

## **Effects of animal corpse decomposition: A Literature Review**

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### **Abstract**

#### **Keywords**

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The presence of dead animals in various settings is a widespread phenomenon. In this study, the researcher sought to examine the effects of animal corpse decomposition on various fields. The researcher studied a total of 16 papers to acquire the necessary information on the topic at hand. The studies examined include the effects on the environment (both terrestrial and aquatic), changes in microbial and arthropod communities, and the potential spread of harmful substances, as well as pollution. The researcher brought together all this information in one place for easy reference and further analysis and to provide recommendations for future research.

### **Introduction**

The study of animal corpse decomposition is a fascinating and multidisciplinary field that offers a wealth of insights into the natural processes that occur after death. The breakdown of animal corpses is a natural phenomenon that takes place regularly, with corpses found in various locations including homes, gardens, forests, and rivers. According to ChemEurope (2011), decomposition commences immediately following death, and is the process of breaking down a previously living organism's body into simpler forms of matter. The corpse then becomes a source of sustenance for

bacteria, fungi, and various worms. One of the primary reasons why the study of animal corpse decomposition is so fascinating is that it provides a deeper understanding of the interactions between different organisms and the environment. Australian Museum (2020) states that this knowledge can be utilized to enhance forensic investigations and criminal cases, as well as to gain a better understanding of ecosystem dynamics and nutrient cycling. Additionally, studying animal corpse decomposition can also aid in the development of new methods for managing animal waste and reducing environmental pollution. By comprehending the

decomposition process, scientists can devise more efficient and sustainable methods for disposing of animal remains, which can decrease the negative impact on the environment and public health. Furthermore, Trees for Life (2014) express that the study of animal corpse decomposition is also crucial for understanding the evolution of decomposers and scavengers. By investigating how different organisms interact with animal remains, scientists can gain insight into the ecological and evolutionary pressures that have shaped these organisms over time. Hence, the study of animal corpse decomposition is a multidisciplinary field that offers a wide range of fascinating insights into the natural world and has important practical applications for various fields such as forensic science, environmental management, conservation biology, and evolutionary biology. Therefore, understanding the complex processes of animal corpse decomposition and its effects on the environment and the organisms within it is crucial.

As per previous related studies, animal decomposition has been shown to have effects on multidisciplinary fields. Animal corpse decomposition has effects on the environment, including antibiotic-resistant genes (ARGs), pollutants, and harmful substances. Studies by Dekeirsschieter et al. (2009), Yang et al. (2022), and Yu et al. (2020, 2021) show the presence of harmful compounds like sulfur, nitrogen, phosphorus, nitrate nitrogen, and ammonia nitrogen. ARGs are also abundant in both terrestrial (Feng et al., 2021) and aquatic (Su et al., 2021, 2022) settings. Nitrogen pollution, pathogens, and deterioration of the aquatic environment were observed in the studies of Zhou et al. (2021, 2021) and Wang et al. (2022).

Animal corpse decomposition also affects microbial and insect communities. Blandford et al. (2019), Damann (2010), and Metcalf et al. (2016) reported microbial assembly and bacterial abundance, respectively, while Singh et al. (2018) noted bacterial community patterns due to nutrient cycling. Archer & Elgar (2003), Feddern et al. (2019), Moreau et al. (2022), Parkhideh et al. (2017), Rai et al. (2022), Roglin et al. (2022),

and Voss et al. (2011) observed abundance of arthropods, carnivorous and parasitic species, and mites colonizing carcasses. Breeding of species are also noted by Kelly et al. (2008). Su et al. (2022) and Taylor (2020) found impacts on Generas and nematode communities, while Szleszkowski et al. (2018) observed various life forms inhabiting a human corpse. Additionally, carcass decomposition also affects soil chemistry which are noted in the study of Barton et al. (2016), Benninger et al. (2008), Fancher et al. (2017), and Szelecz et al. (2018). Cholewa et al. (2022) also found benefits in plant growth. Consequently, analyzing the effects of animal corpse decomposition is necessary.

The main objective of the study is to shed light on the effects of animal corpse decomposition on various areas of research. This includes but not limited to the effects on the environment quality, changes in microbial communities, effects on insects and other animals, and the potential spread of pathogens and antibiotic-resistant genes. The study aims to provide a comprehensive understanding on the topic at hand on a multidisciplinary perspective.

## **Objectives of the Study**

The focus of the research is on the effects of animal corpse decomposition. The research endeavors to bring together all this information in one place for easy reference and further analysis. This research specifically aims to accomplish the following:

1. Determine of the objectives of the studies examined.
2. Determine and provide a summary of the outcomes of the studies.
3. Determine the recommendations of the studies.

## **Methods**

Creswell & Creswell (2018) express that a thorough review of the literature is essential in the research process. This is because it allows

researchers to assess the relevance and significance of their chosen topic, and to gain a deeper understanding of the existing research in that field. By conducting a literature review, the researcher is able to determine whether the topic is worth investigating. Using a literature review in this research is beneficial because it allows the researcher to gain a comprehensive understanding on the existing studies on the topic. Moreover, McCombes (2019) also states that information obtained such as theories, methods, and gaps can be applied later in a new paper or study.

The decision to include studies from the time period of 2000 through 2022 in the research was made. This time period was chosen as it represents the most recent and up-to-date research available on the topic. By including studies from this time period, the researcher can ensure that the findings of the studies are relevant and applicable to the current context. Additionally, the researcher can identify trends and changes in the field over time, which can provide insight into the areas where further research is needed. And also, 30 papers related to the topic at hand were used in carrying out this research. The information obtained will be placed into three tables divided into three sections; the first table includes the objectives of the studies, the second table includes

the findings, while the third table includes the recommendations of each studies. These tables will then be analyzed thoroughly in order to provide comprehensive insights with regards to the topic at hand.

## Results and Discussion

This section presents a summary of the literatures reviewed for this study, which pertains to the effects of animal corpse decomposition. The overview includes the objectives, findings, recommendations, implications, and future scope and limitations of related studies. The aim of this section is to provide a comprehensive understanding of the related studies on this topic.

### 1. Objectives of the Study

As shown in the table, the studies were compressed into four categories, the first category focuses on the effects of animal corpse decomposition on the environment, specifically in terms of the presence of antibiotic-resistant genes (ARGs), pollution, and harmful substances. This category highlights the potential risks to human health and the environment posed by the decomposition of animal carcasses.

**Table 1. Objective of Related Studies**

Objectives	Author(s)
Exploring areas regarding ARGs, pollution and harmful substances released by corpse decomposition.	(Cholewa, et al., 2022); (Yu, Zhou, Wang, Feng, & Li, 2020);(Feng, et al., 2021); (Su, et al., 2021); (Yu, et al., 2021);(Zhou, et al., 2021); (Zhou, et al., 2021); (Wang, et al., 2022); (Su, et al., 2022); (Yang, et al., 2022)
Exploring areas regarding the insect community.	(Archer, M., & Elgar, M., 2003); (Dekeirsschieter, et al., 2009); (Feddern, et al., 2019); (Kelly, et al., 2008); (Moreau, et al., 2022); (Parkhideh, Abai, Akbarzadeh, Rassi, & Rafizadeh, 2017); (Rai, et al., 2022); (Roglin, et al., 2022); (Singh, et al., 2018); (Szleszkowski, Kadej, Thannhauser, Tarnawski, & Jurek, 2018); (Taylor, 2020); (Voss, et al., 2011)

Exploring areas regarding the microbial community.	(Blandford, et al., 2019); (Damann, 2010); (Metcalf, et al., 2016)(Su, et al., 2022)
Exploring areas regarding soil chemistry.	(Barton, et al., 2008); (Benninger, et al., 2008); (Fancher, et al., 2017) ; (Szelecz, et al., 2018)

The objectives in the first category aligns with the study of Cholewa et al. (2022), Yu et al. (2020) and (2021), Feng et al. (2021), Su et al. (2021) and (2022), Wang et al. (2022), Yang et al. (2022), and Zhou et al. (2021) and (2021). The second category focuses on the effects of animal corpse decomposition on the entomofauna or insect community. Insects play a crucial role in the decomposition process and provide important information about the dynamics of organisms in a decaying body. Studies in this category provides insights into how insect populations are affected by animal corpse decomposition and how this affects the ecosystem. The objectives in the second category aligns with the study of Archer et al. (2003), Dekeirsschieter et al. (2009), Feddern et al. (2019), Kelly et al. (2008), Moreau et al. (2022), Parkhideh et al. (2017), Rai et al. (2022), Roglin et al. (2022), Singh et al. (2018), Szeleszkowski et al. (2018), Taylor (2020), and Voss et al. (2011). The third category focuses on the effects of animal corpse decomposition on the microbial community. Microorganisms play a key role in the decomposition process, breaking down the animal remains into simpler components. Studies in this category provides important information about the types of microorganisms involved in the decomposition process and how they interact with each other and with the

surrounding environment. The studies of Blandford et al. (2019), Damann (2010), Metcalf et al. (2016), and Su et al. (2022) are aligned with objectives of the third category. And the last, the fourth category focuses on the effects of animal corpse decomposition on soil chemistry. As the remains of dead organisms break down, the organic matter is decomposed by microbes which release nutrients such as nitrogen, phosphorus, and sulfur, into the soil. The release of these nutrients also has an effect on the overall soil chemistry, altering the pH, cation exchange capacity, and other chemical properties of the soil. The studies of Barton et al. (2008), Benninger et al. (2008), Fancher et al. (2017), and Szelecz et al. (2018) are aligned with the objectives depicted in the last category.

## 2. Findings of the Studies

In this table, the findings of the studies were explained individually unlike on the first table wherein the studies were compressed into three categories. This table provides a specific analysis on each study. Rather than the general overview provided by the grouping in the first table, this allows for a more in-depth understanding of the studies.

**Table 2. Findings of Related Studies**

Findings	Author(s)
Carrion flies were witnessed in carcasses during early the stage.	(Archer & Elgar, 2003)
Witnessed that carcasses affect soil chemistry.	(Barton, et al., 2016)
Compounds were found and altered soil chemistry.	(Benninger, Carter, & Forbes, 2008)
Microbes were abundant due to toxicity.	(Blandford, et al., 2019)
Benefits on plant growth were witnessed.	(Cholewa, et al., 2022)
High levels of bacteria were observed.	(Damann, 2010)
Substances containing sulfur and nitrogen were discovered.	(Dekeirsschieter, et al., 2009)

Change in soil chemistry were observed constant.	(Fancher, et al., 2017)
Abundance of insect colonization have been found.	(Feddern, Mitchell, Amendt, Szelecz, & Seppey, 2019)
Excessive amounts of ARGs have been nourished.	(Feng, et al., 2021)
Species breeding were observed on carcasses.	(Kelly, Van Der Linde, & Anderson, 2008)
Microbial assembly and changes were observed.	(Metcalf, et al., 2016)
Arthropods were witnessed colonizing cadavers.	(Moreau, et al., 2022)
Carnivorous, parasite, and predator species were obtained and identified.	(Parkhideh, Abai, Akbarzadeh, Rassi, & Rafizadeh, 2017)
Cadavers attracted mites.	(Rai, et al., 2022)
Colonization of dipteran species were witnessed.	(Roglin, Szentiks, Drebler, Ondruschka, & Schwarz, 2022)
Bacterial and arthropod community patterns to cadaver decomposition.	(Singh, et al., 2018)
Resistomes, or genetic elements, became more prevalent in high-volume water supply.	(Su, et al., 2021)
ARGs had high abundance.	(Su, et al., 2022)
Generas like Cyclobacterium and Trueperella were observed.	(Su, et al., 2022)
Soil pH were found to exhibit changes.	(Szelecz, Koenig, Seppey, Le Bayon, & Mitchell, 2018)
Several life forms were discovered nesting within a mummified human corpse.	(Szleszkowski, Kadej, Thannhauser, Tarnawski, & Jurek, 2018)
Changes in the nematode communities.	(Taylor, 2020)
Deterioration were found in the aquatic environment.	(Wang, et al., 2022)
Insect arrival were consistent.	(Voss, Cook, & Dadour, 2011)
Total phosphorus are found increased.	(Yang, et al., 2022)
The concentration of NH <sub>4</sub> <sup>+</sup> -N increased.	(Yu, Zhou, Wang, Feng, & Li, 2020)
Nitrate nitrogen (NO <sub>3</sub> -N) and ammonia nitrogen (NH <sub>4</sub> <sup>+</sup> -N) are increased.	(Yu, et al., 2021)
Nitrogen pollution and abundance of potential pathogens on aquatic environment were observed.	(Zhou, et al., 2021)
Water quality deterioration due to various toxic metabolites.	(Zhou, et al., 2021)

As shown in the Table 2, animal decomposition displays a ton of effects. Such effects include antibiotic-resistant genes (ARGs), pollutants, and harmful substances. Dekeirsschieter et al. (2009) expressed that pig corpses produces harmful compounds such as sulfur, nitrogen, and many others. In support of this, Yang et al. (2022) also

found a harmful substance which is phosphorus and is found to have a high concentration. Yu et al. (2020) and (2021) also observed the presence of nitrate nitrogen and ammonia nitrogen. Aside from the substances and compounds, ARGs were also observed.

Feng et al. (2021) states that ARGs were found to be in abundance during carcass decomposition in a terrestrial setting, and in support of this findings, Su et al. (2021) and (2022) also states that ARGs are in abundance even in an aquatic environment. In a similar aquatic setting, nitrogen pollution and abundance of pathogens were witnessed as well in the study of Zhou et al. (2021), and according to Wang et al. (2022) and Zhou et al. (2021), these substances causes a deterioration on the aquatic environment which pose a threat to the environment and human health. On the other hand, corpse decomposition also displays effects on the microbial community. Metcalf et al. (2016) conveyed that microbial assembly were observed during decomposition. The study of Blandford et al. (2019) and Damann (2010) observed bacterial abundance as well. And according to Singh et al. (2018), bacterial community patterns to cadaver composition due to the nutrient cycling that cadavers produces which is essential to their communities in order to thrive. Furthermore, corpse decomposition also exhibits effects on the insect community. Archer & Elgar (2003) and Voss et al. (2011) states that arrival of insects on carcasses were consistent, especially on the early stage of decomposition. Also, Moreau et al. (2022) witnessed arthropods colonizing pig carcasses in a rice field, and this can be supported by the study of Feddern et al. (2019) and Roglin et al. (2022) in which they found insect colonization as well. The study of Parkhideh et al. (2017) also observed species that

are carnivorous and parasitic in nature. Aside from that, (Rai et al. 2022) found mites being attracted to cadavers. And species were found breeding in the study of Kelly et al. (2008). On the other hand, Generas and nematode communities were also affected, this scenario was observed in the study of Su et al. (2022) and Taylor (2020). And also, Szleszkowski et al. (2018) found that several life forms were witnessed inhabiting a human corpse which displays the complex dynamic within species. Additionally, carcasses were also witnessed to affect soil chemistry. Compounds produced by carcasses are the main reason behind the constant alteration in the chemistry of soil, this were observed in the study of Barton et al. (2016), Benninger et al. (2008), Fancher et al. (2017), and Szelecz et al. (2018). And also, amidst the adverse effects of animal corpse decomposition, benefits in plant growth were observed in the study of Cholewa et al. (2022). Based on these discoveries, studying the effects of animal corpse decomposition is crucial and should be given importance.

### 3. Recommendations of the Related Studies

This table presents the recommendations of each study, however, some of the recommendations of some certain studies were not available due to inaccessibility. Despite this, the table still provides useful overview of the recommendations made by the studies that were available.

**Table 3. Recommendations of Related Studies**

Recommendations	Author(s)
Further tests on the consequences of cadavers to infertile soils.	(Barton, et al., 2016)
Further studies on soil microorganisms.	(Benninger, Carter, & Forbes, 2008)
Testing in different environment.	(Blandford, et al., 2019)
Material is suggested to be collected at frequent intervals.	(Cholewa, et al., 2022)
Further exploration and Developing new models about cadaver decomposition.	(Damann, 2010)
Additional research on the volatile organic compounds found in cadavers.	(Dekeirsschieter, et al., 2009)

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Further research including factors such as BMI.	(Fancher, et al., 2017)
Further exploration on the effects of climate determined by habitat.	(Feddern, Mitchell, Amendt, Szelecz, & Seppey, 2019)
Further studies are needed to determine how corpse decomposition in open natural environments affects ARGs.	(Feng, et al., 2021)
Effects of drug overdose present in carcasses.	(Kelly, Van Der Linde, & Anderson, 2008)
Future research should investigate the presence of antibiotic-resistant genes (ARGs) over a longer period of time and at more frequent intervals.	(Singh, et al., 2018)
The study suggests that it is crucial to dispose of animal corpses promptly and to implement more effective strategies.	(Su, et al., 2021)
The study recommends development of methods for assessing and managing the risk of contamination.	(Su, et al., 2022)
Further research with more data.	(Szelecz, Koenig, Seppey, Le Bayon, & Mitchell, 2018)
Further study about the dynamic of organisms in a corpse.	(Szleszkowski, Kadej, Thannhauser, Tarnawski, & Jurek, 2018)
Expand research on decomposition in soil to include multiple disciplines	(Taylor, 2020)
It is crucial to handle and treat animal carcasses in a timely manner.	(Wang, et al., 2022)
Further work on data observed on species succession.	(Voss, Cook, & Dadour, 2011)
Further research should be done in evaluating the risk of disease transmission from corpses in water and develop effective strategies regarding this issue.	(Yu, Zhou, Wang, Feng, & Li, 2020)
Additional research in open natural environments.	(Yu, et al., 2021)
Future research in running water setting.	(Zhou, et al., 2021)
Additional research on metabolites of decaying carcasses.	(Zhou, et al., 2021)

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As presented by the table, the studies recommend further research or experimentation with regards to the topic at hand as it is crucial in order to better understand and have a clearer picture on the issue at hand. For instance, Feng et al. (2021) and Singh et al. (2018) suggests that research on ARGs with a longer period of time and in an open environment is recommended to gain insights on its spread and implications. Additionally, several

studies suggest new and specific methods should be implemented or developed, the study of Su et al. (2022) suggests this. These recommendations include the suggestion of Su et al. (2021) and Wang et al. (2022) which is the early treatment of animal corpses and the development of methods for assessing risk, it is of importance as animal corpse causes a potential spread of harmful substances that poses a threat to human health.

Szeleskowski et al. (2018) and Voss et al. (2011) also suggested that a further study be done on the dynamic of organisms on a corpse; with this, disposal and management of carcasses will be much more effective. Barton et al. (2016); Benninger et al. (2008) and Taylor (2020) also found that it is recommended to expand research on decomposition in soil in a multidisciplinary manner, this approach would allow researchers to gain insights of the implication of corpse decomposition on the terrestrial environment. On the other hand, Blandford et al. (2019); Feddern et al. (2019); Feng et al. (2021); Yu et al. (2021) and Zhou et al. (2021) suggests that a multidisciplinary approach can also be applied on a different environment. Thus, these suggestions are important as they provide practical ways to address the issues related to animal corpse decomposition. Overall, the table provides valuable insights into the recommendations made by the studies and highlights areas where further research is needed.

## Conclusion

In conclusion, animal decomposition has various effects on a multidisciplinary level, as shown in several studies. These includes effects on water and soil quality which is notable as the quality of soil and water changes in a negative manner, changes in microbial, insects and other animal communities were also observed, as well as the potential spread of pathogens, antibiotic-resistant genes and pollution which can have a ripple effect on the environment. Furthermore, nesting of creatures inside a corpse were also noted, which highlights the effects of decomposition on the habitat of different species. Additionally, effects on soil chemistry were observed as well.

Given these recent findings on the harmful substances found in cadavers that have shed light on the effects of animal corpse decomposition, it is recommended that further research with a larger and frequent scale be conducted to better understand the full extent of the effects. Researches with the use of human corpses could also be utilized as it is stated that it could produce insights on forensic investigations. Human

corpses, unlike animal corpses, can offer a more accurate representation on human decomposition in real world scenarios. Furthermore, to mitigate the adverse effects of animal decomposition, it is recommended that effective management should be developed and implemented. Timely disposal is one such strategy, as it reduces the amount of time that the harmful substances spread. In addition, methods like composting or a secured burial site are also recommended. Some alternatives should also be developed and considered. Although, these alternative methods have its own advantages and disadvantages, and the best solution will depend on the specific circumstances, such as the type of animal, the location, and local regulations. It is important to choose a method that is environmentally sustainable, reduces the spread of pathogens, and protects human health.

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