Biology of Human:
Evaluative Focus Group Report

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Executive Summary

Evaluators conducted a focus group for the Biology of Human project to give project Principal Investigators and staff insight into the current level of understanding that 10- to 14-year-olds have about the human microbiome and the language that they use to discuss these topics. Questions focused on youths' perceptions about different microbes, where they learn about microbes, and their ideas about science identity. The youth participating in the focus group were between the ages of 10 and 14, and were participants in an after-school program.

All of the youth in the focus group recognized the terms "bacteria," "virus," and "germ," and described some features of these microbes, including that they were small, could make you sick and could spread through contact. However, there was a lot of confusion and confounding of the meaning of the three terms. Often, the terms "virus" and "bacteria" were used interchangeably or the youth said that one caused the other, indicating that they did not have a clear understanding of the difference between the two types of microbes. This was something that the youth themselves expressed as well. They thought that bacteria could affect humans in positive as well as negative ways, but were unable to provide details. Youth were also asked about "fungus" and "parasites" and a similar degree of knowledge and confusion could be seen. Collectively, the youth described some of the ways in which these microbes spread and places where they are found, both on our bodies and in the environment.

The youth indicated that they learned information about microbes from a variety of sources, including school and summer camp, as well as through informal means, such as television and parents. When asked what questions they had on the topic of microbes, the long list they produced included basic questions about how they were discovered, and how they are categorized, as well as health-focused items, such as how you get them, and if there are diseases you can die from.

Finally, when asked what makes someone a "science kind of person," the students indicated that they associate hands-on activities with learning science. Interestingly, in spite of the discussion just preceding this question, none of the youth discussed scientists studying or learning about microbes, and they didn't describe a "science kind of person" as someone who is curious or wanting to learn more about the natural world. Nevertheless, they did see science as important to learn, and they related that to the microbes discussion indicating that science can help us learn about disease.

Overall, participating students displayed a limited but relatively functional knowledge of microbes, that they indicated they had learned both in and out of school. They were interested in learning more about microbes. Their perception of a "science kind of person" was somewhat stereotypical and appeared to be drawn from their school experiences with science teachers. The focus group provided a guide for the researchers to better understand the current level of knowledge and usage of scientific terminology by the youths in the target age group.

Introduction

Biology of Human is educational outreach project funded through the National Institutes of Health (NIH) Science Education Partnership Award (SEPA). Through a variety of educational activities and materials, this project aims to help youth and adults explore and better understand scientific principles that underlie modern research in human biology. The project focuses on four main themes:

- Villages inside us: The communities of organisms that share our bodies and shape our genomes
- Like minded and different: How do health and disease relate to the tree of life?
- Wild cells: Cancer, microbes, and cell biology
- World of cures: Biodiversity, medicine, and disease.

The purpose of this study was to gain some insight into youths' current understanding of one of these human biology topics (Villages inside us), and the language youth use to discuss these concepts. In addition, to aid in the development of learning research instruments, the youth were asked about some science identity topics. This information will be used during the development of both evaluative and learning research instruments throughout the course of the project.

A focus group was selected as the method of research because it allowed for an open-ended discussion in which the youth could have the space and time to describe what some biological terminology meant to them. In addition, it enabled group discussion amongst the youth that could help illuminate the ways in which youths use the words in question. We recruited participants from an after-school program that includes a large proportion of minority and immigrant participants. This is because the deliverables being developed as a part of the project are being designed to reach a diverse population of students, including those from populations traditionally underrepresented in science and who might not typically be thought of as having a high interest in science.

Methods

A ten-question focus group script was developed to address the "Villages Inside Us" theme that focuses on the human microbiome. Additionally, a section of questions were included to address science identity if time was available. The focus group questions were drafted and revised by the project staff, including social science researchers, informal educators, and evaluation experts. The focus group script can be found in Appendix A.

Seven youth from a community organization that provides after-school programming participated in this focus group. This organization provides free activities for youth in five main areas: education, enrichment, healthy bodies, community involvement, and special events. This organization was selected because they serve youth who were within our target age group (11 to

14) and their population of youth is very diverse, including many ethnic minorities and immigrants. When we conducted the focus group, any youth within our age range were able to participate if they chose to do so, and all youth who participated received a $5 cash incentive. Due to confidentiality and anonymity constraints, with the exception of their grade, all demographic information was collected through observations by the researchers. The youth who participated were all African-American. Six of the youth were female, and one was male; six of the youth were eighth grade students, and one was in sixth grade.

Before conducting the focus group, the project staff obtained approval from the University of Nebraska Institutional Review Board and the community organization's programming director. This approval included the focus group protocol, the parent notification form distributed, the recruitment and assent script, and the $5 incentive.

Results

What are microbes? The youth were asked about bacteria, viruses, and germs, and how they are related to each other. When asked, "What is bacteria?" the first response from a youth was that they were "nasty things that can get you sick." A second youth quickly responded that there are "nasty bacteria, but there is also good bacteria too." Another said that bacteria were "little specks of things that pass on every time you touch something" A fourth youth described bacteria as ""when you wash the dishes but then you're tired so you go sit down or something instead of emptying the dishwater and the next day there's bacteria everywhere." The youth described bacteria as "nasty," and as "tiny specks." "When people get the flu" and "I think of mold" were two final responses from youth about bacteria.

The youth were then asked about viruses. One youth said that viruses cause "different sickness" and another added that one has a virus "when you're really sick." One person mentioned "flu" and another stated that "my cousin has RSV," referring to the respiratory syncytial virus.

Thirdly, the youth were asked what they knew of about germs. One youth answered that germs made her "think of very nasty things." A second added that germs "can also get you sick. Like other people have germs and you can catch the germs and get sick." One example offered was if you "used someone else's toothbrush." Another youth told about her cousin: "my cousin is a germaphobe, and every time I touch something she says wash your hands and gives me her hand sanitizer." One youth asked "Are there already germs in the body?"

The youth were also probed about how bacteria and viruses were the same and how they were different. One youth said "they get you sick. Bacteria can get you to have like a virus." One said there could be "bacteria that's a virus," but another said "I don't think bacteria and viruses are the same thing. You can get a virus from bacteria, but they are not the same thing."

The youth were then asked whether bacteria and viruses are germs. The youth answered that germs are both bacteria and viruses, but that they are all different in ways of which the

students were not sure. One youth stated "there's a difference (between bacteria, viruses, and germs), but they have the same thing in common." One person said you can "get viruses with germs." Another said "I think there's a difference but it's confusing." One youth said that "some germs help you, like antibiotics."

The youth were also asked about fungi and parasites. The first thing a youth mentioned at the prompt of fungi was "ugh that's nasty." Together, the group provided many rapid-fire statements about fungus including "they're crawling in your toes," "is fungus mold?," "you can eat moldy bread and not know and it will get in your stomach," "I think of green stuff, like mushrooms, foot fungus," and "it doesn't have to be visible." One youth asked the question "is mold like rust?" to which another answered "if metal is like food, at first it looks all good, but then after a while if you leave your food out, it's going to get all green, like pipes are going to get all rusty." One youth asked, "Is mold everywhere?" Finally, the group discussed the idea of getting sick from mold, and asked if salmonella was mold, or if it was virus, and if it could spread. Then someone asked if it was bacteria, and another asked "isn't it on uncooked meat?" One youth stated that one shouldn't cut raw meat on a cutting board and then cut onions, because it could make a person sick.

When the topic of parasites was raised, the youth became really animated. A couple of youth mentioned watching a show called "Monsters Inside Me" which is about parasites that infect humans. One youth told a story from the show, saying "on the show, a girl put her hand in a fish tank and then she touched her eye and the parasite got in her eye." A second youth mentioned watching a video on YouTube of a spider that was inside a girl's skin. One youth was also very curious about whether parasites were like bacteria, asking "isn't a parasite like bacteria basically?" A second added "is it like a worm?" In response to that question, another youth answered that "it's like bacteria but then it gets into your body and becomes like a worm." Finally, one youth asserted that "parasites can kill off other bacteria."

How are microbes helpful and harmful to our bodies? When asked if microbes could be helpful to our bodies, one youth responded that "there's bacteria in food and stuff, and my teacher told me that bacteria is in your food and it helps something in your body, but I forgot what." Another described a helpful feature of bacteria saying "I think there's some bacteria that whenever you get sick, that whenever you take something there's bacteria in it and it helps you get better." One youth said that "good" bacteria live in our intestines, but could not articulate what they did that was beneficial. Finally, one youth likened bacteria to viruses in vaccines, stating "like a virus, whenever you take the flu shot and then it comes back, I learned this in class, when you get the flu again, it like goes away easily."

The youth were also asked how microbes can be harmful to us. Similar to their responses about getting sick, one youth said about their transmission: "Like we touch something and it spreads on that (pointing) and then we get that and we touch something else, and it spreads and just keeps going on. Kind of like germs."

Where do microbes live? The youth stated that microbes lived "on everything," more specifically, one youth stated "everything that people touch." This same thought was true for where microbes lived on the human body. The youth provided a litany of places in which microbes were found on the body: "on your hands," "on your face and everything you touch," "probably in your mouth," "hair," "especially in your cuts, -- that's how germs spread inside your body" "earwax," "a whole bunch of bacteria in your intestines," "there are billions of bacteria on your body." Outside of the body, "sometimes water fountains, they have germs all over them," "basically everywhere people touch," "in bathrooms," and "money" were given as examples of places where microbes could be found. Some youth thought they also were "in the air" and that animals could have microbes, too. Many youth mentioned that microbes are spread by humans touching things, and when specifically probed about it, seemed to think that humans were responsible for all of the spread of microbes. The moderators probed the youth to see if there was anywhere microbes did not live, and one youth suggested that soap was a place free from microbes. Another answered the question with "I think there probably are places without microbes" and a second said there are "probably some things, but I don't know what."

Asked why microbes might live on and in human bodies, a youth responded that "some to hurt and some to help". Another youth mentioned that they are on our bodies "because of the things we touch."

Where do you get information about microbes? After discussing their current knowledge of microbes, the youth were asked about where they acquire information about microbes. One youth said "medicine shows, where they show you what happens when you take a medicine." They gave a long list, including school, science class, summer camp, television commercials, "like a doctor show," "anything that has to do with chemical books," and "science books, health books." The youth were asked about what questions they had about microbes and our bodies and then where they would go to find answers to these questions. The list of questions the youth asked include:

- "How do you get them [microbes]?"
- "How did they [scientists] find out what they [microbes] are?"
- "Can you kill germs?"
- "Who discovered them [microbes]?"
- "What's the difference between these things [germs, bacteria, viruses]?"
- "How does one categorize them [microbes]?"
- "How many kinds of germs are there?"
- "Is there a disease you can die from?"
- "What did they name it that?"
- "Is there medicine for them?"

To find the answer to these questions, several of the youth immediately said that they would consult Google. Other places included a doctor or nurse, mom (who is a nurse), scientist, science teacher, BrainPOP, the college (UNL), and Bill Nye.

What makes someone a science kind of person? Time allowed at the end of the focus group for the researchers to ask the youth questions about science identity. When asked about what makes someone, either someone their age or an adult, a "science kind of person," the youth responded that doing hands-on activities made something science, and one student elaborated that "hands on activities made me like science." When probed more, they said that an adult is a science kind of person if they do experiments and teach people about what they like. This adult, according to the youth, "has to know math so maybe they like math." They thought that someone their age could be labeled a science kind of person based upon the subjects they chose for school projects. One youth said that she likes sciences because she likes "seeing what happens instead of (teachers) telling me what happens."

The youth were also asked about the importance of learning science. Youths responded generally positively, with one participant saying that "science is like anything, like mixing things together." Another youth mentioned that "math, science, social studies, and English all go together." This discussion was also tied back to the previous topics when a youth responded that science helps us learn about life if we get sick.

Summary and Conclusions

All of the youth in the focus group recognized the terms "bacteria," "virus," and "germ," and described some features of these microbes, including that they were small, could make you sick, and could spread through contact. However, there was a lot of confusion and confounding of the meaning of the three terms. Often, the terms "virus" and "bacteria" were used interchangeably or the youth said that one caused the other, indicating that they did not have a clear understanding of the difference between the two types of microbes. This was something that the youth themselves expressed as well. They thought that bacteria could affect humans in positive as well as negative ways, but were unable to provide details. Youth were also asked about "fungus" and "parasites" and a similar degree of knowledge and confusion could be seen. Collectively, the youth described some of the ways in which these microbes spread and places where they are found, both on our bodies and in the environment.

The youth indicated that they learned this information about microbes from a variety of sources, including school and summer camp, as well as through informal means, such as television and parents. A few youth were especially animated when discussing a television program on parasites, called "Monsters Inside Me." Even though many of the youth cited teachers and hearing things in school during the discussion, it was clear that sources outside formal education also played a role in their knowledge of human microbiology. When asked what questions they had on the topic of microbes, the long list they produced included basic

questions about how they were discovered, and how they are categorized, as well as health-focused items, such as how you get them, and if there are diseases from which you can die. They indicated that they could find answers to these questions not only from their teachers, but also outside resources, like doctors, relatives, books, and online resources.

Finally, when asked what makes someone a "science kind of person," the students indicated that they associate hands-on activities with learning science. A couple of the students specifically commented that they liked science because of these types of activities, while another student tied the practice of science to knowledge and use of math. Interestingly, in spite of the discussion just preceding this question, none of the youth discussed scientists studying or learning about microbes, and they did not describe a "science kind of person" as someone who is curious or wanting to learn more about the natural world. Rather, they focused on someone who likes to experiment or mix things together, or teach. Nevertheless, they did see science as important to learn, and they related that to the microbes discussion indicating that science can help us learn about disease.

Overall, participating students displayed a limited but relatively functional knowledge of microbes, that they indicated they had learned both in and out of school. They were interested in learning more about microbes. Their perception of a "science kind of person" was somewhat stereotypical and appeared to be drawn from their school experiences with science teachers.

Appendix A

Biology of Human Focus Group Session 1

Introduction

Good afternoon and welcome to our session. Thank you for taking the time to join our discussion about human biology. My name is [name] and I am the [title] of the Bureau of Sociological Research, who was asked by the programming committee to conduct this session. Assisting me with some note-taking is [name], also a Bureau employee.

The purpose of the focus group is to gather information to better understand what you currently know about human biology and what human biology topics are most interesting to you. Information will be used to help create resources about human biology.

Today we will be discussing your experiences and your thoughts about human biology. There are no right or wrong answers but rather differing points of view and experiences. Please feel free to share your point of view and ideas even if it differs from what others have said.

Before we begin, let me share some ground rules. This is strictly an evaluation project and your participation does not help or harm your relationship with the university or the program. Please speak up – only one person should talk at a time. We're recording the session because we don't want to miss any of your comments. If several are talking at the same time, the tape will get garbled and we'll miss your comments. We will be on a first name basis today, and in our later reports no names will be attached to comments. You may be assured of complete confidentiality as much as we possibly can. Obviously some of you are familiar with each other, but I would ask that out of respect for each that we keep the comments made here within these walls. Finally, your participation in this focus group in no way helps or harms your relationship with the Lighthouse, the University, or the researchers. As a reminder, at the end of this focus group, you will receive the $5 incentive.

Our session will only last about forty-five minutes. Let's begin.

1. Tell us your name and one thing you plan to do this weekend.
2. Tell us what you think of when you hear the word "bacteria"…."viruses"
    a. What are they?
    b. How are they the same?
    c. How are they different?
    d. What are germs?
    e. Are bacteria germs?
    f. Are viruses germs?

We call all these "microbes."

    g. How can microbes be helpful to our bodies?
    h. How can microbes be harmful to us?

3. Where do microbes live?
    a. Are there places in your body where there are no microbes?
    b. Where on your body are the most microbes?
    c. Where outside of our bodies do we find microbes?
4. Why might some microbes live on or in our bodies?
5. Where do you get information about microbes?
6. What questions do you have about microbes and our bodies?
7. Is there anything else about microbes that you want to talk about?
    a. What is a fungus? Do they live on our bodies?
    b. What is a parasite? Where in our bodies do we have parasites?
    c. How are they helpful or harmful to us?

Should time allow:

8. What makes someone a science kind of person?
    a. What makes an adult a science kind of person?
    b. What makes someone your age a science kind of person?
9. What do you think about the science you learn in school?
10. What do you think about the science you encounter outside of school?