Hairy Oil Saves The World

Table of contents

Abstract

Hair is a natural oil absorbent that is largely available to us. Hair and fur are hydrophobic and naturally absorb oil, which makes them a great resource to help fix our water pollution issue. Our goal with this project is to find out which animal's hair and fur can absorb the most oil out of water. For our project, we used goat hair, horse hair, bbuffalo hair, cat hair, fox hair, coyote hair, dog hair, motor oil, water, cups, a digital scale, gloves, measuring cups, plastic bags, and scissors. Methods we used in our project include creating mats by keeping the hair inside of a bag and matting the hair. We took the hair mats and dipped them into a cup filled with oil and water. We then took the hair and let the water drip out of it and measured how much oil was absorbed by each hair mat. We did this to see which animal hair would be optimal for oil spill clean-ups. We hypothesized that the buffalo hair would absorb the most oil out of the water while leaving the most water remaining in the cup. Our hypothesis was then supported by our trial results when on average buffalo hair had absorbed the most oil overall.

Research

Underneath the skin, we have hair follicles that are given the nourishment they need to grow by blood vessels at the base of the follicle. Each hair on an animal's body has a shaft and a root. The shaft is the visible part of the hair that we can see on an animal. The hair root is what stays deeper into the skin surrounded by the hair follicle which is a sheath of skin and connective tissue that keeps the root in place. At the end of the root is a bulb where the blood vessels get supplied to. Hair growth occurs in a repetitive cycle that is made up of three phases: The Anagen, the Catagen, and the Telogen. The anagen is the growth phase of the hair. Most hair is in the anagen phase at any given time. Each hair can spend years in this cycle. Next is the catagen phase which is a hairs transitional phase. This is when hair with start to slow its growth over a few weeks and the hair follicle will begin to shrink. Next is the telogen phase which is the resting phase for hair. The growth will stop and the old hair will detach from the hair follicle and new hair will begin the growth process in its place and push the old hair out.

Hair has a porous cortex which allows the hair to absorb oils and moisture. If the hair has tightly bound cuticles it will have a low porosity making it more difficult for oil to penetrate and seep into the hair. The hair cuticle acts as a protective barrier to the hair shaft but can be damaged by heat or chemicals which will affect the porosity of the hair. The higher the porosity your hair has the more easily it will absorb oil, making it useful to clean up oil spills. Higher porosity hair isn’t as healthy as low porosity hair but it can absorb more moisture which is more beneficial to oil absorption.

Animal hair properties and how they store oil is very important to how they can help take the oil out of the water. Fox hair, coyote hair, buffalo hair, goat hair, horse hair, cat hair, and dog hair all have similar makeups but all of them have different makeups than human hair. Fox's hair

is characteristic in its length, color, tip region size, basal cuticle scale pattern, and medulla cross-section. Foxes have three layers of hair to protect themselves: dawn hair, guard hair, and down hair. Coyote hair consists of soft and short underfur and long coarse guard hairs.

Oil is dumped into the ocean in large amounts every year it can be anywhere from 60 million gallons to 134 million gallons. Exposure to an oil spill can severely harm humans depending on the amount of exposure to their bodies. If a human were to come into contact with an oil spill some symptoms that may occur include respiratory issues, irritation, neurological effects, traumatic symptoms such as pain, decreased immunity, liver damage, and increased risk of cancer. The more time a person spends around an oil spill the worse their symptoms will be. Oil can cause a human's mercury level to increase drastically, a study showed that men who worked near oil spills had twice as much mercury in their urine as a person who didn't. Mercury can severely damage your brain and liver leaving you with lifelong problems or if the problems get too severe they can cause death. This is why trying to keep oil spills under control is so important, it directly or indirectly harms our people and life on earth.

Introduction

Each year 134 million gallons of oil are dumped into the ocean annually according to the "National Oceanic and Atmospheric Association" When larger spills happen we resort to using dispersants filled with toxicants to clean them up. These harmful chemicals and toxicants end up polluting the ocean and harming living organisms. Dispersants are toxic to fish that come across them throughout their whole life, from egg to adulthood. These dispersants can also harm commercial fish, we will consume these harmful toxins that can cause us to become severely ill. Before beginning our research we had come across a video that showed human hair mats could absorb large amounts of oil. We immediately became interested in this topic because we know pollution is a big problem as well as the chemicals used to break down the oil. We know human hair can absorb oil from water but we wanted to take that idea further by trying different types of animal hairs to see if one would work better than another. This experiment was conducted to further test the idea of oil-absorbing hair mats to improve their effectiveness. Most if not all oil spilled into the ocean is something you'd call crude oil. Crude oil can be bought in huge barrels but it can be extremely pricey. We decided to use motor oil for our project because we thought it would create a closer idea of what the real thing would be like. We found animal hides at a yard sale and decided to incorporate them into our project by shaving them. We found a fox and coyote hide and we were given a buffalo hide from one of our parents. Our friend gave us the dog hair we needed for our experiment, the dog was a mini Australian shepherd with a border collie mix. Luckily one lady had an old racing horse who was shedding and brushed out hair for us. Her neighbor had a goat and they let us watch her and her dad give Betsy the goat a haircut. We then called a groomer to see if they could save their cat hair for us. We wanted to figure out

which hair type absorbs oil the best without leaving too much oil in the water. This is how we came up with the idea for our project.

Question:

Which type of animal hair absorbs the most oil out of water?

Hypothesis:

If we take 7 different species of animal's hair, and turn them into mats, to use them to absorb oil out of water, then the buffalo hair will absorb the most oil because buffalos naturally produce large amounts of oil so their hair already naturally is made to hold more oil.

Variables:

Independent Variable: Type of hair
Dependent Variable: Amount of oil absorbed
Constant: The amount of water and oil used, mass of hair before experiment started, amount of time held in emulsion liquid, type of oil, type of water

Materials:

- ☐ Fox hair
- ☐ Dog hair
- ☐ Coyote hair
- ☐ Buffalo hair
- ☐ Horse Hair
- ☐ Goat hair
- ☐ Cat Hair
- ☐ 2 Graduated cylinder
- ☐ Beaker
- ☐ Scissors
- ☐ 600 ml Motor Oil
- ☐ Gloves

- [ ] Digital Scale
- [ ] 2000 ml Water
- [ ] 105 cups
- [ ] Plastic bags

Procedure:

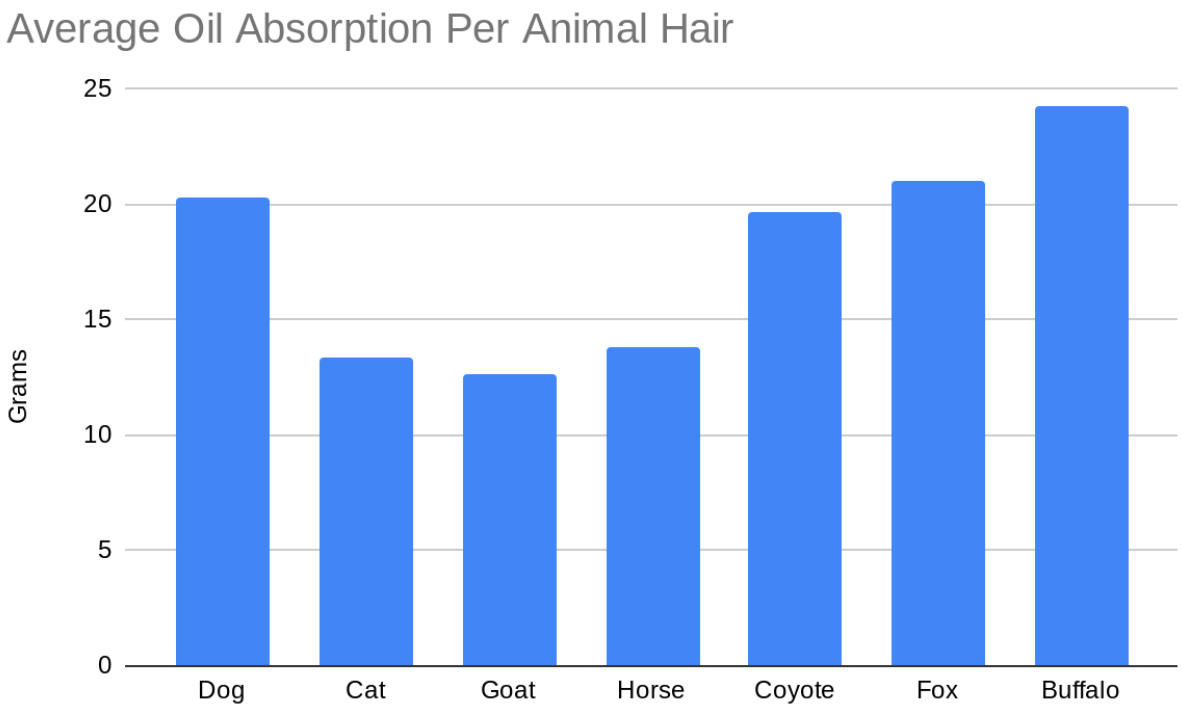
1. Gather all of your materials
2. Grab one type of animal hair and mat the hair by putting it in a plastic sandwich bag and rubbing it between your hands in a circular motion until a mat forms.
3. Take your hair mat and cut it into 15 separate mats that weigh 1 gram each
4. measure out 100 ml of water and 30 ml of oil in separate graduated cylinders.
5. Pour the oil and water that you measured into one plastic cup do this in 15 separate cups.
6. Take one of the mats and dip it into the cup with the water and motor oil
7. Leave mat in the water for 10 second to let the motor oil soak into the mat, then hold mat above container for 10 seconds to let water drain out of the mat.
8. Place the saturated mat onto the digital scale and weigh how much mass has been gained from absorbing the oil.
9. Clean your area before deciding to measure another mat
10. Repeat 6-9 14 more times
11. Repeat steps 2-10 until you have used each type of animal hair.

Data:

	Trial 1	Trial2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11	Trial 12	Trial 13	Trial 14	Trial 15	Average
Dog	19g	17g	19g	19g	20g	20g	23g	20g	22g	21g	19g	21g	21g	22g	21g	20.27g
Cat	13g	10g	13g	13g	13g	15g	15g	18g	16g	10g	14g	11g	12g	14g	16g	13.53g
Goat	8g	16g	10g	13g	15g	7g	14g	16g	14g	15g	15g	13g	11g	14g	9g	12.67g
Horse	20g	15g	15g	13g	14g	16g	13g	14g	15g	16g	16g	15g	13g	16g	13g	13.86g
coyote	20g	20g	19g	18g	22g	19g	20g	18g	20g	20g	19g	19g	21g	20g	20g	19.67g
fox	22g	20g	16g	20g	21g	20g	19g	22g	23g	19g	21g	20g	21g	21g	22g	21g

buffalo	21g	21g	22g	24g	23g	25g	26g	24g	27g	24g	25g	26g	23g	26g	27g	24.27g

Results:



Conclusion

Which type of animal hair absorbs the most oil out of water? Our project is meant to help our water pollution problem, we took 7 different types animal hair mats and used them to absorb motor oil out of water. The types of hair we used included fox, dog, coyote, horse, goat, cat, and buffalo. Our hypothesis was if we take buffalo, fox, coyote, dog, horse, goat, and cat hair, turn them into mats and use them to separate the oil out from the water, then the buffalo hair will absorb the most oil because buffalos naturally produce larger amounts of natural oils to lubricate the skin which means that their hair is already suitable for holding in oil. Buffalos have two different hair types, they have an outer layer of thick hair and an inner layer of thin hair. The thin hair helps absorb their natural oil easier that they produce and the thick layer of hair helps keep the oils in. This makes buffalo hair a great oil absorbent, their hair naturally absorbs large amounts of oil and then holds it in for long periods of time.Our hypothesis was supported by our data, the buffalo hair held the most oil out of the other 6 types of hair in our experiment. In our data it showed on average that dog hair absorbed 20.27 grams, the fox hair absorbed 21 grams, the coyote hair absorbed 19.6 grams, the goat hair 12.67 grams absorbed , the horse hair absorbed 13.86 grams , the cat hair absorbed 13.53 grams, and the buffalo hair absorbed 24.27 grams of oil. Issues that could have affected our data is we cannot tell how much trapped water was absorbed by the hair mat. Water is denser and heavier than oil, if a significant amount of water were to get trapped inside of the hair mat it would affect our results significantly. To fix this problem in the future we will let the mat of animal hair hang above the water for a longer period of time to allow all of the trapped water to escape.

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