Animal Health

Review article

Statistical Analysis in the 'One Health' Approach as a Bridge Between Animal and Human Health

José A. Betancourt Bethencourt *, Lidyce Quesada Leyva *, Zaddys Ahimara Ruiz Hunt *

*University of Medical Sciences. Center of Immunology and Biologicals. Camagüey. Cuba.
Correspondence: betanster@gmail.com

Received: December 2024; Accepted: January 2025; Published: February 2025.

ABSTRACT

Background: Background: The "One Health" approach aims to promote coordination and collaboration among human, animal, plant, and environmental health programs to improve prevention and preparedness for future health threats. **Aim.** To highlight the importance of statistical analyses as a bridge between animal and human health within the "One Health" approach. **Development:** A limited to full-text, free-access search was conducted in Google Scholar and PubMed databases in December 2024, comprising articles from the last five years, which aided researchers make a selection of articles of interest. **Conclusions:** The importance of statistical analyses as a bridge between animal and human health in the "One Health" approach was argued. It was also stated that measuring the effectiveness of the "One Health" approach requires a diverse set of statistical methods integrating data on human, animal, and environmental health. Applying these techniques allows for a more comprehensive understanding of the impact of implemented policies and programs, facilitating better decision-making in public health and sustainable animal exploitation.

Keywords: Approach, statistics, teams, health (*Source*: DeCS)

INTRODUCTION

The "One Health" approach seeks to promote coordination and collaboration among human, animal, plant, and environmental health programs as a communication bridge to improve prevention and preparedness against future health threats (Cella *et al*., 2023).

The "One Health" approach recognizes that diseases interact as complex systems between humans, animals, and the environment. For example, the COVID-19 pandemic highlighted how a

Citations (APA) Betancourt Bethencourt, J.A., Quesada Leyva, L., & Ruiz Hunt, Z.A. (2025). Statistical Analysis in the 'One Health' Approach as a Bridge Between Animal and Human Health *Journal of Animal Prod*, *37*. https://apm.reduc.edu.cu/index.php/rpa/article/view/e164

©The author(s), the Journal of Animal Production, 2020. This article is distributed under the terms of the international license Attribution-NonCommercial 4.0 (https://creativecommons.org/licenses/by-nc/4.0/), assumed by collections of open access scientific journals, recommended by the Declaration of Budapest, which may be consulted at Budapest Open Access Initiative's definition of Open Access.

zoonotic virus can affect global public health, emphasizing the need for an integrated approach that, of course, includes statistics to prevent future health crises (Horefti, 2023).

The European Union (EU) system for monitoring and collecting information on zoonoses gathers relevant data, zoonotic agents, antimicrobial resistance, and foodborne disease outbreaks using statistics, big data, and artificial intelligence. These tools assess trends and sources of these agents, as well as outbreaks within its territory, and present an annual report by the end of May to the European Commission with the collected data (Authority *et al.*, 2021; Guillermo Alejandro *et al*., 2024).

This perspective allows disease control to be approached from multiple disciplines, facilitating effective strategies for the prevention, detection, and response to zoonotic outbreaks such as rabies or Ebola. By integrating and analyzing knowledge from veterinary science, human medicine, and ecology, more comprehensive solutions can be developed (Urbizu-González *et al.*, 2023).

The implementation of the "One Health" approach contributes to the Sustainable Development Goals (SDGs) by promoting a healthy environment that benefits all living beings. This includes sustainable management of natural resources and ecosystems, which is essential for mitigating the impact of climate change and improving food security. Cooperation among different sectors and disciplines is encouraged, which is vital for addressing complex issues such as antimicrobial resistance and health inequalities. This collaboration is crucial for creating effective policies that respond to global health needs. This model not only focuses on specific diseases but also considers social, economic, and environmental factors that affect health. Therefore, it is crucial for designing sustainable strategies that address, among others, the social determinants of health (Vera & Bretaña, 2023).

This paper aims to highlight the importance of statistical analyses as a bridge between animal and human health in the "One Health" approach.

DEVELOPMENT

I. Origin of Diseases:

The "One Health" concept highlights the interdependence between human, animal, and environmental health. This comprehensive perspective is crucial for addressing public health challenges in a world where ecosystems, biodiversity, and population health are deeply interconnected (Montijo *et al.*, 2024).

A significant portion of emerging infectious diseases in humans originate from animals. It is estimated that approximately 60% of human infectious diseases are transmitted from animals to humans. Additionally, around 75% of emerging pathogens come from animals. This underscores the importance of monitoring animal health to prevent outbreaks in human populations (Galindo-González, 2024).

Moreover, healthy ecosystems are fundamental to the well-being of both humans and animals. Environmental degradation, deforestation, climate change, and pollution can alter natural habitats and increase the risk of disease transmission. For example, more frequent contact between humans and wild animals due to habitat loss can facilitate the emergence of new zoonoses (Caspistegui, 2024).

Antimicrobial resistance (AMR) is a growing concern affecting both human and animal health. The excessive and inappropriate use of antibiotics in veterinary medicine and agriculture can contribute to the development of resistant strains that threaten effective treatments in humans. Collaboration among sectors is essential to implement strategies that mitigate this problem (Lozano, 2023).

Animal diseases can impact food production and, consequently, affect human nutrition and health. A "One Health" approach promotes sustainable agricultural practices that consider animal welfare and minimize public health risks (Pascual, 2024).

The implementation of public policies that recognize these interconnections is essential. This includes developing programs that integrate epidemiological surveillance in human and animal health, as well as initiatives to protect the environment. Collaboration across different disciplines and sectors is key to effectively addressing these challenges. The connections between animal, human, and environmental health are undeniable and require a collaborative and integrated approach to tackle the complex problems facing our society. Adopting the "One Health" model not only helps prevent zoonotic diseases but also promotes a healthy environment that benefits all species and ecosystems involved (Carrascal Velásquez *et al*., 2023).

II. Statistical analysis

Statistical analysis is fundamental in scientific research as it provides essential tools for data collection, interpretation, and analysis. It establishes an objective basis for evaluating research outcomes, which is crucial to avoiding bias and ensuring that conclusions are based on reliable data (Carrascal Velásquez *et al.*, 2023).

Through statistical analysis, researchers can identify patterns and trends in data that may not be evident at first glance. This helps formulate hypotheses and better understand the studied phenomenon. Statistics provide information that facilitates evidence-based decision-making, which is essential in fields such as medicine, psychology, agricultural sciences, and social sciences. This contrasts with decisions based on assumptions or personal beliefs, increasing the credibility of results. Additionally, it is crucial in experiment design, allowing researchers to select appropriate samples, define variables, and establish controls, ensuring that experiments are valid and reproducible (Ortega *et al*., 2024).

Statistical techniques help determine whether the differences observed among groups are significant or merely the result of chance. This is vital for validating hypotheses and ensuring that results are generalizable. Using statistical tools enables efficient processing of large datasets (big data), saving time and resources compared to manual methods. This is especially important in research dealing with extensive datasets (Ortega *et al*., 2024).

These analyses facilitate clear and understandable presentation of results, which is crucial for communicating findings to various audiences, including scientists, policymakers, and the general public. Ultimately, the proper use of statistical analysis significantly contributes to scientific knowledge advancement by allowing validation and comparison of previous studies and the development of new theories (Morcillo-Muñoz & Subirana-Casacuberta, 2024).

III. Types of statistical analysis

Statistical analysis is a key tool in health research, enabling data interpretation and informed decision-making (Lino *et al*., 2024). Below are the main types of statistical analysis used in this field:

1. Descriptive Statistics (Guillermo Alejandro *et al*., 2024): It summarizes and describes the characteristics of a dataset. Its main functions include:

- ➢ Measures of Central Tendency: These include the mean, median, and mode, which provide a representative value for a dataset, along with measures of dispersion such as range, variance, and standard deviation, indicating data variability or spread (Sanchez *et al*., 2024).
- ➢ Tables and Graphs: Used for visualizing data and facilitating understanding, such as histograms, bar charts, and box plots.

2. Inferential Statistics (Ngwira *et al*., 2024) Inferential statistics allows for generalizations about a population based on a sample.

3. Hypothesis Testing Hypothesis tests are used to determine whether there is sufficient evidence in sample data to accept or reject a hypothesis about the population.

4. Confidence Intervals: these provide an estimated range that is likely to contain the population parameter, offering a measure of the estimator's precision.

5. Regression Analysis Regression analysis is applied to explore relationships between variables and predict values (García-Mayor *et al*., 2020). For example, linear regression can be used to analyze how factors such as age or body mass index affect blood pressure. Multiple regression analysis: It assists in evaluating the impact of several independent variables on a single dependent variable, thus helping with the detection prognostic factors in health (Habay *et al*., 2023). Overall: multivariate analysis look into multiple variables simultaneously to understand their interrelations and joint effects (Ijaz *et al*., 2023).

6. Analysis of Variance (ANOVA): ANOVA is used to compare means among three or more groups and determine whether at least one is significantly different (Espino, 2023).

7. Factor Analysis: Factor analysis helps reduce dimensionality and identify patterns in data by grouping correlated variables (D'Auria *et al*., 2023).

8. Programs are used to design and analyze sampling in animal populations, which is essential for assessing the health status of herds and making decisions on disease control and prevention (Betancourt-Bethencourt, 2024; de la Torre Rodríguez *et al*., 2023; Lino *et al*., 2024).

- Statistical analyses allow researchers to correlate vaccination rates with livestock production, highlighting how health interventions directly impact the economy and sustainability (Florin-Christensen *et al*., 2021). Inferential statistics are applied to evaluate the effectiveness of vaccination programs in animals. Hypothesis tests are used to determine whether the observed differences in disease incidence before and after vaccination are significant (MORENO, 2023). Clinical studies: In medical research, statistical analyses are essential for designing clinical studies. Methods such as T-TEST, ANOVA, and multiple regression are used to assess the effectiveness of treatments and medications, analyzing how different variables (age, gender, preexisting conditions) influence clinical outcomes (Hunter & Holmes, 2023).
-

- Descriptive statistics is used to collect and present data on the prevalence and distribution of diseases in human populations through graphs and tables that visualize epidemiological data, facilitating the identification of outbreaks and trends (Panel *et al*., 2023).
- Statistical analyses allow researchers to evaluate the impact of public health policies (Maynard-Bermúdez *et al*., 2023). For example, studies can assess the effect of healthcare access on mortality or morbidity rates, using statistical techniques to control confounding variables.
- In animal health, they enable control and prevention of disease in herds, while in human health, they are necessary to evaluate sanitary treatments and policies. The effective integration of these methods improves evidence-based decision-making, leading to overall well-being in humans.
- Data pooling: Statistical analysis allows researchers to pool similar data (clusters), such as various diseases that appear together in certain regions or communities. It could reveal geographical patterns.
- Time series: Time series permit analysis of variable changes through time. For instance, they are useful in analyzing the timeline tendency of disease effects or how temperature changes in a region.
- Factor analysis: It permits identifying the underlying factors that cause variability in a data set.
- Bayesian networks: They are useful in modeling causal relations among variables.

IV. How statistical analyses strengthen the “One Health" approach

Statistical analyses play a crucial role in this integrative approach by providing tools to:

1. Identify patterns and trends:

- Statistical analyses enable the monitoring of incidence and prevalence of infectious diseases in both humans and animals, identifying potential outbreaks and shifts in distribution patterns. This approach allows for the establishment of synergistic relationships and comprehensive assessments across different contexts from an integrated perspective (Barriga, 2024; Pablo, 2024).

- Risk factor analysis: By linking disease data with environmental and socioeconomic variables, common risk factors can be identified, providing a deeper understanding of underlying causes to take effective action, primarily in prevention efforts (del Rocío Contreras-Rodríguez *et al*., 2024).

2. Evaluation of intervention effectiveness:

- Program evaluation: Statistical analyses allow for the evaluation of the impact of public health interventions, such as vaccination campaigns, health education programs, and disease control measures, by quantifying changes in health outcomes. Under the One Health approach, common and comprehensive actions will be established, enhancing their strategic effectiveness.
- Group comparisons: By comparing groups exposed to different interventions, it is possible to determine which one is the most effective.

3. Modeling future scenarios:

- Outbreak prediction: Statistical and mathematical models (Betancourt-Bethencourt *et al*., 2022) can be used to predict the spread of infectious diseases and simulate the impact of different control strategies, helping to plan material and human resources as well as modes of action.
- Policy evaluation: By modeling future scenarios, the consequences of different policies can be assessed, allowing for evidence-based decision-making.

4. Strengthening interdisciplinary collaboration

- Common language: Statistical analyses provide a common language for professionals from different disciplines (physicians, veterinarians, ecologists) to collaborate and share data.
- Data integration: Statistical analyses allow for the integration of data from various sources, such as medical records, veterinary data, plant health records, and environmental data, to gain a more comprehensive view of the system (Betancourt, 2013).

V. Applications of statistical analysis in animal and human health research

Statistical analysis is crucial in research related to both animal and human health, as it provides a framework for interpreting data and making informed decisions. Below are some specific applications of these analyses in both fields.

VI. Connections between animal, human, and environmental health: A "One Health" approach

The "One Health" approach highlights the interdependence between human, animal, and environmental health. These connections are deep and complex, manifesting at multiple levels.

- Disease transmission: (Galante, 2024)
  - Zoonotic Diseases: Many infectious diseases originate in animals and can be transmitted to humans (e.g., COVID-19, avian influenza).

- Environmental Factors: Environmental factors such as climate change can alter the habitats of disease vectors (mosquitoes, rodents), increasing the risk of transmission to humans.
- Pollution: Water and soil contamination with chemicals and pathogens can impact both human and animal health. Food contamination can also cause disease in both populations.
- Extreme events: Extreme Weather Events: Climate extremes like droughts, floods, and heatwaves can disrupt food production, increase disease transmission, and displace human and animal populations.
- Deforestation: Deforestation leads to habitat loss, increasing contact between humans and wild animals, potentially leading to the emergence of new diseases.
- Intensive farming: The excessive use of pesticides and fertilizers can contaminate the environment and impact the health of ecosystems and the people who consume these foods.

Benefits of a "One Health" Approach (Rivero *et al*., 2023)

- Disease prevention: By addressing the underlying causes of diseases, we can prevent outbreaks and pandemics.
- Preservation of biodiversity: A "One Health" approach promotes biodiversity conservation and healthy ecosystems.
- Food safety: By ensuring animal health and food safety, we contribute to food security.

Limitations

The lack of automated information systems and reliance on manual records complicates accurate data collection and analysis. This results in incomplete or inconsistent information, which affects the quality of statistical analysis. Data quality may vary significantly between different regions and contexts, influenced by factors such as the education level of personnel responsible for collection and processing.

Biological and ecological differences between species complicate the application of standardized statistical models. This is particularly relevant in studies that integrate human and animal health data, where variations in disease susceptibility can impact results. The diversity of biological responses to environmental or pathological factors may lead to erroneous conclusions if not properly accounted for in models.

Systems integrating human, animal, and environmental health are inherently complex, with multiple interactions that can be difficult to model. This can lead to underestimation or overestimation of certain health risks or benefits. Establishing clear causal relationships between variables within the "One Health" framework is challenging due to the multifaceted nature of social and environmental determinants affecting health (Lofaro, 2024).

The lack of standardized methodologies for intersectoral analysis may lead to inconsistencies in results. Additionally, many studies rely on observational designs that may be subject to biases. Limited financial and human resources restrict the ability to conduct comprehensive studies that integrate all aspects of the "One Health" approach.

These challenges highlight the need for improved data infrastructures and the development of more robust methodologies to facilitate effective analysis within the "One Health" framework.

Advances in technologies such as big data and machine learning offer significant opportunities to enhance statistical analysis in the "One Health" approach. The ability to collect and analyze large datasets from various sources (medical records, epidemiological studies, environmental data) provides a more complete and accurate view of interactions among human, animal, and environmental health. This facilitates the identification of patterns and trends that may have previously gone unnoticed (Ahmad *et al.*, 2023).

The use of big data enables predictive analyses that can anticipate disease outbreaks or identify risk factors in specific populations, improving prevention and response to health crises. Machine learning algorithms can process medical information and detect diseases faster and more accurately than traditional methods. They can also be used to simplify administrative processes in the healthcare sector, enhancing operational efficiency and allowing professionals to focus on patient care. Additionally, big data facilitates the implementation of technologies such as telemedicine and wearable devices that monitor health in real time, providing valuable data that can be analyzed to improve medical care and the management of chronic diseases.

The integration of different technological platforms facilitates the exchange of information between sectors, which is crucial for an effective "One Health" approach. This allows for a more holistic and coordinated analysis of health-related data (Lofaro, 2023).

CONCLUSIONS

This study has highlighted the importance of statistical analyses as a bridge between animal and human health within the "One Health" approach. It has been argued that measuring the effectiveness of the "One Health" approach requires a diverse set of statistical methods that integrate human, animal, and environmental health data. By applying these techniques, a more comprehensive understanding of the impact of implemented policies and programs can be achieved, facilitating better decision-making in public health and sustainable animal exploitation. Collaboration among veterinarians, physicians, statisticians, biologists, and other professionals is essential to address the complex challenges of global health. This interdisciplinary approach not only enhances the understanding of interrelationships among human, animal, and environmental health but also fosters effective and sustainable solutions to improve overall population well-being.

REFERENCES

Ahmad, N., Joji, R. M.,& Shahid, M. (2023). Evolution and implementation of One Health to control the dissemination of antibiotic-resistant bacteria and resistance genes: A review. *Frontiers in cellular and infection microbiology*, *12*, 1065796. https://www.frontiersin.org/journals/cellularandinfectionmicrobiology/articles/10.3389/fcimb.2022.1065796/full

Barriga, D. B. (2024). Nuevos retos de salud: la (re) aparición de enfermedades transmitidas por vectores artrópodos desde la mirada de One Health. *Revista de Salud Ambiental*, *24*(Especial Congreso), 27-30. https://www.ojs.diffundit.com/index.php/rsa/article/download/1673/1584

Betancourt-Bethencourt, J. A. (2024). Jamovi para calcular potencia, muestra y tamaño de efecto en las investigaciones de salud. *Archivo Médico Camagüey*, *28*, 9955. https://revistaamc.sld.cu/index.php/amc/article/view/9955/4855

Betancourt-Bethencourt, J. A., Aúcar-López, J., y Cendra-Asencio, M. (2022). Necesidad de superación en modelos matemáticos de epidemiología. *Revista Archivo Médico de Camagüey*, *26*. https://revistaamc.sld.cu/index.php/amc/article/view/8822

Betancourt, J. A. (2013). [A transdisciplinary model for public health research]. *Rev Panam Salud Publica*, *34*(5), 359-363. http://www.ncbi.nlm.nih.gov/pubmed/24553764

Carrascal Velásquez, J., Ayola Carrasca, S., y González Meza, J. (2023). One Health: Enfoque holístico e interdisciplinar proyectado a comunidades en riesgo. *Revista MVZ Córdoba*, *28*. http://scielo.sld.cu/scielo.php?pid=S0253570X2024000100012&script=sci_arttext&tlng=en

Caspistegui, D. N. (2024). Una sola salud–One health. *Navarra agraria*, (263), 2. https://dialnet.unirioja.es/servlet/articulo?codigo=9771479

Cella, E., Giovanetti, M., Benedetti, F., Scarpa, F., Johnston, C., Borsetti, A., Ceccarelli, G., Azarian, T., Zella, D., y Ciccozzi, M. (2023). Joining forces against antibiotic resistance: The one health solution. *Pathogens*, *12*(9), 1074. https://www.mdpi.com/2076-0817/12/9/1074

D'Auria, L. J., Rofrano, G., Danese, A., Di Marco Pisciottano, I., Signorelli, D., Vecchio, D., Di Stasio, A., Pizzolante, A., Miniero, R., y Brambilla, G. (2023). Buffalo milk quality in southern Italy: trace elements y endocrine disruptors. A One Health analysis. *Revista Cientifica de la Facultade de Veterinaria, 33*. https://openurl.ebsco.com/EPDB%253Agcd%253A14%253A18874174/detailv2?sid=ebsco%253Aplink%253Ascholar&id=ebsco%253Agcd%253A174450997&crl=c&link_origin=scholar.google

de la Torre Rodríguez, M., Junco Bringa, D., Marrero Pérez, M. D., y Rodríguez Soto, I. (2023). Software Jamovi en la docencia de la asignatura *Metodología de la Investigación.*

Educación Médica Superior, 37(4). http://scielo.sld.cu/scielo.php?pid=S0864-21412023000400009&script=sci_arttext

del Rocío Contreras-Rodríguez, C., Jiménez-Oliveros, P. A., y Aguiar-Hernández, D. F. (2024). Ciudad y salud ambiental: propuesta de una herramienta tecnológica para la medición de determinantes de la salud. *Trilogía Ciencia Tecnología Sociedad, 16*(34), e3106-e3106. https://revistas.itm.edu.co/index.php/trilogia/article/view/3106

Espino, D. J. (2023). Evaluación de los Servicios Ecosistémicos de la Infraestructura Verde en la Comunidad Valenciana (ECOVAL). https://greeniusviu.com/wp-content/uploads/2023/09/informe_intermedio_210323.pdf

Florin-Christensen, M., Schnittger, L., Bastos, R. G., Rathinasamy, V. A., Cooke, B. M., Alzan, H. F., y Suarez, C. E. (2021). Pursuing effective vaccines against cattle diseases caused by apicomplexan protozoa. CABI Reviews (2021). https://www.cabidigitallibrary.org/doi/full/10.1079/PAVSNNR202116024

Galante, E. (2024). Una Salud, vivimos en un mundo interconectado. RIdEC, 17, 8-11. https://rua.ua.es/dspace/bitstream/10045/145701/1/Galante_2024_RIdEC.pdf

Galindo-González, J. (2024). Zoonosis, enfermedades infecciosas y pandemias: ¿qué está pasando*? Bioagrociencias, 17*(2). https://www.researchgate.net/profile/Jorge-Galindo-Gonzalez/publication/384569130_Zoonosis_enfermedades_infecciosas_y_pandemias_que_esta_pasando/links/66fda4209e6e82486ffe7d60/Zoonosis-enfermedades-infecciosas-y-pandemias-que-esta-pasando.pdf

García-Mayor, J., Moreno-Llamas, A., y Cruz-Sánchez, E. D. l. (2020). Prevalencia de tabaquismo y hábitos de vida relacionados con la salud en función del uso del tabaco tras la implantación de la Ley 42/2010: análisis de encuestas de salud en España 2009-2017. *Revista Española de Salud Pública, 93,* e201907042. https://www.scielosp.org/article/resp/2019.v93/e201907042/

Guillermo Alejandro, H. H., Zurelys, G. G., Guillermo Luis, H. M., y Dania Maria, H. M. (2024). Estrategia educativa para la concienciación sobre la resistencia a los antimicrobianos con enfoque "Una Salud". UNASALUDCAV 2024. https://eventosunivca.sld.cu/index.php/unasaludcav/2024/paper/viewPaper/23

Habay, J., Uylenbroeck, R., Van Droogenbroeck, R., De Wachter, J., Proost, M., Tassignon, B., De Pauw, K., Meeusen, R., Pattyn, N., y Van Cutsem, J. (2023). Interindividual variability in mental fatigue-related impairments in endurance performance: a systematic review and multiple meta-regression. *Sports medicine-open, 9*(1), 14. https://link.springer.com/article/10.1186/s40798-023-00559-7

Horefti, E. (2023). The Importance of the One Health Concept in Combating Zoonoses. *Pathogens, 12*(8), 977. https://www.mdpi.com/2076-0817/12/8/977

Hunter, D. J., y Holmes, C. (2023). Where medical statistics meets artificial intelligence. New England *Journal of Medicine*, *389*(13), 1211-1219. https://www.nejm.org/doi/full/10.1056/NEJMra2212850

Ijaz, M., Javed, M. U., Ahmed, A., Rasheed, H., Anwar, F., Shah, S. F. A., y Sabir, J. (2023). On-farm molecular epidemiology and therapeutic insights into multidrug-resistant Staphylococcus aureus isolated from bubaline mastitis. *Revista Cientifica de la Facultade de Veterinaria*, *33*. https://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=07982259&AN=174450985&h=7iLtGkBCgnoQ9nK6hJFlA6QbcobmsZNHrDBCmkwZmZBIBmK08PRLbDktFEQfpjav2y36M311K3CtnZPSLwbxKw%3D%3D&crl=c

Lino, V., Rivadeneira, D. D. C., Zambrano, J. L. M., y Delgado, Y. M. I. (2024). Jamovi como herramienta para el análisis de datos en la asignatura de estadística y diseño de experimentos. *Revista Alcance*, *7*(1). http://alcance.unesum.edu.ec/index.php/alcance/article/view/62/77

Lofaro, G. (2023). Innovación, digitalización y sostenibilidad de la salud pública entre el aprendizaje automático y el suave empujón. *Revista de la Facultad de Derecho de México*, *73*(285), 31-60. https://revistas.unam.mx/index.php/rfdm/article/download/85382/74905/257012

Lofaro, G. (2024). Retos éticos y jurídicos de la restauración de la naturaleza: enfoque One Health y protección de la biodiversidad. *Bioderecho*. https://revistas.um.es/bioderecho/article/view/622941/371871

Lozano, I. C. (2023). La importancia del análisis sistemático internacional frente a la resistencia a los antimicrobianos en el entorno One Health. Resumen del artículo original: Antimicrobial Resistance Collaborators. The burden of antimicrobial resistance in the Americas. *Revista de Salud Ambiental*, *23*(2), 201-204. https://ojs.diffundit.com/index.php/rsa/article/download/1639/1570

Maynard-Bermúdez, G. I., Maynard-Bermúdez, R. E., y Silva-Gerardo, A. D. A. d. (2023). La visión One Health, consolidación del paradigma salubrista en Cuba. *Revista Información Científica*, *102*. http://scielo.sld.cu/scielo.php?pid=S1028-99332023000100017&script=sci_arttext

Montijo, L. M. M., Murillo-Cisneros, D. A., Gaxiola-Robles, R., Angulo, C., Lugo-Lugo, O., y Zenteno-Savín, T. (2024). One Health, Una Salud. https://www.cibnor.gob.mx/revista-rns/pdfs/vol9num3EE/2_ONE_HEALTH.pdf

Morcillo-Muñoz, Y., y Subirana-Casacuberta, M. (2024). El rol transformador de las enfermeras en el marco de One Health. Tesela, *Liderazgo y Gestión*, e15542-e15542. https://www.ciberindex.com/index.php/ts/article/view/e15542

MORENO, E. E. (2023). Informe de misión de cooperación técnica evaluación y recomendaciones sobre brucelosis animal y humana instituto colombiano agropecuario (ica) e instituto nacional de salud (INS). https://www.paho.org/sites/default/files/informe_de_mision_de_cooperacion_tecnica_brucelosis_colombia_0.pdf

- Ngwira, A., Manda, S., Karimuribo, E. D., y Kimera, S. I. (2024). One Health. https://www.researchgate.net/publication/384928794_Identification_of_common_spatial_and_temporal_trends_in_the_epidemiology_of_cattle_bovine_tuberculosis_and_human_extrapulmonary_and_drug-resistant_tuberculosis_in_Malawi

Ortega, A. F., Bautista Gómez, L. G., Martínez Castañeda, J. S., y Sánchez Ramos, M. Á. (2024). Systematic Analysis of the Zoonosis by SARS-CoV-2 in Domestic Cats Under the Concept of One Health. *Coronaviruses.* https://www.benthamdirect.com/content/journals/covid/10.2174/012666797530345824092304450 6

Pablo, P. P. J. (2024). Revisión bibliográfica de la resistencia parasitaria en la aplicación de antihelmínticos en bovinos del Ecuador. https://repositorio.uta.edu.ec/items/e836dbfb-e2f1-42b5-9f42-50612107fe40

Panel, O. H. H.-L. E., Hayman, D. T., Adisasmito, W. B., Almuhairi, S., Behravesh, C. B., Bilivogui, P., Bukachi, S. A., Casas, N., Becerra, N. C., y Charron, D. F. (2023). Developing one health surveillance systems. *One Health*, 100617. https://www.sciencedirect.com/science/article/pii/S2352771423001374

Pascual, M. S. (2024). Evolución del concepto de seguridad alimentaria. *Anales de Veterinaria de Murcia*, *38*, 6-7. https://www.proquest.com/openview/bc3b8105636c37237052974ae291d914/1?pq-origsite=gscholar&cbl=2035774

Rivero, A., Álvarez, J., y Hernández, E. (2023). La reducción de riesgos de desastres desde el enfoque de One Health. *Revista MVZ Córdoba*, *28*. https://openurl.ebsco.com/EPDB%3Agcd%3A5%3A13467877/detailv2?sid=ebsco%3Aplink%3Ascholar&id=ebsco%3Agcd%3A177977130&crl=c&link_origin=scholar.google.com

Sanchez, L. M. M., Rojas, M. A., Valencia, M. S., y Orrego, L. C. G. (2024). Caracterización de pacientes con úlceras cutáneas y sus niveles de reactantes de fase aguda. *Revista Repertorio de Medicina y Cirugía.* https://revistas.fucsalud.edu.co/index.php/repertorio/article/view/1510

Urbizu-González, A. L., Vázquez-Ruiz, L., Ceballos-Olvera, I., Hernández-Cabrera, W., González-Alanís, P., Goldaracena-Olvera, M., y de la Luz Vázquez-Sauceda, M. (2023). Una sola salud: una perspectiva veterinaria. *Ciencias Veterinarias y Producción Animal*, 59-69.

https://cienciasveterinariasyproduccionanimal.uat.edu.mx/index.php/cienciasVeterinarias/article/view/5

Vera, R. S., y Bretaña, R. M. G. (2023). Panorámica de la calidad en Cuba. Universidad de La Habana (298), e2730-e2730. https://revistas.uh.cu/revuh/article/view/2730

AUTHOR CONTRIBUTION STATEMENT

Research conception and design: JABB, LQL, ZARH; data analysis and interpeetation: JABB, LQL, ZARH; redaction of the manuscript: JABB, LQL, ZARH.

CONFLICT OF INTEREST STATEMENT

The authors state there are no conflicts of interest whatsoever.