Name: _____

**CASE**

## 🔆 Activity 7.2.3 Predicting the Future

## Purpose

Expected Progeny Differences (EPDs) are another tool for predicting inheritance probabilities of quantitative traits. EPDs use the ratios within the contemporary group of not only the individual animal, but the ratios of all relatives for which data are available. Because EPDs include data from relatives, they are more powerful predictors of inheritance than contemporary group ratios or individual performance data.

In *Activity 7.2.1 Black + Black = Red*, you studied qualitative traits which are observable traits predicted by the use of Punnett Squares. EPDs predict quantitative traits, which are controlled by more than one gene pair, are measureable, and can be modified by environmental factors. An animal's growth rate can be measured in pounds of weight gained each day. The mature height of an animal is measured in inches. Both of these are examples of quantitative traits.

Expected Progeny Differences (EPDs) help animal breeders to uncover genes that may be hidden. EPDs utilize not only the individual performance of an animal, but also the performance of all the relatives and progeny of that animal. In addition, the heritability estimates are used to separate genetic merit from environmental factors and predict the  genetic merit as potential parents. EPDs are simple for producers to understand and use. The use of EPDs predicts the expected difference of offspring in pounds, inches, or days using actual units. Could you evaluate animals for breeding purposes using EPDs?

## Materials

**Per student:**

- Computer with Internet access
- Pencil
- *Agriscience Notebook*

## Procedure

In this activity, you will learn the definitions of several important expected progeny differences in animal agriculture, and compare and select animals for important economic traits.

**Part One – Defining EPDs**

Using a computer research Expected Progeny Differences. Find common definitions of EPDs used throughout the industry. Record the information for each EPD listed in Table 4 of *Activity 7.2.3 Student Worksheet*. Use the following website to assist you in your research.
- American Angus Association – **http://www.angus.org/nce/definitions.aspx**
- National Swine Registry –
  **http://nationalswine.com/pedigree_services/stages_interior/stages_glossary.php**

**Part Two – Reading EPDs**

As a class, review the following the EPDs of a Simmental heifer and compare each of the EPDs to the listed breed averages. Continue working as a class and answer the five *Simmental EPD* questions in *Activity 7.2.3 Student Worksheet*. You may refer to your notes from Part One to guide you.

**Table 1.** *Simmental Heifer EPDs*

| Animal ID | DOB | BW EPD | WW EPD | YW EPD | MM EPD |
|---|---|---|---|---|---|
| Tag AJ47 | 1/22/08 | 3.4 | 22.3 | 61 | 2.2 |
| **Breed Avg.** | | **1.3** | **32.2** | **57** | **4.6** |

*EPD Key:*
DOB = Date of Birth
BW EPD = Birth Weight EPD
WW EPD = Weaning Weight EPD
YW EPD = Yearling Weight EPD
MM EPD = Maternal Milk EPD

**Part Three – Using EPDs**

1. Use the following EPDs for four Hereford bull calves to answer the *Herford EPD* questions in *Activity 7.2.3 Student Worksheet*. You may need to refer to your notes from Part One to guide you.

**Table 2.** *Hereford Bull Calves*

| Number | DOB | BW EPD | WW EPD | YW EPD | MM EPD |
|---|---|---|---|---|---|
| 1 | 2/1/08 | 1.2 | 54 | 80 | 16 |
| 2 | 1/16/08 | 5.0 | 58 | 85 | 24 |
| 3 | 1/24/08 | 5.6 | 64 | 95 | 12 |
| 4 | 1/9/08 | 2.4 | 59 | 90 | 25 |
| **Breed Avg.** | | **3.7** | **46** | **56** | **15** |

2. Use the following EPDs for four Yorkshire gilts to answer the *Yorkshire EPD* questions in *Activity 7.2.3 Student Worksheet*. You may need to refer to your notes from Part One to guide you.

**Table 3.** *Yorkshire Gilts*

| Number | DOB | NBA EPD | LW21 EPD | BF EPD | DAYS EPD |
|---|---|---|---|---|---|
| 1 | 4/14/08 | +.6 | +12 | +.01 | -2.5 |
| 2 | 4/11/08 | -.1 | +3 | -.03 | +1.2 |
| 3 | 4/8/08 | 0 | -1 | -.01 | +0.3 |
| 4 | 4/10/08 | +.2 | +2 | +.03 | -3.5 |
| **Breed Avg.** | | **+.3** | **+4** | **+.02** | **-.6** |

## Conclusion

1. Describe a quantitative trait.


2. Explain how the expression of EPDs makes it simple for producers to understand and utilize them.


3. If presented with the actual performance data of an animal, its ratio, and an EPD for the same trait, which would you choose as the basis of selection? Why?

Name: _____

# Activity 7.2.3 Student Worksheet

**Directions:** Record the information presented in the Expected Progeny Differences (EPDs) presentation.

**Table 4.** *EPD Definitions*

| EPD Abbreviation | EPD Title | Unit of Measurement | Purpose | Preference (High or Low) |
|---|---|---|---|---|
| **Beef Cattle** | | | | |
| BW | | | | |
| WW | | | | |
| YW | | | | |
| MM | | | | |
| **Swine** | | | | |
| NBA | | | | |
| LW21 | | | | |
| BF | | | | |
| Days | | | | |

*Simmental EPD Questions*
1. Would you expect the calves of the heifer to be heavier or lighter at birth than the breed average? How many pounds? Is this good or bad?


2. Would you expect the calves of the heifer to be heavier or lighter at weaning time than the breed average? How many pounds? Is this good or bad?


3. Would you expect the calves of the heifer to be heavier or lighter at one year of age than the breed average? How many pounds? Is this good or bad?


4. Would you expect the calves of the heifer to have more or less milk than the breed average?


5. Which is the only EPD trait in which this heifer would be likely to improve the performance of her offspring when compared to the breed average?


*Herford EPD Questions*
1. Which bull is the youngest?


2. Which bull would you choose if you wanted to increase yearling weight in your herd?

3. The daughter of which bull would be expected to produce the least milk?

4. If you were selling calves at weaning, which bull would you use to maximize weaning weights?

5. If bulls were mated to heifers who are young females with the greatest chance of birthing difficulty, which bull would be the best choice to reduce the chance of birthing difficulty?

6. A bull with balanced EPDs means that he is strong in all EPDs, but may not be the best in any one EPD trait. Which bull has the most balanced EPDs?

7. Too much milk production can cause cows to become thin and fail to rebreed, especially if fed on poor range conditions. Which two bulls would be most likely to sire daughters that might have too much milk for poor range conditions?

8. Which bulls would be most likely to sire calves that are heavier than breed average at weaning?

9. Are any bulls below breed average for yearling weight EPD? If yes, please identify.

10. Which EPD exhibits the most important difference between bulls 2 and 4?

### Yorkshire EPD Questions
1. Which gilt would you select to improve number of young born alive?

2. Which gilt would you select to reduce back fat thickness?

3. Which gilt would you select to improve growth rate?

4. Which gilt is the poorest performing in the maternal traits of litter weight and number born alive?

5. Which gilt excels in the same maternal traits?

6. Between gilts 2 and 4, which would you choose if you wanted to improve litter size and growth rate at the same time?

7. Which gilt has more backfat than the breed average? (use BF EPD)

8. Which two gilts are worse than breed average for DAYS EPD?

9. Which three gilts are worse than breed average for LW21 EPD?

10. Which gilt has the most balanced EPDs?