Think of a disease. What comes to mind? Perhaps you thought of hepatitis or influenza (the “flu”). You may have thought of COVID 19 or coronavirus. Vaccines cannot prevent all diseases but they do prevent many. The deadly disease, smallpox, once afflicted people across the world. With the help of vaccines it was wiped out by 1980. Scientists are working on vaccines to prevent other diseases you may have heard about. The hope is that a new vaccine will help to protect people against the new COVID 19 as well.

Before we can have a vaccine, someone has to make one. Labs in universities, hospitals and biotech companies have labs that work on vaccinations. Scientists in these labs might specialize in studying a virus or bacteria that causes disease. As they learn about the disease, they try to figure out how to prevent it. Testing a vaccine, drug or surgical procedure often requires the use of animals.

**Why do scientists work with animals?**

From an idea, a scientist creates a hypothesis. Often, the only way to test a hypothesis is by working with animals. Mice are among the most popular animals that scientists use. Scientists also work with other animals. Depending on the study design, they may use fruit flies, rats, rabbits, chickens and monkeys among others. Using animals enables scientists to test hypotheses more efficiently. The reasons why include the following:

(1) Living things are very complicated. Even the most advanced computers cannot model every aspect of a living system. Specific hypotheses related to living processes may be testable only with living creatures.

(2) Unknown chemicals and procedures cannot be tested on people. Until something is likely to work, scientists can’t test it on people. That would be dangerous and unethical.

(3) Scientists can get results faster.

The most widely used animals, such as mice and fruit flies, have short life spans. Using them, scientists can get answers more quickly. Tests done on people would take much longer. Also, animals, notably small animals, are easy to get in large numbers. Larger numbers increase the sample size. Bigger sample sizes increase the confidence of
statistical analyses. The same study on people would take much longer because of the time needed to get a large sample size.

(4) Scientists can use animals that are genetically similar.

Animals enable scientists to design robust scientific experiments. For example, results are hard to interpret if individuals differ greatly in their genetic makeup. Breeding in the lab provides genetically similar individuals. Scientists can therefore be more confident in how they interpret the results.

How do animals help scientists make vaccines?

Vaccine research and development typically benefit from animal research. Consider a type of virus or bacteria that makes animals sick. Scientists can study the disease in the animals. They can then better understand what happens in people. For example, untreated rabies is almost always fatal in humans and animals. The French scientist Louis Pasteur studied rabbits to develop the rabies vaccine. He then tested his vaccine on dogs before treating human infections.

Scientists can also use animals virus to develop a vaccine. In this case, they use a virus similar to the one that infects people. The animal virus must be able to infect humans without causing serious illness. People infected by the animal virus then become immune to the human virus. Edward Jenner made the very first vaccine this way. He made his vaccine from cowpox. This virus infects cows. A mild cowpox infection protects people from getting smallpox. Smallpox is similar to cowpox but is often deadly when people become infected.

Scientists can also use animals to check the immune response caused by a possible vaccine. In this approach, the animal's immune system substitutes for a human's which is why it is called an animal model. Scientist can use the model to study how the immune response develops and adapts to experimental changes. The researcher could change the number or timing of doses. Other changes could be the amount of vaccine in each dose or how the dose is administered (such as orally or through an injection).

Research with animals can take several years. Scientists need enough data to feel confident that a drug, vaccine or surgical procedure will work in people. Animal studies provide a wealth of data but the work is far from finished. This is when scientists test their idea on people. These tests are called clinical trials. Only clinical studies can show whether or not a product truly works in people. If clinical trial results are unacceptable, scientists try to understand why. In this case, scientists may return to working with animals. Animals play a huge role in helping doctors and scientists fight diseases.
Respond to the following questions using the information in the passage.

1. The scientist responsible for developing a vaccine for rabies with the help of animals is __________________________.

2. List three animals that scientists use when studying vaccines:
   __________________________
   __________________________
   __________________________

3. Why can’t scientists just test their new vaccine immediately on people?
   _____________________________________________________________________
   _____________________________________________________________________
   _____________________________________________________________________

4. The first vaccine for humans, developed by Edward Jenner was to prevent the deadly disease ____________.

5. According to the article animals are used in research for new vaccines because they have __________ life spans.

6. Why does it take so long to develop a vaccine? ______________________________
   _____________________________________________________________________
   _____________________________________________________________________
   _____________________________________________________________________

7. Number the steps in the correct order for creating a new vaccine.
   ___A. Determine how to test a hypothesis.
   ___B. Generate hypothesis.
   ___C. Test the vaccine on animals.
   ___D. Determine the need for vaccine.
   ___E. Conduct clinical trials on people.