INTERNATIONAL FEDERATION OF BEEKEEPERS' ASSOCIATIONS

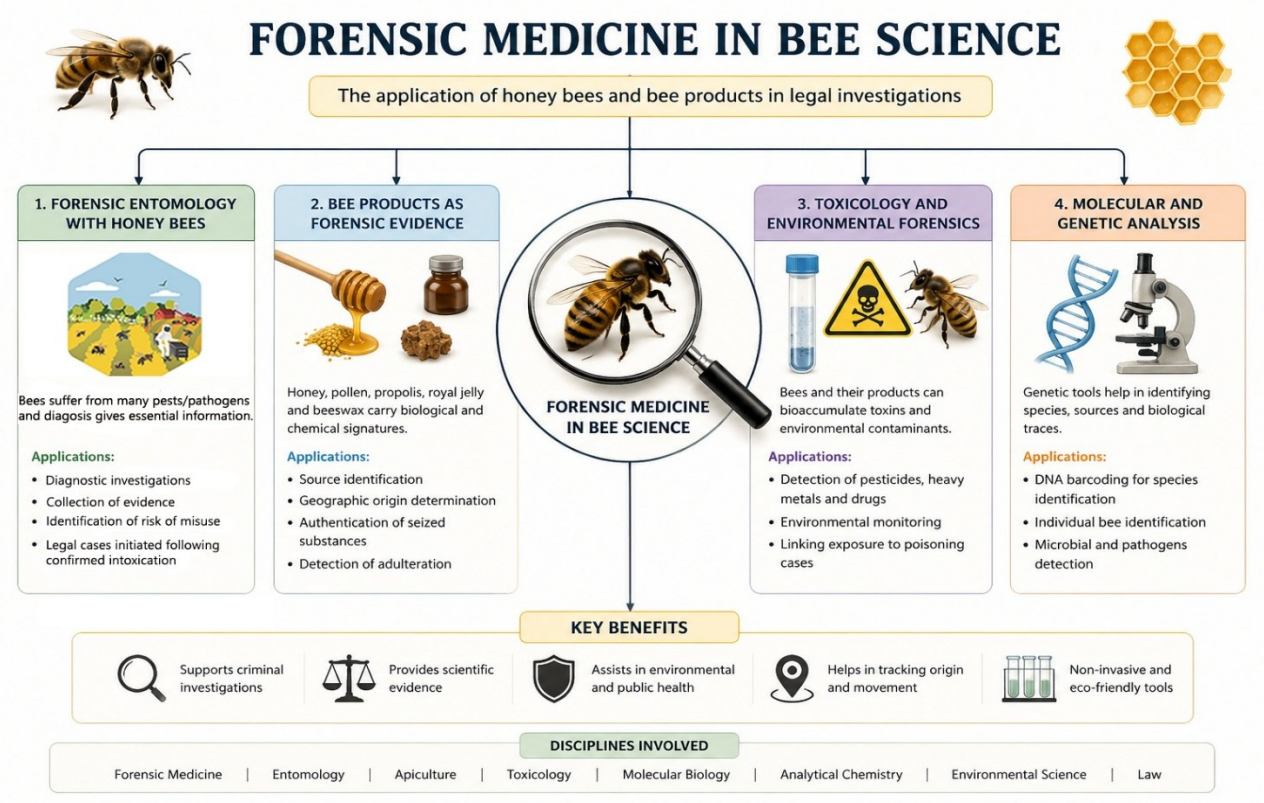
POLICY BRIEF

FORENSIC VETERINARY MEDICINE, ENVIRONMENTAL TOXICOLOGY, AND ONE HEALTH APPROACH

1. Executive Summary

Issue:

Honey bee vitality and welfare in relation to pathogen load, veterinary medicine intoxication, environmental intoxication, and 'diagnostics' needs. Routine clinical and postmortem veterinary diagnostic techniques play a major role in forensic investigations of honey bees.



One Health approach, Environmental Toxicology, and Forensic Veterinary Medicine are closely connected fields that work together to protect public, animal, and ecosystem health. Veterinary forensics is a relatively new and emerging specialised field, and in a broader sense, focused on bees, implies diagnostic investigation and careful collection of evidence after a) disease/ pathogen incidence or outbreak, and b) adverse effects of in-hive and environmental pollution or intoxication on bees. These findings and evidence can be used to protect managed bee communities, wild pollinators, food and feed systems, and eventually ecosystems, often by preparing court cases. The findings will also impact consumers and, through the food chain, will link public health, environment, and primary production, thus underpinning the One Health approach in focus.

Honey bees also act as biological indicators of environmental contamination, including pesticides, heavy metals, radionuclides, veterinary drug residues, and industrial pollutants. Therefore, bee health surveillance contributes not only to apiculture sustainability but also to environmental and public health monitoring under the One Health framework.

Beekeeping is a farming industry of increasing importance: either on a large scale or as small holdings, it supports livelihoods and sustainable food production. Health, welfare, and quality of honey bee products are mirrors of our environment and our health.

One Health dimension

Sector	Relevance to Bee Forensics
Animal health	Disease diagnosis, pathogen detection, treatment misuse
Environmental health	Pesticides, pollutants, heavy metals, contamination
Public health	Food safety, residues, apitherapy product quality

Main gaps:

Although there is a wide network of analytical and chemical laboratories, not all veterinarians in the World use the existing knowledge to practice the forensic approach to the level required for the determination of cause and the history of a death or intoxication event in honey bee colonies.

A lack of harmonised international forensic investigation protocols for honey bee mortality and intoxication events remains a major gap, limiting the ability of countries to conduct consistent, comparable, and scientifically robust investigations.

In addition, there is an absence of standardised sampling procedures and chain-of-custody requirements for legal and laboratory purposes, which compromises both the reliability of diagnostic results and the admissibility of evidence in judicial contexts.

Furthermore, underreporting of bee intoxication incidents, combined with the lack of centralised databases, prevents the systematic collection, analysis, and sharing of data at national and international levels, thereby weakening surveillance, risk assessment, and coordinated response efforts.

veterinarians often lack education on environmental toxicology, and they are not in close collaboration with other disciplines necessary to address the One Health approach.

Finally, we consider as an important gap the absence of *Chemical poisoning* in WOAH-listed diseases.

Why it matters

I. **Pollination:** Honey bees pollinate 75% of flowering plants and 30% of crops, supporting biodiversity, agriculture, and ecosystems worth billions annually. Thus, they secure food availability as they increase food quality.

II. **Food quality and health**: We are what we eat! Having honey bee products that are produced in clear and safe conditions is the primary goal, and veterinary medicine can help achieve this goal through bee health, bee welfare, and public health. Anyone who produces a product to be consumed as a food or to be served as a drug/constituent for apitherapy and medicine needs to be knowledgeable on how to do it with the minimum harm possible to the bees. That is why honey bees and their products are often used as biological indicators of environmental quality.

III. **Environmental quality**: Bees are an essential part of our natural history and evolution. Humans are intervening in the natural world, altering the environment, and creating risks for bees' health and welfare. Environmental pollutants are key drivers for bees' declines, with consequences also for wildlife and ecosystem stability. Honey bees acting as indicators of environmental contamination, they project public health under the One Health framework.

IV. **Honey bee pathogens and their mitigation:** In many countries, veterinary medicinal products are frequently used without prior laboratory diagnosis, residue analysis, or veterinary prescription, increasing the risk of misuse, resistance development, product contamination, and intoxication events.

Key recommendations

Apimondia calls upon national veterinary authorities, WOAH, FAO and partner institutions to formally recognise honey bee intoxication and mortality investigation as an essential component of animal health surveillance, environmental monitoring, and food safety systems under the One Health framework:

- Application of forensic medicine in all countries of the world.
- Veterinary education in a university: forensic medicine and apidology should be included in the curriculum.
- WOAH reference labs for disease diagnostics, and with capacity for a large number of sample analyses.
- Development of rapid response teams or designated authorities for mass colony mortality events, and allocation of national funds.
- Development of international forensic protocols Creation of national or international registries/databases for recording intoxication incidents, laboratory findings, and legal outcomes.

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2. Background and problem statements

- The forensic approach is neglected in veterinary services in many parts of the world.
- The existing international/national framework for bee health is rather weak and not focused, and usually, no budget is assigned to achieve the desired results.
- There is a lack of communication between countries and between stakeholders within the countries for standardisation. Relevance to One Health: Saving the bees is mandatory, but there is a lack of infrastructure in many parts of the world for sample analysis.
- Veterinary medicine is neglected when it comes to environmental services to be engaged in problem recognition. Many countries lack rapid response systems for unexplained mass colony mortality events, resulting in delayed sampling, loss of critical forensic evidence, and reduced capacity for determining causality.

3. Evidence Base

Evidence point **1**: Veterinary forensic medicine remains underrepresented in major international bee-health scientific forums, indicating limited institutional recognition of the discipline. (e.g., Apimondia, Eurbee).

Evidence point **2**: Large colony losses in most developed parts of the world, despite the use of veterinary medicines.

Evidence point **3**: Not enough visibility and emphasis on the 'Bees and ONE Health approach'.

Evidence point **4**: Pesticides continue to threaten managed and non-managed bees, continue to induce decline in bee populations, and contaminate all hive products.

Evidence point **5**: Not all veterinary medicines and plant protection products used are authorised and prescribed by a veterinarian.

Evidence point **6**: No harmonised international database currently exists for systematic recording of honey bee intoxication or forensic investigation outcomes.

Evidence point **7**: Delayed or improper sample collection frequently compromises laboratory interpretation and legal admissibility of evidence.

Evidence point **8**: Not every intoxication incident is registered and creating a court case; therefore, nobody is ever prosecuted for harming the bees and the environment.

4. Policy Gap Analysis

- Structural limitation: WOAH is not actively involved in the standardisation of toxicity protocols, testing guidelines, manuals for intoxication and prevention, and guidelines for mitigating massive intoxication events.
- Educational gap: There are not enough veterinarians with knowledge of toxicology.
- Institutional barrier: In several countries, it is not known which body is responsible for several of the bee health problems (e.g., intoxication, invasive species).
- Operational gap: In many countries, no official emergency protocols exist for immediate field investigation, sample preservation, and laboratory submission following sudden mass colony losses.
- Financial constraints: Annual countries' budgets usually do not include financial support for immediate mitigation measures after massive bee colony deaths or threats from invasive species or sudden intoxications.

5. Recommendations

- Improvement of Veterinary education on forensic medicine and apidology through university curriculum in all countries.
- Increase the number and the capacity of WOAH reference laboratories for diagnostics of diseases and intoxications.
- Increase national funds for mitigating the effects of massive deaths suspected of bee disease infection or intoxications.
- Increased visually relevant knowledge sources on WOAH and FAO web pages, also for the consumers, apart from the producers.
- Mandatory registration of intoxication events in all countries.
- Development of international forensic protocols for honey bee mortality investigations, including field examination, necropsy procedures, toxicological sampling, and laboratory submission guidelines.
- Creation of national or international registries/databases for recording intoxication incidents, laboratory findings, and legal outcomes.
- Facilitation of producers to make a lawsuit (legislation in place where needed).
- Coordination of bodies such as Apimondia, WOAH, and FAO on forensic medicine establishment procedures.

6. Implementation Pathway

- Lead institution: Apimondia
- Supporting actors: WOAH, FAO, IAEA
- Short-term action (0–12 months): Communication
  -Stakeholder mapping
  -Drafting of forensic investigation protocols

-Launching an awareness campaign on One Health and bee toxicology

❖ Medium-term action (1–2 years): Action, protocols, standards

- Pilot implementation in selected countries
-Laboratory training workshops
-Harmonisation of reporting systems

7. Expected Impact

- Improvement of honey bee health, establishment of manuals, standardisation of protocols and approaches, and registration of worldwide data.
- Strengthened veterinary integration into agricultural practices: give bees rights that all productive animal species have under WOAH.
- Sustainability contribution: Effective policies stemming from forensic work help in coordinated One Health actions.
- Advancing the One Health approach by linking animal investigation with human health and environmental well-being, thus fostering a more integrative and preventive strategy for global health challenges.
- Reducing unexplained colony losses through earlier diagnosis and intervention.
- Improving traceability and legal accountability for environmental contamination events
- Strengthening consumer confidence in honey bee products and apitherapy products.

8. Monitoring Indicators

- Number of countries implementing forensic protocols
- Number of Universities including forensic medicine in their curriculum
- Percentage of trained veterinarians in bee toxicology and forensic medicine
- Number of registered intoxication cases per country annually
- Number of accredited laboratories performing bee toxicology analyses
- Average time from bee mortality report to sample collection, to results
- Number of investigated mortality events with laboratory confirmation
- Percentage of registered cases resulting in formal investigation
- Number of legal cases initiated following confirmed intoxication

9. Key Stakeholders

Organization	**Main Orientation**	**Role in Honeybee Health**
Apimondia	Scientific & professional	Beekeeping science and dissemination/ global cooperation

Food and Agriculture Organization - FAO	International Agriculture & Food Security Organization	Pollinator protection, sustainable agriculture, food security, rural development, and ecosystem-based agricultural policies
World Organisation for Animal Health - WOAH	Veterinary regulation	Animal disease standards and surveillance
Food Standards Agency - FSA	National Food Safety Authority	Honey safety, residue monitoring, food-chain regulation, labelling, and consumer protection
International Atomic Energy Agency - IAEA	Scientific technology	Isotope methods and contaminant analysis
European Food Safety Authority - EFSA	Scientific risk assessment	Pollinator toxicology and environmental safety
National veterinary services	Diagnostics/ data providers	Animal disease monitoring and surveillance
Ministries of Agriculture	Policy and decision makers	Policy on all aspects of animal. plant and environment production
Environmental protection agencies	Environmental advocacy	Pollinator protection, sustainable agriculture, food security, rural development, and ecosystem-based agricultural policies
National reference laboratories	Diagnostics/ data providers/ Advisory bodies	Animal disease monitoring and surveillance/ Advisory bodies to governments
Universities and toxicology institutes	Diagnostics/ data providers/ Advisory bodies	Animal disease monitoring and surveillance/ Advisory bodies to governments
Beekeeping associations	Main beneficiaries/ advocacy bodies	Honey bee protectors

10. Conclusion

Honey bees are sentinels of environmental integrity, food-system sustainability, and ecosystem resilience. Strengthening forensic veterinary medicine, toxicology, and diagnostic capacity in apiculture is not only a matter of bee health, but of planetary health governance under One Health.

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References

Bargańska, Ż., Ślebioda, M., & Namieśnik, J. (2016). Honey bees and their products: Bioindicators of environmental contamination. *Critical Reviews in Environmental Science and Technology, 46*(3), 235–248. https://doi.org/10.1080/10643389.2015.1078220

Brugnerotto, P., Seraglio, S. K. T., Schulz, M., Gonzaga, L. V., Fett, R., & Costa, A. C. O. (2021). Pyrrolizidine alkaloids and beehive products: A review. *Food chemistry*, *342*, 128384.

Cooper, J. E., & Cooper, M. E. (2008). Forensic veterinary medicine: A rapidly evolving discipline. *Forensic Science, Medicine, and Pathology, 4*(2), 75–82. https://shorturl.at/AjXu0

Fernández-Alba, A. R., Murcia-Morales, M., Oller-Serrano, J. L., Martínez, J. A., Van der Steen, J. J. M., Brodschneider, R., Gratzer, K., Hatjina, F., Carreck, N., Gray, A., Pinto, M. A., Quaresma, A., Roessink, I., Buddendorf, B., Pietropaoli, M., Kasiotis, K. M., Zafeiraki, E., Tzanetou, E., Vejsnæs, F., Kilpinen, O., Brusbardis, V., de Graaf, D. C., & Danneels, E. (2025). Honey bee hives as biomonitors of pesticide environmental pollution: The INSIGNIA-EU monitoring action. *Science of The Total Environment, 999*, 180285. https://doi.org/10.1016/j.scitotenv.2025.180285

Lewikowski, K., Siedlecka, K., & Listos, P. *Use of entomology and entomotoxicology in veterinary forensic medicine*. https://shorturl.at/rCLfM

Maqbool, F., Ali, M., Salman, M., Ghani, M. U., Hassan, A., Achakzai, W. M., ... & Humayun, M. (2025). Decline of honeybee populations and its consequences for wildlife and ecosystem stability. *Planta Animalia, 4*(5), 505–515. https://plantanimalia.com/index.php/journal/article/view/266

Margaoan, R., Papa, G., Nicolescu, A., Cornea-Cipcigan, M., Kösoğlu, M., Topal, E., & Negri, I. (2025). Environmental pollution effect on honey bees and their derived products: A comprehensive analysis. *Environmental Science and Pollution Research, 32*(16), 10370–10391. https://link.springer.com/article/10.1007/s11356-024-33754-4

Martinello, M., Baratto, C., Manzinello, C., Piva, E., Borin, A., Toson, M., ... & Mutinelli, F. (2017). Spring mortality in honey bees in northeastern Italy: Detection of pesticides and viruses in dead honey bees and other matrices. *Journal of Apicultural Research, 56*(3), 239–254. https://doi.org/10.1080/00218839.2017.1304878

Requier, F., Pérez-Méndez, N., Andersson, G. K., Blareau, E., Merle, I., & Garibaldi, L. A. (2023). Bee and non-bee pollinator importance for local food security. *Trends in Ecology & Evolution, 38*(2), 196–205. https://www.cell.com/trends/ecology-evolution/abstract/S0169-5347(22)00273-7

Santrac, V. (2019). *Vitality versus pathogen load in the hive and diagnostic need*. 24th Annual Counselling of Doctors of Veterinary Medicine of Republic of Srpska (Bosnia and Herzegovina), International Scientific Meeting, Ethno Village Stanišići, Republika Srpska, Bosnia and Herzegovina, June 12–15, 2019, Abstract page 88.

Santrac, V. (2025). *Veterinary practice, antimicrobial resistance, and food safety in beekeeping*. 49th International Apimondia Congress, Copenhagen, Denmark, September 23–27, 2025, Book of abstracts, p. 159, Online Flipbook.

Van der Steen, J. J. M., Brodschneider, R., Brusbardis, V., Buddendor, B., Carreck, N., Danneels, E., de Graaf, D. C., Gratzer, K., Gray, A., Hatjina, F., Kasiotis, K. M., Kilpinen, O., Martínez, J. A., Murcia-Morales, M., Martinez-Bueno, M. J., Oller-Serrano, J. L., Pietropaoli, M., Pinto, M. A., Quaresma, A., Roessink, I., Tzanetou, E., Vejsnæs, F., & Fernández-Alba, A. R. (2026). Synthetic varroacides in honey bee colonies: A comprehensive monitoring program across the European Union. *Environmental Technology & Innovation, 42*, 104861. https://doi.org/10.1016/j.eti.2026.104861

Yanai, T. (2025). Current status of veterinary forensic science in Japan. *Journal of Toxicologic Pathology, 38*(1), 3–16. https://www.jstage.jst.go.jp/article/tox/38/1/38_2024-0041/_article/-char/ja/