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ANALYSIS OF DIALOG SURROUNDING ANIMAL TESTING IN VACCINE RESEARCH

by

NATALIE JOHNSON
M.A. University of Central Florida, 2017

A thesis submitted in partial fulfillment of the requirements
for the degree of Master of Arts in Rhetoric and Composition
in the Department of Writing and Rhetoric
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ABSTRACT

This study analyzed the scholarly discussions surrounding the topic of animal testing for vaccine potency and safety in humans. The primary stakeholders in this discussion are the scientists, medical professionals, and researchers who are involved in animal models and alternative testing methods, specifically related to vaccine development. The debate among these professionals regarding alternative methods, which encompasses any testing approach that does not involve animals, has been analyzed. This project looks at the argument from a historical perspective, which provides background context for the current debate and an understanding of how the current arguments originated. The changing mindset over time of using animals has been explored, as well as conversations and arguments about alternative methods.

Research questions and prior questions consider the conversation's historical influences on this present day debate and are answered in this analysis. Persuasive language has been looked at, with a consideration of how it is used both within and outside the research community, as well as the influences the various stakeholders have on one another. The burgeoning field of the rhetoric of health and medicine provides a forum and a community of scholars for a rhetorical analysis such as this one to be discussed and the findings considered for other rhetorical studies. This research design project provides a comprehensive rhetorical analysis that uses the topoi theory and a textual-intertextual analysis as a framework, along with detailed coding of the texts. This project shows the advantages of a combined rhetorical approach that leads to understanding a debate through identifying multiple layers of argument. The findings and its implications for those within rhetoric, the scholarly community, as well as the scientific field are discussed in the final chapter.

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CHAPTER ONE: INTRODUCTION

The use of animals in testing vaccines for humans is a long-standing practice that has been attributed to the protection against viruses such as the common flu starting in 1976 and the bird flu in 1997 (Davis, 2015). Animal testing has generated a number of reactions over time, from indifference and scientific justification to outright opposition. This thesis presents an analysis of the scholarly discussions surrounding the topic of animal testing for vaccine potency and safety in humans. The primary stakeholders in this discussion are the scientists, medical professionals, and researchers who are involved in animal testing methods and alternative testing methods, specifically related to vaccine potency and safety testing. The debate among these professionals regarding alternative methods, which encompasses any testing approach that does not involve animals, has been analyzed. While regulatory agencies play a significant role in implementing and enforcing regulations surrounding this practice (Baylor, 2011) and animal activist groups have an influence in this debate as well (Paul, 2002), this thesis only considers these agents in relation to their effect and involvement with the above mentioned stakeholders.

Since many of the professionals referred to in this thesis work within the sciences and medicine, the majority are involved in research activities. Because of this fact, the professional community involved in this debate will be referred to as either scientific or medical researchers. The discussions on this topic have been debated since animals were first used in research (Hendriksen, 1996 & Franco, 2013); therefore, this thesis takes a historical perspective first to provide background context and analysis for the current debate. The thesis primarily focuses on contemporary debates within this community that have occurred over the past ten years according to these texts. Several of the primary issues brought up for debate on this topic involve arguments based on ethics, scientific validity, and the complexity of gaining approval for

alternate methods. The changing mindset over time of using animals in testing vaccines for humans use has been explored, as well as the conversations and arguments presented for animal testing and alternative methods have been analyzed in this thesis.

The primary research questions consider ways in which further consensus on this topic can be reached within the professional community through improvements in communication and the strategies of arguments. These questions are a way to provide structure for rhetorical analysis and also provide the framework for the identification of terms and phrases used within this conversation (Leach & Dysart-Gale, 2011). These research questions are the following:

1) How do stakeholders involved in animal testing methods within the research community meet, debate, discuss and collaborate with one another regarding the use of animal testing and alternative methods?
2) What are the general topoi, special topoi and sub-topoi used by professionals and how do stakeholders on either side of the issue invoke these topoi? In addition, how do these topoi shape and frame the debate, including finding common ground and disagreements?
3) How can conversations improve within this community through a better understanding of the topoi identified, and how can this type of analysis clarify what is at issue and assist in reaching a consensus?

These conversations within the research community are the primary focus of this proposal, as well as the analysis of the conflicting arguments. The secondary focus of this thesis are the growing number of non-scientific groups and individuals who execute various rhetorical acts as a reaction to this debate, either unknowingly or in an effort to argue their stance on the issue. How the research community communicates with those outside their group, as far as the arguments used and the approaches in conversation are considered.

Scholarly dialog among those in the research community is the primary focus for this thesis; however, the consideration of what occurred over time to develop the conversation into what it is today is explored. In order to accomplish this, Judy Segal's approach of asking "prior questions" (Leach & Dysart-Gale, 2011) has been used. The concept of prior questions is typical of rhetorical studies because it takes a more holistic approach to analyzing an argument over time. By implementing the approach of asking prior questions, the analysis starts by first asking why and how something occurred, rather than starting the analysis by evaluating and considering the application of a specific topic. This concept, as explained by scholar Judy Segal, not only asks questions that others may not have considered but also questions meaning ahead of the scientific or medical practices (Leach & Dysart-Gale, 2011). These questions will assist in understanding how the dialog developed into what it is today and, for this project, consist of the following questions:

1) What historical dialog contributed to the present controversy?
2) How does this historical dialog shape the present controversy?
3) How does the content of these texts attempt to frame the beliefs and understanding of the argument at a particular moment in time?

The first attempts to create vaccines occurred in 6th century China (Hendrickson, 1996); therefore, there is a significant amount of history on this topic that shaped the current practices and mindset today. However, for this thesis the focus is on the history that directly informs the current debate. By applying literary scholar Jacqueline Royster's (2002) discussion of social circulation, how the past and present are forever entwined can be better understood and related to the debate. Royster (2002) states, "noticing such ebbs and flows within ever-changing, often ever-broadening circles of interaction enables us to see how the past can reach into the present"

(p. 101). The consideration of social circulation helps in gaining a better understanding of how these past practices and beliefs are interwoven with current practices. By looking at the historical conversations of vaccines and animal testing within society, important frameworks and mindsets have been found that provide a better understanding of the discussion today. This analysis looks at the persuasive language used by those within and outside the research community, and the influences the various stakeholders have on one another.

Because of my background in healthcare, I am interested in the final implementations of how these discussions and the potential changes in communication could affect future research methods and health outcomes. My interactions with the clinical side of healthcare have led me to be involved in an array of situations in which common medications or vaccinations did not have the intended outcomes for the patient. Therefore, questioning medicine and science when it comes to how it can affect human bodies differently is an area of interest to me. In addition to this, understanding how this topic is discussed and whether or not these arguments are productive is important to look at in order for a consensus to be reached. Having a questioning approach and considering how conflicting sides are formed and interact with one another can improve medical and scientific advancements.

The burgeoning field of the rhetoric of health and medicine provides a forum and a community of scholars for a rhetorical analysis such as this one to be discussed and the findings applied to other rhetorical studies. This thesis considers different levels of topoi that will not only show "the connection-making features of thought" but will also be a way to reveal unexpected associations (Prelli, 1989, p.66). This analysis uses a combined approach that identifies the arguments used and how different layers of topoi are used to frame and generate these arguments. This approach leads to finding layers of topoi that have not been found before, such

as sub- and meta-topoi, which show how and why specific arguments are made. This insight can lead to understanding the debate and where it came from, which can provide the means to a consensus that reflects the current beliefs of our society and advancements of research today.

Medical and scientific research is expanding and becoming more complex, both scientifically and in its ability to cross boarders and affect multiple countries and people (Collins, 2010). Therefore, the progression of scientific research has led to further changes and considerations regarding the use of animals that has not been considered in the past (Burnett, 2009 & Garbe, 2014). Rhetoricians Joan Leach and Deborah Dysart-Gale (2011) consider the importance of these changes in rhetorical theory and analysis within science and medicine because of the "significant debates that will emerge in the coming years" (p.7). They argue that due to the inevitable future of advancements by industrialized countries in healthcare and scientific practices, the use of animals in vaccine production for human health and well-being will be a debate that continues to expand (Dysart-Gale, 2011). Animals have been a long-standing part of the scientific process, but this does not necessarily mean that it is the most effective method today. This thesis considers the debate's development over time, and presents an Aristotelian topical approach that provides a comprehensive analysis into the conversation that cannot easily be obtained through other types of analysis.

Literature Review

Complex fields such as the sciences and medicine use rhetoric on a continuous basis both knowingly and unknowingly; therefore, these fields benefit from an analysis that breaks down the language and categorizes the communication (Ceccarelli, 2001). Within the study of rhetoric the following three questions are central to what rhetoricians are concerned about, 1) a topic

about which people disagree, 2) there being two or more plausible views, 3) there being no substantive art in which the debate can be arbitrated (Gross & Walzer, 2000, p.42). The animal testing debate involves these three concerns. Each of these points makes up the foundation for why there is controversy on this topic. The animal testing debate has disagreements, varying viewpoints, and arguments among those within and outside the research community, while at the same time there are attempts to reach a consensus within this community. Overall, the multiple stakeholders on this topic situate animal testing as a highly contested issue in society today. In this thesis' rhetorical-topical approach, the specific language that persuades the reader through texts that appear neutral must be considered because of its persuasive impact.

For this analysis rhetoric is identified as the "webbed relations among knowledge, belief, language, argument, speakers, and audiences" (Derkatch, 2005, p.138); therefore the impact of texts on the beliefs and practices of this community is shown through this analysis. As rhetorician Colleen Derkatch (2005) found in her study of texts within the medical community these "seemingly neutral texts profoundly shape" the medical situations of those involved (p. 139). For this community, the persuasiveness of a particular article or book depends on the perceived character of the author as well as the type of journal or publisher involved in the dissemination of the information. To further show what is persuasive for this community, consider rhetorician Lisa Keränen's (2010) findings in her text, in which she also rhetorically analyzed a scientific debate. Keränen (2010) presents the common practice of viewing scientists and their claims as being unbiased and objective, and the trust that leads to this positive perception. When the scientific findings and character of the individual or source of information is trusted, significant persuasive influence is being enacted through the texts, making them

rhetorically powerful. Therefore, considering the specific language of the field in this way provides insight into the persuasive elements of a contested issue such as animal testing.

Another reason for why these texts are influential can be found in Amy Koerber's (2013) analysis of persuasive scientific texts. Koerber (2013) finds that metaphor and figurative language are key components in persuasion, especially when presenting information about a topic in which there is no clear, scientific understanding or decision. Analyzing texts rhetorically can lead to additional new discoveries, which is demonstrated in scholar Judy Segal's work. Segal (2005) presents how rhetoric is applied in the medical community when there is uncertainty, which is the point where "rhetoric enters to fill gaps of knowledge" (p.39). This is a strategy where language is adapted to a specific context and findings are created in vague terms in order to be persuasive to its audience, while not being completely founded in scientific fact. Koerber (2013) also applied topical theory to the scientific debate she analyzed and found it to be enlightening because it allows the researcher to view the history in detail, which provides a clearer picture of the progress that has been made. In her analysis she applied topoi theory to help identify categories within the history of formula feeding and breastfeeding. These topoi led to an understanding of what has influenced the present social and cultural ideas regarding breastfeeding, along with the mixed messages received by breastfeeding women today (Koerber, 2013).

Texts and Audience in the Scientific Debate

Many consider scientific findings through research studies and testing procedures, as well as the data and evidence that result from these procedures, as factual. The reason for this is related to the view that scientists are experts in their field, and considered neutral and unbiased

(Keränen, 2010). Koerber (2013) notes in her analysis that since the mid-twentieth century there has been an increase in the credibility of scientific findings, and science is now seen as a source for solutions more than it has in the past. This general belief and trust in scientific findings can also be understood as a result of one of the foundational concepts of rhetoric in which Aristotle stated, "we believe fair-minded people to a greater extent and more quickly [than we do others]" (Kennedy, 2007, 1356a). How these scientific findings circulate and become "common knowledge" within the discourse of the community and outside the community is something that can be explored through a rhetorical analysis approach (Leach & Dysart-Gale, 2011). This approach can also be useful when considering how arguments become legitimized and the process whereby it becomes an accepted topic within the community, which is addressed later in this analysis.

A rhetorical analysis considers what makes persuasion possible in a particular circumstance and among different groups of people, depending on their culture, social group, and the rhetoric circulating within that group (Leach & Dysart-Gale, 2011 & Prelli, 1989). What defines the rhetoric of the research community can be found by looking at Amy Koerber's (2013) analysis in which she explores the concept of rhetorically powerful situations and the role this has in relation to knowledge. Scientific texts can be seen as rhetorically powerful because of their status of being published articles in peer-reviewed journals, which serve the purpose of sharing field specific knowledge written by experts. As Colleen Derkatch (2016) finds in her analysis of peer-reviewed journals within the medical community, the reliance on these texts means that what is published both regulates the professional boundaries of the field and defines the profession. Therefore, analyzing the persuasive elements within the texts can provide information as to how and why the current practices and beliefs within this field exist.

Those involved in animal testing procedures have different beliefs than the general public when it comes to animal testing. For example, in a study of biomedical journals and the approaches in published texts on the subject of animal testing, the discussion of ethics was analyzed. It was found that open access journals provided more explanations regarding ethical standards on animal testing than journals that are written specifically for the scientific and medical communities (Martins & Franco, 2015). As Derkatch (2016) found in her rhetorical analysis of what constitutes the medical profession, "legitimate health care is determined significantly by the discursive activities of professions, such as the publication of professional journals" (p.52). Therefore, this study of published journal articles shows how ethics is not a prominent area of concern for those within the scientific community, particularly when compared to those outside the community. This means that rhetoric will change based on the specific community being addressed. In addition to this, the rhetoric being implemented is shaped by the community and their social norms, and also plays a role in shaping the community.

An additional reason for this difference can be found in a study that looked at patients and scientific researchers' opinions on the topic. According to this study involving focus-group interviews and questionnaires, a significant difference was found between these two categories of respondents. This is understandable since these two groups have different roles of being either directly or indirectly involved in animal testing methods, along with different sets of knowledge in the practices and outcomes of testing methods. Therefore, patients were reported to more likely see animal testing "as the least bad option because of the lack of alternatives" (Masterson, Renberg, & Sporrong, 2014, p.33). Within this same study scientists were found to have an overall belief that humans have superiority over animals, which justifies animal models. On the other hand, patients were more likely to indicate that there is an absence of differences between

humans and animals, such as intelligence and the ability to feel pain (Masterson, Renberg, & Sporrong, 2014). A potential reason for this difference in viewpoint can be found in scholar Jacqueline Royster's (2012) analysis of lived experiences in which she states that "actions, circumstances, conditions, and experiences endow our sense of being, inform the ways in which we see and interpret events and scenes and shape our way of doing things" (p.94). The scientific and medical communities are made up of those who conduct tests involving animal models, they learn about these methods through school and workplace practices, and they have been taught justifiable arguments for its use, therefore influencing their perceptions and stance within the debate.

The different cultures of each community, those directly involved in the scientific aspect of animal testing and those who are not, affect the rhetoric being used because of the different purposes of their involvement and writings. Purpose is a central rhetorical principle and is important in understanding why and how information, knowledge, and text are shared and communicated (Derkatch, 2005). Purpose can also be understood as what motivates the writer. This motivation comes from the writers' background as well as the ideals and beliefs of their community. Therefore, the rhetoric being used will vary depending on the group that is writing the text and for whom the text is being written.

Rhetoric Outside and Inside the Scientific Community

Texts written by experts for the scientific community, as well as texts written for those outside the community, have been analyzed in this thesis. The audience of the texts is important since this group constructs the criteria for the most effective method of persuasion (Gross & Walzer, 2000). When these rhetorical concepts were applied to this thesis, other rhetorical

scholars' analysis of scientific practices and beliefs were used for comparison. For example, Colleen Derkatch (2016) uses the terms "mainstream knowledge" and "marginal knowledge" in her analysis of alternative medicine and the debate regarding its acceptance within the medical community. She considers how rhetoric can have an effect on changing people's minds in the scientific community to accept what was once considered "marginal knowledge." Even with the widely discussed implementation of alternative methods, approaches to replace animal testing are still considered new. In some instances these alternate methods have not become standardized even when a procedure has been found scientifically valid (Stokes, 2011).

The social interaction among those in the medical community presented by Derkatch (2016) is a relevant point since it shows the rhetorical opportunities for these new ideas and approaches. The acceptance of these different approaches into the community involves a "social process" according to Derkatch (2016), which is paramount in order for the acceptance of alternative approaches to occur. The multiple texts in this thesis show that there is an ongoing conversation on this topic as the community continues to debate. In some cases alternative approaches are formally recognized for their scientific accuracy, such as methods involving in vitro testing which do not involve the use of animals in its testing methods (Garbe, 2014).

Scholar Lisa Keränen (2010) examines the multiple influences that determine what is accepted and what is not accepted within the scientific community. Keränen uses an analysis of rhetoric with a focus on character to explore a medical controversy in which falsification of data occurred during breast cancer research trials. Much like the controversy that Keränen presents, animal testing methods are under scrutiny both within and outside the research community, which has resulted in texts with varying and at times controversial viewpoints (Brom, 2002 & Garbe, 2014). Keränen presents the fact that when scientific knowledge is being speculated or is

deemed uncertain a "credibility contest" occurs with those involved and with the scientific findings that are produced. This places importance on the rhetorical focus of character, and how it can influence the debate. In Keränen's analysis she considers not only ethos as important for the speaker or group when presenting a new finding but also personae and voice. These three aspects combined, the cultural values, roles, and "language choice of a speaker" (Keränen, 2010, p.33), determine the complex persuasive elements involved. This approach helps when looking at the culture of the scientific community and why specific arguments are being presented. The combination of influences within the community all dictate the persuasive effect an argument will have, which will determine whether a new practice is accepted.

The general topic of animal testing can be considered interdisciplinary since it involves science, medicine, and research. This topic also involves patients, as well as the general population and animal welfare groups. Therefore, how these texts speak to other disciplines that are stakeholders in animal testing practices and the community outside of research, the secondary audience, must be an additional consideration in the persuasiveness of the text. Those outside the research community have influences on the scientific community and their practices. For example, one argument in the research community is that the public's interest in animal welfare causes animal testing practices to come under question, rather than the practices being questioned for purely scientific purposes (Paul, 2002). This, according to some, can lead to faulty science and could impede the future advancements of research (Tannenbaum, 2001).

Methodology

A combination of analytical moves were used in this analysis. The first step defined scope through identifying the prior questions; these questions assisted in defining what dialog

occurred in the past that informs the current debate. The next step was textual-intertextual analyses that lead into a topical analysis; each being guided by the primary research questions and using the methodology presented here. Throughout this rhetorical-topical approach the term rhetoric is defined as the "webbed relations among knowledge, belief, language, argument, speakers, and audiences" (Derkatch, 2005, p.138). Rhetoric is also considered the persuasive element of communication, which includes the identification of language that persuades in a way that is less visible than texts outside this genre, but still includes rhetorical, persuasive strategies.

The contextual and textual rhetorical analysis for this project is used in order to "get a fuller appreciation of the interplay between text and context" (Bazerman, 2004, p. 302). By considering context, the whole conversation, the interaction between the texts, and the influences of society can be accounted for within the debate. Rhetorician Jack Selzer presents this contextual-textual approach, but also points out that most rhetorical studies involve a combination of these two approaches, which is the strategy taken in this analysis.

Rhetorician Leah Ceccarelli (2001) takes a textual-intertextual approach that urges scholars to go beyond the reading of an individual text from a certain time period and instead look at the results from the text, such as subsequent writings that occur in response to a text. This thesis considers these texts in conversation with one another. Therefore, the responses given to arguments based on the cultural and scientific beliefs at that time have been analyzed using a "close textual-intertextual analysis" approach defined by Ceccarelli (2001). This approach enabled Ceccarelli (2001) to define how rhetorical strategies have an effect on their audiences, including how the text influenced and was interpreted by the audience. By finding specific examples of responses made to a text, or a certain element within a text, Ceccarelli (2001) pinpoints how and why a text "inspires interdisciplinary activity among scientists" (p. 9). By

implementing Ceccarelli's methods, both an analysis of the history and the present day conversation will be conducted. Identifying the kairology of a particular text and what resulted over time in preceding texts can show its influences on beliefs and the progression of changing mindsets and practices.

How certain texts can have an impact on the beliefs within and outside the community can be explored further by using Ceccarelli's approach. What is used by these texts to be influential can be found by analyzing the effects that texts have on one another and its audience. This thesis uses the same approach that Ceccarelli (2001) implements in her analysis of scientific texts, which includes the categorization of specific language that is particularly influential within the scientific community. This genre has elements that can be used as a basis for identifying different layers of topoi within the texts. The elements of this genre include 1) text which synthesis, 2) texts in which a different persona is invoked by the author as compared to the typical scientific texts, and 3) texts which recognize multiple audiences (Ceccarelli, 2001, p.5). Within the third element, Ceccarelli (2001) finds subcategories, which she categorizes as rhetorical strategies in which the writer is able to appeal to multiple audiences. Similar to this thesis in which levels of topoi are identified and used to inform the research community, Ceccarelli (2001) presents a textual-intertextual analysis in which words, phrases, and their meanings are categorized in order to see how and why their rhetoric is particularly persuasive to their audience.

Specific information regarding the texts, such as the number of articles, sources, and dates published are provided since this issue is constantly evolving. In order to give the reader a better understanding of kairos within the debate, dates have been provided with the texts when giving examples or paraphrasing. This analysis includes peer-reviewed, scholarly articles, and

books used to address the research questions. These texts were selected based on their publication source, when they were written, their topic of discussion regarding animal testing or alternative testing methods, and the cross referencing of names and sources for their arguments. The identification of texts included an approach that considered the background of the writers, their stance on the issue, and arguments on either the advantages of animal models or an alternative approach.

The historical analysis section is comprised of arguments made regarding previous testing procedures and outcomes, as well as the rhetorical conflicts and other influences surrounding this topic in the past. As a result, the historical component of this analysis and the concept of kairos are included. In effect, the debate being studied will open up to an analysis which shows the persuasiveness of language over time and across the dialog's exchanges, which also gives insight into the motivation of the writers. Combining the concept of kairos into this historical analysis, these "different historical moments" (p.14) that Koerber (2013) presents will be applied. Amy Koerber (2013) states that kairology involves taking "a closer look at the multiple forms of rhetorical activity that have preceded the recent shift" (p. 3). This viewpoint can be applied to animal testing procedures when considering the progression of common beliefs over time and the shift regarding alternative methods and the well-being of research animals. This approach assists in identifying the special topoi that lead to a thorough understanding of where the debate has been and any future challenges or potential progress that can be made.

Judy Segal (2005) explains this combination of chronology and kairology of events as being "a study of historical moments as rhetorical opportunities" (p.23). For this thesis, these "historical moments" in time are affected by the scientific advancements and changing regulations that are continuing to impact how animals are viewed and used in research. This

application of kairos is also explained by Segal (2005) as assisting in making sense of the past and present, which is important in order to show the chronologically of the debate and what the future might entail.

In the section of this thesis that contains past and current discussions, each scholarly text is analyzed and categorized into the type of argument invoked, when it was written, and the stance on the issue. This assists in identifying and categorizing the topoi that will frame the conversation and organize it in way that recurring themes, beliefs, opinions, and past or recent findings can be seen within the debate. This identification of topoi also shows what arguments were used in the past in relation to what is being presented now, as well as how and why such arguments were used during a certain time in history.

Rhetoricians such as Lawrence Prelli (1989) can provide explanations of what constitute topoi, therefore assisting the discovery of topoi within the conversations and how stakeholders are arguing. Topos is best understood as "a conceptual place to which an arguer may mentally go to find arguments" (Gross & Walzer, 2000, p. 132). Aristotle is attributed to defining and using topoi, though other ancient rhetorical scholars such as Isocrates also used topical theory in their rhetorical teachings as well (Gross & Waltzer, 2000 & Walsh, 2010). However, since the time of these ancient philosophers, topoi theory lost some of its useful appeal until its revival in the 1970s (Gross & Walzer, 2000; Kennedy, 2007 & Walsh, 2016). More recently it has been modified from its original form and now embraces the "the interrelation of people, texts, and experience" (Walsh, 2016, p.123). This demonstrates the changing needs of rhetoric over time and the ability of topoi theory to adapt to the needs of an evolving society.

Rhetorician Carolyn Miller reexamined Aristotle's discussion of special topics and looked at the meaning behind the consideration "that heuristic discovery can become

opportunity" (Gross, 2000, p.134). According to Miller, this means that when Aristotle referred to topos he considered it to be closely related to kairos. Therefore, for this analysis, topos and kairos will be combined and understood as being a place in the debate where a persuasive opportunity was identified and words or phrases were used during a specific moment in time and moment within the debate. Miller considers the use of topos to connect significant points of interest and frame what is familiar and unfamiliar in a conversation, allowing hidden perspectives to be seen (Gross, 2000). By analyzing a conversation in this way, new viewpoints can be found while also identifying why those viewpoints exist, which is done in this analysis.

Rhetorician Michael Leff (1983) discusses two topics of importance in the analysis of arguments, which are persons and acts. These two topics, according to the findings presented by Leff (1983), can be considered the foundation for "principles for constructing arguments" (p. 24). According to Leff (1983), Cicero's work shows that he believed topics should move from presenting the general "attributes of persons and acts" (p. 27) and reach the point where findings occur through the "discovery of materials for arguments" (p. 29). By taking this approach, the method in this analysis looks at topoi as a way to identify the materials used as arguments. These arguments will be looked at in combination with the actions taken by stakeholders within this debate. For example, the act of invoking common arguments surrounding the 3Rs and the pressure exerted to apply these principles within the research community is one point of convergence where the topoi of people, actions, and materials for arguments come together.

By using topical theory, the methods applied will involve sectioning the topic into three different phases in time. The separation of arguments based on time will be divided in a way similar to Aristotle's common topics and can be thought of as a place to find the source of the argument (Gross & Walzer, 2000). By taking an Aristotelian topical approach these sections will

provide a place to situate the argument and answer the research questions, as well as organize the debate within these texts. The initial codes will be labeled as the following: 1) past facts, 2) current circumstances, and 3) possibilities for the future.

In addition to these common topics, additional levels of topoi will be found within these texts. Special topoi is one level in which scholar Carolyn Miller (1987) describes as differing from common topoi by its ability to fulfill the needs of an analysis to find relevant, detailed, and complex meanings within the texts. Identifying special topoi can be enlightening when considering rhetorician Lawrence Prelli's (1989) finding in which he showed how topoi in scientific discourse can "provide formulations that explain both how such discourse is made and how it is judged as science" (p. 8). Lynda Walsh (2010) presents rhetorician Prelli's three categories related to topoi within the scientific field, 1) problem-solution, 2) evaluative, and 3) exemplary (p.124). From these topoi, Walsh (2010) presents Prelli's additional special topoi within these three categories, which Prelli claims correspond to the "professional habits of researchers" (p.124). Prelli (1989) also recognizes special topoi as varying across fields of discourse and its usefulness in being dependent on its field. The benefit of this fact is that topoi can than become a "distinctive principle of the field" (Prelli, 1989, p.71) rather than a general way of communicating. Rhetorician Lynda Walsh (2010) identifies "field-specific topoi," as the specific knowledge of the debate that occurs in a particular field. By finding field-specific topoi a better understanding of how rhetoric is made in the field can be reached. This assists in providing insight into how a rhetorical analysis of texts can inform those within the field, as well as other disciplines (Walsh, 2010). Since this thesis takes place within a specific field of expertize, the analysis benefits from taking another look into identifying the different levels of topoi, such as the special and field-specific topoi discussed by these scholars.

The 3Rs Principles are an underlying argument within many of the discussions on this topic in the professional community today. Therefore, the categorization of the 3Rs—1) refinement 2) reduction 3) replacement—can be considered special topoi which has been developed and named by the research community and is analyzed further in this thesis. Understanding the different approaches to how the 3Rs Principles are used can help to better understand the process of discussions surrounding this particular topic within the scientific field. Overall, a topical approach can serve to better understand the arguments, show how patterns of arguments are framed, demonstrate the kinds of arguments possible, and disclose where those in the community are basing their arguments.

The texts, which include articles as well as books, were found through the search engine within the University of Central Florida's Libraries. This search method primarily included Academic Search Premier and MEDLINE databases, both of which are EBSCOhost search engines. Rhetorician Peter Smagorinsky (2008) emphasizes the importance of including "limitations and cautions about the data" (p. 395). This is explained in the analysis for transparency regarding how the texts were collected. Through the searches for these articles and books, some unavoidable limitations included not being able to access the texts due to copywrite issues or limitations in the borrowing of items for reasons such as being at another institution. However, every effort was made to find a variety of texts to encompass all aspects of the debate. The over twenty scholarly articles on scientific and medical discussions used here have been divided into the type of argument and the stance on the topic. Three common topics were identified when first accumulating and categorizing the articles and are the following: 1) past facts, 2) current circumstances and 3) possibilities for the future. The articles were then separated

into these categories in order to focus on the primary arguments, and identify the arguments found to be the most influential within the community.

The stakeholders in this debate are the scientists, researchers and medical professionals who have knowledge and involvement in animal testing practices, as mentioned earlier. The members of these groups show a variety of viewpoints depending on their area of expertise. For example, journals such as *Antiviral Research* and the *Journal of Pharmaceutical Sciences* present arguments which focus on findings and facts from previous research. These journals use terms such as identifying "scientific rationale" for a study, in order to prove whether or not a product is safe, effective, and stable (Garbe, 2014). These texts are written by those within the scientific field, holding positions such as professors and doctors of veterinary medicine. For example, A. Sally Davis (2015), a Professor of Experimental Pathology and medical doctor, and virologist Jeffery Taubenberger collaborated on the text "The Use of Nonhuman Primates in Research." In this text they made the argument that research in primates needs to parallel safety and efficacy to be more useful for human influenza research (Davis, 2015). Bioethicists such as Frans W.A. Brom (2002) are also involved in this conversation by presenting the "different ethical views" (p.78) involved in this debate. In addition to this there is C.F.M. Hendriksen who is a Professor of Veterinary Medicine who focuses on the scientific arguments surrounding the 3Rs Principles and the use of alternative methods. The less scientific texts focus more on analyzing the arguments, the historical influence on the debate today, and appeal for changes in testing methods. Those who are writing these texts involve R.G. Frey "Justifying Animal Experimentation" and Ellen Frankel Paul "Why Animal Experimentation Matters," both of which are researchers and professors of philosophy.

In the remaining scholarly texts specific phrases and wordings based on the concept being analyzed has been looked for, such as the method of persuasion and arguments invoked. Therefore a "qualitative codebook" (Creswell, 2009, p. 187) is the method used for coding these texts. This is the preliminary book, a tactic in which professor John Creswell (2009) recommends the researcher develop during the initial phases of analysis in order to have a starting point for focused codes to be established. The predetermined codes are based on underlying arguments and themes found in the texts, as well as frameworks found in similar analyses containing topical theory. These codes were identified before the coding of the texts started, which is a common practice when coding communication within the health sciences (Creswell, 2009, p.187). These codes were then listed in the codebook along with a brief definition of each code in order to clarify and specify its meaning and to better identify it within the texts. Taking this additional step as codes were first identified also assisted in the codes retaining their original meaning and not shifting during the process, which allowed the research findings to open up to new levels of topoi. While conducting a close textual-intertextual analysis, and using topoi theory to frame the research, these codes developed throughout the coding process leading to special, sub- and meta-topoi identified throughout the debate.

CHAPTER TWO:
HISTORICAL CONTEXT AND PROCESS OVERVIEW

Historical Overview of the Debate

Animals have been used to advance medical and scientific knowledge since antiquity (Franco, 2013; Hendriksen, 1996). Only within the last one hundred years has there been an increase in the protection of animals through laws and policies, as well as attitude changes among many of those within the research community and the population in general (Masterton, Renberg, & Sporrong, 2014). While many continue to proclaim the value of testing animals in designing vaccines, some note that finding an animal model that replicates human responses to disease and vaccination proves difficult and can lead to delays in certain cases (Hendrickson, 1996). For example regarding polio vaccines, the use of monkeys was found to be "inconsistent and the results were disappointing overall" (Hendrickson, 1996, p. 7). In addition to this, according to the 1949 paper presented by Enders, Weller, and Robbins, the use of samples containing non-nervous human tissues proved to be the scientific breakthrough in designing the polio vaccine (Hendrickson, 1996, p. 7). As one scholar stated in recent years, even if some animal testing results have been beneficial for humans, it is believed that the same results could have been reached through alternative approaches rather than testing animals (Burnett, 2009).

Human Test Subjects and the Animal Testing Debate

Similar to the use of animals due to convenience, being in a controlled environment, and their cost-effectiveness (Bouvier, 2010), the same arguments were once used for human subjects (McDermott, 2013). By considering the similarities of the human research debate with the

animal testing debate, the current and past influences of the conversation will be defined. Prisoners and those hospitalized or receiving treatment for mental or physical illness were once considered the ideal test subjects because of these reasons listed. There is also the fact that some would accept risk, whether or not they were mentally capable of understanding the risks, and they would do so for little money (McDermott, 2013). Because of this lack of protection for the vulnerable population, they were subjected to illness and disease through experiments that were conducted on them without their knowledge or through coercion (Collins, 2010 & McDermott, 2013). While protections are now in place for humans, the current regulations today have been a result of many years of opposition and arguments for change to protect these vulnerable populations. By looking at the changes to regulations that have occurred over time, in the case of humans, the changes in regulations and protections occurred at specific "historical moments" (Koerber, 2013, p.14). These specific moments serve as opportunities for modification, which can become open to change due to the transformation of rhetoric, mindsets, or beliefs within and outside the research community.

Many of the same arguments from the past surround the animal testing debate today. Jane Johnson's (2013) animal vulnerability argument and the "maximize benefits and minimize risk" approach (McDermott, 2013, p.10) are two examples. One of the most significant instances involving research with a vulnerable population that led to changes in policies was the Tuskegee study. This was a research study conducted over a 40-year period that involved deceiving the participants and withholding their medical treatment (Emanuel, 2015). In this case, along with the lack of ethics surrounding the overall study, the risks being inflicted on this vulnerable population did not outweigh the potential benefits of the findings. Therefore, the National

Research Act of 1974 was first implemented as a result of how these individuals were being treated and since that time various additional protections have been added (Emanuel, 2015).

This progression of beliefs that humans in research should be protected and have a right to be protected can be analyzed further by using Koerber's analysis involving kairology. Koerber (2013) considers how a shift in beliefs can be related to rhetorical activities that "have altered the public space" (p. 3). For example, since 1974 a number of protections have been put in place, and a Presidential apology was made in 1994 and 1997 for the radiation experiments conducted from 1946-1974 and for the Tuskegee study (Collins, 2010). These are just a few examples of how the changing rhetoric of treating all humans ethically has influenced the rules for governing research and influenced the verbiage of those with power to oversee changes within the system.

The same question of whether or not the harm outweighs the benefits associated with research participants can be asked when looking at the long standing practice of using primates in influenza production. The use of primates in this capacity has been occurring since 1893 (Davis, Taubenberger & Bray, 2015). Even with it being a practice that has been performed for over 100 years, there are still questions that researchers are asking to be further defined. The use of primates through this method has still "not been a recognized part of the regulatory process to licensure" (Davis, 2015, p. 93), which is the final stage in the approval and usage of vaccinations (Baylor, 2011). Therefore, the benefits of using primates for this type of testing and whether the benefits of this officially unrecognized part of influenza research outweighs the harm is a valid consideration.

Regulatory agencies play a significant role in approving and finalizing vaccinations, as well as ensuring the safety of vaccines by upholding the required development and review process of vaccines before use by the public (Baylor, 2011). However, even in human subjects

and the protections that have evolved over time, there are still concerns involving these protective laws. Much like the safeguards implemented for animals in research, it is argued by some that the protections for humans have holes that are exploited. For example, medical doctor and professor Ezekiel Emanuel argues that even with the constantly growing area of science and medicine, regulations and the rules protecting human subjects have changed very little since 1991 (Emanual, 2015). This lack of concern over the continually evolving uses of research participants, and the fact that new governmental regulations only apply to "federally funded research trials" (Emanual, 2015, p. 2297), are additional examples of how protections for vulnerable populations can still be circumvented depending on the study.

One of the most recent regulations enacted, which addresses ethical concerns involving humans, was put into effect in 2002 and is called "Approval of Biological Products When Human Efficacy Studies Are Not Ethical or Feasible" or also called the "animal rule" (Baylor, 2011, p. S28). It is significant to note that this rule was put into effect only within the last fifteen years, even though it involves the protection of "healthy human subjects" from being administered "potentially lethal or permanently disabling toxic substance" (Baylor, 2011, p. S28). Since this regulation addresses the ethical concerns and protections for humans at the expense of potentially harming animals, it could be seen as a setback for research animal advocates. However, the fact that the regulations are expanding to protect human subjects in more ways can actually be seen as progress in the overall, general ethical debate. These changes show that ethics are now being included with a potential to become broader and encompass arguments for an expansion on the ethical rules.

Similar to Jane Johnson's arguments that different types of vulnerability exist which make animals vulnerable to research practices, there are also groups who impose protection

requirements that do not address animal vulnerability. As a result of this, it is argued that a false impression is presented to the public concerning ethical oversight (Johnson, 2013). However, Johnson (2013) also notes that the extensive history of attempts to address ethics surrounding the vulnerable human population can be used to "provide direction for the case of vulnerable animals" (p. 503). For example the field-specific topos identified by the research community, referred to as the 3Rs Principles, is an example of how animal testing regulations are evolving regarding testing methods and oversight protection for animals. When looking at both these issues, in the past and present, the discovery of the foundational causes of the debate could be found.

From the continued use of questionable practices involving primates in vaccine research to weak protections for animals in testing models, why these areas are a point of contention can be analyzed further by considering the first two prior questions presented in chapter 1.

1) What historical dialog contributed to the present controversy?
2) How does this historical dialog shape the present controversy?

The argument can be made that the underlying cause of why this conversation started is from the belief that there is a lack of overall ethical standards in research, whether it be on vulnerable humans or vulnerable animals. By closely examining vulnerability arguments, how a consensus can be reached could be discovered. In addition to this, a topical approach to answering the prior questions can be identified through looking at "the predominant assumptions that shape what can be said and most readily accepted as true at a given historical moment" (Koerber, 2013, p.13). This look at past beliefs and practices, moments in time, and the rhetoric circulating at a particular time allows the researcher to categorize the changes and see what influenced those changes. Segal (2005) presents how "naming shifts in diagnostic habits or medical institutional

structures" (p.23) can open up "motives and symbolic action" (p.23). Therefore through this approach that encompasses, kairology, the prior questions listed, and topoi in a textual study, motives and rhetorical opportunities can be identified.

History of the 3Rs Principles

In 1959 the 3Rs Principles were first presented within the scientific community (Franco, 2013; Knight, 2012). This is the term currently used to describe the concept of 1) refinement 2) reduction and 3) replacement of animal testing methods. While the original definition of the 3Rs has changed over the years, its impact on the research community has remained constant even today. The 3Rs encompass three main approaches to take when considering animal testing methods and are as follows:

1) Refinement of animal use to avoid or minimize animal pain, distress, or other adverse effects suffered at any time during the animals' lives and to enhance well-being.
2) Reduction of animal numbers to the minimum possible.
3) Replacement of animal use with non-animal alternatives, wherever possible. (Knight, 2012).

The overall intent of the 3Rs approach is to reduce animal suffering. Others within the scientific community argue that 3Rs also promote finding more reliable data and reducing the time it takes to verify the safety of a product (Gomez et al., 2006). An example of the implementation of the 3Rs Principles can be seen in the abnormal toxicity test (ATT), which is a common test conducted on animals for vaccination safety. ATT was first developed in the early 1900s and the procedures involved have not changed since 1940 (Garbe et al., 2014). Since the acceptance of the 3Rs as principles within the scientific community (Masterton et al., 2014), the

usage of testing animals now warrants additional consideration surrounding "relevance, ethical concerns, potential benefits, and scientific justification" (Schechtman, 2002, p. S85). From these principles, ATT was found to be useless and did not contribute to information that could already be obtained through alternate testing methods; moreover, its omission worldwide is still being discussed (Garbe et al., 2014).

Even though the 3Rs have existed for over fifty years, animal models that have been proven to need adaptation or elimination are slow to be accepted and implemented by all, especially the regulatory agencies (Long & Griffin, 2012). The reasons for this may lie within the prior questions, which for this case would be the dialog that contributed to and shaped the debate, and which explains the reasons for why animals were used for experiments in the past. Past practices have condoned little to no ethical oversight or regulations, and the historical-rhetorical and cultural view of animals being treated in whatever way deemed necessary has also contributed to the slow uptake for change. Arguments exist that changes are now occurring, both in the general population and research community, and a more widespread viewpoint is growing which advocates the "freedom from unnecessary or unjustifiable pain or distress" (Tannenbaum, 2001, p. 93). Arguments insist that legal and moral principles, while separate from one another, also overlap, and changing attitudes over time can inflect change within either category (Masterton et al., 2014). This fact presents the possibility that the practices and beliefs surrounding animal testing continue to evolve.

The 3Rs Principles was a pivotal point in this conversation since it stimulated collaboration and dialog within the scientific and medical community. This topic within the debate is a way to address the third prior question from chapter 1:

3) How does the content of these texts attempt to frame the beliefs and understanding of the argument at a particular moment in time?

The 3Rs was first presented in 1959 and are currently a common topic on the subject of animal testing throughout the texts in this analysis. Therefore, the argument can be made that reliance on a purely scientific approach without mention of research animals' wellbeing is becoming less common. How this has happened can be found through further analysis in the coding that will be conducted when looking at the prior questions and underlying use of kairos as a "principle of contingency and fitness-to-situation" (Segal, 2005, p.22).

Background of the Current Debate

The 3Rs Principles has had a slow integration into the scientific community as a standard set of practices, but has recently been established as part of the scientific principles surrounding animal testing (Knight, 2012; Long & Griffin, 2012; Masterton et al., 2014). Within this community are those who advocate the traditional methods, as well as those who argue for the complete eradication of animal testing (Brom, 2002; Long & Griffin, 2012; Paul, 2002). From the information gathered in this analysis, most of these professionals are "situated somewhere between these two extremes" (Brom, 2002, p. 78). The 3Rs make a step toward communication among those within the scientific and medical fields on the topic.

In a study conducted on the 3Rs approach among scientists regarding vaccines, one scientist pointed out the difficulty in comparing a new method with a method that has been used historically. This scientist observed that while the old method is not scientifically defined or understood, but "just happens to be right, how do you do a comparison?" (Long & Griffin, 2012, p. 421). Another regulatory scientist voiced concerns surrounding the variability of animal

models and the fact that the current tests are not able to keep up with a product that is becoming more complex (Long & Griffin, 2012). Some scientists note that vaccines are unique to other pharmaceuticals because of the complex nature involving "combinations of antigens from different microorganisms" (Long & Griffin, 2012, p. 418). Therefore, predicting the results of human responses from animal tests has always been a point of contention for researchers.

Even with the impact of the 3Rs Principles with looking at and analyzing animal testing methods that have been used for some time, arguments still exist within the research community. These disputes are made in relation to the historical mindset, corresponding research conventions, and regulatory expectations of animal testing. The argument is also made that these points are the reason for the 3Rs' inadequate contribution in reducing the use of animals. Similar to scholar Amy Koerber's (2013) analysis of how a historically believed set of practices still lingers, even when scientific evidence has refuted the past practices, this same concept can be seen in implementations of alternative methods. For example, the concept of animal vulnerability continues to be absent from the 3Rs approach. According to some this is an issue that impedes change in the long established practice of animal testing.

Scholar Jane Johnson (2013) makes the argument that animals used for testing are situationally vulnerable, not just inherently vulnerable, and the 3Rs does not address this fact. Johnson argues that inherent vulnerability is about the basic needs that all living beings have and these needs vary in complexity depending on the species. While this is a basic concept accepted by many, animals used for testing practices are also situational vulnerable because of the circumstances that humans have placed them in. Johnson goes on to explain that this type of vulnerability involves the dependency that these animals in particular have on humans because

they have been confined and made vulnerable to exploitation (Johnson, 2013). Therefore, this type of vulnerability fluctuates depending on what humans desire to do with the animal.

Johnson (2013) argues that the 3Rs promotes a false sense of comfort within the scientific community and the general public by perpetuating a belief that there are methods in place which address the ethical issues surrounding animal testing. Another hurdle for 3Rs uptake and more widespread implementation lies in the way animals have been used for experiments in the past. Historically there has been little to no ethical oversight or regulations. This, along with the historical and cultural views of animals being treated in whatever way deemed necessary because of our superiority over them, leads to further challenges to shared understandings and consistent application of the 3R's principles.

The topic of the 3R principles can be found throughout many texts in relation to the animal testing versus alternative methods debate. Therefore, the 3Rs concept is a special type of topoi created by the research community, which makes it a field specific topoi that branches out and serves as a frame for additional special topoi found in the texts. Because of the distinctive role 3Rs has in this coding process, and its value within the debate, the following figure will show the many approaches to this special topoi. Figure 1 is a depiction of the facts surrounding the 3Rs existence that serve as its framework and the basis for field specific topoi that will emerge in the following chapter and be used as a premise for arguments within and outside the research community.

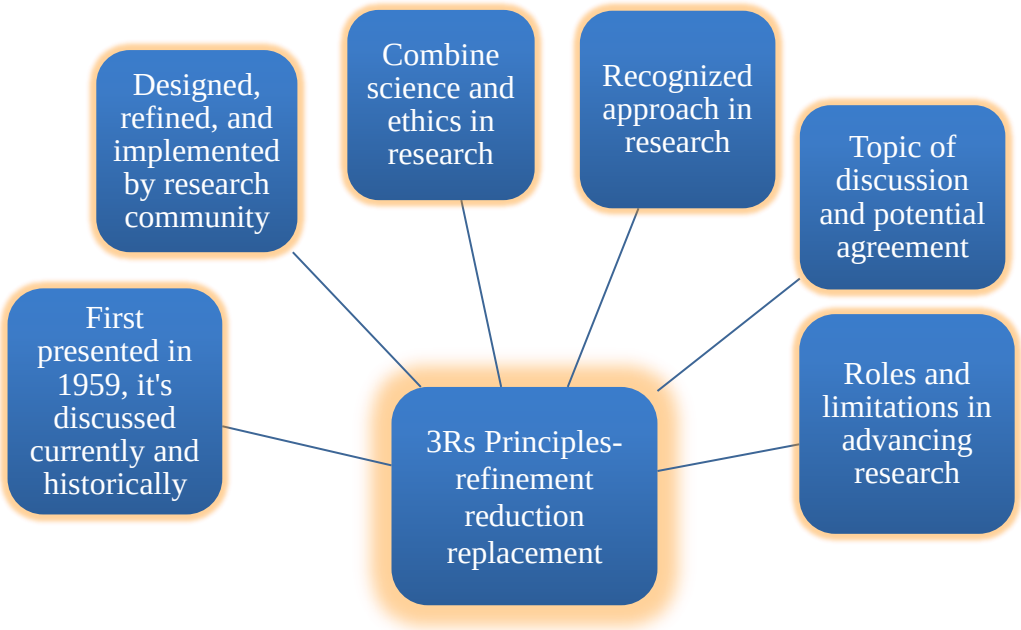

Figure 1: Approach to Coding Process for 3Rs Principles

Coding Process and Analysis Overview

In 2010 an international workshop was held among scientists to discuss the implementation of the 3Rs Principles in vaccine testing (Stokes, 2011). During this workshop, regulatory agencies, scientists, and medical professionals were given the opportunity to discuss animals in research and the validity of testing methods. Goals included identifying and promoting alternative methods that will meet the 3Rs approach of reducing, refining or replacing the use of animals in vaccine potency and safety tests (Stokes, 2011). By conducting a preliminary "close textual-intertextual analysis" (Ceccarelli, 2001, p. 6) with a text such as this

one, rhetorical strategies that might not otherwise be noticed can be found. For example, by looking at the rhetorical approach of this text and considering how the audience was invited to respond can provide further information into the conversation that is happening within this community (Ceccarelli, 2001).

An analysis that uses this textual-intertextual approach will reveal the social interactions that are involved in this discussion. This analysis also provides additional evidence that scientific practices and beliefs are not based solely on an individual working alone and then presenting scientific, factual findings to the community for acceptance. Instead, for a new approach to become a common practice, rhetorical interactions within this community are paramount for acceptance. In the case of animal testing and alternative methods, while the dialog is now open and being discussed among those with the ability to directly influence change, there continues to be additional challenges.

This research study will use Leah Ceccarelli's (2013) analysis of the challenges for those within rhetoric when speaking to and getting their information across to audiences outside of rhetoric. Ceccarelli's findings will be applied to the final implications of this thesis, and will be an underlying consideration throughout the coding process. Ceccarelli (2013) presents that a rhetorical analysis needs to expand and address the stakeholders in the field being researched so that the findings can be applied, which will help move the rhetorical analysis into action. For this thesis, her concept will be applied so that any discoveries can be related to those within the research community in order to improve collaboration.

The coding conducted through the use of topical theory and rhetorical criticism can improve the understanding of the actions taken, while also serving to clarify the issues and arguments. How these codes are identified can be found by considering the research questions,

since these are the primary questions and thoughts that surround what codes will be looked for in the texts. In Smagorinsky's (2008) explanation of coding, data reduction, and analysis, he states the importance of being explicit when reducing data in an effort to illuminate the readers. A selected representation of texts has been gathered for this analysis by using the university's search engines. This process entailed the discarding of some texts in the initial process due to redundancy and the need for texts with a variety of views and arguments to have samples from all sides of the conversation. The coding of data will use Smagorinsky's (2008) "coding as the manifestation of theory" (p. 399). In this section of Smagorinsky's (2008) analysis he stresses the importance and significance of coding by explaining that it establishes the "researcher's subjectivity in relation to the data and the framework through which data are interpreted" (p. 399). By taking this approach the subjectivity of the researcher in regards to the data will be established and the texts will be interpreted in a way that answers the research questions and assists in forming a theory on the topic (Smagorinsky, 2006).

Specific codes are expected to emerge during the data analysis phase due to several factors within the animal testing debate. These factors include codes that may emerge as a result of the specific language used by the experts, the relationships between the stakeholders, and how those outside the research community are addressed. In addition to this, the writers' purpose or intent will also affect what is written and the codes that emerge. The primary steps taken in this analysis are specifically outlined below and include the following: identifying the texts, framing the analysis, coding the data, conducting the final analysis and interpretation of the data, and presenting the findings.

The following three figures show the initial stages involved in the data analysis process and represent the inter-relationships involved in defining, analyzing, and refining the codes.

Figures 2-4 divide the three stages in this analysis and represent the steps in developing theory and building on it from the beginning until the final theory is developed. Figure 2 shows the five initial steps taken in this analysis based on the rhetorical-topical framework related to categorization, the rhetorical approaches already outlined, and analysis of how the past conversation affects the current debate. An estimated three initial codes are identified in Step 5 and will be based on Aristotle's common topics. Identifying these codes is the first step that will connect common ideas to unfamiliar concepts. These unfamiliar concepts either relate to those outside the research community or to rhetoric that has not been identified or analyzed by those in the research community in the past (Gross, 2000).

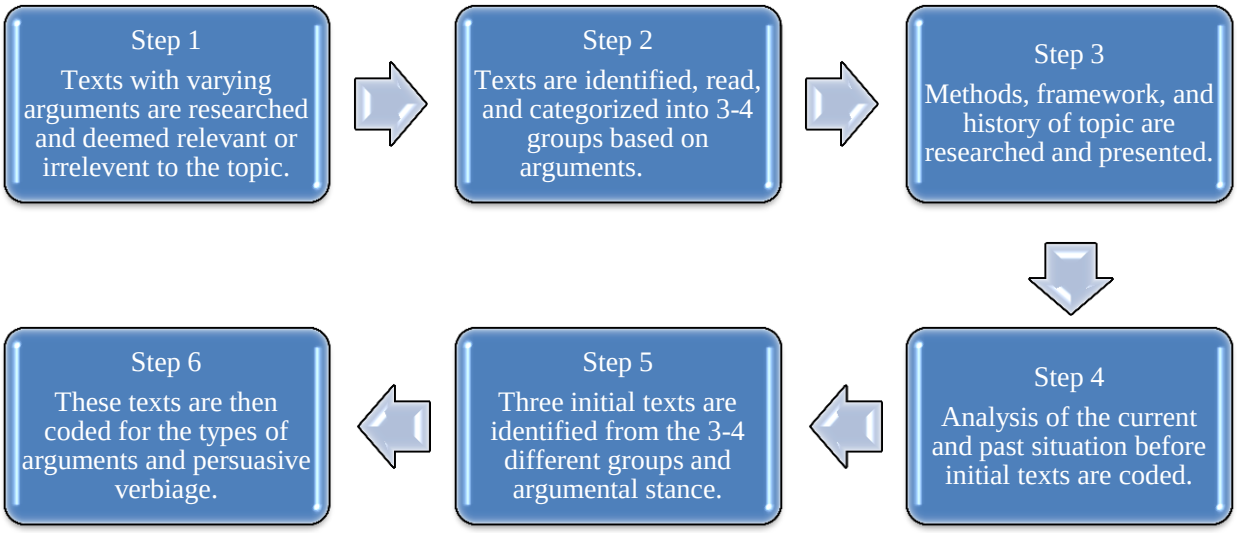

Figure 2: First Stage in Data Analysis Process

The second stage of this process is represented in Figure 3 below and depicts the inter-relationship of the steps within this analysis. The common action taken among these four steps is

defining, analyzing and refining the codes throughout the process. This significant part of the process also entails the use of topoi theory and the textual-intertextual analysis as already outlined by rhetoricians Lawrence Prelli and Carolyn Miller. As Prelli (1989) states, the topical method involves making a "flexible list of heuristic categories" (p. 65), which will help reveal associations found within the codes. In Figure 3 each step relates back to the actions shown in the center circle and therefore each step undergoes this continual refinement of the codes.

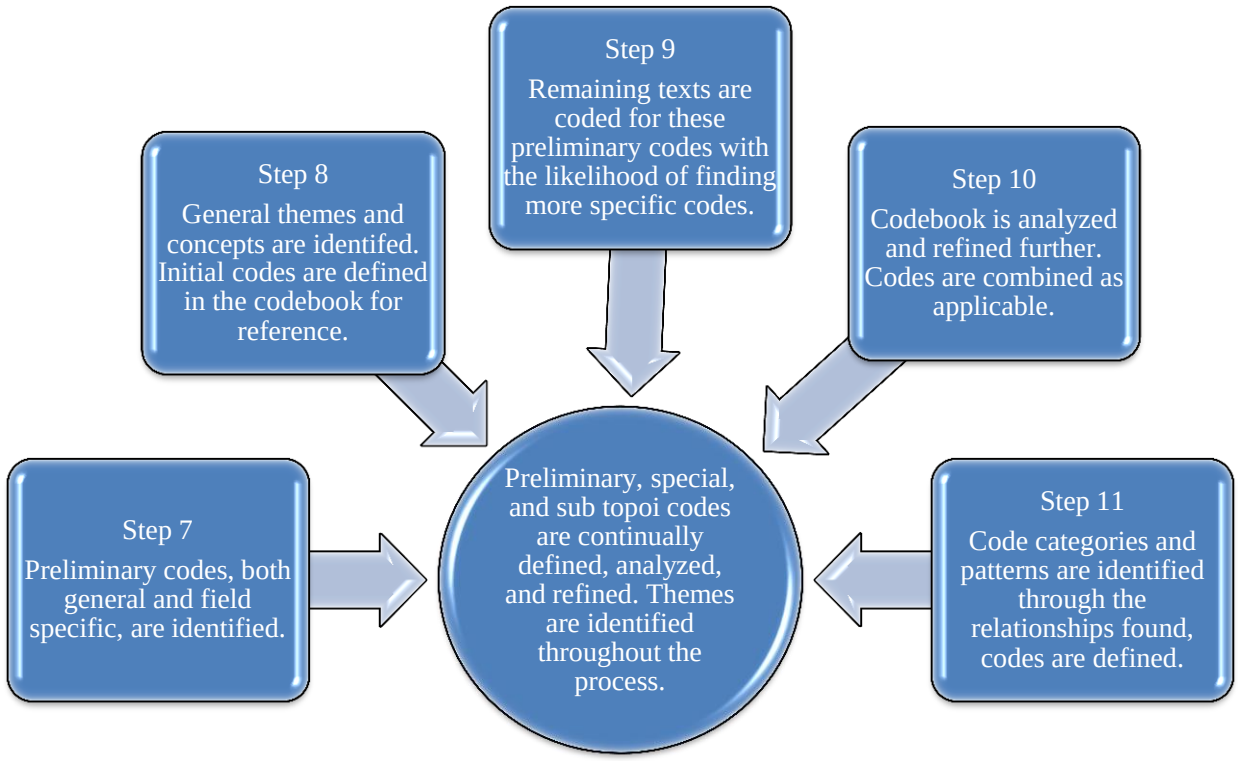

Figure 3: Second Stage in Data Analysis Process

The third stage, shown below in Figure 4, depicts the final steps in the theory development process. In this stage the codes identified in all the texts and noted in the codebook are then applied to the rhetorical frameworks for this thesis. The tables generated throughout the

coding process are expanded in this stage and made more specific according to the codes and any recurring themes found. In this stage a final analysis of recurring themes, descriptions, and their meanings are identified. In addition to this, Steps 12 and 13 that apply the rhetorical methods previously discussed are expected to result in the development of a final theory and answer the research questions as applicable.

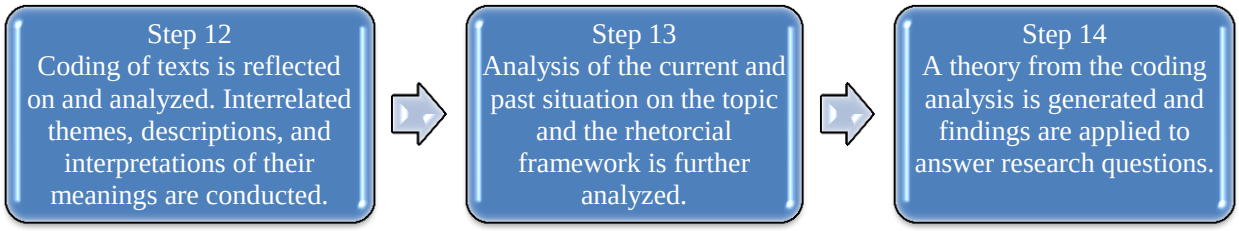

Figure 4: Third Stage in Data Analysis Process

Since topos serves as a conceptual place (Gross, 2000) in which the researcher can go to find a means to persuade (Kennedy, 2007), within this analysis topos is also a place in which answers can be found. This thesis will start with the familiar places first in order to assist with understanding the arguments taking place. Rhetorician Amy Koerber (2013) presents the different topoi found in her breastfeeding analysis as being "rhetorical commonplaces." Therefore the general topoi will be considered the familiar places to start. As more specific topoi are revealed, what are considered the "unfamiliar" within the debate are expected to be the codes that evolve. The initial codebook follows what researcher John Creswell (2009) explains as gathering a "general sense" of what is said in the texts. These codes will be presented in the following chapter and serve as a starting point for the rest of the codes that emerge. The

codebook will also serve as a basis to refer back to when identifying new codes and developing a more specific list of codes, which will include identifying special topoi or sub-topoi. Therefore, through this process of implementing various rhetorical strategies and applying topoi theory to the coding of the texts, the research questions will be addressed and findings will be related back to those in rhetorical studies as well as the research community.

CHAPTER THREE: TOPOI AND FINDINGS OVERVIEW

Through the application of topical theory in a contextual-textual-intertextual analysis, the coding process generated findings, and key examples, about the limitations of and possibilities for arguments in this debate. The chapter presents how the use of topoi-driven coding in conjunction with rhetorical approaches assisted in the findings of this analysis. The meaning of the codes, why the codes were identified, and how these findings apply to the research questions are presented. It will also be explained in this chapter how the methodology shaped the coding process. The discovery of how language was used in the debate and the persuasion tactics identified will be analyzed, along with how rhetoric was implemented both within and outside the research community.

While coding, the prior questions were considered by identifying topoi that involve past conversations and its effects on the present debate. These codes provide evidence and examples of the arguments used in the past and this analysis will consider the effects these codes have on the present debate. According to qualitative research expert and rhetorician Kathy Charmaz (2006), coding is the "critical link" between data and the researcher's explanation of its meaning. This coding process will help in addressing the first two research questions presented in chapter 1. By answering these research questions, information will be obtained such as discovering how these codes relate to and shape the debate, and how identifying them can help in better understanding the debate. The two research questions being considered in this chapter are the following:

1) How do stakeholders involved in animal testing methods within the research community meet, debate, discuss and collaborate with one another regarding the use of animal testing and alternative methods?

2) What are the general topoi, special topoi and sub-topoi used by professionals and how are these topoi invoked from those on either side of the issue? In addition, how do these topoi shape and frame the debate, including common ground and disagreements?

Identification of the codes starts with the type of argument or the general topoi found in this analysis, then special and sub-topoi are identified. Professor and researcher John Creswell (2009) presents six steps for an effective data coding analysis and this is the approach followed for this analysis. He presents that after the data is organized, prepared, and completely read through, the coding process can begin. Creswell (2009) explains, "coding is the process of organizing the material into chunks or segments of text before bringing meaning to information" (p. 186). Therefore, tables 1-5 are examples of the first phase of identification of the codes. This includes the categorization and grouping of topoi as the findings emerge until the final qualitative codebook is established and applied to the new discoveries and implications of this research study.

Levels of Topoi Within the Debate

The following table shows the four categories of topoi used in this analysis and their definitions according to Lawrence Prelli's book *A Rhetoric of Science* and Lynda Walsh's findings from "The Common Topoi of STEM Discourse." For this analysis, the idea has been broached in the initial coding analysis that the identification and definition of general and common topoi are separate categories. Aristotle introduced the concept of common topics in the *Rhetoric* and identified 28 of these topics that were later used as a means "to generate arguments on any issue" (Walsh, 2010, p.122). Therefore, this analysis will use the findings of these rhetoricians to specifically define general topoi, which is a topoi category that will be used when

identifying more specific levels of topoi. By doing this, the process will start with an overall understanding of the arguments used in this debate, which will then lead to special and sub-topoi.

As rhetorician Lawrence Prelli (1989) states, a topic is considered a heading and is "suggestive of subordinate particulars or subpatterns" (p. 69). Therefore, the general topoi in this thesis are identified partly based on their characteristic of serving a particular purpose to those in the field and being a field-specific inclusive topoi in which sub-topoi may emerge. The sub-topoi for this analysis are the specific topoi related to the animal testing debate that are particular, precise, and provide a deeper more significant meaning within the debate than the special topoi. While conducting this analysis the concept of sub-topoi was developed partly due to the findings regarding the ingrained concept of the 3Rs Principles within the field. From these principles, specific arguments emerged from this overarching topic in the debate. The categories found were subcategories of these principles because many arguments are derived from it. Like all sub-topoi, these would likely not be as persuasive or hold as much influence in the debate without their parent topoi. This can be found in the arguments surrounding the basic concept of the 3Rs Principles for example. The following table provides the list and definitions of the topoi being identified in this debate.

Table 1: Topoi Types

Common Topoi	An overarching topoi category that includes any topic that can generate an argument on any issue.
General Topoi	Topic for any audience with a general understanding of the situation.
Special Topoi	Themes related to a certain field and serve a particular purpose to those within that field.
Sub-Topoi	Subcategory within special topoi that was found in this debate and which specifically relates to the field, giving a deeper understanding to the arguments.
Meta-Topoi	Category that developed later in the analysis and represents a topic that serves as a nodal point for additional arguments to emerge at varying levels and across opposing arguments within the debate.

According to the articles and arguments in this analysis, the following are the common topoi that have been identified after gaining a general sense of the conversation from all the texts in this debate. These common codes provide an overall sense of the categories and topoi that will emerge and encompass this debate. The codes will be further defined and expanded on in table 2 and are the following:

1) past facts
2) current circumstances
3) possibilities for the future

The articles used in the initial coding analysis were based on these initial common topoi that were discovered. The texts used in this analysis were then divided up based on these three common codes so that each text could be coded with a specific baseline stance on the issue. Once categorizing the texts in this manner was done, it was found that more specific overarching codes could be identified based on the specific, persuasive arguments within the debate. From these common topoi, what will be referred to as general topoi were identified. The definition for each

category is shown below in order to clarify how these topoi were considered within this analysis when expanded upon and used as a guide in the identification of special and sub-topoi.

Table 2: Common Topoi Codebook

Common Topoi	Definitions
Past facts	Historical practices that have been used regarding animal testing or alternative testing methods
Current circumstances	Ethical concerns and discussions taking place within society and throughout the research community
Possibilities for the future	Implications about the future regarding effective, safe vaccines

These common topoi were discovered through analyzing the texts based on a common theme analysis and then moving from that into a more specific analysis and identification of codes. For example, the statement was made in one of the primary articles being coded that "there are still unknowns in extrapolating human responses from animal based tests" (Long, 2012, p. 418). While this argument can fall under the common topoi of "current circumstances," it would be more helpful in understanding this debate if it were specifically identified related to its argumentative approach as a general topoi of "arguments based on scientific methods and effectiveness." Another example is of topoi based on "past facts" in the statement regarding the use of monkeys in designing a vaccine against polio, which is claimed to have been "inconsistent and the results were disappointing overall" (Hendrickson, 1996, p. 7). While this is an argument based on vaccine development from the past, a useful description of this argument for the current debate would be identifying it as an "argument based on historical practices." The common topoi "possibilities for the future" can be found in an example of an international workshop that focused on future endeavors within the animal testing debate. In this text it is stated that those in

the workshop "identified knowledge gaps and priority research" as well as "vaccines that should have priority for efforts to further reduce, refine, and replace the use of animals" (Stokes, 2011, p. 9). While this example looks to the recommended future changes, it also addresses a significant argument found in the analysis of these texts regarding ethics. More specifically this example references the 3Rs Principles in order to pinpoint what the ethical concerns are in this topic. Therefore, identifying this example under the general topoi category of "arguments based on ethics" is more productive in order to find the specific topoi that this argument falls under.

Throughout this initial coding of the articles, the general topoi continued to develop through the identification of arguments with a common topoi theme, but had verbiage that was more specific to the debate and could lead to additional topoi with a specific role in the debate and a deeper understanding of the argument. Following Creswell's recommended steps for data analysis, three articles were found that presented strong, dissimilar arguments on the topic with an approach that would highlight the distinctive general codes that were evolving in the analysis. The articles used for this initial coding and identification of the most significant arguments for this analysis consisted of the following: 1) Arguments based on scientific methods and effectiveness in the design of vaccines, "Animal Models for Influenza" 2) Arguments based on ethics, "Vulnerable Subjects?" and 3) Arguments based on historical practices, "Challenges and Opportunities." A close textual reading and coding analysis was done on these texts, which included looking for specific phrases, wordings, and arguments that support the research questions. From this stage in the analysis, the following are the general topoi theory based codes along with examples found in these three initial texts.

Table 3: General Topoi Examples

General Codes	Examples
Arguments based on scientific methods and effectiveness	Animal testing is necessary in order to understand "viral and host factors that contribute to disease and transmission" in humans (Bouvier & Lowen, 2010, p. 1530) There are "still unknowns in extrapolating human responses from animal based tests" (Long & Gilly, 2012, p. 418)
Arguments based on ethics	Those who have the most knowledge of research animals' needs, the researchers, are disengaged and distanced from responsibility (Johnson, 2013, p. 503)
Arguments based on historical practices	Quote from regulatory scientist: "the test is no longer keeping up with the complexity of the product" (Long & Gilly, 2012, p. 422) "The model has been validated through years of experience, and the ferret model is thought to most accurately represent human influenza" (Bouvier & Lowen, 2010, p. 1536)

Table 3 above is the start of an initial codebook based on what Creswell (2009) explains as a "qualitative codebook" (p. 187), and topoi theory, which serves as one of the key rhetorical approaches used in this analysis. This codebook presents the predetermined codes based on the initial analysis and coding of the three texts previously identified. These codes are the starting point for the types of arguments identified, which will evolve into special topoi and sub-topoi and will be presented in additional tables. The examples provided serve as a way to stay grounded in the debate and provides an understanding of how these themes can be defined. The arguments for the debate are first coded based on these three commonly used general codes, these codes are general enough to include the many different approaches used in the argument, while also being field specific enough to assist in findings within the conversation. For example, consider the quote in the above table from a regulatory scientist regarding vaccines, "the test is

no longer keeping up with the complexity of the product" (Long, 2012, p. 422). This argument is characterized as being based on historical practices, however the text also draws on a scientific argument, which gives the statement additional persuasive power. In the text it is stated as an introduction to this quote that the difficulty in vaccine development is that "animal methods are highly variable" and that "variable results often lead to invalid tests" (Long, 2012, p. 422). This shows that while the themes and statements can be categorized, there is also an interaction of arguments being implemented. For this example the interaction of arguments used to speak to the research community was a scientific argument based on facts, as well as consideration for the influences of past practices. By the conclusion of this text the government showed willingness in implementing the 3Rs Principles for vaccines (Long, 2012). *By looking at the conversation in this way and seeing how the spoken rhetoric in the field interacts with the texts, and codes can be combined in the conversation in order to elevate the persuasiveness of a point, a reconsideration of the current practices in place can be achieved.*

The following figure provides an overview of what the debate looks like when segmented into different arguments at this initial stage in the coding process. The figure below shows the 3Rs as a significant point of collaboration. The 3Rs Principles help address the first research question through its use in the debate. It promotes collaboration and communication among those in the research field, and serves as a common meeting point in which science and ethics converge. It has been indicated by researchers that following the 3Rs Principles is currently considered good practice in research, product testing, and technical procedures (Burnett, 2009). Therefore, it proves to be a topic that has significant power in the overall debate. Breaking it down and analyzing its use as a foundation for further arguments can show meaningful rhetorical strategies within the debate. This figure will also present the other three general topoi that have

been discussed above, in a format that shows how it was the basis for identification of additional arguments. Additional explanations of the meaning of this figure will follow and consideration of the chronology of the topoi will be presented.

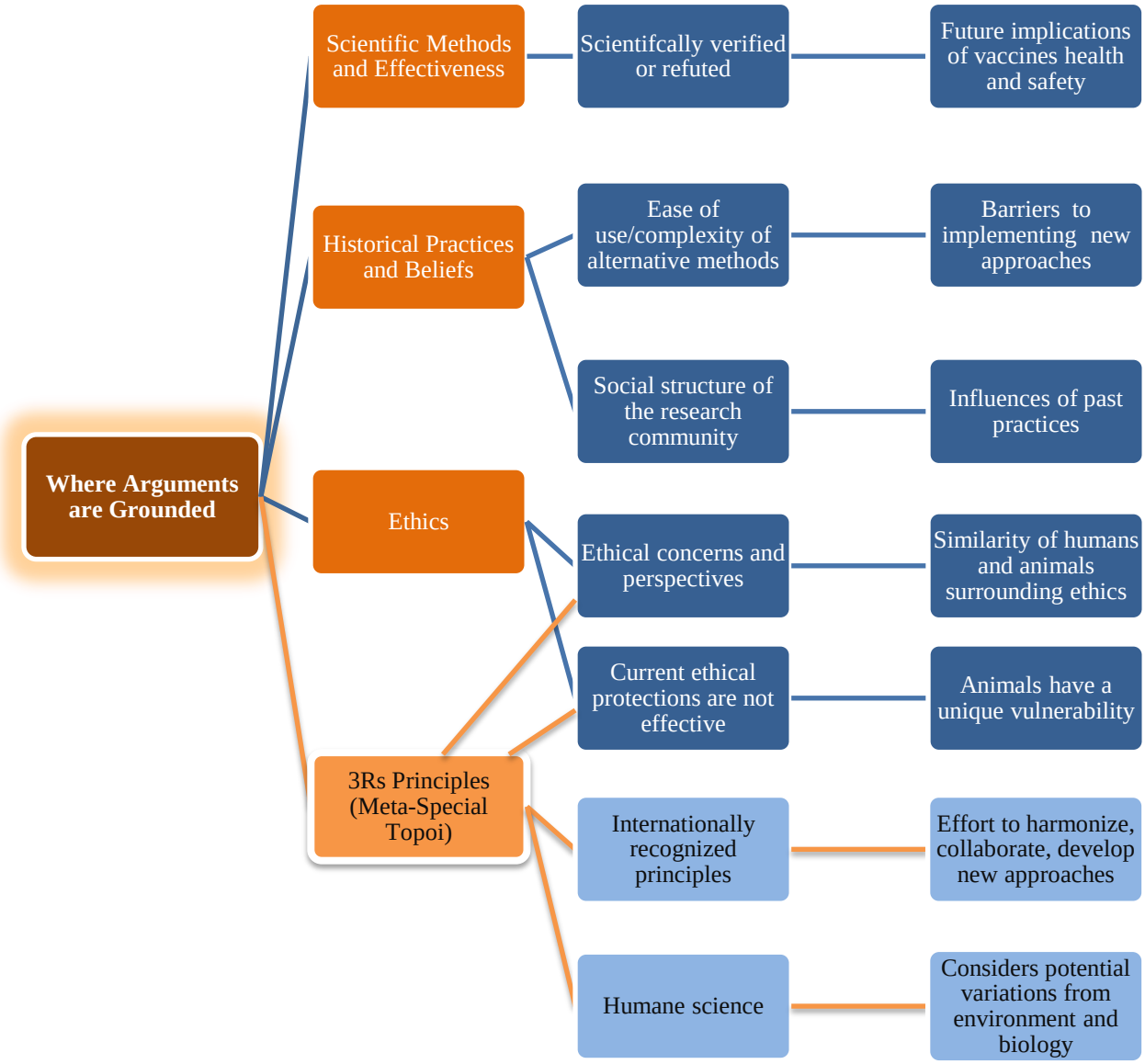

Figure 5: Topoi Theory Based Coding Progression

The codes evolved as the analysis progressed while at the same time additional layers of topoi began to emerge. Figure 1 shows the progression of theory building and coding practices implemented, as well as how one argument draws from another argument or reacts to another persuasive statement in the debate. This figure also represents how the overall debate looks for this analysis. The four arguments in orange are the categories based on the initial three articles coded. The 3Rs Principles is the fourth orange block and has been added to this section because it is a reoccurring topic used in the debate throughout the majority of texts. It is considered a meta-special topoi because it relates specifically to the research field, the debate, and many of the texts use arguments from the 3Rs category, therefore creating sub-categories. In addition to this, arguments framed by the 3Rs bring in other types of topoi for support. For example, the combination of scientific arguments and the 3Rs Principles result in the humane science argument depicted in figure 5.

These four topoi reflect what was found after reviewing the texts with the common topoi in mind, which were primarily based on a chronological evaluation of the conversation. Therefore, these four topics can be seen as more specific examples of the three arguments from which they originally came. For example, "scientific methods" and "historical practices and beliefs" encompass what is considered the "past facts" for those in this community. Arguments surrounding ethics have become more common in our society and within this community, so this is one topic reflecting our "current circumstances." In addition to this, the 3Rs, which have become "widely adopted as principles in the scientific community" (Masterton et al, 2009, p. 27), also make up its own category of argument within the ethical "current circumstances" surrounding the debate. The "possibilities for the future" topoi are also reflected in the category "scientific methods" and include arguments surrounding new testing procedures for vaccines and

updated scientific analysis, which consider the effectiveness of past and current practices. This fact can be found in articles that discuss the perceived advancements that will help "future progress in terms of not only more efficient methods, but also more accurate methods" (Stokes et al, 2011, p. 11). This category of arguments based on the future, also entails the continual implementation of the 3Rs Principles, as it endures in being a topic of collaboration and communication on vaccinations and testing methods within the debate.

Coding for general topoi in the initial texts included looking for specific phrases, wording, and arguments that have the potential to provide insight into the research questions. From the information gathered regarding the debate, the following are the special topoi according to the framework theory presented in this proposal:

1. Scientifically verified or refuted
2. Ease of use/complexity of alternative methods
3. Influences of past practices
4. Ethical concerns surrounding use of animals
5. Future implications
6. 3Rs Principles

These are the six initial special topoi identified within each of the three sample articles first analyzed. After this step, these general topoi and special topoi were then applied to the remaining thirty-two articles for analysis across scholarly texts. These codes were sought out and expanded on when further analyzing the texts. The 3Rs Principles were found entwined among the other special topoi in the debate, while there were other instances where it became its own category of argument. This phase of the analysis also revealed that the 3Rs could lead to additional sub-categories within the debate, which means the identification of different layers of

arguments containing the 3Rs topic was beginning to emerge and show its rhetorical power. This finding resulted in its identification as a meta-topoi. The following table presents examples of four findings when coding for these special topoi throughout all the texts.

Table 4: Special Topoi Examples

Scientifically verified or refuted	**Garbe et al, 2014, p. 3350; Davis, Taubenberger & Bray, 2015, p. 77, 92** Bouvier, p. 1532; Long, p. 421	An animal model used since 1940 has been found to not serve its purpose or provide any useful information; A flu outbreak occurred and the primates did not show any illness until an hour before their death, no virus or diagnosis was found
Influences of past practices	**Garbe et al, 2014, p. 3354; Johnson, 2013, p. 503** Davis, p. 79, 83, 92; Johnson, p. 503; Franco, p. 255	ATT has been found to be unjustified but has still not been deleted from safety testing internationally; Current implementations reinforce the status quo
3Rs Principles	**Masterson, Renberg, & Sporrong, 2014, p. 27** Long, p. 424; Stokes, p. 1, 10; Frey, p. 37	"[3Rs] have been widely adopted as principles in the scientific community"
Ease of use/complexity of alternative methods	**Bouvier, 2010, p. 1532; Davis, Taubenberger, & Bray, 2015, p. 87**	"The mouse is a convenient model in terms of size, cost and husbandry…..ability to manipulate mice genetically"; 2-4 routes of virus exposure in research animals are implemented at researchers discretion
Future implications	**Tannenbaum, 2001, p. 122** Johnson, p. 11; Franco, p. 255	With the continued growth of efforts to consider animal pain/suffer, attachments will result with the researcher making it impossible to use the animals in research

By implementing predetermined special topoi when conducting the coding, what rhetorician Lawrence Prelli (1989) describes as legitimizing scientific discourse and making it

reasonable can be achieved. In order to achieve this, additional sampling was conducted while coding the texts, and these codes were then modified and refined by becoming more specific in relation to the topic of animal testing and alternative methods. These six special topoi offer specific topics to analyze the conversation and find what the stakeholders are discussing, as well as what the specific arguments are in the debate, and what codes are productive or limiting.

The Emergence of Sub-Topoi

The following tables show the final stages in identifying and categorizing the arguments. At this stage in the analysis a thorough understanding of the texts and categories where different arguments can be placed has been reached, therefore the beginning of a codebook was started. The chart below presents an initial codebook specific for this analysis described as "Arguments and Topoi Theory Based Codes." This table is the result of the first round of data analysis involving all the texts and the codes already identified; therefore this table shows the predetermined codes that will be used as a basis for table 6 the "Refined/Qualitative Topoi Codebook." Special, sub- and meta-topoi have an important role in this analysis, offering separate levels of understanding to the debate. These layers of argument provide a distinctive field and debate oriented understanding to the texts, with the sub- and meta-topoi as the levels that can categorize the most specific and influential language of the debate. Therefore, what is considered sub-topoi for this analysis has been carefully identified in order to meet these criteria and frame the entire debate. For example, the table below lists the sub-topos "researchers are distanced from ethical decision making" under ethical arguments. While this topos can fall under broader arguments about the design of the system or past practices, for this stage of the analysis its role is important because it identifies a crucial ethical factor for why this debate exists. This

sub-topos provides a category to place arguments in order to understand why different beliefs are held about how research animals should be treated. By identifying this as a sub-topos, the circulating rhetoric regarding ethical decisions and who makes these decisions, can lead to finding points of collaboration and understanding between those on either side of the conversation.

The information in table 5 is an extension of Creswell's (2009) "qualitative codebook" (p. 187), first presented in table 3. These are the codes that emerged from the general codes in the debate and have been broken up into special and sub-topoi categories; therefore they have been categorized based on their usefulness in this analysis. The general codes are used to categorize the texts and show the foundational argument for the additional codes identified. Table 5 divides the topoi based on where the argument is grounded and which general topoi each code stems from. The codes listed in table 5, and any additional codes that emerge, were then specifically looked for and coded in all the remaining texts. At this stage in the coding, the meta-topoi category was beginning to further develop from the identification of arguments in the sub-topoi category. Therefore, some of the sub-topoi listed in table 5 involve the 3Rs. This is an example of arguments that were originally categorized as sub-topoi until the final coding was conducted, which is when the arguments were broken into their own meta-sub-topoi category as depicted later in the analysis.

Table 5: Arguments and Topoi Theory Based Codes

Arguments Based on Scientific Methods and Effectiveness	
Special Topoi	**Sub-Topoi**
Scientifically verified evidence or lack of evidence	Future implications of vaccines health and safety
Ease of use/complexity of alternative methods	3Rs considers animals environment and differences in biological makeup
Human similarity to animals	Validation of new methods take time
Human differences from animals	
Effort to reach consensus on debate	
3Rs are internationally recognized	
Cost savings with animal testing	
Arguments Based on Ethics	
Special Topoi	**Sub-Topoi**
Ethical concerns and perspectives surrounding animals	Researchers are distanced from ethical decision making
Holes in the ethical approaches that have been implemented	Implementing the 3Rs provides an easy, ethical "check in the box"
Problems with the system	3Rs Principles are humane science
Uniqueness of animals make them vulnerable	Imposing morals into the topic
Animal models in research have a morally dysfunctional view of animals	Consequences of unethical use of animals
Choice between the health of a human or the wellbeing of an animal	Speciesism
Cultural, social, moral, and religious traditions are against the use of humans	
Ability to consent	
Quality and value of life arguments	
Humanity, morality, ethical arguments	
Arguments based on the 3Rs Principles	
The greater good argument	

Arguments Based on Historical Practices	
Special Topoi	**Sub-Topoi**
Problems with the system	Social structure of the community
Lack of consideration for effects of past practices	Lack of evidence that humans are the preferred specie
Influences of past practices and beliefs	Scientific view of animals
Uniqueness of animals make them vulnerable	Animals have been adapted for testing practices over time
Animal models in research have a morally dysfunctional view of animals	
Motivation must exist in order to change past practices	
Animal testing procedures are controlled by those with wealth and power	
There are assumed benefits surrounding animal testing	

One common theme that was reflected in table 5 through the specific topoi identified, involved the discussions in peer-reviewed, published journals involving alternative approaches. These journal articles shape the research community, both in practice and the beliefs regarding the use of animals (Derkatch, 2005 & Martins, 2015). Special topoi such as "human similarity to animals" and "human differences from animals" show one tactic in which either side of the issue can be argued based on biology, science, ethics, or opinions surrounding comparisons. Discussions which highlight the simplicity of using animal models in conjunction with considering scientific reasoning and purpose were shown in topoi such as "scientifically verified evidence" and "ease of use" regarding animal models and its long established practice. Some texts were found to be open to discussion on either side of the debate, while others focus primarily on scientific reasoning or only present a strong ethical argument regarding how animals are treated. This can be seen in the special topoi "quality and value of life" and "lack of [scientific] evidence" arguments identified. In many ways the texts that provide a combine,

balanced approach allow for productive discussion and can be more persuasive both within and outside the community.

Meta-Topos: 3Rs Principles

The significance of the 3Rs Principles in the debate continued to emerge as the different levels of argument were categorized. The special topoi in table 5, "arguments based on the 3Rs Principles," is a category of argument found throughout the majority of texts, some to a larger extent than others. The important role of the 3Rs was first found when conducting the initial rounds of coding and through the process of generating the codebook. For example, it was found in articles such as "The International Workshop on Alternative Methods" how significant the communities' acceptance of the 3Rs has been in building communication on the topic. This article presented workshop members from the U.S. Food and Drug Administration, World Health Organization, scientists from Europe, Canada, Japan, along with many other national and international agencies and organizations. The workshop was arranged to discuss animal testing and alternative models in the creation of vaccines. From this collaborative effort, decisions were made regarding applying the 3Rs Principles to certain priority vaccinations (Stokes, 2011). In addition to this, agreements were made for the recommended approaches that will achieve continued harmonization and acceptance of alternative methods. These are just a few of the tactics among stakeholders when meeting, discussing, and making efforts to collaborate, which showed how the 3Rs can play an important role in consensus building opportunities.

The 3Rs is found in arguments regarding ethics as well as those surrounding scientific methods. Because it is a versatile topic of argument, productive special and sub-topoi emerged from this topos. As one researcher observed, the 3Rs have put the burden on the researchers to

provide “convincing evidence for the necessity of using animals” (Franco, 2013, p. 260). As shown in the table above, it is argued that the 3Rs considers biology and environment, which are two important factors that can change the results of the design, potency, and safety of a vaccine (Burnett, 2009). Therefore, it is argued as a more reliable scientific method since it stresses these considerations. At the same time it is an ethical topic because it encompasses looking at animal models in a different way that will “avoid or minimize animal pain, distress, or other adverse effects” (Knight, 2012, p. 107). Therefore, as one researcher presented in his analysis of the 3Rs implementation, these principles have led to those in the community to consider the combination of “relevance, ethical concerns, potential benefits, and scientific justification” (Schechtman, 2002, p. S85) when evaluating or re-evaluating animal models.

The 3Rs was found to have importance in the debate because of its function within the conversation and its connection to other topoi in the argument. Seeing the importance of the 3Rs in this manner occurred while coding and reading each text line-by-line. After identifying its significant role throughout the debate, from those primarily using scientific arguments to those who focus on humane practices, the 3Rs was initially categorized as a special topoi with sub-topoi layers. The 3Rs can be within the special topoi category depending on the argument and its interaction with the other special topoi already identified. Later in the analysis, the 3Rs was labeled a meta-topoi because of the different layers of argument it adds to the debate through its connection with other identified topoi. The 3Rs topoi, and its use within the conversation, have potential future effects as it continues to move the debate forward. The meta-topoi term developed when it was found that the 3Rs connected one argument to another, therefore making different but closely related topics in the debate.

The 3Rs Principles frame many arguments for this community by considering the scientific effectiveness and reliability of a method, as well as the pain and distress caused to animals. However, there are also criticisms about the limitations of the 3Rs, such as not addressing animal vulnerability and instead making animals more vulnerable because these principles are seen as a way to fully address ethics (Johnson, 2013). Therefore, the 3Rs frames arguments for researchers in a way that is "a re-evaluation of the extent and manner in which animals are used" (Schechtman, 2002, p. S85). This involves the reconsideration of animal models in regards to ethics, scientific effectiveness, and safety of vaccines for human use. The 3Rs topic opens the research community to the acceptance of arguments for the humane treatment of animals, enabling the community to meet on common ground and collaborate. However, even with the many layers of argument the 3Rs generates and its role in altering the community to consider research animal's well-being, it still lacks certain aspects that would make it a strong topic for ethical arguments, which would potentially move the community into reaching a consensus.

Final Topoi Codebook

As the process of analyzing the codes identified in table 5 continued, refining and combining these codes for table 6 was also being enacted. The definitions for these codes were derived from the multiple codes in table 5 that have been expanded, refined, combined, or absorbed. This part of the process included eliminating some codes due to lack of recurrence in the conversation or the need to identify it in more general terms. [1]The strategy included merging

[1] The code "animal testing procedures are controlled by those with wealth and power" in table 4 merged with code "social structure of the research community" in order to identify the

some codes and their meaning into another code, to encompass a broader range of arguments and provide the basis of where the argument originates. The following table shows the outcome of the process, which involved consolidating the codes from the previous table in order to identify the primary, overarching arguments in the debate

Table 6 takes Creswell's (2009) explanation of a qualitative codebook and adapts it for a purpose specific to this analysis. Creswell (2009) states that a codebook will "develop and change based on the information learned in the data analysis" (p. 188), which it did during the initial and follow-up rounds of coding and analysis. By encompassing definitions, which developed throughout the process, this codebook serves as a reference point for this chapter and the following chapter, in order to see the meaning of a code, its impact, and its use within the debate. It also serves as a place where additional codes can be added, already identified codes can continue to develop, definitions can be expanded, and it serves as a basis for presenting the findings and theory. The following table lists the codes after conducting a textual analysis during multiple coding sessions, which included the identification of arguments that can potentially address the research questions. Table 6 can be used to answer the second research question in

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foundational basis for this argument. Special topoi "holes in ethical approaches that have been implemented" changed to "problems in current ethical approaches" in order to encompass a broader range of arguments. "Problems with the current system" was a special topoi that has been merged into sub-topoi "social structure of the community" which includes arguments encompassing problems within the system. "Uniqueness of animals make them vulnerable" has been merged into a different special topos that encompasses the "compare and contrast" aspect of this argument.

which the primary arguments and types of arguments used by stakeholders are becoming more defined.

Table 6: Refined/Qualitative Topoi Codebook

Special Code Names	Definition
Compare or Contrast; Humans and Animals	Involves similarities or differences based on biology, science, ethics, or opinions surrounding comparisons
Assumption of Benefits	There are presumed benefits to using animals in testing procedures and there is no need to elaborate or defend their use
Past Practices and Beliefs	Influences, effects, establishment, and adaption of animals for testing procedures in the past
Humanity, Morality, Ethics, Psychological Well-being	Arguments grounded in personal beliefs (morals), the ethical beliefs of a group or system, or the beliefs held by humankind (humanity)
Recognition of 3Rs Principles	Use of these principles in the international scientific debate
Efforts to Reach a Consensus	Efforts to collaborate, discuss, and set goals in implementing alternative methods
Black or White Argument	Animal testing is a choice between the health of a human or the wellbeing of an animal
Problems in Current Ethical Approaches	Implementations made to protect the well-being of animals do not serve the intended purpose and may cause more harm
Value of Life	The argument that one life is less or more important than another life due to any number of reasons such as its specie, quality of life, ability to understand
Difficulty of Change	The challenges that arise when changing already established practices
Human Argument	Cultural, social, moral, and religious traditions that don't condone the use of any humans in testing practices that have any potential for harm
The Greater Good Argument	Whatever is inflicted on research animals is for the greater benefit of vaccinations against disease for humans and other animals
Complexity of Vaccines	Vaccines have a complex structure and are continually changing and evolving in order to address the health of the population
Ease of Use	Arguments surrounding the ease of using animal models rather than scientific justification

Sub-Topoi Code Names	Definition
Social Structure of Research Community	How researchers and the scientific field operate and respond to ethical considerations regarding animals and in what way they generally consider animals, as well as the power and control they have over research animals
Speciesism	The concept of favoring the interests of one's own specie over another specie
Past Precedent	The past practices being an influence and indicator of current and future practices because of the expectations and understandings that have already been set
Future Implications	Arguments about the future outcomes of current practices or about the debate for alternative methods of vaccines health and safety
Imposing Morals on the Topic	Efforts to make the topic about morals and the results of lack of morals
Unreliable Scientific Outcomes in Animal Models	Using animals in testing methods generate results that are not safe, accurate, reliable, or clearly understood
Meta-Topoi Code Names	**Definition**
Limitations and Benefits of the 3Rs Principles	Arguments that the 3Rs provide some type of ethical oversight on this topic; arguments that 3Rs is a pretense for protecting research animals
3Rs Principles are Humane Science	Language which uses the 3Rs as a scientific principle which considers the animals environment and differences in biological makeup in testing outcomes

During the coding process it was discovered that in order for the analysis to be productive, multiple arguments that were identified in the beginning of the process had to be combined and made less specific by being absorbed into another code rather than becoming its own special, sub-, or meta-topoi. Narrowing down the arguments in this way, and considering common themes throughout the texts and the specific arguments effect on the debate, serves as a way to address the research questions and find the best topoi layer to identify in order to gain a better understanding of the debate. *Therefore, the arguments presented for this analysis are based on the ability to bring a deeper understanding to the debate, as well as persuasiveness,*

potential reactions and interactions among the texts, and the ability to address the research questions.

Key Findings About Prominent Topoi

Along with the general discussions involving the 3Rs Principles, past practices that have been used in creating vaccines, and arguments advocating for the overall health of the population, the primary codes identified when stakeholders argue either side of this debate were found to be the following:

- Assumption of Benefits
- Value of Life
- Difficulty of Change
- The Greater Good
- Complexity of Vaccines
- Compare or Contrast; Humans and Animals

These six topoi were consistently used throughout the texts and provide persuasive arguments that encompass any one of the general topoi previously identified: ethics, historical practices, or scientific methods. Table 7 below provides examples of these codes followed by an additional discussion of how and why these particular arguments hold such a persuasive role within the debate.

Table 7: Primary Topoi Used By Stakeholders

Special Topoi	Examples
Assumption of Benefits	"False-negative" and "false-positive" are produced in 52-100% of animal models (Burnett, 2009, p. 38); "Benefits of research are not all that we take them to be" (Frey, 2001, p. 37)
Value of Life	The treatment of sentient beings is based on "specie rather than the level of intelligence, cognitive awareness, emotional development or the ability to feel pain" (Masterson, Renberg, & Sporrong, 2014, p. 26)
Difficulty of Change	"Considerable scientific efforts have already been spent to establish specific animal models for human diseases" (Masterson, Renberg, & Sporrong, 2014, p. 27)
The Greater Good	Any pain caused is justified because it's for humankind (Franco, 2013, p. 244); Important goals can justify severe suffering in animals but not humans (Brom, 2002, p. 81)
Complexity of Vaccines	Many vaccines still require animal tests due to its complex nature (Davis, Taubenberger, & Bray, 2015, p. 79)
Compare or Contrast; Humans and Animals	No evidence exists that humans are the preferred specie (Frey, 2001, p. 46); influenza in mice does not cause fever, instead "hypothermia has been reported" (Bouvier & Lowen, 2010, p. 1535)

The "Value of Life" argument and "The Greater Good" argument will be considered in more detail here. These two topoi are considered separate argumentative categories for this analysis because each identifies two persuasive strategies used by professionals within the field to advocate for and against the use of animal models. The former argues for the importance and well-being of one specie over another for a particular purpose. The later already assumes that the reader agrees humans are the most important specie and using animals to potentially help humans is justifiable because it may help protect the lives of humans, which is for "the greater

good." *The four additional topoi listed above lead back to the fact that this argument's topic relates to science and therefore factual claims and arguments weighted with scientific evidence are stronger persuasive forces and used more often in the debate.*

The progression of language is seen when extending outside the research community where it originated. This language becomes common or assumed information both within and outside the field through this progression. "Assumption of Benefits" topoi looks at what is assumed regarding scientific methods, which is that past methods produce accurate, effective results, and this can be argued either for or against the claims surrounding animal testing. The example for this category, shown in the table above, challenges the argument that animal testing produces reliable results in most cases by using an argument based on factual findings. This can be highly persuasive both in the community and outside the community as well. These approaches that strive to disprove or point out inaccuracies in animal models is influential due to the focus on scientific findings and facts, which are important foundations for research. "Complexity of Vaccines" and "Difficulty of Change" reflect the complex nature of vaccines and how difficult change can be, especially for a topic such as this one since there are additional factors other than the beliefs and practices within the system that need to be changed. For example there are also regulatory agents, the consideration of whether or not what is being put in place is more accurate or cost effective, and a number of other factors in designing and producing vaccines that can be used as an argument on either side of the debate. The "Compare or Contrast; Humans and Animals" category provides an important role in this debate by stakeholders because "separating humans from animals forms the starting point of any justification of animal experimentation" (Frey, 2002, p. 39).

Examples of where the codes were found in the texts have been presented in tables 3, 4 and 7. Therefore, the concept of kairos as implemented by Amy Koerber (2013) and Judy Segal (2005) is invoked, and by considering the conversation in this way the progress of rhetoric by the different stakeholders is seen. These tables show the underlying motivation of the rhetors and examples of topoi depending on Koerber's (2013) "different historical moments" (p.14). By taking an Aristotelian view of topos, these tables shows the places where a persuasive opportunity was identified and specific words or phrases were used in order to have an effect on its audience during a specific moment in time and within the debate (Miller, 1987).

There are other times when the topoi identified may simply be rhetoric filling in a gap of knowledge (Segal, 2005). The use of rhetoric when uncertainty exists, in a field that is credited for being based on facts, information, and knowledge, is a strategy that can have a significant persuasive influence when used effectively. This provides the rhetor with the opportunity to make persuasive statements that may be assumed true. These tactics have already been defined in rhetorical studies for centuries, and can be explained through the five cannons of rhetoric established in ancient Roman times. "Invention" is one of these cannons and is used to explain the actions of rhetoricians, it can be defined as "the finding or creation of information for persuasion" (Bazerman, 2004, p. 284). In addition to this, the other cannons prove to have a role in this debate as well through the presented information's style, delivery, arrangement of information, and memoria, which is defined as "the memorization of what has been invented and arranged" (Bazerman, 2004, p.284). Examples of these strategies can be found in table 6, for example the "Black or White Argument." One example of this argument was found in a text that considered "the level of risk that the public will accept for vaccine use" (Long, 2012, p.421). In this article a regulatory scientist argued the difficulty in accepting the results of alternative

methods for infant vaccines because this would mean "putting a highly vulnerable, otherwise healthy population at risk" (Long, 2012, p.421). This is an example of persuasive verbiage, even though there are no facts or findings presented to prove this point.

Coding was conducted with a discourse analysis assumption that the language, arguments, and phrases used in these texts have a greater function that serve a persuasive purpose. In some cases these refined topoi have become a "distinctive principle of the field" (Prelli, 1989, p. 71), which have evolved to become "common knowledge" within and outside the field (Leach & Dysart-Gale, 2001). As rhetorician Barbara Warnick explains in her analysis on topical theory, topical patterns can become a recognizable part of a culture and therefore "will be used over and over in various manifestations and will be effective by virtue of its recognizability" (Gross & Waltzer, 2000, p.110). This shows how powerful rhetoric can be within a field such as this one, proving that not just scientific findings or factual evidence play a role in what is considered truth both within and outside the field of debate.

CHAPTER FOUR: FINDINGS FROM THE ANALYSIS

The purpose of this chapter is to 1) analyze what has occurred in the past to shape the current debate, 2) present what this study has found within the conversation, 3) show what this analysis provides to those studying the rhetoric of health and medicine, 4) discuss the implications for the research community engaged in the debate. The coding of texts for this analysis was not a linear process; instead it was made up of multiple readings of the texts and reanalysis of the codes and their definitions. This involved a rhetorical approach that included a focus on the arguments, or topoi, and conversational repetition, themes, or lack of repetition in different persuasive approaches exhibited throughout the texts. The implications explained in this chapter make up two categories 1) productive shaping of the research debate and efforts to improve collaboration and 2) contributions of the analysis to rhetorical theory by developing and analyzing multiple levels of topoi and discovering new layers of topoi.

In chapter 1 the primary research questions were presented. These primary questions provide a way to gain insight into how a consensus can be reached within the professional community. This chapter focuses on improvements in communication and the rhetorical strategies used in the debate to come closer to a consensus. This chapter will provide details regarding the findings in relation to the final research questions, and a synthesis of these findings with the overall focus on the conversations within the research community and the conflicting arguments. The two groups who will benefit from the findings in this project include rhetoricians who study science and medicine and those in the research community, this chapter covers how the two groups can apply the findings. The consideration of prior questions throughout this analysis have assisted in showing the evolution of the conversation by asking why and how

something occurred, rather than jumping to evaluation and application of the arguments found and the overall conversation.

Discussion of the Prior Questions

The prior questions are a rhetorical tactic that was presented early in this thesis and helped shape the rhetorical study and its findings. These questions consider the current standings within the debate and how the conversation has evolved, while also considering kairos or the historical moments and rhetorical opportunities (Segal, 2005). This part of the analysis will take another look at the prior questions presented in chapter 1 and provide a way to objectively look back on the debate and consider its progress. The findings related to these prior questions add an additional layer of understanding when considering the implications that this study has for rhetorical theory and the discipline of the rhetoric of health and medicine.

What Historical Dialog Contributed to the Present Controversy?

Over time the use of humans in vaccine research has evolved into what it has become today. Currently these changes include commitments from research regulators to learn from past actions of clinical researchers, which included coercion in some cases, in order to provide better protection for participants (Collins, 2010). As presented in chapter 2, there have been changes made to protect the vulnerable human populations through legal and governmental oversight. This progress has already been compared to the gradual changes that have occurred since animals were first used for vaccine research, which occurred as far back as 6th century China (Hendrickson, 1996). Since the beginning of modern day research, the consideration of morality and ethics were argued because of the fact that animals were inflicted with pain or death through

animal testing methods (Bulger, 1987). Scientist and professor Ruth Bulger (1987) presents in her overview the historical arguments regarding animals in research going back as far as the 1500s, a time when some believed that animals could not feel pain or were not "self-conscious" (p. 216). Others considered these actions cruel, which made it wrong because it could make "a person predisposed to being cruel" (Bulger, 1987, p. 216) to another human being.

What evolved from these beliefs is identified by scholar Jerrold Tannenbaum (2001) as the more modern-day "traditional approach," which he used to categorize the most common type of beliefs regarding animals in research over the past century. This approach involves the ethical desire to minimize the pain and distress of animals, and the consideration of whether the distress, pain, or death is justifiable (Tannenbaum, 2001). This belief in legitimizing certain practices over others can lead to further controversy about what practices are justified and which ones are not. Therefore, when looking at the history of this conversation, arguments that surround this type of reasoning can lead to sub-categories of dispute and the emergence of new arguments. For example, the topos found in the coding analysis, "Problems in Current Ethical Approaches" includes arguments that only look at the freedom from unjustifiable pain or distress rather than the well-being of research animals. The topos "Assumption of Benefits" is a category that reconsiders the justification of certain animal models and the benefits it provides to scientific research or human health and safety.

One significant argument during the beginning of this debate was distinguishing between animals and humans, as the former having "simple consciousness" and the latter "self-reflective consciousness" (Bulger, 1987, p. 217). This argument has been categorized under the "Compare or Contrast; Humans and Animals" topos because it contrasts the two by arguing that this distinction exists, which can be followed by arguments for the justification of animal models.

However, when looking back at the history of this debate, Darwin's findings in the 1800s were used to challenge this argument in the scientific field because of the "gradual evolution of self-consciousness" (Bulger, 1987, p. 217) that can be inferred from his findings. Therefore, as science progresses, new and sometimes opposing ideas can change the types of arguments used within a long-standing debate. The newfound knowledge and accepted information within the community can lead to refuting past beliefs and understandings, therefore changing the debate and beliefs of the professionals within the field.

How Does This Historical Dialog Shape the Present Controversy?

By looking at these changes and the reasons for the changes in the conversation over time, the historical effects on the current controversy can be identified. In 1996, an expert in laboratory animal science and alternative methods C.F.M. Hendriksen, stated that "a new era is now beginning in which increasing emphasis will be placed on *in vitro* methods" (p. 3). This statement was made over twenty years ago, however as the research in this analysis has demonstrated, we are still within this era of evolving mindsets regarding the use of alternative methods. The influences of past beliefs and practices continue to unfold even today. From the coding of these texts and the application of rhetorical theories, different layers of arguments have been found. Taking another look at the "Ease of Use" special topos from table 6, many of the arguments under this category stem from historical practices and beliefs that support an animal model for a specific scientific purpose today. In the present day debate these types of arguments provide justification for continued use because of the convenience of using an already established and widely accepted practice in a highly regulated industry such as vaccine development (Baylor, 2011). The basis for argument than leads to those who debate the lack of

scientific justification in certain animal models, which were found through the sub-topos in table 6, "Unreliable Scientific Outcomes in Animal Models." The current advancements in science and medicine can be improved upon by looking back at certain testing procedures that did not have the desired outcome or anticipated results, and applying what was learned then to current approaches today. The 3Rs Principles and its topoi play a role in shaping the present debate because one of its key components is that it is used to reevaluate past animal testing models for both ethical reevaluation and current scientific need.

How Does the Content of These Texts Attempt to Frame the Beliefs and Understanding of the Argument at a Particular Moment in Time?

The "Common Topoi Codebook" in chapter 3 presents three categories that can be used to separate the beliefs, practices, and arguments used in the texts during a particular time. These categories are made-up of the following: 1) Past facts, which are the historical practices that have been used, 2) current circumstances, which are the ethical concerns and discussions taking place within society and throughout the research community in the more recent texts being analyzed, and 3) possibilities for the future, which are the implications made in these texts about the future regarding effective, safe vaccines. These categories demonstrate the division of beliefs at certain periods in time, providing context for the initial coding analysis.

By looking at the texts through this division in time, what was once considered a persuasive argument during a particular moment in history can be found less or more persuasive by those living in a different time, depending on the beliefs and knowledge of those within the community. It has already been established that the beliefs, knowledge, and practices that shape science and medicine is subject to change based on new knowledge and information; therefore, the arguments used in a debate such as this one will change as well. For example the 3Rs

Principles, which are now widely accepted as a humane science, have been changed since first presented in 1959 in order to be "more accessible to the large number of people involved with laboratory animal science and alternatives today" (Knight, 2012, p. 108). Having the 3Rs as a foundation for arguments surrounding this topic leads to categories that can further evaluate and consider the "Limitations and Benefits of the 3Rs Principles" as presented in table 6. An argument within this category relates back to what was previously discussed regarding certain research goals justifying the infliction of pain or distress. This is considered a limit of the 3Rs in providing protection to research animals since it allows researchers to disregard ways to alleviate pain or distress when there is the potential of compromising research goals (Johnson, 2013). Arguing the benefits and limits of the 3Rs will help refine and improve the ability to extend ethical approaches in research while maintaining scientific integrity.

Final Research Question and Implications

How Conversations Might Be Improved Within this Community in Order to Clarify What is at Issue and Come Closer to Consensus?

In order to address the last research question, the themes within the conversation and points in the debate where any of the following occurred must be closely examined: 1) There is an opportunity for clarification of a specific topic within the debate, 2) The communication could be improved upon among those arguing the different sides of the debate, 3) A point identified in the analysis where an opportunity for consensus has been found. By identifying one of these points, Koerber's (2013) approach of connecting topos to a place and location in time or within the argument is being enacted. Therefore, the answer to this research question can be found within the debate by looking at the different layers of topoi.

Implications for the Research Community

The following is a discussion of the topoi that serve as points in the conversation that address collaboration, improved communication, underlying causes of the current debate, and potential consensus. The goal of this section is to present what can be applied by the research community from the findings in this analysis regarding the productive shaping of the research debate and collaboration efforts. The sub-topoi category in this project reaches beyond Prelli's (1989) identification of special topoi as being "clusters of ideas and ways of thinking about data peculiar to a particular field of endeavor" (p. 72). In addition to this concept, sub-topoi is defined as representing a subcategory of special topoi and therefore relate to the argument with the purpose of providing a deeper understanding of the rhetorical strategies and why these strategies are used by those within the community. The meta-topos of the 3Rs Principles was found to be a common underlying argument within the animal testing debate, and it is also a significant juncture in the debate where consensus or clarification on the issue can be reached.

A complex scientific debate such as this one entails a combination of different stakeholders who have a variety of reasons for being involved in the discussion. This must be considered while at the same time maintaining the health of the human population is the underlying purpose of these vaccines; therefore, the different beliefs on this topic and reasons for the beliefs result in a variety of arguments. Taking a combined approach to analyzing the conversation is beneficial because it leads to understanding the complexities of the debate and applying the findings to a contested issue, such as the one presented here. This is important for professionals within this conversation to consider so they can understand how arguments become legitimized in the community and turn into common practice. The 3Rs as a meta-topos provides

a point in which an understanding of one another's viewpoints can lead to collaboration, which would result in improved testing models that still maintain scientific integrity.

This research project presents an approach that uses different rhetorical methods along with identifying the layers of argument through coding, specific examples, and the categorization of what is being said in the debate. An approach used by those in the scientific community that takes this same strategy and considers all sides of this complex debate results in finding a way to move the debate forward. The 3Rs is a pivotal point in the debate that leads to collaboration, but it is also important to acknowledge it as a topic of argument that does not include every ethical concern that is being argued. If the 3Rs were to encompass the many different ethical considerations being argued, full acceptance and integration of ethical arguments in the debate could occur, leading to changes in practices based more readily on ethics. This might concern some in the research community, because it may be assumed that a focus on ethics will lead to a decrease in basing the testing models on scientific findings. However, this project has shown that scientific, factual arguments are an ingrained part of the debate and will remain to have persuasive impact within the community and among those discussing this topic. In addition to this, the analysis presented here has proven that the 3Rs is a topic which considers animal's well-being, while at the same time considering scientific practices and actually improving on the testing models in place.

One of the primary benefits of implementing the 3Rs has been identified as initiating "the desire for and steps taken towards harmonization of test methods" (Long, 2012, p.424). This involves collaboration among countries, regulators, and industry professionals, and involves concerns surrounding test performance, costs, as well as ethical considerations. In many ways this is a complex debate; however, good communication has been found to be a starting point in

discussing the most effective method to implement alternative testing procedures in the design of vaccines (Long, 2012). Therefore, through the establishment and acceptance of the 3Rs Principles, the harmonization of testing procedures between all stakeholders can come closer to being achieved.

Implications for Rhetoricians of Science and Medicine

This section will discuss the layers of topoi identified in this analysis, showing how the approach used provides a way of using topoi theory to see the multiple layers of argument used in the debate. Examples and explanations of sub-topoi and meta-topoi are also provided in this section, further expanding on the identification of the 3Rs Principles as a meta-topoi found in this analysis.

The Meta-Topos Layer

The 3Rs Principles has already been identified as an argument with power to bring collaboration and consensus to the debate. However, the 3Rs is also a special type of topoi that serves as an example of the multiple layers of argument found in a topical analysis that emerge when looking rhetorically at a field that involves research, science, or medicine. In this analysis, meta-topoi has been defined as a topic of argument that can be either a special or sub-topoi which generates additional topical layers. Each of these topoi adds another layer to the arguments that are specific to the debate and field. Meta-topoi are a category that encompasses arguments used to present a variety of different beliefs, scientific facts, and approaches in arguing opposing sides of the debate. The 3Rs is a topic that has been identified by the research community, therefore it provides a specific, scientific based topic of argument that encompasses ethics and an approach in reaching collaboration and consensus.

The meta-topoi "3Rs Principles are Humane Science" combines the arguments surrounding ethics and science, which are the two primary sides taken in this debate. There are those in the research field who advocate and follow the 3Rs Principles, using it as a guidepost in the analysis and reanalysis of animal models. On the other hand there are those who use scientific findings both past and present as a foundational reason for animal models. When the 3Rs topic is invoked as a humane science, these two sides are combined and it is a point of convergence in which collaboration and potential consensus can be reached. In fact, a consensus has already been reached in small ways regarding specific animal testing practices. For example, in an article written regarding the removal of the abnormal toxicity test (ATT) it was found that ATT "lacks a scientific rationale" (Garbe et al., 2014, p. 3349). Because of the fact that the test "lacks scientific merit" (Garbe et al., 2014, p. 3354) and there were a large number of animals used in the test, it was agreed by researchers that it should be eliminated.

Another meta-topoi identified in table 6 of chapter 3, "Limitations and Benefits of the 3Rs Principles" is a common topic of argument throughout the texts in this debate. Because of the common knowledge and overall persuasiveness of the 3Rs Principles as a topic, its discussion of benefits or limitations is a point in which collaboration can occur. Professor and philosopher Jane Johnson (2013) discusses the limitations of the 3Rs in its failure to address vulnerability. She makes the point that by addressing vulnerability, a potential resolution could be reached in the debate. In the human research debate, protections have developed over time in order to ensure that vulnerable humans do not have their basic ethical principles of "respect for persons" (Collins, 2010, p.2064) violated. Therefore, vulnerability is argued as a topic that could improve communication because it is a different, alternative argument for animal testing that provides a connection "between human and nonhuman animals" (Johnson, p. 503, 2013). Those

who have power and control over humans or animals can place either specie into a vulnerable situation; therefore, this commonality can turn a limitation of the 3Rs into an opportunity to reach a point of agreement and understanding. An additional limitation of the 3Rs applies to the possibility that "research be curtailed on the ground that it is incompatible" with any one aspect of the 3Rs (Frey, 2002, p.38). This concern encompasses the idea that ethical approaches can interfere with and negatively affect research practices and findings.

Topos is used in this analysis as leading to the discovery of arguments, while also having the additional role of providing a structure in which arguments can be framed. By framing arguments in this topical manner, it is discovered that some types of arguments will play a stronger persuasive role in the debate or be more readily accepted by the community than other arguments. The examples provided are limited to the topical category they are placed in, and for the meta-topoi of the 3Rs, all aspects of animal vulnerability outlined by Johnson (2013) do not fit into this category and are not a currently accepted argument within the 3Rs Principles. However, the identification of the 3Rs as meta-topoi provides a way to see the different levels of arguments and how the 3Rs concept is used throughout the debate even though it may not include all possible elements needed to make it a strong ethical approach to the debate.

One of the primary benefits of implementing the 3Rs has been identified as initiating "the desire for and steps taken towards harmonization of test methods" (Long, 2012, p.424). This involves collaboration among countries, regulators, and industry professionals, and involves concerns surrounding test performance, costs, as well as ethical considerations. In many ways this is a complex debate; however, open communication is one starting point to discuss the most effective method to implement alternative testing procedures in the design of vaccines (Long,

2012). Therefore, through the establishment and acceptance of these principles, the harmonization of testing procedures between all stakeholders can come closer to being achieved.

The Sub-Topoi Layer

The "Compare and Contrast; Humans and Animals" sub-topos involves looking at the similarities and differences of humans and non-human animals based on biology, science, ethics, or a commonly held opinion. The consideration of this sub-topos when an opinion is being asserted can assist in reaching the underlying reason for why some argue the use of animal models, or why others argue against it. For example, there is the view that humans are simply superior **(**Franco, 2013, p. 239), but on the other hand there is the argument that animals do experience pain, pleasure, fear, distress, and many other characteristics that at one time were considered primarily human (Burnett, 2009, p. 34). Within these arguments, the similarities between humans and animals, such as the internal experiences listed above as well as biological commonalities, can be used as evidence for why animal models should be used. The argument has been made that since animals are similar to humans, the testing results will likely be more accurate and comparable to the results that would be found if the test was done on a human (Davis, 2015). This same argument can also be used to argue against the animal models. Because there are many similarities that animals share with humans, it is argued that any testing deemed unacceptable to humans should also be unacceptable to animals (Brom, 2002). While this same argument can be used to debate either side of the issue, it also shows a commonality within the debate, that humans and animals share similarities. By using the "Compare and Contrast; Humans and Animals" topos as a foundation for why this debate exists, a better understanding of one another's stance on the issue can be seen by those within the research community. This can

lead to further clarification about the reasons for the debate and how to establish common ground.

Overview of the Contributions

The emergence of multiple layers of topoi during coding shows a productive rhetorical strategy that uses a combination of different approaches. The result is a thorough understanding of the debate, how it evolved, and by what means a consensus can be reached. This topical-rhetorical analysis has proven that an approach to coding that looks for specific themes involving common, general, special, sub- and meta-topoi throughout a group of texts can distinguish the persuasive arguments for further examination. This approach also led to finding the meta-topoi category, which relates primarily to the 3Rs Principles. The methods used in this analysis can apply to other rhetorical studies as well as textual studies in science and medicine, especially when considering the rhetoric of a community that has multiple stakeholders who use varying argumentative strategies and approaches to a topic.

For this debate, the approach has been effective because the topic is rooted in what rhetorician Colleen Derkatch (2016) describes as the "collective efforts toward building a consensus about what we know about the world and how it works" (p. 45), which is a foundational concept for scientific research. This means that data and facts support the findings in the field of science, but these findings are not in a solid state of being; instead, it is a field that evolves and changes over time. How topics of argument within the research community become legitimized is a reason to consider the combination of kairology and close textual-intertextual analysis done in this project. Looking at the historical shifts in a debate regarding a specific topic will show how members of the community came to accept it over time. For example, the 3Rs

was first presented in 1959, but since that time the language has changed and it is now integrated and accepted as an argument and an applied practice within the community. This was a gradual occurrence that happened over time and through its acceptance within the community. These chronological changes of what becomes legitimate within the community depend on a combination of the mindsets among stakeholders, their visions, and the many "knowledge-making" (Derkatch, 2016, p. 45) actions that produce findings within this field. The field of science is also interactive, having "social dimensions" (Derkatch, 2016, p. 45) that have significant persuasive effects in the debate. This social aspect of the community means that the ethical arguments being made by those within this field will continue to influence the debate, and the practices implemented. Therefore, harmonization within the community between science and ethics, with the 3Rs Principles as a starting point for this collaboration, will continue to progress and influence the design of testing models.

Conclusion: The Future of the Debate and Additional Research

Follow-up research would assist in gaining a more focused understanding of current and future arguments on this topic among research professionals. In order to extend the analysis already presented, additional consideration of how the research community communicates with those outside their community and how these groups and individuals influence and contribute to the debate can be explored further. For example, patients and the general population are involved in this debate; therefore, their influences on the research community could be further analyzed in order to discover their role in the debate. To extend the concepts of moments in time and the categorization of beliefs based on time, interviews of future professionals or current professionals in this field could be conducted. The application of this topical-rhetorical analysis

to these interviews would result in richer information for the category "possibilities for the future," which was presented when looking at the beliefs and practices at a particular moment in time. Interviews such as these could also aid in the current understanding of the scientific communities' methods and discussions today. The interviewees could include students in the research sciences, professors who teach in this field, or actual practicing scientists. These questions could provide answers for tracking the historical process further and show ways in which topoi and the arguments they generate become legitimized. Using the textual information gathered on past and current arguments to frame interview questions in this way would broaden the scope of this project and provide more detail into the conversation. The interviews could consist of questions about their knowledge, opinions, and personal beliefs, and the findings from these interviews would provide insight into the future dialog on this topic. One important question in this research project is whether and to what extent there are ways in which further consensus on this topic could be reached within the professional community. Interviewing and coding the language of these current and future stakeholders would also provide an opening into further analysis of the current teaching practices about this debated topic.

The use of alternative testing methods in research is growing, both in practice and regarding what is being taught to future stakeholders (Burnett, 2009, p.38). Therefore, now is an important time to consider the arguments and pursue efforts for collaboration and consensus because this topic will only continue to grow. One of the underlying reasons for this debate relates to the varying answers to this question: Should humans have the right to use animals in whatever way deemed necessary without regard to their well-being, no matter the costs or potential benefits? The answer to this question varies depending on individual and community viewpoints of research animals, and the scientific methods currently used and believed to be the

most accurate and effective. From the analysis of these texts, answers range from a definitive yes or no, to those who believe that the answer depends on the circumstances and there is no concrete response to such a question. The 3Rs Principles, while useful for scientific purposes, are also an important topic of argument within this debate because of its underlying purpose of decreasing the practice of using animal models. In addition to this, humane practices and regulations that protect a research animal's well-being are continually being questioned and reevaluated through these principles. Therefore, the topical patterns found among the texts analyzed show how the different arguments are generated and framed by a variety of layers that can be used to unravel and reassess beliefs and practices. These layers provide a way to look more closely at the arguments and show the important aspects in the debate that lead to a reanalysis of current and past practices where ethics are called into question. The reevaluation of beliefs and practices in this debate can gradually change the belief system of the field and thereby the practices used when designing vaccinations for humans.

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