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Biology

### Magic GMO's

In this episode of Magic School Bus, we are taking you on an adventure through the process of what Genetically Modified Organisms are and how they are made. In the opening scene, Arnold is seen watching a cow eat alfalfa. He then wonders what makes it so tasty to cows, so he picks up a strand of Alfalfa and starts chewing it. "Ew!" exclaims Dorthy Ann, "Alfalfa is for animals! Besides it isn't good for you, it has GMO's in it!". Arnold asks, "What is a geemo?" and Dorthy Ann replies, "No silly, the letters GMO stand for Genetically Modified Organism, it's an organism whose genetic material has been altered using engineering techniques" (3). To Arnolds dismay, he had no idea that any sort of plant or food could be altered. He asks, "So we can actually create a whole new species of plants, and it would be considered a GMO?". At this time his teacher, Mrs. Frizzle overhears this and responds, "Yes! Actually almost 70 percent of the food in grocery stores has genetically modified ingredients in it, and GMOs have only been around for almost 25 years" (2). Arnold replies, "why do we use these GMOs then?". "Well," Mrs. Frizzle explains, "farmers specifically like genetic engineering because they face challenges from insects, disease, weeds and weather in their efforts to cultivate healthy, productive crops. Genetic engineering provides another tool to deal with some of these challenges" (6). Arnold is very surprised and is eager to learn more about this topic, but mostly so he can fuel his fantasies of combining superhero powers into one super human.

Mrs. Frizzle had announced earlier that day that the class was going on a field trip to see exactly what GMOs are and how they are made. The kids all entered the bus excited to see what Mrs. Frizzle had in store for them, little did they know they would get up close and personal with

GMOs themselves. As the magic school bus shrinks and flies away, soon the kids find themselves in the middle of a corn field, with the corn seeming like skyscrapers next to them. The bus was flying down the middle of a corn patch when Dorothy Ann asks, “how do they make GMOs? Just by putting two types of corn together?” and Mrs. Frizzle responds, “that is actually called cross breeding, genetic engineering is a little more precise, let's get a closer look!” (2). The bus driver then shrinks the bus even more and flies into the corn itself, everyone gets excited as they see the corn on a molecular level, something that is astonishing to every eye. As they are taking a look at the corn DNA, Mrs. Frizzle holds up a picture of what the original corn DNA looked like and compares it to the one outside the windows. She explains, “As you can see, genetically engineering these crops is quicker and more desirable to get the trait that the farmer is wanting, it splices new genes directly into an organism’s DNA sequence, rather than waiting for the offspring to produce a desired trait” (2). The kids all murmur a mix of ‘wows’ and ‘cools’ as they are fascinated to see an actual DNA strand up close. “You kids get a good look? I hope so! Next stop, the laboratory!”.

The school bus then zooms to an engineering laboratory nearby that specializes in engineering foods and crops. As they enter the lab, as small as a fly, they get to witness how these GMOs are being made. First they watch as the scientists identify what desired trait they want the specific crop to have, in this case the scientists were looking to make this strand of corn have a resistance to drought since the county was having a dry few years (3). After that, they see the scientists find a specific organism that already has a resistance to drought and copy-and-paste that trait into the corn DNA in the place of where the corn didn't have a resistance to the drought (4). The bus then flies to the scientists’ growing room where they make sure that the organisms have grown up with the desired traits they were given and then reviewed so that these organisms

are safe to be sold to farmers (3). Arnold pipes up in the back of the bus, “but why wouldn't these crops be safe, they make them to be better right?”. “On the contrary, Arnold” Mrs. Frizzle replies, “There is concern that the protein products of introduced genes may be toxic or allergenic to certain individuals, a concern for loss of nutrition, as well as a concern of genetically modified versions mixing with the naturally existing populations of plants from which they're derived” (1,4). “But that sounds scary! Why are GMOs so popular?” exclaims another, Mrs. Frizzle replies, “There is a lot of controversy surrounded by Genetically Modified Organisms, but there is a long process that they have to go through to get approved to be sold, as well as being required to state whether the product has a GMO or not too!”.

The bus begins to fly away from the laboratory and towards a grocery store nearby. “Now we are going to look at what foods we eat every day have GMOs in them!” which catches the interest of many of the kids on the bus. As they enter the store, the kids begin to notice the labels that say ‘GMO’ or ‘No GMO’ and they are surprised to see that they completely missed noticing them when they are eating foods. Mrs. Frizzle quizzes the kids by asking, “So kids, what foods do you notice are the most common that are or have GMOs?”. One kid yells “Corn of course!” while another hollers “canola oil!” and Mrs. Frizzle applauds them for being so observant. Dorthy Ann then questions, “so if GMOs are so bad, then why are they in almost everything I see?”, “very good question Dorthy Ann” Mrs. Frizzle replies, “There are also many benefits to GMOs as well such as it makes the food tastier, use of less pesticides, increased supply of food with reduced cost and longer shelf life, faster growing plants and animals, and food with more desirable traits which can be used as medicinal foods! You see children, whether GMOs are good or bad, it is in the eye of the beholder and what their personal health views are” (5). As the bus

and the class return to normal size again, the kids all begin to create their own versions of GMOs or as they liked to call them, 'superfood breeds'.

## References

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