Animal Health and Therapy Reports (2023)2:2: 02-11 ***02***
DOI: 10.31491/AHTR.2023.02.002

RESEARCH

Message Convergence as Reassurance about the Safety of the Food Supply Concerning African Swine Fever Virus

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Abstract

Foodborne illness remains a serious risk for consumers. Knowing their vulnerability to this risk makes audiences attentive to risk messages about food safety. Though much is known about risk and crisis communication responding to known cases of foodborne illnesses, less in known about reassuring messages that the food supply is safe. This study expands our understanding of message convergence by exploring how audiences react to convergent messages intended to reassure them that no risk exists. Focus groups observed and responded to a series of messages explaining that African swine fever, though a threat to the pork industry, is not a danger to consumers. Most focus group participants recognized and saw value in message convergence based on accurate science attributed to credible sources. The study concluded that message convergence is effective in promoting reassurance; however, message convergence cannot be fully effective or sustain its positive influence unless it is ethical, adapted based on continuous dialogue with and feedback from audiences, and maintained over time. Despite these rigorous demands, message convergence has clear potential as a communication strategy for providing reassurance to audiences about the safety of the food supply.
Keywords: Message convergence, foodborne illness, African swine fever, focus groups

Introduction

According to the Centers for Disease Control and Prevention, each year 48 million people, or 1 out of every 6 Americans, will contract a foodborne illness [1]. Given the likelihood of being personally impacted by foodborne pathogens, consumers are aware of some level of risk and seek out the latest recalls, warnings, and information as data becomes available [2]. Foodborne illnesses are wide-reaching and impact all areas of the agricultural, food production, and food service sectors [3].

The U.S. swine industry has faced several potentials and realized crisis situations over the last decade, including the Porcine epidemic diarrhea virus (PEDv) in 2013 and more recently the COVID-19 pandemic. Though COVID-19 did not infect swine, the shortage of processing and packing workers available to move pigs throughout the food production process heavily impacted the industry, causing a backup of swine and resulting in the killing (culling) of thousands of pigs in the U.S. The story was reported by major broadcast, print, and social media outlets, and brought the spotlight back to the swine industry [4]. The news coverage caused public outrage, and speculation began about the millions of healthy swine that were euthanized because of poor planning. In addition, consumers were given an inside look at the pork production process, which created a new awareness of the potential risks within the swine industry to both animals and humans.

One area of ongoing potential threat to the swine industry is African swine fever virus (ASFv). ASFv is a highly contagious and deadly virus that infects both feral and farm-raised pigs. Fortunately, ASFv has never been found within the U.S., but it has caused significant swine losses around the world, including sub-Saharan Africa, China, Mongolia, Vietnam, as well as within parts of the European Union [5]. Though ASFv is a significant potential threat to the U.S. swine industry, the illness cannot be transmitted to humans through human to animal contact, and people will not become ill if they consume pork products containing the virus [6]. Despite these biological facts, consumers and other stakeholders in the swine in-

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Received: 23 September 2022 / Revised: 10 January 2023
Accepted: 10 Feburary 2023 / Published: 15 March 2023

dustry are frequently forced to, as Trotta *et al*. [7] explain, "unravel fake news" spread in the domain of veterinary medicine generally and on the topic of ASFv specifically.

When confronted with a crisis, the stakeholders on many levels seek to resolve uncertainty by locating information about "whether the crisis will affect them, how they should think, and what they should do" [8]. As risk and crisis communication research has progressed, the influence of consistent or convergent content shared by multiple sources in warning messages about specific agricultural threats has been consistently established [9]. This research has focused on multiple government and media sources identifying points of consistency in what is known even when a great deal of uncertainty remains about the risk or crisis at hand [2, 9, 10]. Less is known, however, about the role of such message convergence from multiple sources intended to reassure audiences about the absence of risk. Specifically, how do message recipients, particularly consumers, respond to convergent messages focused on reassuring them the food supply is safe?

This study expands our understanding of message convergence by exploring how audiences react to convergent messages intended to reassure them that no risk exists. Previous research has focused on message convergence during high risk or crisis events. Specifically, a diverse audience of consumers viewed broadcast messages reassuring them that the swine industry is committed to a) avoiding the introduction of ASFv in the U.S. and b) that even if ASFv were present in the U.S., the disease cannot infect humans. Thus, this study seeks to answer the research question: To what extent does message convergence reassure consumers about the safety of an animal food product that is threatened by a novel disease? This study has the potential to inform the risk communication process in the agriculture industry by extending research of message design from the reactive to the proactive realm. Such proactive communication may prove beneficial for addressing the ongoing threat of misinformation and disinformation that Trotta *et al*. [7] identify among such diseases as ASFv. We begin with a review of the message convergence literature, particularly the message convergence framework. We then explain our materials and methods used in the study, discuss our results, and provide conclusions and suggestions for future research.

Message Convergence Framework

The Message Convergence Framework (MCF) was born out of Perelman and Olbrechts-Tyteca's [11] treatise, *The New Rhetoric: A Treatise on Argumentation. The New Rhetoric* seeks to understand the processes by which publics informally reason their way to conclusions and resulting actions based on the multiple messages they receive [12]. The MCF explains that audiences of different backgrounds, experiences, and values often share similar reasoning for choosing a particular action or behavior. Though past research has shown that identifying areas where messages in risk-based scenarios converge can help practitioners craft more effective messaging, little is known about how the public will respond to risk-based messaging that reassures audiences that the risk will not impact them directly.

Anthony *et al*. [2] distilled three central propositions for MCF based on the work of Perelman and Olbrechts-Tyteca [11]. First, they noted that converging claims made by distinct sources increases the perceived strength of the claims. Second, they observed that the strength of convergence was influenced favorably by the importance of the topic to the audience. Finally, they established that, though convergence may be widely recognized by an audience, convergence can weaken or dissolve over time as conflicting information is discovered and presented. Sellnow *et al*. [9] extended the third proposition to argue that organizations challenged by convergent claims based on false evidence, such as the fake news referred to by Trotta *et al*. [7], can begin the convergence process anew by contesting those false claims.

Considerable work has been done to understand the role of message convergence during crisis circumstances. For example, Sellnow *et al*. [9] used the MCF to describe how members of the pork industry worked with agriculture journalists to present a convergent message during the PEDv epidemic. They explain that the initial challenge was to recognize the source of the mounting animal deaths was indeed PEDv. Swine veterinarians were essential to this process. Similarly, Zhao *et al*. [13] applied the MCF to observe the role of trust in government agencies during the COVID-19 pandemic. They documented patterns of information seeking that demonstrate the importance of trust in government sources in building positive message convergence.

Distrust of government sources often arises through misinformation and false claims, or disinformation spread through social media [14]. Social media is a primary means through which false claims are spread rapidly and broadly. Ye and Ki [15] explored the potential for organizations to cultivate message convergence on social media when confronted by a crisis. Previous studies of organizational crisis communication within social media mainly focused on communication within or between organizations. Less is known about the impact of multiple messages from multiple sources through social media on how the public perceives the reputation of an organization. Using the MCF, Ye and Ki [15] explored the impact of crisis communication strategies and message convergence on how audiences view an organization's reputation on Facebook in a preventable crisis. The results suggest that organizational reputation was impacted by the consistency between the organization's Facebook posts and followers' comments and was also influenced by the perceived credibility of those leaving comments. This study suggests there is value in promoting positive message convergence with the public—in this case, social media followers before, during, and after crises. The current project extends the work of Ye and Ki [15] to explore the impact of message convergence to proactively reassure against potentially fallacious claims or unwarranted fears.

Incentive for seeking information is another factor in the influence of message convergence. Explicitly, the motivation for seeking out information about prevailing issues, particularly those requiring a scientific interpretation, var-

ies according to the degree of importance audiences assign to a topic [16]. Whether reporting of scientific information on a risk topic was convergent or divergent was not influential unless the issue was perceived as important. This finding offers further support for the observation of Anthony *et al*. [2] in their third proposition, that the impact of convergence is influenced by the perceived importance. Based on this evidence, the potential for convergent messages to influence audience perceptions is largely dependent on the degree to which they recognize or are inspired to recognize the issue as important to them.

Although most research applying the MCF has focused on crisis communication, a study by Herovic *et al*. [17] did focus on reassurance prior to a crisis. Herovic and colleagues conducted a case study using the MCF analyzing risk communication surrounding the L'Aquila earthquake. Several earth scientists were imprisoned after their message prior to the deadly earthquake in L'Aquila was interpreted as overly reassuring. The scientists were later acquitted when further evidence was presented establishing that the convergent message was based largely on a misinterpretation provided by a government spokesperson who was not a scientist. The authors conclude that convergence, particularly in scientific messages, should not exceed the evidence available.

In summary, message convergence has been studied frequently in crisis communication settings. The MCF, however, has been applied sparingly in the study of reassuring messages presented prior to a crisis. This study seeks to understand the function of reassuring scientific messages shared proactively about the lingering threat of ASFv.

Methods

A qualitative approach was taken, using focus groups to collect and observe audience critiques of convergent messages intended to reassure them that ASFv was not a threat to humans or to the U.S. food supply. After viewing each of three videos, participants were asked to share their level of confidence that the pork supply would be safe to eat if ASFv infects farms.

Participants

A total of 39 people participated in the focus groups from a pool of 148 people contacted. A total of 44 people were initially contacted through email by six of the researchers working on the project through their personal and professional connections. The remaining 104 people were recruited through snowball sampling by asking the original 44 potential participants if they knew of anyone else who may be interested in participating in the study. Participants had to be U.S. residents, over the age of 18, consumers of pork products, or a person who prepared and served pork at home. Of the 39 participants, 19 self-identified as female and 20 as male. Participants self-identified their age as follows: (3) 18-24, (11) 25-34, (11) 35-44, (4) 45-54, (4) 55-64, (5) 65-74, (1) 75-84.

Procedure

Six focus groups were conducted between March 29, 2022, and March 31, 2022. Focus groups lasted 41-52 minutes with an average of 47 minutes. The time it took to play the news video clips was not included in the total time. Informed consent was obtained for each focus group participant. The focus groups were conducted and recorded via Zoom technology. Focus group content was transcribed by a professional transcription service between March 31, 2022, and April 1, 2022. A total of 84 single-spaced pages was generated by the focus group discussions. Transcription did not include audio transcription of the video clips played during each of the focus groups.

Focus group facilitators were trained in best practices for the use of Zoom as a communication channel for focus groups. Participants were asked to remain unmuted unless they had excessive background noise. All participants were required to have their camera on. Participants were encouraged to use the hand-raising emoji if they wanted to alert the facilitator that they wanted to speak next while someone was speaking; otherwise, participants were free to talk at will. All facilitators reported there were no issues with interrupting, and that all participants actively participated in the focus group with no reported issues.

Each focus group included three short videos. The videos were modeled after a broadcast news story lasting between one and two minutes. Ecological validity was established through consultation with a broadcast journalist who was hired to create the videos. Factual content for the videos was taken directly from existing publications and video material shared about ASFv by the swine industry and United States Department of Agriculture. The first video included a single source reassuring audiences they could not contract ASFv. The second video included three sources with a convergent message that humans cannot contract ASFv. The third message included the three sources and a reference to the pork industry as a whole with an explanation of how biosecurity efforts are being used by the swine industry to keep ASFv out of the U.S. After each video, viewers were asked to discuss their level of confidence that ASFv could not infect them. They were then asked to describe their confidence in the source or sources and to mention any information or sources they felt were missing. The focus group followed the progression of showing a video, discussing the content, showing the next video, discussing the content, showing the final video, and discussing the content.

Analysis

The transcripts were analyzed qualitatively to identify key themes emerging from the participants. Initial questions for focus groups and the general coding categories were derived using an "*etic* analytical lens" established by "existing disciplinary knowledge" of MCF [18]. The coding categories began with knowledge of previous literature and allowed for discovery of nuance based on the messages' intent to provide reassurance rather than warning. Thus, initial categories focused on the message's presence or absence of convergence, perception of the sources presented, and the utility or perceived relevance of the message content. Coders read the transcripts independently

using a constant comparison method to determine the viability of existing categories and the need for further combination, recategorization, or the establishment of new categories [19]. The coders then met face-to-face to share their coding subthemes and to identify areas where the themes could be combined or relabeled. Discussion continued until consensus was reached. Coders then selected representative examples from the transcripts for each subtheme. Table 1 shows the themes and subthemes included in the analysis.

Results

Responses were grouped thematically according to the participants' perceptions of convergence in general, specific questions regarding the content of the messages, references specific to biosecurity, and other (Table 1). Representative quotations from participants are provided for each theme and subtheme. Respondents whose quotations appear in the results are coded by two numbers. Each focus group and each individual within each focus group were given a number. For example, person one in focus group two is referred to as participant #2-1. We begin with a discussion of participants' awareness of the absence, presence, and value of convergence.

Recognition of Convergence

As mentioned above, focus group participants viewed three messages differing in the number of sources providing convergent content. The third video also mentioned biosecurity as a form of convergence with other messages. Participants noted both an absence of convergence in the first video and the presence of convergence in the second and third videos.

Table 1. Themes and subthemes identified in focus group transcripts

Themes	Subthemes
Recognition of Convergence	
	Absence of Convergence
	Presence of Convergence
	Value of Convergence
Critiquing Message Content	
	Effective Message Content
	Message Content Weaknesses
	Missing Information
	Credibility of Message Sources
Biosecurity	
	Fear-Inducing
	Reassuring
Other	
	Imagery
	Financial Concerns

(1) Absence of Convergence

After viewing the first message with a single source, multiple participants recognized the lack of convergence in the first video. Participant #6-6 noted the problems with hearing from just one voice, suggesting: Yeah, I also feel like just watching that video and getting all of our information from one person and nothing else, like information can be… you can get it from one person anywhere and it can be completely wrong. So, who are we to just trust this one person that we've never seen before. I've never been to Iowa, so I don't know who she is.

Similarly, Participant #4-6 pointed out that, in the first video, "It seemed like they didn't give nearly enough information. They gave like one source from one random veterinarian. If they would have given more sources overall, I feel like it would have been more useful." Participant #6-3 shared a similar perspective, noting: I feel like the fact that they only gave one side and one person talking and then they just cut it back, it's not… I mean I think you need more sources to make something reliable or something at least a little bit believable. So just having her talk and then that's it, I don't think it's as credible as having multiple sources.

Clearly, the lack of convergence was a recognized weakness in the first message.

(2) Presence of Convergence

In addition to recognizing the lack of convergence in the first video, many participants recognized the presence of convergence in the subsequent videos. Comparing the second video to the first video, Participant #3-5 commented, "I think it was nice that the second video incorporated those other sources. I think it makes the message stronger." Likewise, Participant #3-1 valued having more than one source confirming the information, suggesting that "having somebody who is a secondary expert, or, like, just as, just a second expert at all, I think, it, kind of, helps out a bit." Participant #3-4 agreed, stating, "I think having more people speak made me feel more confident." Reflecting on the alignment of the sources, Participant #2-2 noted, "Whenever for me you have multiple sources confirming the same trajectory or the same direction, it always feels a little more confidence producing."

(3) Value of Convergence

In addition to identifying the presence and absence of convergence, some participants specifically reflected on the value of convergence. Participant #2-4 explained: I just think the fact that they all agreed 100% with each other, there was not really any variation in their message. It was safe, and it did not cross over to humans. Nobody had a different message. That was confidence producing.

Along these lines, Participant #3-4 stated, "Ultimately, it really wouldn't matter to me who gave the message, it's more about the consistencies in the message." Others saw the benefit of having multiple voices from multiple areas of expertise. As Participant #2-1 suggested, they preferred the video(s) that demonstrated convergence because "each one... brought just a little bit of something different to the table. They brought a little bit more information or a little bit more background from it." The value of convergence was also noted through its contrast with the first video's lack of convergence. As Participant #5-1 suggested: I think when we watch one person who is acting as the expert message sender, that is a red flag to me. It's like saying nine out of ten dentists surveyed that Crest is the best

toothpaste, but did we survey a million dentists or only ten? I don't question her credibility in her field, but that one person is not enough for me.

The value of convergence was clearly expressed by the majority of study participants.

A few participants had an alternative perspective on the value of convergence. For instance, there was also some concern over the possible bias in sources; as Participant # 6-4 noted: The source was an Iowa veterinarian and they made it pretty clear that Iowa is the number one pork supplier in this country. They all have a vested interest in continuing to keep our confidence in their economy basically. So, I would want one more, at least one more, confirming source to make sure that that wasn't just a biased view.

Further, while the aim of the message was to reassure participants that the pork they eat is safe, the following example from Participant #4-4 illustrates where the convergence had the opposite effect. They stated, "I think I do have less confidence in it now because you know, one story is interesting. The second story kind of elaborated a little more. And it's like yeah, I think there is something going on."

Critiquing Message Content

Although most of the study participants saw convergence as a notable asset to the ASFv messages, a minority saw the convergence as problematic. An explanation of how respondents critiqued the content of the messages provides further insight into what they valued and what concerned them about the message content and convergence.

(1) Effective Message Content

Many participants were eager to share their views on the value of the content being shared in the videos. One of the categories of information most frequently cited as being helpful was information on how the disease cannot be transmitted to humans. When asked if they would still eat pork after viewing the videos, Participant #3-5 stated, "Yeah, I would still eat it. I mean it said that it's not a concern for humans. So that was key for me." Similarly, Participant #2-4 expressed that when it came to eating pork, they were "still confident. I think that they stressed in the last video that this had been studied for a really long time. The fact that it cannot jump to humans and that it was biologically cell-specific for pigs." Participant #5-7 added: Particularly, I'm more comfortable that the virus won't pass to a human. They made that very clear, and they talked about the people who have spent hours and hours and hours around these pigs and have never gotten the virus.

Along these lines, some participants noted that they found the scientific data shared to be particularly valuable. Participant #2-6 stated, "I feel like the data points in this were a little bit more scientifically backed, and therefore easier to believe." Likewise, Participant #4-6 expressed: I'll say that I was a lot more convinced by this video because the narrator also said that this was a scientific fact that it wouldn't spread to human. Like I would go out and do my own research as well to make sure that was legitimate, but it was also more reassuring to me, like oh, this is obviously scientific fact.

Participant #2-6 also touched on the value of sharing scientific data and the ability to verify it for oneself, noting that, "These individuals provided the data for at least me to be able to go look up more information on my own if I chose." This sentiment was also shared by Participant #5-8, who expressed approval when they added, "you'd certainly be able to at least research more sources."

(2) Message Content Weaknesses

Some information was seen as being unhelpful. For example, Participant #5-7 perceived a contradiction: Unless I missed something, they're mostly focused on the virus transmitting to a human, not transmitting to a human through eating of the food. I don't—unless I missed it—nobody has said yet that the virus doesn't live in cooked pork, or you won't have to worry about this even if the pig you eat had the virus as long as your pork is fully cooked. I still don't feel comfortable, because I feel like they're focused on the wrong thing. Yeah, I'm not even going to be around a pig, so getting the virus from a pig doesn't concern me. It's more what if I eat the pork that came from the pig, and I don't feel like that's been really thoroughly addressed.

Several other participants perceived similar inconsistencies in messaging that they considered troubling. For example, Participant #3-4 suggested: There were a couple things that were a little, like, "I'm not sure about that." For instance, they said, on the one hand it doesn't affect humans at all; on the other hand, we're working hard to make sure none of the contaminated pork gets in the human food supply. And it's, like, "Well, why do you care if it's in the human food supply if it doesn't affect humans at all?"

Participant #5-4 made a similar observation, stating, "To me, it's very contradicting in a particular point. It says it does not affect the food chain at all, but yet at the same time, it kills half of the supply. What?"

Another type of information participants expressed suspicion towards was when it appeared that speakers were making claims without evidence. Participant #1-1 stated:

I honestly say that my confidence is actually a little lower than it was after the first video. I did like the information provided about, you know, that the certain cell that is unique to the pig which is why it can't infect humans. But I felt like there was more emphasis on USDA not letting "bad" meat into the system.

Similarly, Participant #2-6 asked, "Has there been a study where people have eaten that particular meat and did not come down with it?".

Interestingly, several participants felt that the information and warnings being provided made the issue seem like it was actually more serious than was being publicly shared. As Participant #1-2 asked, "I'm like why would they be on alert if nowhere in America or you know, everything is so safe." Participant #3-4 had a similar view, warning: I think you have to be careful, though, about adding some about food safety because for me, that could almost have the opposite effect. Because if you say, "Here's how you need to cook your meat," then I'd be, like, you're lying to me. This is really going to affect humans and that's why

you're telling me.
Though respondents found value in much of the message content, some participants also had concerns about elements of message content. In addition, some participants found the messages failed to provide key information they wanted to know.

(3) Missing Information

The participants were particularly vocal about the information they felt was missing from the videos. One of the reoccurring items they pointed out was they wanted to hear about the processes in place to ensure sick animals do not enter the food chain. For example, Participant # 1-1 wanted to see more about the testing protocols or procedures: Like how are they verifying that it isn't here yet after making those claims. And what are they going to do if it is detected? But it, the second half of that isn't as important to me as the first half of that. Well, how are you ensuring that it isn't here?
Similarly, Participant #1-3 expressed a desire to see "Maybe how they test and what percentage of hogs are tested. Do they do a sampling of five percent or 50 percent or more? That would be nice to know." Along these lines, Participant #6-2 suggested "Maybe also include testing procedures or what they're doing for testing. Like how are they identifying the sick pigs other than the pigs lying on their sides that we saw in the video."
Another question was, as Participant #4-7 inquired, "I would like to know like are they working on developing like a vaccine for these hogs? Are they, you know, are they working on some sort of medication they can take?"
Additionally, some participants wanted to know if there are ways of checking if the meat is contaminated. Participant #4-7 asked: Maybe the industry would layer on some sort of testing to assure you that like meat is tested for and for being virus free. And then, you know, so you had that assurance when you were buying it like oh, this is antibiotic free and you know, swine flu, swine fever free.
Similarly, some participants wanted to hear more about food preparation safety measures they could take to reduce the risk of contamination. As Participant #1-3 commented: I was just curious as to whether there has been any testing to see if a contaminated animal gets through the system, does cooking it, making it or any food preparation that they recommended temperature for pork eliminate the contamination or does it get through the cooking process also.
Likewise, Participant #3-3 noted, "I don't know if you have to cook at more temperature or less, what? Maybe a little piece from a food expert would've, instead of just pork."
Multiple participants were curious where the disease has spread so far. Some were particularly concerned whether it may have unknowingly spread to the U.S. Participant #2-6 asked: When they are sitting there saying it is not here, where are the data points to support that? Did they check three pigs and say it is not here? Have they tested every pig to say it is not here? Is it only Indiana, but maybe it exists in California?
Another area participants felt the videos lacked information on was how other countries are dealing with the issue. As Participant #5-6 expressed: If we had heard maybe something about what farmers and the agriculture industry is doing in Asia where the problem is much more severe, or I guess existing at all. Hearing what they're doing, that's good. You know, even though a lot of their pigs are sick, no one over there is getting sick from eating pork. So, something they're doing, seeing how they're processing their livestock in terms of the biosecurity that you were mentioning would give a little more confidence.
Relatedly, some participants also wanted to learn about the case numbers so far. As Participant #2-3 noted, "I would like to know the number of cases in countries that we import pork from."
Some participants wanted to learn more about practical health impacts, such as how the disease is transmitted and how it might impact humans and the meat they eat. As Participant #1-1 suggested: They said that it won't affect humans. But I don't think they said in what way. So, you mean like the infectious disease itself cannot be transmitted to us through certain touch or however, or is that through eating of the meat, if that animal did have this disease and it went through the whole process kind of and then like what was said like cooking a certain temperature take that risk away. But it just said it couldn't affect humans but not necessarily in what way, at least I don't think they did.
Extending this observation, Participant #1-6 questioned, "What are the side effects of consuming contaminated meat?"
Some participants had hoped to glean more statistical and graphical representation of data in the messages. Participant #4-6 commented: I was going to add as well, in all three videos there was a lack of statistical data. I feel like if they would have shown like a bar graph of how the disease has progressed over time, sort of like how they've done with COVID.
Several other participants expressed the desire to see more graphics, charts, or visual aids adding to the information being presented in the videos. This included scientific visuals, as reflected in.
Participant #6-1's comment, "I would like to see graphs and charts that are tracking everything. And just use comparative data between the different countries and see where the exact red zones are and see if there is a spike in sicknesses in people."

(4) Credibility of Message Sources

In addition to the content presented in the videos, the sources sharing the information were subject to both praise and criticism by the participants. Multiple participants commented on the qualifications of the individuals in the videos. To that end, some participants questioned the relevancy and ethos of the state veterinarian solely featured in the first video. As Participant #2-6 noted, "If the person that takes care of my cats says the food is safe to eat, I don't know if that is the person I want to be relying to for truth to source on that." This elicited the opposite reaction from at least one participant, Participant #3-6, who also commented on the state veterinarian: But

I mean, I trusted the veterinarian because, I mean, they weren't a pig farmer, and they weren't somebody directly that, like, benefits. I mean, like, they treat the animal, but they don't directly benefit from profits. So, I was just, I trusted them.

A second veterinarian/professor who was shown working with pigs on a farm was on the whole viewed as being more qualified than the state veterinarian who spoke from a desk and a public health expert. For example, Participant #3-3 stated: I thought the second veterinarian, it added some, almost accountability because I think they said that he also writes the rules for the FDA. So, if he is out there saying, like, it's not the threat. So yeah, it adds credibility, and a little bit of accountability, I think.

Beyond their individual qualifications, many participants commented on the agencies these individuals represent. Several participants expressed skepticism over government agencies and those who belong to them, particularly the FDA. Participant #1-2 stated: I believe our government is interested in safe food and United States compared to other countries, especially third world countries, *etc*., you know, is known for their safety. But I am skeptical of, you know, FDA and those knowing what they approve and what they don't approve in other areas outside of like the pork.

Although the sources featured in the videos were perceived as credible by the majority of participants, a few participants raised minor concerns about the motives of the sources and the agencies they represent.

Biosecurity

When commenting on the biosecurity elements included in the third video, the study participants were divided in their reaction. Some felt the added reference attributed to the pork industry about biosecurity heightened their fear, while others found the message reassuring. Still others questioned whether the added mention of biosecurity was intended to manipulate their reaction to ASFv.

(1) Fear Inducing

Some participants felt that references to biosecurity were fear-inducing, despite the intention of these references to reassure people that the appropriate safety measures were being taken. As Participant #5-3 commented, "That whole thing about the bio thing, it was kind of like introducing a nuclear wasteland or something to it, so not giving me much confidence."

It seems that the visuals associated with biosecurity measures heightened participants' concern and sense that something was wrong. Participant #6-4 elaborated: I personally I think probably went backwards in the wrong direction after that video. Just some of the visual. Like why do the humans have to sanitize themselves in a shower in between entering a facility if there's no danger of cross contamination between humans and pigs? And just more showing how many precautions they're taking, like in between herds being brought into the food processing plants. It just seems like that almost frightened me more.

Comments such as these suggest that some participants recognized their impressions were counter to the intent of the video. As Participant #5-8 astutely noted: It definitely seemed to be doing more…well, it was putting more time into explaining what was being done to keep infected animals from ending up in our food, but I can see how some of the imagery might spur more concern over it. So, I can see that it was trying to spend more time allaying those fears, but ironically, some people are seeing that as more concerning.

In short, a minority of participants actually felt less reassured after viewing the biosecurity content.

(2) Reassuring

While the biosecurity measures heightened some people's fear and concern, other participants viewed them in a more positive light. Participant #3-1 noted, "I felt a lot more confidence with the ending section, specifically where they were showing imagery of actually spraying down, like, the hog pens." These biosecurity measures were viewed by the majority of participants as being helpful and consistent with their understanding, as Participant #4-7 commented: I felt a little bit more confident seeing the procedures that are taken to help or to help prevent this from spreading to you know, American farms. And it seemed to make sense. Like it was logical and consistent with what I would expect might be in place to help prevent that.

Participant #3-6 pointed out that the positive association with cleaning measures may be related to the recent COVID-19 pandemic, suggesting: I think the images of the pens being cleaned was more reassuring than it was, like, confidence boosting. But I think that's also just because we're coming off of, like, the corona, coronavirus, and, like, everybody had to clean everything, and just, like, general cleanliness needs.

Other Findings

While most of discussion fit within themes related to message convergence, two extraneous sub-categories were also uncovered: video imagery and financial concerns.

(1) Imagery

Some respondents made note of the imagery in the videos. For instance, with regard to the video imagery, Participant #1-4 observed: The images that were used were like concerning to me because I thought oh, no, I thought pigs were treated better in places. And the way that they were just all squished together, it made me think oh, if it comes here, it's definitely like, it's going to spread because those don't look like sanitary conditions. So, the imagery used was honestly, it grossed me out.

In contrast, other participants expressed an appreciation for the video imagery and production quality, noting that it added to the credibility of the message for them. Specifically, Participant #3-6 said (regarding the impact of the video imagery on credibility) "it's a little bit of both, it's, like, the fact that there were more sources, and the fact that the production crew put more effort into it".

(2) Financial Concerns

Financial concerns were also observed as a sub-category that arose in multiple focus groups. For instance, Participant #4-2 expressed: I also wondered just how it will affect, potentially affect pork prices. You know, if you have to kill off a bunch of hogs and you're only leaving a few good ones, like it's going to, I would assume, raise the price a lot. So, I guess that would be some sort of impact it would have on the market.

Similarly, Participant #2-5 stated: I think the other concern is the price of pork could possibly go up if they are slaughtering all these pigs that are contaminating, and they could spread it. We could be running out of pork in the supermarkets again like we did with chickens a couple of years ago.

These financial concerns seemed to be shared by a number of a participants, as Participant #2-4 also noted, "I was more concerned about the $15 pound of bacon I was buying." For some, this concern seemed to be one of the more salient themes of all three videos, leading Participant #1-6 to question the intent of the videos altogether: I'm more questioning who the actual target audience is. I know that there is a swine [problem], right, like making sure you are not eating contaminated meat, but really is this preparing us for an increase in price and a disruption in distribution, and impact to the farmer, or is this really a health alert?

Though discussion of imagery and financial concerns were consistent, they occupied very little of the focus group discussion time.

Discussion

This study explored the potential for message convergence to reassure audiences about an important issue before it potentially manifested into a high risk or crisis event. ASFv is a looming threat to the U.S. food supply but is not currently present in the country. The messages progressing from an absence of convergence to convergence and ending with convergence and biosecurity examples did, for most study participants, provide reassurance that the food supply is and would remain safe. Thus, MCF is viable for fostering reassurance in pre-crisis contexts. This overall finding, however, comes with several cautions regarding message content in general and messages emphasizing biosecurity specifically.

Given the ability of participants to distinguish between the presence and absence of message convergence and the majority of participants' perception of the value of convergence, the strategy of providing convergence in messages early in discussions of evolving risk issues is advisable. Trotta *et al*. [7] commiserate with veterinarians who must toil with sources of what they label fake news as they seek to communicate the facts of ASFv and other animal diseases. Providing explanations of ASFv and other diseases with clear representations of message convergence is one means of adding positive influence to risk discussions. Doing so provides an early countermeasure to the misinformation that can spread quickly about risk issues. This study suggests, however, that message convergence can benefit from ongoing public dialogue and feedback.

The majority of study participants recognized and saw value in message convergence. A minority of participants, however, also identified content they felt was missing and concerns about some of the sources providing convergent messages. For example, some participants were not persuaded by the convergent messages because they remained fearful that they had not heard enough reassurance about how to cook potentially contaminated pork. Adding this information to reassuring messages is not difficult; however, practitioners would not necessarily know cooking procedures are important to an audience without engaging them in dialogue or seeking feedback to their initial messages. Similarly, a minority of participants had concerns about individual sources and the agencies they represent. Although the concerns were not consistent toward any single source or agency, the fact remains that individuals view convergent messages with preconceptions about some sources. Dialogue and feedback are needed to recognize when a particular source or agency is not seen as credible for a particular audience or subgroup. Thus, future applications of MCF in research and consultation with practitioners should include an emphasis on dialogue and feedback to determine what aspects of message convergence are problematic. Without corrective action for problems perceived by audiences, message convergence cannot reach its positive potential.

Perelman and Olbrechts-Tyteca [11] introduced message convergence with the expectation that audiences would continuously seek information about topics of importance to them. In response, the propositions Anthony *et al*. created emphasize that convergence is ongoing and can change over time [2]. Indeed, participants in this study were complimentary of the fact the information shared in the videos could serve as a basis for their future inquiries. In contrast, some participants indicated that they simply needed more information and intended to find it on their own. Neither response is surprising given the findings of previous studies [9, 20]. The point is clear. A single message providing convergence is a step forward, not a destination. Audiences will continuously seek or demand strategy information about issues of importance. Thus, message convergence is a form of risk communication that must be undertaken with regulatory on given risk issues if it is to have the level of influence advocated by Trotta *et al*. [7].

This study also revealed that a minority of participants feared the message convergence they observed could have been contrived or manipulated. Such doubts in the veracity of claims can thwart efforts to inspire reassurance. Again, feedback and dialogue are needed to assess the degree to which particular audiences perceive such manipulation. Once known, practitioners can and should respond with accurate and ethical information audiences want or need to hear. Herovic *et al*. [17], however, offer a stern warning against attempts to over-reassure an audience by making claims that outpace the scientific evidence available. If the evidence available at the time is not convincing for audiences, despite high levels of convergence, practitioners should show patience. Herovic *et al*. [17] document the harrowing results of over-reassurance and communicating beyond scientific fact in an earthquake-prone area.

Biosecurity was introduced in the third message as an example of convergence on best practices for controlling the spread of ASFv. Although the majority of study participants found the biosecurity messages reassuring, a minority responded that the protective measures were ironically stress-inducing. Seeing brief footage of workers preparing to shower in and shower out of a swine facility and watching individuals spraying facilities with pressure washers made some feel the situation was much worse than they were actually being told. Why, they wondered, would such measures be needed if ASFv is not in the U.S. Future efforts to study the potential influence of biosecurity measures to promote convergence need to include a more general explanation explaining that biosecurity is an ongoing practice used to protect animals from multiple disease threats, not a measure introduced occasionally when severe risks or crises are imminent.

Summary

Foodborne illness remains a serious risk for consumers. Knowing their vulnerability to this risk makes audiences attentive to risk messages about food safety. These messages, however, are as prone to misinformation as any other risk issue [7]. Message convergence has the potential to reassure audiences through clearly explained scientific evidence that is endorsed by multiple, credible sources. This risk communication strategy, however, cannot be fully effective or sustain its positive influence unless message convergence is provided ethically, adapted based on continuous dialogue with and feedback from audiences, and maintained over time. Despite these rigorous demands, message convergence has clear potential as a communication strategy for providing reassurance to audiences well before an issue reaches high risk or crisis levels.

Declarations

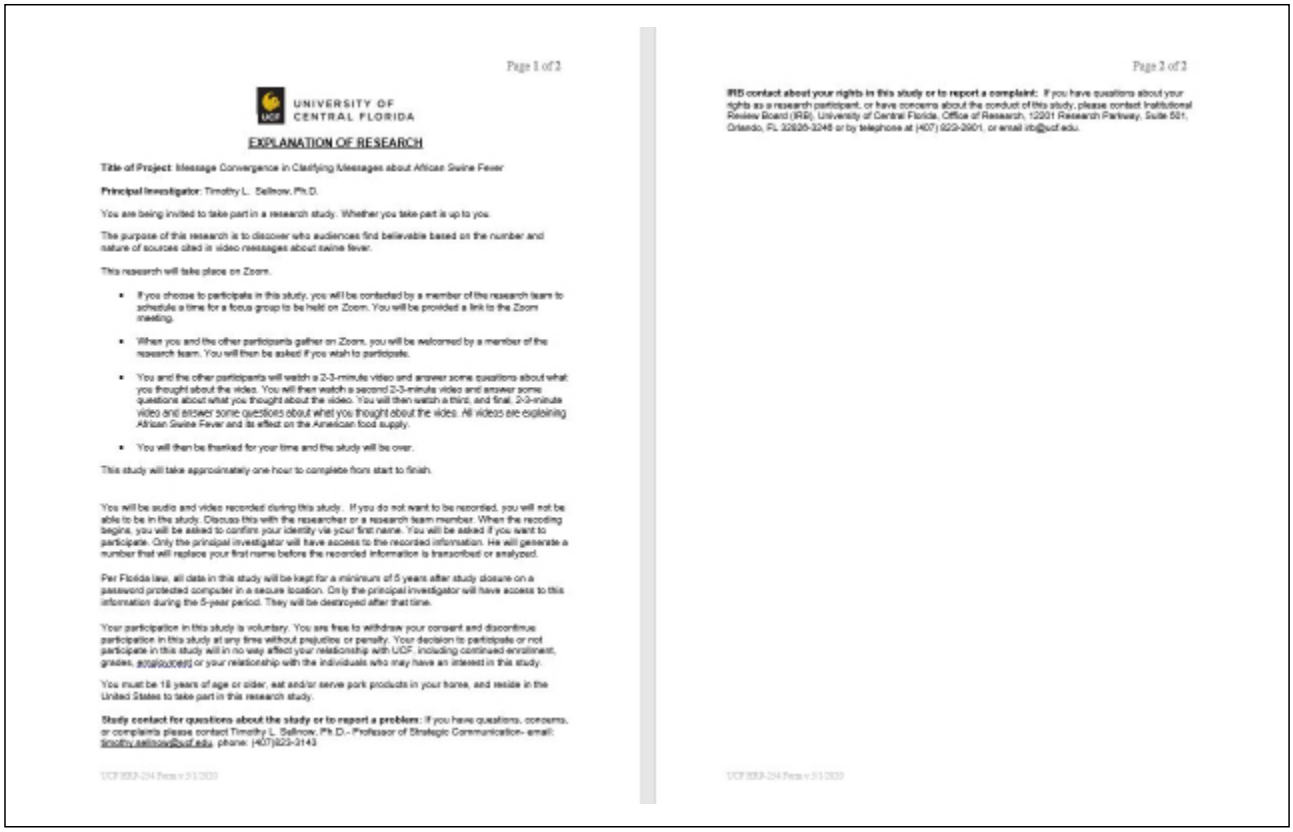
Authors' contributions: Performed data analysis and interpretation as well as data acquisition and administrative support: Mayer M, Vega J. Performed data acquisition as well as provided administrative and analytical support: Demarco I, Eicher R, Flores Molina D, Lee C, Perez Naufel J, Sheng X, Sublette J. Made substantial contributions to study planning and execution and reviewed the literature: Freihaut R. Made substantial contributions to conception and design of the study and performed data analysis and interpretation: Sellnow TL.

Availability of data and materials: Data supporting our findings can be retrieved from the corresponding author upon request.

Financial support and sponsorship: This research was supported, in part, by a grant from the United States Department of Agriculture; National Institute of Food and Agriculture [2015-69004-23273].

Conflicts of interest: All authors declared that there are no conflicts of interest.

Ethical approval and consent to participate: The University of Central Florida Institutional Review Board approved this study (Ref #STUDY00003893). The approved



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UNIVERSITY OF CENTRAL FLORIDA

EXPLANATION OF RESEARCH

Title of Project: Message Convergence in Clarifying Messages about African Swine Fever

Principal Investigator: Timothy L. Sellnow, Ph.D.

You are being invited to take part in a research study. Whether you take part is up to you.

The purpose of this research is to discover who audiences find believable based on the number and nature of sources cited in video messages about swine fever.

This research will take place on Zoom.

- If you choose to participate in this study, you will be contacted by a member of the research team to schedule a time for a focus group to be held on Zoom. You will be provided a link to the Zoom meeting.
- When you and the other participants gather on Zoom, you will be welcomed by a member of the research team. You will then be asked if you wish to participate.
- You and the other participants will watch a 2-3-minute video and answer some questions about what you thought about the video. You will then watch a second 2-3-minute video and answer some questions about what you thought about the video. You will then watch a third, and final, 2-3-minute video and answer some questions about what you thought about the video. All videos are explaining African Swine Fever and its effect on the American food supply.
- You will then be thanked for your time and the study will be over.

This study will take approximately one hour to complete from start to finish.

You will be audio and video recorded during this study. If you do not want to be recorded, you will not be able to be in the study. Discuss this with the researcher or a research team member. When the recording begins, you will be asked to confirm your identity via your first name. You will be asked if you want to participate. Only the principal investigator will have access to the recorded information. He will generate a number that will replace your first name before the recorded information is transcribed or analyzed.

Per Florida law, all data in this study will be kept for a minimum of 5 years after study closure on a password protected computer in a secure location. Only the principal investigator will have access to this information during the 5-year period. They will be destroyed after that time.

Your participation in this study is voluntary. You are free to withdraw your consent and discontinue participation in this study at any time without prejudice or penalty. Your decision to participate or not participate in this study will in no way affect your relationship with UCF, including continued enrollment, grades, employment or your relationship with the individuals who may have an interest in this study.

You must be 18 years of age or older, eat and/or serve pork products in your home, and reside in the United States to take part in this research study.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints please contact Timothy L. Sellnow, Ph.D.- Professor of Strategic Communication- email: timothy.sellnow@ucf.edu, phone: (407)823-3143

UCF IRB-234 Form v.5/1/2020

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IRB contact about your rights in this study or to report a complaint: If you have questions about your rights as a research participant, or have concerns about the conduct of this study, please contact Institutional Review Board (IRB), University of Central Florida, Office of Research, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901, or email irb@ucf.edu.

UCF IRB-234 Form v.5/1/2020

informed consent form is pictured below.

Consent for publication: Not applicable.

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Cite this article as: Mayer M, Vega J, Demarco I, Eicher R, Molina DF, *et al*. Message Convergence as Reassurance about the Safety of the Food Supply Concerning African Swine Fever Virus. *Animal Health and Therapy Reports*, 2023, 2(2): 02-11. doi: 10.31491/AHTR.2023.02.002