

Editorial: Harnessing the Power of Large Language Models in Agricultural Safety & Health



Invited Editorial

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HIGHLIGHTS

- Generative artificial intelligence will play a major role in the daily work of agricultural safety and health professionals.
- Properly trained large language models can assist educators, researchers, and clinicians in responding to agricultural safety and health questions.
- Numerous issues and obstacles must be overcome to use LLMs in these settings, including accuracy and completeness of responses, bias, and intellectual property concerns.

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The age of smart digital technology is upon us, and some authors have suggested we have entered the fourth industrial age, sometimes cited as “Industry 4.0” (Liu et al., 2020). This includes the development and widespread deployment of a range of tools that include artificial intelligence, machine learning, and a host of closely interconnected methods such as deep learning. There are obviously significant implications and applications for agriculture and food production, including within the profession of agricultural safety and health.

One significant AI form—Large Language Models (or LLMs) have seemingly burst onto the scene over the past year. While these AI-based tools are not new, the release and widespread publicity surrounding the release of the various versions of “ChatGPT” by the company OpenAI is a new phenomenon that has pushed the idea of generative artificial intelligence quickly and aggressively into the mainstream.

Generative AI, a category of artificial intelligence that includes LLMs, is already finding its way deeply into research (Stokel-Walker and Van Noorden, 2023). These models can serve as a support tool in a range of business areas (George et al., 2023) like healthcare (Xue et al., 2023), education (Cooper, 2023), and service or travel industries (Dogru et al., 2023). Descriptions of AI in today’s media conversations reflect both hopeful anticipation as well as anxiety (Anderson and Rainie, 2023) that it will change our economy, communities, and lives. Those of us in higher education will see shifts in how we do our research

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(Peres et al., 2023), teaching (Smolansky et al., 2023), and outreach/Extension activities (Ray, 2023a) as we apply AI-based tools to pressing societal challenges and research questions. This technology will also continue to impact how we work.

Since the arrival of OpenAI's ChatGPT 3.0 (OpenAI, 2023a), followed soon after by the paid "Plus" version of ChatGPT 4.0 (OpenAI, 2023b), I have spent considerable time exploring, thinking about, and deploying this tool in my workflow as an Agricultural Safety and Health specialist and professor in our biological systems engineering department at UW-Madison. I have used LLMs and generative AI image generation such as Midjourney (Midjourney, 2023) in several facets of my extension, research, and classroom teaching. In this article, I suggest and demonstrate five specific use cases that I believe will have a place soon for practitioners in agricultural safety and health. I will also discuss three issues, barriers, and hurdles that we will need to overcome as generative AI becomes more heavily used in our field as well as other sectors of health, agriculture, and connected industries. Note that every week, the landscape around generative AI changes with new models, use cases, and an ever-evolving legal landscape. I have attempted in this editorial to capture not only current use cases but also the nature of the evolving issues and concerns that will be with us for several years to come.

Use Case 1: Responding to Technical Questions

The most obvious use case for a well-trained LLM is to answer technical questions common for people who work in agricultural safety and health. This can include extension experts, clinicians, educators, engineers, researchers, and other experts who get queried by individual producers, the media, healthcare providers, or agricultural professionals. The Appendix shows the responses from ChatGPT 4.0 to several common questions I get several times a year, depending on the season, conditions, and other factors. The specific questions shown are:

- What are the main hazards associated with working around stored manure on a typical livestock or dairy farm?
- What safety-related advice should I provide to a retired man and woman who recently purchased a hobby farm and plan to purchase a tractor?
- A farm parent asks at an event if you think it is safe for their 11-year-old child to drive a tractor. How would you answer?
- What questions and concerns should the transplant team at the local research hospital address or at least consider with farmers who undergo lung transplants and plan to return to the farm, given that there is little literature available on the topic? (note, this was a unique and one-time question from 2023)

Since I have over three decades of research and Extension experience in each of these general areas, a quick review of each of the LLM generated responses seems concise, reasonably accurate, and serves at least to be an adequate starting point to guide further exploration. In the case of the lung transplant inquiry, I had found very little in the academic literature, but I had brainstormed with the group who inquired, and later found that the LLM response to be helpful and suggested some avenues for questions I had not previously fully considered.

The "prompts" (Ekin, 2023) used to respond to technical questions of an LLM are important, and I have found it helpful to provide as much context as possible, in some cases explaining the "role" that you want ChatGPT 4.0 to play as it formulates its response. I have

also found it helpful to ask the AI, “What ten questions are among the most important in helping answer a question such as _____?” This ensures more thorough consideration, often suggesting new avenues for conversation, which often leads to my clientele arriving at an acceptable solution simply by helping them to think critically about problems or situations. As an example, here is an alternative way to ask one of the aforementioned questions:

- I am a farm safety and health specialist at a Midwest university. After a presentation on farm safety, a dairy farm couple approached me asking if I think it is safe for their 11-year-old child to drive a tractor during routine work on their family farm. What are ten questions I should ask that will help us arrive at an acceptable and accurate answer? The questions should be based on evidence or research-based information. (the response is provided in the Appendix)

Again, from the responses in the answer provided by the LLM, these would generally be the types of questions I would use to lead parents of a child through this process of thinking, considering, discussing, and arriving at a recommendation or decision. Often, in these roles we play as ASH professionals, it is our job to help our clientele eventually arrive at a suitable and safe answer by “asking the right questions” and/or encouraging the client to arrive at the most important questions that get to the root of their concerns. In this case, ChatGPT has been helpful for me in this role.

It is beyond the scope of this editorial, but several LLMs also provide the opportunity to include consideration of known, trusted, publicly accessible websites and documents that the model considers in formulating an answer. While ChatGPT 3.5 and 4.0 only considers “training data” collected and processed through late 2021 (Ray, 2023b) in its foundation in providing its responses, there are “plugins” available for free or at low cost that allow the user to specify specific technical information from which to formulate its answer. Additionally, in the latter months of 2023, ChatGPT Plus does provide the opportunity to “browse” and include more current web-based information (Reuters, 2023).

Use Case 2: Interpreting Research Articles and Technical Information

As of the time of this writing, there are several methods that can be used to provide ChatGPT 4.0 with more contextually important data from a specific article, paper, transcript, or other source of data and information. Recently, I had a specific need for a concise summary of a public hearing done by California OSHA’s board on the safety and regulatory stance for highly automated and autonomous agricultural machines and tractors in the state (California OSHA Standards Board, 2023). In this situation, audio from the public hearing was available. After downloading the audio file, it was transcribed with software (Temi, San Francisco, CA), and the transcription was uploaded to ChatGPT 4.0 with a prompt to “summarize key points” from the hearing. The process to prepare the data and query the LLM took less than 15 minutes, allowing me to grasp critical findings from a two-hour hearing that was quite difficult to follow given irrelevant parts of the conversation, breaks, various interruptions, and its overall length. There are ChatGPT 4.0 plugins and other tools that will similarly directly summarize YouTube videos and other “public information” videos. These plugins use transcripts as text-based input data, providing concise summaries, outlines, or responses to other user prompts.

Use Case 3: Summarizing Incident Reports and Suggesting Trends, Common Denominators and Appropriate Messaging

In 2020, well prior to the release and widespread use of ChatGPT, we presented a paper on the “learnings” from the analysis of a large collection of publicly available tractor fatality reports from NIOSH through the FACE program (Sandner et al., 2021). This work was intensive and required manual coding of detailed incident reports, analysis using traditional descriptive data, ANOVA, and other analysis. In addition, a simple program was developed in Python to randomly select data from the coded selection of all reports (items like tractor model and configuration, terrain, slope, obstacles, operation at the time of rollover, environmental conditions, etc.), generating entirely new, synthesized cases that can be used to perform risk analysis by engineers and technologists.

LLMs present an alternative but important and interesting option for these same data that are now only available in a narrative, text-only format, such as incident investigation reports, news accounts, and coroner’s reports. As an example of what is possible, I have selected three FACE state reports from three states, all of which involved an overturned tractor. I selected the three most recent overturns from the state-FACE website (NIOSH, 2023), also with the criteria of having three different states represented. The reports selected were from Washington State (WA State FACE Program, 2023), Michigan (Michigan FACE Program, 2019), and Iowa (Iowa State FACE Program, 2006). The case investigation PDF files were downloaded and combined into a single document. The plugin AskYourPDF Pro (AskYourPDF, 2023) was used to upload the combined file to be used in ChatGPT 4.0. The Appendix contains the responses to these three prompts:

1. There are three specific reports—one from Iowa, one from Michigan, and one from Washington. Can you provide a brief summary of each using the information and specific factual information from the report.
2. As you examine these three incidents, please provide a ten item list of incident trends, common denominators, or lessons learned that would be important to discuss if you were doing a safety presentation using case studies for a group of farmers or hired farmworkers? All should have some tie to these specific cases.
3. We are planning to implement a social media campaign. Please provide five tweets on farm safety and tractor rollover or overturn protection that considers the specifics of these three incidents. The tweets should not reference the specific states or specific details from the individual cases, but should instead be more general in nature, yet should be specific to tractor rollover safety.

Use Case 4: Support Tool to Interpret and Guide the Use of Engineering and Regulatory standards

Engineering and regulatory standards and practices documented via standards are often densely written, complex, and confusing, but they are foundational to much of the work in agricultural safety and health. Examples include the standard Lighting and Marking of Agricultural Equipment on Highways - (ASABE Standards, 2019) and the Manure Storage Safety Engineering Practice (ASABE Standards, 2022). These documents usually contain technical language, jargon, or cross-references to other standards, practices, and specific

terms or phrases that are defined within the standard itself. As will be described in the section that follows, the process of training an LLM using the specific content within an ASABE, ANSI, or ISO standard presents difficulty because these documents are obtained through purchase and are copyrighted and are not considered “sharable” or open-source intellectual property.

However, there are ASABE standards that are made “publicly available” through various means. In preparing to write this article, I experimented using ChatGPT 4.0, the previously mentioned PDF conversion plugin, and the ASABE standard Cotton Module Cover Material Performance (ASABE Standards, 2022), as it was publicly available for use without concerns on copyright infringement or misuse of intellectual property. While this standard is not explicitly connected to safety, it is complex and structured in a similar way to many ASABE (and ISO) safety standards. Queries about that standard’s content included things like drafts of compliance checklists, bulleted summary outlines of the standard, or other key features. The prompts I provided yielded accurate, though somewhat incomplete, summaries from the LLM. This application would seem useful as a tool to understand, interpret, and create actions that are based on standards, but should not be viewed as a replacement for thoroughly understanding all aspects of specific engineering standards or engineering practices.

Similarly, regulatory standards can be queried. As an example, the entire OSHA Part 1928 Occupational Safety and Health Standards for Agriculture standard (OSHA, 1971) for agriculture was uploaded to ChatGPT 4.0 through the PDF plugin. Queries included:

- I am an agricultural safety and health specialist at a land grant university. I have been asked to provide a 30-minute summary of key parts of the OSHA Part 1928 Occupational Safety and Health Standards for Agriculture standard. My audience is crop and dairy farmers in Wisconsin. What are key topics I should include in my presentation? Please provide at least 10 bulleted, high-level issues to cover based on the standard with three to four sub bullets under each of the main topics.
- Now, assume I am a farmer and I want to develop a compliance checklist with specific things I need to do, conditions I need to examine for regulation compliance, specifically with tractor and machinery safety, and other actions necessary to comply with pertinent sections of OSHA 1928. Please provide a comprehensive checklist that will help me to comply.
- As a farmer, I think all of these are important. But, I would like to have you expound more on the checklist item that says: "Train operators to reduce speed when turning, crossing slopes, and on rough or slippery surfaces." Please provide more detail and suggestions of where I might learn more about this particular item.

Note that an LLM trained on specific data and information can provide summary and explanatory detail at various levels, starting with a high-level overview, translating regulatory text into actionable things like checklists, and then drilling down on specific content through further inquiry. Of course, the resulting output would need to be reviewed, cross-referenced with the original source material, and fact-checked for accuracy, especially in situations where highly specific recommendations are being given.

Use Case 5: Outlining and Brainstorming Content for Presentations, Articles, and Research Questions

In my professional role, the ability to quickly use an LLM to brainstorm content for a lecture, presentation, outline for a press release, or draft set of research questions is an amazing timesaver. In my Extension role, I get called on to do about 8-10 major keynote presentations each year at organizational annual conferences, national or state meetings, or other specialty events for industry organizations. This is in addition to many smaller local or regional sessions. These begin with an exploratory phone call or email from an outside organizer who might have a general idea for a desirable topic(s). After the conversation, we will narrow the focus of the request. There is usually a promise that I will formulate a title, bulleted summary, and short descriptor that can be printed in the promotional materials. The use of ChatGPT 4.0 has saved me dozens of hours on this follow up task.

In my workflow prior to using an LLM, I would capture notes during a conversation and then try to meet the organizer's final deadlines, often two or three months down the road—often as they were preparing to print a final program agenda. This workflow was part procrastination, but also part wanting to really give the request adequate thought over time. However, as deadlines near, the process of reconstructing the original conversation, remembering my thoughts several months prior, and then sending the information before the deadline is stressful and takes much last minute mental rumination. As I have begun to use ChatGPT to assist with this workflow in recent months, here is an example of a very recent prompt that I have since used several times with success:

“I was just contacted by a national organization whose members provide (*fill in info*) agricultural services for (*fill in info*) growers throughout North America. They have asked me to provide a 50-minute presentation that covers three topics. These are: stress and mental health in (*fill in info*) production; specific safety recommendations to consider during busy times of the year for (*fill in info*) production; and an overview of new and exciting digital technologies coming in the next five to ten years in the (*fill in info*) industry. Please provide an interesting and compelling title for this presentation. Also provide a short, compelling, and fun sounding 125-word summary of my talk and a suggested outline that will cover each of my main topics dividing it into three equal pieces, with two to three bullets per section and three bullets under each major point.”

As an outcome of using this prompt in recent months, in one instance, I was given ten potential titles by the LLM. I picked one that resonated and asked it to iterate on my favorites with three alternative versions, deciding immediately on one. The 125-word summary was well-crafted from my iterated title, and I was able to immediately send it to the sponsor with just a few minutes of minor edits that better reflected my writing style and tone. The entire follow-up process took less than a half hour, and I met my deadline for the organizer that same afternoon. This would have normally taken days of thought, and I would have likely waited until the last minute to meet deadlines, often with an end result of lesser quality due to the time lag from the initial conversation and the rush to meet the deadline. I have had similar success in planning and organizing classroom lectures, brainstorming titles, and outlining papers. While these might seem to be simplistic workflow examples, the time savings has been significant, allowing me to spend more time on the science and

content, developing deeper understandings, concentrating on analysis and nuance, and improving the quality of the end product.

Three Caveats, Pitfalls, and Cautions

I am convinced, through my experimentation this past year, that LLMs and generative AI, more broadly, are game changers. This includes impacts on time management and product quality and the ability to use these tools to expand one's thinking and creativity. They can also add a degree of confidence and thoroughness by making suggestions and providing new ideas that the user may not have considered without an additional tool that helps with thinking. I view generative AI as an assistant—not a replacement. Output needs to be carefully examined for completeness and accuracy and should never be viewed as a “replacement for” expert human-based guidance. Despite my enthusiasm for this technology, here are some specific caveats.

Potential for Misleading, Inaccurate, or even “Hallucinated” Outputs

It is quite possible and even common for an LLM to provide superficial, out-of-context, or inaccurate responses, often due to a lack of training data (Ray, 2023b). Future versions are likely to improve over time. But LLMs function by ingesting prompts, converting them for model use, and then responding through natural human language in a serial way, word-by-word, using probabilities and statistical methods that predict what word “should” come next based on billions or trillions of data points based on training data (Wolfram, 2023). In cases where the model does not have access to adequate training data, many models will hallucinate or make up answers (Alkaissi and McFarlane, 2023). Users must be extremely cautious and always double check, cross-reference, and use past education and experience-based knowledge. This issue can be somewhat alleviated by supplying key information through thorough prompts or using plugins that reference specific websites, data sets, or other online information. It is concerning to hear that “AI could fully takeover” the role of experts (Liu et al., 2020) in key areas, but it still takes skill and knowledge to develop prompts, review output, and especially to continue to develop the knowledge bases that feed and train these tools through research and communication. It is also important that future LLM models that are used for these purposes have a greater degree of transparency, enabling the user to understand sources of key information and to provide accurate citations.

Use of Copyrighted or Proprietary Information in Open Source Commercial Models

Copyright and intellectual property implications associated with LLM use are in a state of flux as LLMs are a technology still in its infancy stages (Kahveci, 2023; Strowel, 2023). Currently, with ChatGPT 4.0, the last data that was used for base model training purposes is from 2021. Other models and future versions can reference more current websites and other specific resources and references. It is and will be tempting to use plugins to upload the kinds of materials discussed in this article—engineering standards, journal articles, textbook chapters, etc. But it is very important to understand the legal implications of proprietary data uploaded and used to inform a specific LLM “session.” In some cases, there are concerns that the data fed into and used by the model will eventually become part of the model's current or future training, making it available for all users. This sharing of copyrighted or proprietary information in “training” would not be legal via other historical forms of media and technology (like sharing copyrighted content on a website, distributing photocopies, etc.). There are enterprise versions of these tools (OpenAI, 2023b) that tout

the use of private data that can only be accessed by the local user who owns or has the requisite permissions to use these data in analysis, guaranteeing that use will only remain local and that it will not be used broadly for base model training. But this is an area that is complex, in flux, and will likely be the subject of litigation and legal scholar analysis for at least the next decade. For now, be careful and know the law as well as the terms of service for any model or application you might use.

Bias

There are many forms of bias that can result from the perspectives that are digitally embedded in the billions of pieces (tokens) of data used to train LLMs like ChatGPT 4.0. These are extensively described by Ray (2023b), who describes examples of cultural, linguistic, ideological, temporal, and other biases in detail. As an example, in the farm safety and health “practice,” there is much technical information and best practice content for farmers and ranchers in the public domain. These data are likely to have been gathered and summarized during the training of commercially available LLMs through access to university extension websites, fact sheets, posted videos, news reports, and other forms of information. These data, when used to train a commercial LLM, could tend to bias the responses of users more toward U.S. perspectives as an audience and, even more specifically, toward White (European American) farm owners and operators, who have tended toward being the most targeted historical audience that much content has been developed for over the last several decades. Further, responses and the content used would be more concentrated in specific geographic regions of the country where there have been more university specialists preparing and posting such information, more funding, and more research activity. Responses could likely tend toward not fully considering the current and future needs of immigrant and migrant farmworkers, non-English speakers, and other underserved audiences who are becoming increasingly important to feeding a growing global population. And this does not even consider that the vast majority of people worldwide involved in food production are actually located outside of the U.S. and North America (FAO, 2020). We will need to continue to be aware of and account for other forms of bias and make additional adjustments both in terms of the development of LLMs as well as their judicious use.

Conclusion

We stand on the threshold of a new era—the widespread use of different forms of AI and especially the integration of Large Language Models into everyday work, including the efforts of those in the field of Agricultural Safety and Health is now here. Developing an understanding of these tools, their uses, limitations, and risks is not just an option—it's an imperative. These tools offer opportunities to accelerate and translate technical data and research, enhance education, and improve on-the-ground safety practices. However, they come with a set of ethical and practical challenges that we must navigate conscientiously. The call to action is clear: it is time for practitioners in our field to collaborate and discuss how we might best harness the power of these digital tools. By doing so, we can unlock the full potential of AI to make groundbreaking contributions to agricultural safety and health, setting a global standard for responsible innovation.

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Appendix

This Appendix contains a range of sample prompts and the unedited replies from the ChatGPT 4.0 along with various plugins that are used to inform responses through user input. These are provided ONLY for illustrative purposes and have not been carefully reviewed to ensure 100% completeness or accuracy. Please consider these examples in their proper context, and if you are answering any of these questions, consult appropriate sources, experts, and research.

ChatGPT Output and Notes

Prompt:

What are the main hazards associated with working around stored manure on a typical livestock or dairy farm?

Reply:

Working around stored manure on a typical livestock or dairy farm presents several hazards that require careful attention to ensure the safety and health of workers and animals. Here are some of the main hazards:

1. **Gas Emissions:** Stored manure can produce harmful gases such as methane, ammonia, hydrogen sulfide, and carbon dioxide. Exposure to these gases can lead to respiratory issues, eye irritation, and, in extreme cases, asphyxiation or death.
2. **Pathogens:** Manure is a breeding ground for bacteria, viruses, and parasites that can be harmful to both humans and animals. Proper handling and storage are essential to minimize the risk of disease transmission.
3. **Spills and Leaks:** Improperly stored manure can lead to spills or leaks, contaminating water sources and posing a risk to aquatic life. This also increases the risk of nutrient runoff, which can harm local ecosystems.
4. **Physical Hazards:** The storage facilities themselves can present risks. For example, a poorly constructed or maintained storage pit could collapse, leading to injuries or fatalities.
5. **Fire Risk:** Methane gas emitted from manure is flammable and poses a fire risk if not properly managed.
6. **Odor and Air Quality:** While not directly hazardous, the strong odors from manure can be a nuisance and contribute to poor air quality, which may exacerbate respiratory conditions.
7. **Chemical Exposure:** Some farms use chemicals to treat manure or control odors, and these substances can be hazardous if not handled correctly.
8. **Slips, Trips, and Falls:** Wet or uneven surfaces around manure storage areas can lead to slips, trips, and falls, causing physical injuries.
9. **Equipment Hazards:** The use of equipment like tractors or pumps for handling and transporting manure can also pose risks if not operated safely.

Given your expertise in agricultural health and safety, you are likely aware that engineering controls, proper training, and safety protocols are crucial in mitigating these risks. Would you like to know more about any specific hazard or preventive measures?

Prompt:

What safety-related advice should I provide to a retired man and woman who recently purchased a hobby farm and plan to purchase a tractor?

Reply:

Given your expertise in agricultural health and safety, you are well-positioned to offer valuable advice to a retired couple who have recently purchased a hobby farm. Here are some safety-related recommendations you might consider sharing:

Tractor Safety

1. **Operator Training:** Encourage them to take a tractor safety course. Even if they have some experience, a refresher course can be invaluable.
2. **Equipment Inspection:** Before purchasing a tractor, they should have it thoroughly inspected to ensure it meets all safety standards.
3. **ROPS (Roll-Over Protective Structure):** Make sure the tractor has a ROPS to protect the operator in case of a rollover.
4. **Seat Belts:** Always use seat belts when operating a tractor, especially those with a ROPS.
5. **PTO (Power Take-Off) Shield:** Ensure that the PTO shaft is well-shielded to prevent entanglement.

6. **Slow-Moving Vehicle Sign:** Attach a slow-moving vehicle sign to the tractor to alert other road users.
7. **No Extra Riders:** Tractors are designed for one person. Extra riders can be a distraction and a safety risk.
8. **Terrain Awareness:** Advise them to be familiar with the terrain to avoid tipping over, especially on slopes.
9. **Emergency Plan:** Have a plan in place for emergencies, including a first aid kit and a way to communicate for help.
10. **Regular Maintenance:** Regular checks and maintenance can prevent many accidents.

General Farm Safety

1. **Personal Protective Equipment (PPE):** Use appropriate PPE like gloves, boots, and hearing protection.
2. **Chemical Safety:** Properly store and handle agricultural chemicals, and make sure to keep Material Safety Data Sheets (MSDS) accessible.
3. **Animal Handling:** If they plan to keep livestock, they should be trained in safe animal handling techniques.
4. **Fire Safety:** Install fire extinguishers and smoke alarms in all farm buildings.
5. **Electrical Safety:** Ensure all electrical installations are up to code and regularly inspected.
6. **Hydration and Sun Protection:** Remind them to stay hydrated and use sun protection, as farming often involves long hours outdoors.

Given your interest in using facts and stories to make points, you might share anecdotes or data that highlight the importance of these safety measures. This could help them understand the risks involved and take the necessary precautions.

Prompt:

A farm parent asks at an event if you think it is safe for their 11-year-old child to drive a tractor. How would you answer?

Reply:

Given your expertise in agricultural health and safety, you are well-equipped to address this concern. The safety of allowing an 11-year-old to operate a tractor is a complex issue that involves various factors such as the child's physical and cognitive development, the type of tractor, and the specific tasks involved.

From a safety and engineering perspective, most guidelines and regulations recommend that children should be at least 16 years old to operate a tractor. This is primarily because younger children may not have the physical strength, cognitive abilities, or judgment required to operate such heavy machinery safely. The American Society of Agricultural and Biological Engineers (ASABE) and the National Children's Center for Rural and Agricultural Health and Safety both provide guidelines that generally discourage young children from operating tractors.

However, it is also important to consider the context. In some family farm situations, children are taught to operate machinery from a young age under close adult supervision. If the parent is considering allowing their 11-year-old to operate a tractor, strict supervision

and comprehensive safety training are absolutely essential. Even then, the risks may outweigh the benefits.

So, while I understand that farm life often involves children in work tasks, from a safety and health standpoint, it would be advisable to wait until the child is older and more physically and cognitively developed to handle such a responsibility.

Would you like to know more about specific safety guidelines or training programs that can help prepare young operators for such tasks when they reach an appropriate age?

Prompt:

What questions and concerns should the transplant team at the local research hospital address or at least consider with farmers who undergo lung transplants and plan to return to the farm, given that there is little literature available on the topic? (Note: this was a one-time question).

Reply:

The issue of farmers returning to work after lung transplants is indeed a complex one, especially given the lack of extensive literature on the subject. Here are some questions and concerns that the transplant team at the local research hospital should consider:

Medical Concerns:

1. **Immunosuppression:** How will the immunosuppressive medications required post-transplant interact with the farmer's work environment, which may include exposure to dust, pesticides, and other potential irritants?
2. **Respiratory Health:** What are the risks of exposure to airborne particulates like dust, mold, and animal dander, which are common in farming environments?
3. **Infection Risk:** Are there specific risks related to bacterial, viral, or fungal infections that are unique to the farming environment?
4. **Physical Exertion:** What level of physical activity can the patient safely undertake? Farming often involves heavy lifting and strenuous work.
5. **Medication Management:** How will the farmer manage their medication schedule, which can be complex, while also managing the demands of farming?

Occupational Concerns:

1. **Equipment Safety:** Can the farmer safely operate heavy machinery, given potential limitations in physical capacity and medication side effects?
2. **Chemical Exposure:** What precautions should be taken regarding exposure to pesticides, herbicides, and fertilizers?
3. **Animal Handling:** Are there any specific concerns about handling animals post-transplant?

Psychological and Social Concerns:

1. **Mental Health:** How will the farmer cope with the stress and potential isolation that can come with both farming and post-transplant recovery?
2. **Community Support:** Is there a support system in place within the farming community to assist during the recovery period?
3. **Financial Concerns:** Given that farming is often a family business, what are the financial implications of the farmer being unable to work for an extended period?

Ethical and Legal Concerns:

1. **Informed Consent:** Does the patient fully understand the risks of returning to farming post-transplant, especially given the lack of literature on the subject?
2. **Liability:** Are there legal implications for the hospital if the farmer returns to a high-risk environment?
3. **Resource Allocation:** Are there ethical considerations around the allocation of scarce organs, given the potential for higher risk in a farming environment?

Given your expertise in agricultural health and safety, your insights could be invaluable in addressing these concerns. Collaborating with medical professionals could lead to more comprehensive guidelines for farmers post-transplant.

Prompt:

I am a farm safety and health specialist at a Midwest university. After a presentation on farm safety, a dairy farm couple approached me, asking if I thought it was safe for their 11-year-old child to drive a tractor during routine work on their family farm. What are ten questions I should ask that will help us arrive at an acceptable and accurate answer? The questions should be based on evidence or research-based information.

Reply:

Certainly, John. When assessing the safety of an 11-year-old driving a tractor on a family farm, it is crucial to rely on evidence-based information to make an informed decision. Here are ten questions you might consider asking:

1. **Tractor Age and Design:** Is the tractor equipped with modern safety features such as a Roll-Over Protective Structure (ROPS) and seat belts? Older models may lack these features, increasing the risk of injury.
2. **Training and Experience:** Has the child completed any formal tractor safety training programs? Research indicates that proper training can significantly reduce the risk of accidents.
3. **Adult Supervision:** Will an experienced adult be present to supervise the child at all times while operating the tractor? Supervision is a key factor in reducing risk.
4. **Physical Capability:** Is the child physically capable of operating the tractor, including reaching all controls and having the strength to operate them? Physical limitations can be a significant risk factor.
5. **Mental Maturity:** Does the child demonstrate the mental maturity required to understand the risks involved and make quick decisions in emergency situations?
6. **Type of Task:** What specific tasks will the child be performing with the tractor? Some tasks are inherently more risky than others.
7. **Terrain and Environment:** What is the nature of the terrain where the tractor will be used? Uneven or sloping terrain can increase the risk of roll-over accidents.
8. **Weather Conditions:** Will the tractor be operated in potentially hazardous weather conditions like rain, which can make surfaces slippery, or high winds that could affect stability?
9. **Emergency Response Plan:** Is there an emergency response plan in place, and is the child aware of it? Knowing what to do in an emergency is crucial for minimizing harm.

10. **Local and Federal Laws:** Are you aware of the age requirements and other legal restrictions related to children operating tractors? Compliance with laws is not only a legal necessity but is often based on safety research.

Each of these questions is grounded in research and evidence-based practices related to agricultural health and safety. By considering these factors, you can help the dairy farm couple make a more informed decision about the safety of their child operating a tractor.

Prompt:

There are three specific reports—one from Iowa, one from Michigan, and one from Washington. Can you provide a brief summary of each using the information and specific factual information from the report?

Reply:

Certainly, John. Here are brief summaries of the three specific reports from Washington, Michigan, and Iowa, based on the factual information extracted from the document:

Washington Report

- **Incident:** Fatality of a family dairy farm worker due to a tractor rollover.
- **Location:** Family dairy farm in Western Washington.
- **Employer:** Family dairy farm with roots going back nearly 50 years, incorporated in 2007.
- **Workers:** Two full-time workers and a few part-time workers, including family members.
- **Cause of Death:** Tractor rollover and crushing.
- **Program:** Washington State Fatality Assessment and Control Evaluation (WA FACE) program, administered by the Washington State Department of Labor & Industries.

Michigan Report

- **Incident:** Fatality of a farm owner in his 50s due to a tractor overturning and pinning him in water at the base of a 10-foot deep ditch.
- **Location:** Hayfield rented to another farmer.
- **Equipment:** John Deere 2320 tractor equipped with front forks and a PTO-driven brush hog mower.
- **Cause of Death:** Drowning.
- **Contributing Factors:** Blood Alcohol Concentration (BAC) of 0.204% (legal limit for driving is 0.08%).
- **Program:** Michigan Fatality Assessment and Control Evaluation (FACE) Program.

Iowa Report

- **Incident:** Fatality due to tractor overturn on a slope beside a road in a grassy, triangular area of a field.
- **Location:** Unspecified.
- **Cause of Death:** Tractor tipped to the right, pinning the operator with his back to the ground beneath the tractor's left rear fender.
- **Program:** Iowa Fatality Assessment and Control Evaluation (FACE), a program of the National Institute for Occupational Safety and Health (NIOSH).

Would you like to delve deeper into any of these reports?

Prompt:

As you examine these three incidents, please provide a ten item list of incident trends, common denominators, or lessons learned that would be important to discuss if you were doing a safety presentation using case studies for a group of farmers or hired farmworkers? All should have some tie to these specific cases.

Reply:

Certainly, John. Based on the specific details of the Washington, Michigan, and Iowa reports, here are ten key points that could serve as incident trends, common denominators, or lessons learned for a safety presentation aimed at farmers or hired farmworkers:

1. **Tractor Rollovers:** All three incidents involved tractor rollovers, highlighting the need for proper training on tractor stability and rollover prevention.
2. **Alcohol Impairment:** The Michigan case involved a high Blood Alcohol Concentration (BAC), emphasizing the dangers of operating machinery while impaired.
3. **Working Alone:** In both the Michigan and Washington cases, the victims were working alone at the time of the incidents. Stress the importance of having a buddy system or check-in protocol.
4. **Terrain Challenges:** The Iowa and Michigan cases involved challenging terrains like slopes and ditches. Discuss the need for assessing terrain before operating heavy machinery.
5. **Equipment Safety Features:** None of the summaries mentioned the use of Rollover Protective Structures (ROPS), which could be a crucial safety feature to discuss.
6. **Operator Experience:** The Washington case involved a family dairy farm with roots going back nearly 50 years, suggesting that even experienced operators are at risk.
7. **Time of Day:** The Michigan case mentioned that it was getting dark, raising the issue of visibility and the need for proper lighting when working.
8. **Emergency Response:** In the Michigan case, family members initiated the search for the victim. Discuss the importance of having an emergency response plan in place.
9. **Safety Programs:** The Washington case mentioned that the farm had full-time workers covered by the Washington Industrial Safety and Health Act. Emphasize the importance of adhering to state and federal safety programs.
10. **Post-Incident Analysis:** All three cases were investigated by state Fatality Assessment and Control Evaluation (FACE) programs. Stress the importance of learning from such reports to prevent future incidents.

Each of these points could serve as a discussion topic to delve deeper into the complexities of farm safety, using these case studies as real-world examples. Would you like to explore any of these points further?

Prompt:

We are planning to implement a social media campaign. Please provide five tweets on farm safety and tractor rollover or overturn protection that considers the specifics of these three incidents. The tweets should not reference specific states or specific details from the individual cases, but should instead be more general in nature, yet should be specific to tractor rollover safety.

Reply:

Certainly, John. Here are five tweets that focus on farm safety and tractor rollover protection, taking into consideration the general trends observed in the three incidents:

1. 🛡️ “Safety First! Always use Rollover Protective Structures (ROPS) when operating tractors. It is not just a feature; it is a lifesaver. #FarmSafety #TractorSafety”
2. 🍷 “Think before you drink! Operating a tractor under the influence increases the risk of rollovers. Stay sober, stay safe. #FarmSafety #SoberDriving”
3. 👤 “Two heads are better than one! Always let someone know where you will be working and when you will check in. A buddy system can save lives. #FarmSafety #BuddySystem”
4. 🔦 “Visibility matters! Ensure proper lighting when working in low-light conditions to avoid tractor rollovers. #FarmSafety #SeeAndBeSeen”
5. 🌱 “Know your terrain! Slopes and ditches can be tricky. Assess the land before hopping on that tractor. #FarmSafety #LandAssessment”

Feel free to use or modify these tweets for your social media campaign. Would you like further assistance with this?

Prompt:

I am an agricultural safety and health specialist at a land grant university. I have been asked to provide a 30-minute summary of key parts of the OSHA 1928 standard. My audience is crop and dairy farmers in Wisconsin. What are key topics I should include in my presentation? Please provide at least 10 bulleted, high-level issues to cover based on the standard, with three to four sub bullets under each of the main topics.

Reply:

Certainly, John. Given your expertise in agricultural health and safety and your audience of crop and dairy farmers, focusing on the most relevant aspects of the OSHA 1928 standard would be crucial. Here are 10 high-level topics you might consider including in your 30-minute presentation:

1. **Introduction to OSHA 1928**
 - What is OSHA 1928?
 - Why is it important for agriculture?
 - Scope and coverage
2. **Temporary Labor Camps**
 - Housing conditions
 - Sanitation facilities
 - Safety measures
3. **Storage and Handling of Anhydrous Ammonia**
 - Proper storage techniques
 - Safety equipment
 - Emergency response procedures
4. **Logging Operations**
 - Safety gear
 - Equipment maintenance
 - Logging techniques

5. **Sanitation and Hygiene**
 - Importance of sanitation facilities
 - Good hygiene practices
 - Maintenance and cleanliness
6. **Employee Operating Instructions for Machinery**
 - Securely fastening seat belts
 - Operating tractors safely
 - Hitching guidelines
7. **Occupational Health Standards**
 - Exposure limits
 - Health monitoring
 - Personal protective equipment (PPE)
8. **Ventilation and Screening in Facilities**
 - Adequate ventilation in toilet facilities
 - Appropriate screening
 - Privacy concerns
9. **Accessibility and Proximity of Facilities**
 - Location relative to the field
 - Terrain considerations
 - Exceptions for short work periods
10. **Conclusion and Best Practices**
 - Summary of key points
 - Importance of compliance
 - Resources for further information

These topics should provide a comprehensive overview of the OSHA 1928 standard, tailored to the needs and interests of crop and dairy farmers in Wisconsin. Feel free to adjust these based on your expertise and the specific concerns of your audience.

Prompt:

Now, assume I am a farmer, and I want to develop a compliance checklist with specific things I need to do, conditions I need to examine for regulation compliance, specifically with tractor and machinery safety, and other actions necessary to comply with pertinent sections of OSHA 1928. Please provide a comprehensive checklist that will help me comply.

Reply:

OSHA 1928 Compliance Checklist for Farmers

General Compliance

- Familiarize yourself with the OSHA 1928 standard.
- Designate a safety officer or team responsible for compliance.
- Conduct a baseline safety audit to identify areas of non-compliance.

Temporary Labor Camps

- Ensure housing meets OSHA standards for cleanliness and safety.
- Verify that sanitation facilities are operational and clean.
- Implement safety measures like fire extinguishers and first aid kits.

Storage and Handling of Anhydrous Ammonia

- Store anhydrous ammonia in approved containers.
- Equip storage areas with safety gear like goggles and gloves.
- Develop an emergency response plan for leaks or spills.

Logging Operations

- Ensure all workers have appropriate safety gear.
- Regularly maintain and inspect logging equipment.
- Train workers in safe logging techniques.

Sanitation and Hygiene

- Provide accessible sanitation facilities near work areas.
- Maintain facilities in a clean and sanitary condition.
- Educate workers on good hygiene practices.

Employee Operating Instructions for Machinery

- Ensure seat belts are available and functional on tractors with ROPS.
- Train employees on safe tractor operation.
- Confirm that hitching is done only to approved drawbars and hitch points.

Occupational Health Standards

- Identify potential health hazards (e.g., pesticides, dust).
- Provide appropriate PPE for the identified hazards.
- Implement health monitoring programs for workers.

Ventilation and Screening in Facilities

- Ensure toilet facilities are adequately ventilated.
- Install appropriate screens for privacy.
- Ensure doors can be closed and latched from the inside.

Accessibility and Proximity of Facilities

- Place sanitation facilities within a quarter-mile walk of work areas.
- Make accommodations for terrain challenges.
- Note exceptions for work periods of less than three hours.

Record-Keeping and Documentation

- Maintain records of safety audits.
- Keep documentation of employee training.
- Store records of equipment maintenance and inspections.

Prompt:

As a farmer, I think all of these are important. But, I would like to have you expound more on the following checklist item: “Train operators to reduce speed when turning, crossing slopes, and on rough or slippery surfaces.” Please provide more detail and suggestions of where I might learn more about this particular item.

Reply:

Certainly, the checklist item “Train operators to reduce speed when turning, crossing slopes, and on rough or slippery surfaces” is crucial for ensuring the safety of tractor operators and others on the farm. Here is a more detailed breakdown:

Detailed Checklist Item: Train Operators to Reduce Speed in Specific Conditions

Why It's Important

- Reducing speed in these conditions minimizes the risk of tractor rollovers, which are a leading cause of farm-related fatalities.
- It also reduces the risk of losing control of the tractor, which could lead to other types of accidents.

What to Cover in Training

1. **Turning:**
 - Explain the physics of turning and how speed affects stability.
 - Demonstrate the correct speed and technique for safe turning.
2. **Crossing Slopes:**
 - Discuss the risks of crossing slopes at high speeds, such as tipping over.
 - Train operators to cross slopes at the lowest possible speed and to avoid crossing steep slopes whenever possible.
3. **Rough Surfaces:**
 - Explain how rough surfaces can affect tractor stability and control.
 - Instruct operators to reduce speed and ensure all loads are secure.
4. **Slippery Surfaces:**
 - Discuss the additional risks posed by wet, icy, or muddy conditions.
 - Train operators to reduce speed significantly in these conditions and to avoid sudden turns or stops.

Practical Exercises

- Conduct supervised practical exercises where operators can practice these skills in a controlled environment.

Monitoring and Feedback

- Regularly observe operators to ensure they are following best practices.
- Provide feedback and additional training as needed.

Resources for Learning More

1. **Local Agricultural Extension Office:** They often offer training programs and materials on tractor safety.
2. **National Institute for Occupational Safety and Health (NIOSH):** Offers various resources on agricultural safety, including tractor operations.
3. **Tractor Manufacturers' Guidelines:** Always a good source for specific safety recommendations.
4. **Online Courses and Webinars:** There are various platforms offering specialized training in tractor safety.

By focusing on this specific checklist item, you can significantly reduce the risk of tractor-related accidents on your farm.