indicators.net/site/flash/pdf/AWINProtocolTurkeys.pdf

Sheep Protocol:

<http://www.animal-welfare-indicators.net/site/flash/pdf/AWINProtocolSheep.pdf>

In addition to this, and although it was not included in the original proposal, AWIN translated the welfare assessment protocols into interactive apps to make data collection easy, reliable and available immediately as a management tool to help with decisions at farm level, promoting mechanisms for data storage and data-analysis. The 'I-Watch-Turkey' app, based on an AWIN-developed 'transect' methodology, was tested on turkey farms in Europe, and is available in:

<https://play.google.com/store/apps/details?id=com.daia.iwatchturkey>

This app was the first one for welfare assessment launched in the world. Another app is being designed to implement the welfare protocol for Sheep, and will be soon officially presented once it is suitably tested.

B) WP3: Prenatal social stress and their effects on welfare indicators

WP3 examined the effects of different prenatal environments, studying animal density, group size and the quality of human and animal interactions in pregnant sheep and goats. Welfare indicators and developmental outcomes were assessed in the offspring of the studied animals.

The goal of NEIKER in WP3 was to establish a theoretical model to test in an experimental and controlled manner two major factors that can be sources of disruption of the group social dynamics in sheep; animal density and group size.

WP3 found that stocking density affected pregnant ewe behaviour and physiology. Stocking density of pregnant animals also affected the foetuses, behaviour of the offspring, and maternal behaviour. Stressing processes during embryonic development are known to cause important changes at the level of the neuron branching. The effects of maternal stress caused by alterations of social dynamics and the consequences on the neuronal development, as well as on the cognitive processes of the lambs after birth are being analysed.

Additional information and detailed documentation on the outcomes of the AWIN Project can be found in: http://cordis.europa.eu/project/rcn/99394_en.html

In particular, the final report summary presented to the EU Commission can be downloaded from the site (see also Anexo 1):

3. Información científica generada

- + Publicaciones Científicas Internacionales
- + Publicaciones Científicas Nacionales
- + Comunicaciones a Congresos, Reuniones, Simposios
- + Artículos de Divulgación
- + Monografías
- + Informes Técnicos

In addition to the periodic reports presented to the EU Commission, two versions of the final report:

- Extended version, a 73 pages document, available upon request to the IP of the project, Dr. Inma Estévez.
- A final report summary, which can be downloaded from the site:

<http://cordis.europa.eu/docs/results/266/266213/final1-awin-publishable-summary.pdf>

A. Publication list for the project

Peer review papers WP1

Marchewka, J., Watanabe, T.T.N., Ferrante, V., Estevez, I. (2013). Social and environmental factors affecting the behavior and welfare of turkeys (*Meleagris gallopavo*). Poultry Science 92:1467–1473. <http://dx.doi.org/10.3382/ps.2012-02943> (Oct. 2013, 4th most read paper in Poultry Science)

Marchewka, J., Watanabe, T.T.N., Ferrante, V., Estevez, I. (2013). Welfare assessment in broiler farms: Transect walks versus individual scoring. Poultry Science, 92:2588–2599. <http://dx.doi.org/10.3382/ps.2013-03229> (Oct. 2013, 2nd most read paper in Poultry Science)

Marchewka, J., Estevez, I., Vezzoli, G., Ferrante, V., Makagon, M. (2015). The transect method: a novel approach to on-farm welfare assessment of commercial turkeys. Poultry Science 94:7–16 <http://dx.doi.org/10.3382/ps/peu026>.

Marchewka J., Beltrán de Heredia, I., Averós, X, Ruiz, R., Zanella A. J., **Estevez, I.** (2014). *Behavior and vertical activity of tail docked lambs as pain indicators*. Journal of Livestock Science. Manuscript submitted.

Peer review papers WP3

González, M., Averós, X, Beltrán de Heredia, I., Ruiz, J., Arranz, J., Estevez, I. (2013). The effect of social buffering on fear responses in sheep (*Ovis aries*). Applied Animal Behaviour Science, 140:13-20. doi:10.1016/j.applanim.2013.09.011

Averós, X, Lorea, A., Beltrán de Heredia, I., Ruiz, R., Marchewka, J., Arranz, J., Estevez, I. (2014). The behaviour of gestating dairy ewes under different space availabilities. Applied Animal Behaviour Science 150:17-26. <http://dx.doi.org/10.1016/j.applanim.2013.11.002>

Averós, X., Lorea, A., Beltrán de Heredia, I., Ruiz, R., Marchewka, J., Arranz, J., Estevez, I. (2014). Space availability in confined sheep during pregnancy; effects in movement patterns and use of space. PLoS ONE 9(4): e94767. DOI: 10.1371/journal.pone.0094767

- Averós, X., Marchewka, J., Beltrán de Heredia, I., Zanella, A.J., Ruiz, R., Estevez, I. (2015). Space allowance during gestation and early maternal separation; effects on the fear response and social motivation of lambs. *Applied Animal Behaviour Science*, 163:98-109. doi:10.1016/j.applanim.2014.11.015
- Averós, X., Beltrán de Heredia, I., Ruiz, R., Estevez, I. (2015). Group size effects on the behaviour, movement, use of space, serum cortisol and physical condition of ewes during pregnancy. In preparation.
- Averós, X., Beltrán de Heredia, I., Ruiz, R., Estevez, I. (2015). Group size during gestation mildly affects the fear response and social motivation of lambs either subjected or not to early maternal separation. In preparation.

B. Conference papers

Invited Conference papers

1) Turkeys

- Ferrante, V., Estevez, I. (2013). *The Animal Welfare Indicators (AWIN) Project meets the stakeholders to ensure the acceptability of on-farm turkey welfare assessment*. 7th 'Hafez' International Symposium on Turkey Production, May 30th, Berlin, Germany.
- Estevez, I., Marchewka, J., Ferrante, V., Vezzoli, G., Makagon M.M. (2014). Applicability of the transect methodology to assess the health-welfare of turkeys on commercial farms. *Proceedings of the 8th Turkey Science and Production Conference*. Ed: Turkeytimes, Woodbankl, John Street, Cheshire, UK pp, 37-40.
- Estevez, I., Marchewka, J., Ferrante, V., Makagon M.M. (2015). Evaluación de salud y bienestar en la avicultura de carne. XL Convención Anual de la ANECA (Asociación Nacional de Especialistas en Ciencias Avícolas de México), 29 Abril al 2 Mayo Riviera Maya, Quintana Roo.

2) Sheep

- Beltrán de Heredia, X. Averós, I. Estevez, J. Arranz, R. Ruiz (2013). *Aplicación práctica de Indicadores de bienestar en ovino*. I. March 20th FIMA Ganadera, Zaragoza, Spain.
- Beltrán de Heredia, I., Ruiz, R., Arranz, J., Estevez, I. (2013): *Evaluación del bienestar en ovino*. Averós, X., V Foro INIA de colaboración público privada: protección y bienestar en los animales de producción. Madrid, April 9th.

Presentations at International and National meetings WP1 and WP3

- Averós, X., Marchewka, J. Lorea, A., Beltrán de Heredia, I., Arranz, J., Ruiz, R., Estevez, I. (2012). Restricción espacial: efecto sobre el comportamiento social y uso del espacio en ovejas gestantes. Pp 55, Redondo, T. (editor). XIV Congreso Nacional y XI Iberoamericano de Etología. Libro de resúmenes. Sevilla, Spain. Digital CSIC <http://digital.csic.es/handle/10261/54769> ISBN: 978-84-616-0219-3
- Marchewka, J., Terumi, T. W., Ferrante, V., Estevez, I. (2012). Transectos: Una nueva aproximación para la evaluación del bienestar en broilers. Pp 63, Redondo, T. (Editor). XIV Congreso Nacional y XI Iberoamericano de Etología. Libro de resúmenes. Sevilla, Spain. Digital CSIC <http://digital.csic.es/handle/10261/54769> ISBN: 978-84-616-0219-3

- Marchewka J., Watanabe T.T.N., Ferrante V., Estevez I. (2013). On-farm broiler welfare assessment; Individual versus transect sampling. Conference Proceedings of 2nd Annual Conference FP EU Project Animal Welfare Indicators, May 14-16th, Vitoria-Gasteiz, Spain.
- Marchewka J., Watanabe T.T.N., Ferrante V., Estevez I. (2013). Transects: A new approach for on-farm broiler welfare assessment. Conference Proceedings of the 2nd Annual Conference FP EU Project Animal Welfare Indicators, May 14-16th, Vitoria-Gasteiz, Spain, pp 12.
- Marchewka J., Beltrán de Heredia I., Ruiz R., Averós X., Arranz J., Estevez I. (2013) Behaviour of lambs (*Ovis aries*) under different tail docking procedures. Conference Proceedings of the 2nd Annual Conference FP EU Project Animal Welfare Indicators, May 14-16th, Vitoria-Gasteiz, Spain, pp 19.
- Watanabe T.T. N., Ferrari L., Heinzl E., Lolli S., Marchewka J., Tremolada C., Estevez I., Ferrante V. (2013). Substrate choice by turkeys differing in 3-point gait-scoring system in a mobility test. Conference Proceedings of the 2nd Annual Conference FP EU Project Animal Welfare Indicators, May 14-16th, Vitoria-Gasteiz, Spain, pp18.
- Averós, X., Lorea, A., Beltrán de Heredia, I., Arranz, J., Ruiz, R., Estevez, I. (2013). The impact of space availability in movement patterns of dairy sheep during pregnancy. Conference Proceedings of the 2nd Annual Conference FP EU Project Animal Welfare Indicators, May 14-16th, Vitoria-Gasteiz, Spain, pp 35.
- Hall, S., Averós, X., Wellman, C., Estevez, I., Zanella, A.J. (2013). Analysis of Dendrite spine morphology using Golgi-Cox method. Conference Proceedings of the 2nd Annual Conference FP EU Project Animal Welfare Indicators, May 14-16th, Vitoria-Gasteiz, Spain, pp 40.
- Vas, J., Averós, X., Estevez, I., Andersen, I.L. (2013). Density effects on goats' spatial behaviour. Conference Proceedings of the 2nd Annual Conference FP EU Project Animal Welfare Indicators, May 14-16th, Vitoria-Gasteiz, Spain, pp 42.
- González, M. Averós, X., Beltrán de Heredia, I., Arranz, J., Ruíz, R., Estevez, I. (2013). The effect of social buffering on fear responses in sheep (*Ovis aries*). Conference Proceedings of the 2nd Annual Conference FP EU Project Animal Welfare Indicators, May 14-16th, Vitoria-Gasteiz, Spain, pp 43.
- Averós, X., Lorea, A., Beltrán de Heredia, I., Arranz, J., Ruíz, R., Estevez, I. (2013). The impact of space availability in movement patterns of dairy sheep during pregnancy. 47th Congress of the International Society for Applied Ethology (ISAE), Florianopolis, Brazil, June 2nd-6th. Oral Presentation, Congress Proceedings, pp 48.
- Marchewka J., Watanabe T.T.N., Ferrante V., Estevez I. (2013) On-farm broiler welfare assessment; Individual versus transect sampling, IX European Symposium on Poultry Welfare SLU Uppsala, Sweden 17-20 . 'World's Poultry Science Journal, pp150.
- Marchewka J., Watanabe T.T.N., Ferrante V., Estevez I. (2013) Transects: A new approach for on-farm broiler welfare assessment, IX European Symposium on Poultry Welfare SLU Uppsala, Sweden, 17-20 June. 'World's Poultry Science Journal, pp 155.
- Estevez, I. (2013) On farm broiler welfare assessment; Individual versus transect sampling. Presentación Oral- Congreso Científico de Avicultura (WPSA-AECA). Lleida, España. Octubre de 2013.

- Canali, E., Barbieri, S., Minero, M., Estevez, I., Ferrante, V., Zanella, A. (2014). Protocols for the welfare assessment at farm levels: AWIN Project. Proceedings Veterinary Animal Welfare Conference in Munich, February 2014.
- Estevez, I. Marchewka J., Watanabe T.T.N., Ruíz, R., Carrascal, A., Ferrante V. (2014). i-WatchTurkeys: A smartphone application for on-farm turkeys health and welfare assessment. Proceedings of the FP 7 EU Project Animal Welfare Indicators, 3rd Annual Conference, Prague, May 2014 – Oral and poster presentation pp 20 –Presentation of the i-WatchTurkey App.
- Averós, X., Marchewka, J., Beltrán de Heredia, I., Ruíz, R., Estevez, I. (2014). Space allowance in gestating ewes and early postnatal separation: Impact on the coping abilities of newborn lambs. Proceedings of the FP 7 EU Project Animal Welfare Indicators, 3rd Annual Conference, Prague, May 2014 – Oral and poster presentation pp 30.
- Watanabe T.T.N., Ferrante V., Marchewka J., Tremolada, C., Ferrari, Lorenzo, Lolli, S., Rizzi, R., Estevez, I. (2014). Transect walks: method sensitivity for on-farm welfare evaluation in turkeys. Proceedings of the FP 7 EU Project Animal Welfare Indicators, 3rd Annual Conference, Prague, May 2014 – Poster presentation pp 39.
- Beltrán de Heredia, I., Arranz, J., Estevez, I., Richmon, S. Wemesfelder, F., Canali., E. Dwyer, C. Ruiz, R. (2014). Assessing inter and intra-observer reliability in animal-based welfare indicators in dairy sheep. Proceedings of the FP 7 EU Project Animal Welfare Indicators, 3rd Annual Conference, Prague, May 2014 – poster presentation pp 42.
- Langford, F., MacKay, J., Baxter, E., Dwyer, C., Averós, X, Estevez, I., Zanella, A.J., Varella Gomes, P., Broom, D. M., Braastad, B. O., Vas, J. De Paula Vieira, A. (2014). Digital learning material on lamb survival. Proceedings of the FP 7 EU Project Animal Welfare Indicators, 3rd Annual Conference, Prague, May 2014 – poster presentation pp 57.
- Estevez, I. Marchewka, J., Watanabe, T.T.N., Ruíz, R., Carrascal, A., Ferrante, V., (2014). i-WatchTurkeys: A smartphone application for on-farm turkeys health and welfare assessment. 'Moving On' Proceedings of the 48th Congress of the International Society of Applied Ethology. Editors: Estevez, I., Manteca, X., Marin, R., Averós, X., Vitoria-Gasteiz, July 2014- Presentation App- pp 166.
- Marchewka, J., Estevez, I., Vezzoli, G., Ferrante, V., Makagon, M. (2014). The transect method as an on-farm welfare assessment of commercial turkeys. 'Moving On' Proceedings of the 48th Congress of the International Society of Applied Ethology. Editors: Estevez, I., Manteca, X., Marin, R., Averós, X., Vitoria-Gasteiz, July 2014- Oral presentation pp 118.
- Beltran De Heredia, I., Arranz, J., Estevez, I., Richmond, S., Wemelsfelder, F., Canali,E., Dwyer, C., Ruiz, R.(2014). Assessing inter and intra-observer reliability in animal-based welfare indicators in dairy sheep. 'Moving On' Proceedings of the 48th Congress of the International Society of Applied Ethology. Editors: Estevez, I., Manteca, X., Marin, R., Averós, X., Vitoria-Gasteiz, July 2014- Poster pp 177.
- Averós, X., Marchewka, J., Beltran De Heredia, I., Ruiz, R., Estevez, I. (2014). Space allowance in gestating ewes and early postnatal separation: Impact on the coping abilities of newborn lambs. 'Moving On' Proceedings of the 48th Congress of the International Society of Applied Ethology. Editors: Estevez, I., Manteca, X., Marin, R., Averós, X., Vitoria-Gasteiz, July 2014 - Poster, pp 309.

Marchewka, J., Beltrán De Heredia, I., Ruiz, R., Arranz, J., Estévez, I. (2014). Potential pain indicators in tail docked lambs. 6th International Conference on the Assessment of Animal Welfare at Farm and Group Level, Clermont-Ferrand (France), Sept 4th, Poster, pp 134.

Estevez, I., Marchewka, J., Ferrante, V., Vezzoli, G., Makagon, M. M. (2014). Applicability of the transect methodology to assess on-farm turkey welfare; The i-WatchTurkey app. 6th International Conference on the Assessment of Animal Welfare at Farm and Group Level, Clermont-Ferrand (France) Sept 4th, Poster, pp 146.

Lolli, S., Estevez, I., Ferrari, L., Negro, T.W., Ozkan, S., Tremolada, C. Ferrante, V. (2015). Protocol development for welfare assessment in commercial turkey farms. XXI ASPA Congress (Association for Animal Science and Productions) Milan, June 9th-12th 2015 (<http://www.aspa2015.org>).

c) Popular Press and Extension articles

Estevez, I. (2015). Turkey Tracker. International Innovations. 163: 10-16

<http://www.internationalinnovation.com/turkey-tracker/>

Estevez, I. (2015). I-WatchTurkey Una aplicación de móvil para la mejora de la salud y el bienestar en pavos. Avinews, Mayo, 13-18

<http://avicultura.info/revistas/avinews/mayo-2015/>

D) Doctoral Thesis

Joanna Marchewka: "Development of practical methodology and indicators for on-farm animal-welfare assessment". Neiker-Tecnalia, Vitoria- Gasteiz, Sept. 1st 2011- 29th May 2015), University of Basque Country.

4. Actividades de formación y transferencia realizadas

WP1

- Canali, E., Barbieri, S., Minero, M., Estevez, I., Ferrante, V., Zanella, A. (2014). Protocols for the welfare assessment at farm levels: AWIN Project. Proceedings Veterinary Animal Welfare Conference in Munich, February 2014.
- Watanabe T.T.N., Ferrante V., Marchewka J., Tremolada, C., Ferrari, Lorenzo, Lolli, S., Rizzi, R., Estevez, I. (2014). Transect walks: method sensitivity for on-farm welfare evaluation in turkeys. Proceedings of the FP 7 EU Project Animal Welfare Indicators, 3rd Annual Conference, Prague, May 2014 – Poster presentation pp 39.
- Beltrán de Heredia, I., Arranz, J., Estevez, I., Richmon, S. Wemesfelder, F., Canali., E. Dwyer, C. Ruiz, R. (2014). Assessing inter and intra-observer reliability in animal-based welfare indicators in dairy sheep. Proceedings of the FP 7 EU Project Animal Welfare Indicators, 3rd Annual Conference, Prague, May 2014 – poster presentation pp 42.
- *Marchewka, J., Estevez, I., Vezzoli, G., Ferrante, V., Makagon, M. (2014). The transect method as an on-farm welfare assessment of commercial turkeys. 'Moving On' Proceedings

of the 48th Congress of the International Society of Applied Ethology. Editors: Estevez, I., Manteca, X., Marin, R., Averós, X., Vitoria-Gasteiz, July 2014- Oral presentation pp 118.

- Beltran De Heredia, I., Arranz, J., Estevez, I., Richmond, S., Wemelsfelder, F., Canali, E., Dwyer, C., Ruiz, R. (2014). Assessing inter and intra-observer reliability in animal-based welfare indicators in dairy sheep. 'Moving On' Proceedings of the 48th Congress of the International Society of Applied Ethology. Editors: Estevez, I., Manteca, X., Marin, R., Averós, X., Vitoria-Gasteiz, July 2014- Poster pp 177.
- Marchewka, J., Beltrán De Heredia, I., Ruiz, R., Arranz, J., Estévez, I. (2014). Potential pain indicators in tail docked lambs. 6th International Conference on the Assessment of Animal Welfare at Farm and Group Level, Clermont-Ferrand (France), Sept 4th, Poster, pp 134.
- Estevez, I. Marchewka J., Watanabe T.T.N., Ruíz, R., Carrascal, A., Ferrante V. (2014). i-WatchTurkeys: A smartphone application for on-farm turkeys health and welfare assessment. Proceedings of the FP 7 EU Project Animal Welfare Indicators, 3rd Annual Conference, Prague, May 2014 – Oral and poster presentation pp 20 –Presentation of the i-WatchTurkey App.
- Estevez, I. Marchewka, J., Watanabe, T.T.N., Ruíz, R., Carrascal, A., Ferrante, V., (2014). i-WatchTurkeys: A smartphone application for on-farm turkeys health and welfare assessment. 'Moving On' Proceedings of the 48th Congress of the International Society of Applied Ethology. Editors: Estevez, I., Manteca, X., Marin, R., Averós, X., Vitoria-Gasteiz, July 2014- Presentation App- pp 166.
- Estevez, I., Marchewka, J., Ferrante, V., Vezzoli, G., Makagon, M. M. (2014). Applicability of the transect methodology to assess on-farm turkey welfare; The i-WatchTurkey app. 6th International Conference on the Assessment of Animal Welfare at Farm and Group Level, Clermont-Ferrand (France) Sept 4th, Poster, pp 146.
- Estevez, I. (2014). Turkey Tracker. International Innovations. 163: 16-10
<http://www.internationalinnovation.com/turkey-tracker/>

2014: Applicability of the transect methodology to assess the health-welfare of turkeys on commercial farms. Proceedings of the 8th Turkey Science and Production Conference, Chester, UK March 27th.

2014: Introducción al comportamiento y bienestar animal. Curso de Bienestar en Avicultura de Carne. Organized by *Basque Government, HAZI Erika* y Diputaciones. *Vitoria-Gasteiz, Spain* June 5th.

WP3

Averós, X. Sources of prenatal stress in animal production. Presented in the Workshop Andersen, I.L., "Prenatal and early postnatal effects on offspring development". 'Moving On' Proceedings of the 48th Congress of the International Society of Applied Ethology. Editors: Estevez, I., Manteca, X., Marin, R., Averós, X., Vitoria-Gasteiz, July 2014, pp 67.

Averós, X., Marchewka, J., Beltrán de Heredia, I., Ruiz, R., Estevez, I. 2014. Space allowance in gestating ewes and early postnatal separation: Impact on the coping abilities of newborn

lambs. 'Moving On' Proceedings of the 48th Congress of the International Society of Applied Ethology. Editors: Estevez, I., Manteca, X., Marin, R., Averós, X., Vitoria-Gasteiz, July 2014 – Poster, pp 309

Averós,X., Marchewka, J., Beltrán de Heredia, I., Ruiz, R., Estevez, I. 2014. Space allowance in gestating ewes and early postnatal separation: Impact on the coping abilities of newborn lambs. Proceedings of the FP 7 EU Project Animal Welfare Indicators, 3rd Annual Conference, Prague, May 2014 – Poster presentation pp 30.

Langford, F., MacKay, J., Baxter, E., Dwyer, C., Averós, X., Estevez,I., Zanella, A.J., Varella Gomes, P., Broom, D.M., Braastad, B.O., Vas,J., De Paula Vieira, A. 2014. Digital learning on lamb survival. Proceedings of the FP 7 EU Project Animal Welfare Indicators, 3rd Annual Conference, Prague, May 2014 – Poster presentation pp 57.

2014: Averós, X. Bases del estrés y del bienestar porcino. Curso de Bienestar en Avicultura de Carne. Organized by Basque Government, HAZI Erika y Diputaciones. Vitoria-Gasteiz, Spain June 5th.

5. Desviaciones con respecto a la memoria del proyecto

The project was successfully completed. The project delivered more than what was originally planned for. The launching of the mobile applications, an idea generated by the Neiker team, had a large repercussion on the success of the outcome of WP1.



**Development, integration and dissemination of
animal-based welfare indicators of pain, in
commercially important husbandry species,
with special emphasis on small ruminants,
equidae and turkeys**

EU VII Framework Program (FP7-KBBE-2010-4)



Executive Summary

The European Animal Welfare Indicators Project (AWIN) addressed the development, integration and dissemination of animal-based welfare indicators with emphasis on pain assessment and pain recognition. AWIN research objectives were carried out in four complementary workpackages (WP1, WP2, WP3 and WP4). The project focused on five commercially important species: sheep, goats, horses, donkeys and turkeys. All workpackages carried out research and dissemination with two or more of the key species with some outputs relevant to all animals.

WP1 developed practical, science-based, welfare assessment protocols, including pain indicators, for the project species. WP1 developed a two-step approach to animal welfare assessment and this process is carried through the resulting protocols which are all freely available online. AWIN translated the welfare assessment protocols into interactive apps to make data collection easy, reliable and available immediately as a management tool to help with decisions at farm level, promoting mechanisms for data storage and data-analysis. The 'I-Watch-Turkey' app, based on an AWIN-developed 'transect' methodology, was tested on turkey farms in Europe, North America and Brazil. WP1 contributed to an EFSA Scientific Opinion on Sheep Welfare and on a European Commission Report on Equine Welfare.

WP2 studied the impact of diseases and pain on animal welfare and, in conjunction with WP4, developed interactive apps to facilitate data collection, data storage and data analysis. In goats and sheep the focus was on pain assessment and mitigation in animals with mastitis, pregnancy toxaemia and foot-rot. Conditions which caused lameness in goats were also studied. The 'WelGoat' app, to assess lameness was developed, by WP2 and WP4. Strategies to measure and control pain during lamb castration and tail-docking and goat disbudding were investigated. In horses, studies were carried out to mitigate pain post-castration and during laminitis. Partners also provided a report on the barriers to the implementation of pain mitigation protocols. WP2, WP1 and WP4 worked together to develop the 'Horse Grimace Scale' app was developed, which accounted for more than 5,000 downloads from the Google Play Store.

WP3 examined the effects of different prenatal environments, studying animal density, group size and the quality of human and animal interactions in pregnant sheep and goats. Welfare indicators and developmental outcomes were assessed in the offspring

of the studied animals. WP3 found that stocking density affected pregnant ewe and pregnant goat behaviour and pregnant ewe physiology. Stocking density of pregnant animals also affected the foetuses, behaviour of the offspring, maternal behaviour and placental morphology. Prenatal management strategies were studied in mares and their foals. Group dynamics in group-housed horses affected pregnancy and mares' physiological measures of stress.

WP4 created the Animal Welfare Science Hub (www.animalwelfarehub.com) to disseminate our scientific findings, promoting transparency and synergies among stakeholders and interested parties. The Hub is a global research and education repository for up-to-date scientific knowledge in animal welfare. Outcomes from the AWIN project were disseminated via the Hub through the use of interactive learning objects (LOs) and stakeholder engagement activities. This is the first organized initiative to combine animal welfare science with innovative media and synergic networking. LOs were produced covering the AWIN project activities, including pain assessment, prenatal environment, welfare indicators and assessment protocols, among many others. The Animal Welfare Science Hub is the largest peer-reviewed portal in animal welfare science in the world. Interactions with stakeholders and interested parties were very effective. AWIN delivered talks to more than 30,000 participants and was present in events with audiences exceeding 253,000 people. More than 29 peer-reviewed articles have been published so far and an equal number have been recently submitted for publication.

The Animal Welfare Indicators Partners decided to remain together as a network of excellence, focusing on the development and validation of science based welfare indicators and also on the strategy to provide outstanding opportunities to foster effective communication among stakeholders and interested parties, through the Animal Welfare Science Hub