South Dakota State University

From the Selected Works of Sara Mastellar

June 6, 2016

Scientific Literacy of Equine Students Regarding the Use of Antibiotics and Vaccines

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R.C. Bott, South Dakota State University

Available at: https://works.bepress.com/sara-mastellar/8/
There exists much misinformation about antibiotic and vaccine use. An understanding of these topics is important for the use of these tools for the best equine health outcomes. The purpose of this study was to evaluate students’ understanding of antibiotics and vaccines, identify learned misinformation, and establish baseline data. A survey was administered at the beginning of Equine Health & Disease (AS 213) and Horse Production (AS 365) at South Dakota State University during the spring 2016 semester. AS 213 is not a prerequisite for AS 365. Results of the survey suggest that students may come with some understanding of the concepts surrounding antibiotic and vaccine use (Table 1), but are willing to administer vaccines and antibiotics in situations where they are unwarranted (Table 2). This data suggests that misconceptions related to vaccine and antibiotic use exist in the student population and there may be a need for increased instructional emphasis on the application of vaccines and antibiotics in equine management.

Table 1: Correct student responses (%) to knowledge base questions regarding antibiotics and vaccines at the beginning of AS 213 (n=38) and AS 365 (n=33)

<table>
<thead>
<tr>
<th>Question</th>
<th>AS 213</th>
<th>AS 365</th>
</tr>
</thead>
<tbody>
<tr>
<td>True or False. Antibiotics will kill viruses as well as bacteria.</td>
<td>78.9</td>
<td>84.8</td>
</tr>
<tr>
<td>Which of these is a major concern about the overuse of antibiotics?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. It can lead to antibiotic-resistant bacteria</td>
<td>100.0</td>
<td>97.0</td>
</tr>
<tr>
<td>Many diseases may be cured by antibiotics. However, the success of some</td>
<td></td>
<td></td>
</tr>
<tr>
<td>antibiotics against staph infections in horses has diminished in recent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>years. What is the reason for this?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Bacteria can become resistant to antibiotics</td>
<td>89.5</td>
<td>90.9</td>
</tr>
<tr>
<td>True or False. Vaccines are effective immediately once administered.</td>
<td>97.4</td>
<td>90.9</td>
</tr>
<tr>
<td>True or False. A horse does not need to be vaccinated if it doesn’t leave</td>
<td></td>
<td></td>
</tr>
<tr>
<td>the property.</td>
<td>94.7</td>
<td>93.9</td>
</tr>
<tr>
<td>True or False. A vaccination protocol is essential for ideal equine welfare.</td>
<td>100.0</td>
<td>97.0</td>
</tr>
</tbody>
</table>

Table 2: Student responses (%) at the beginning of AS 213 (n=38) and AS 365 (n=33) to "I would give an antibiotic or vaccine to a horse for (circle all that apply)"

<table>
<thead>
<tr>
<th>Response</th>
<th>Antibiotic</th>
<th>Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AS 213</td>
<td>AS 365</td>
</tr>
<tr>
<td>a. Viral infections, such as the flu</td>
<td>26.3</td>
<td>24.2</td>
</tr>
<tr>
<td>b. Cancer treatment, such as carcinoma</td>
<td>7.9</td>
<td>15.2</td>
</tr>
<tr>
<td>c. Bacterial infections, such as Potomac Horse Fever</td>
<td>86.8</td>
<td>84.8</td>
</tr>
<tr>
<td>d. Disease prevention, such as rabies</td>
<td>15.8</td>
<td>6.1</td>
</tr>
<tr>
<td>e. Parasite removal, such as bots</td>
<td>42.1</td>
<td>36.4</td>
</tr>
<tr>
<td>f. I would not give a horse antibiotics or vaccines</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Correct*</td>
<td>39.5</td>
<td>39.4</td>
</tr>
<tr>
<td>Incorrect**</td>
<td>60.5</td>
<td>60.6</td>
</tr>
</tbody>
</table>

*Only bacterial infections for antibiotic and only disease prevention for vaccine  
**Includes students that marked more than one choice
Scientific literacy of equine students regarding the use of antibiotics & vaccines

S. L. Mastellar & R. C. Bott
Contact email: sara.mastellar@sdstate.edu
Background: Societal issues

1993: MRSA outbreak at vet teaching hospital
2004: Documented MRSA transmission from horse to human
2016: Veterinary Feed Directive set to take effect in December

1993-2013: Antibiotics
1998: Andrew Wakefield study published
2000: Measles eradicated from US
2004: Andrew Wakefield study retracted
2015: Measles outbreak spreads from Disneyland

1993-2015: Vaccines
1993: Documented MRSA transmission from horse to human
2004: Andrew Wakefield study published
2000: Measles eradicated from US
2004: Andrew Wakefield study retracted
2015: Measles outbreak spreads from Disneyland

South Dakota State University
College of Agriculture and Biological Sciences
Background: Scientific literacy

- A scientifically literate population has societal benefits

- Measures tend to focus on physical sciences
  - Minimal inclusion of life sciences
    - Vaccination
    - Antibiotic resistance
    - Evolution
Objectives

1. Evaluate students’ understanding of antibiotics & vaccines

2. ID learned misinformation

3. Establish baseline data
Methods: Survey design

1. Pre-course assessment for demographics
2. Source of current understanding
3. Questions based on Pew Research Data and PISA Literacy Skills
4. Application (circle all that apply) questions
# Methods: Courses

<table>
<thead>
<tr>
<th></th>
<th>AS 213: Equine Health &amp; Disease</th>
<th>AS 365: Horse Production</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Topic focus</strong></td>
<td>Equine diseases, disorders, &amp; conditions</td>
<td>Production of horses in a “capstone” setting</td>
</tr>
<tr>
<td><strong>Pre-requisites</strong></td>
<td>None</td>
<td>AS 104 (Intro to Horse Mgmt) or AS 101 (Intro to Animal Sci)</td>
</tr>
<tr>
<td><strong>Production option for Animal Science major?</strong></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Required for Equine minor?</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**South Dakota State University**
College of Agriculture and Biological Sciences
Methods: Survey administration

Survey administered

Spring 2016

Midterm

Survey administered
Statistics

- Results are presented as frequencies or percentages
Results: Demographics

AS 213 (n = 38)
- Senior: 21%
- Freshman: 24%
- Junior: 21%
- Sophomore: 34%

AS 365 (n = 33)
- Junior: 21%
- Senior: 79%
Results: Demographics

Primary discipline

- Rodeo
- Working/Ranch
- Trail/Packhorses
- Western Pleasure
- Hunt Seat
- Show Jumping
- Saddle Seat
- Reining
- Driving/Pulling
- None
- Other

Frequency

AS 213 (n = 38)
AS 365 (n = 32)
Results: Demographics

Do you plan on pursuing the equine minor?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>Maybe</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 213 (n = 37)</td>
<td>24</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>AS 365 (n = 32)</td>
<td>13</td>
<td></td>
<td>19</td>
</tr>
</tbody>
</table>
How many years of horse experience do you have?

- AS 213 (n = 35)
- AS 365 (n = 30)
Results: Incoming knowledge source

The **primary** source for my current understanding of antibiotics/vaccines is from:

### Antibiotics

- **Veterinarian**
- **College course(s)**
- **Doctor**
- **Parents**
- **High school**
- **Friends**
- **Media**
- **Other**

### Vaccines

- **Veterinarian**
- **College course(s)**
- **Parents**
- **Doctor**
- **High school**
- **Friends**
- **Other**
- **Media**

**Note:** Frequencies given as many students marked more than one choice.
Results: Scientific literacy

True or False. Antibiotics will kill viruses as well as bacteria.

<table>
<thead>
<tr>
<th></th>
<th>Beginning</th>
<th>End</th>
<th>Beginning</th>
<th>End</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 213</td>
<td>81</td>
<td>97</td>
<td>90</td>
<td>93</td>
<td>54</td>
</tr>
<tr>
<td>AS 365</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. adults</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results: Scientific literacy

Which of these is a major concern about the overuse of antibiotics?

\textit{a) It can lead to antibiotic-resistant bacteria}

![Bar chart showing the percentage of correct answers over time for AS 213, AS 365, and US adults.]

% correct

\begin{tabular}{l|c}
Beginning & 100 \\
End & 100 \\
\end{tabular}

\begin{tabular}{l|c}
Beginning & 100 \\
End & 100 \\
\end{tabular}

\begin{tabular}{l|c}
2014 & 74 \\
\end{tabular}

Many diseases may be cured by antibiotics. However, the success of some antibiotics against staph infections in horses has diminished in recent years. What is the reason for this?

b. *Bacteria can become resistant to antibiotics*

---

Results: Scientific literacy

<table>
<thead>
<tr>
<th></th>
<th>Beginning</th>
<th>End</th>
<th>Beginning</th>
<th>End</th>
<th>OECD countries*</th>
<th>NonOECD countries**</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 213</td>
<td>89</td>
<td>97</td>
<td>88</td>
<td>89</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>AS 365</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Includes US & western Europe
**Includes Russia, Brazil, Indonesia

## Results: Scientific literacy

<table>
<thead>
<tr>
<th>Questions</th>
<th>AS 213</th>
<th></th>
<th>AS 365</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beginning (n = 38)</td>
<td>End (n = 32)</td>
<td>Beginning (n = 32)</td>
<td>End (n = 27)</td>
</tr>
<tr>
<td>True or <strong>False</strong>. Vaccines are effective immediately once administered.</td>
<td>97</td>
<td>97</td>
<td>94</td>
<td>96</td>
</tr>
<tr>
<td>True or <strong>False</strong>. A horse does not need to be vaccinated if it doesn’t leave the property.</td>
<td>95</td>
<td>97</td>
<td>97</td>
<td>96</td>
</tr>
<tr>
<td><strong>True</strong> or False. A vaccination protocol is essential for ideal equine welfare.</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
Results: Application

I would give an **antibiotic** to a horse for (circle all that apply)

<table>
<thead>
<tr>
<th>Response</th>
<th>AS 213</th>
<th>AS 365</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beginning (n = 38)</td>
<td>End (n = 31)</td>
</tr>
<tr>
<td>a. Viral infections, such as the flu</td>
<td>26</td>
<td>13</td>
</tr>
<tr>
<td>b. Cancer treatment, such as carcinoma</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td><strong>c. Bacterial infections, such as PHF</strong></td>
<td><strong>87</strong></td>
<td><strong>97</strong></td>
</tr>
<tr>
<td>d. Disease prevention, such as rabies</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>e. Parasite removal, such as bots</td>
<td>42</td>
<td>32</td>
</tr>
<tr>
<td>f. I would not give a horse antibiotics</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Correct</strong>*</td>
<td><strong>39</strong></td>
<td><strong>48</strong></td>
</tr>
<tr>
<td><strong>Incorrect</strong>**</td>
<td><strong>61</strong></td>
<td><strong>52</strong></td>
</tr>
</tbody>
</table>

*Only bacterial infections

**Includes students that marked more than one choice
## Results: Application

I would give a **vaccine** to a horse for (circle all that apply)

<table>
<thead>
<tr>
<th>Response</th>
<th>AS 213</th>
<th>AS 365</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beginning (n = 38)</td>
<td>End (n = 32)</td>
</tr>
<tr>
<td>a. Viral infections, such as the flu</td>
<td>42</td>
<td>41</td>
</tr>
<tr>
<td>b. Cancer treatment, such as carcinoma</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>c. Bacterial infections, such as PHF</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>d. Disease prevention, such as rabies</strong></td>
<td><strong>87</strong></td>
<td><strong>91</strong></td>
</tr>
<tr>
<td>e. Parasite removal, such as bots</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>f. I would not give a horse vaccines</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Correct*</td>
<td>47</td>
<td>38</td>
</tr>
<tr>
<td>Incorrect**</td>
<td>53</td>
<td>63</td>
</tr>
</tbody>
</table>

*South Dakota State University  
College of Agriculture and Biological Sciences

*Only disease prevention  
**Includes students that marked more than one choice
Implications

Veterinarians & college courses are major sources for incoming student knowledge on antibiotics and vaccines

Instructors in a potential position of impact

Students may arrive with some memorized facts, but may not be able to apply the concepts in horse management situations

Shifts in teaching may be required to ↑ students’ ability to apply knowledge
Future research

- Improved question wording
- Senior exit survey ongoing
- Assessment of teaching methods
- Long term content/concept retention?
Acknowledgements

• AS 213 students
• AS 365 students

Bryan Goettsch
Data entry extraordinaire
Questions?

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References


https://www.oecd.org/edu/school/2960581.pdf