"ABOUT ALL YOU CAN EAT"
SHOW 502

EPISODE OPEN

ALAN ALDA For our ancestors, a feast was a very special occasion. Yet today we eat like this more often than you might think. On this edition of Scientific American Frontiers, we'll find out how much our stomachs agree with that.

ALAN ALDA (NARRATION) We'll also try the recipes that made civilizations possible... We'll reveal the secrets of the elusive morel mushroom... We'll solve that critical pet problem, doggie breath... And discover how the overweight hide the truth -- from themselves.

ALAN ALDA I'm Alan Alda. Please join me now for our special edition, About All You Can Eat.

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THE PLIMOTH FEAST

PRIEST Almighty Jehovah, we are grateful, Oh Lord, that thou hast given us good plenty and good harvests, that we might feast together with these our brethren of reformed religion. We offer up our prayers in the name of Thy Son, Christ Jesus, Amen.

GROUP Amen.

ALAN ALDA(NARRATION) The year is 1627. The place -- Plimoth, Massachusetts. The occasion -- a great feast, put on by the colonists to impress their Dutch guests.

ALAN ALDA This smells really good.

MAN Ah, there's the pie.

ALAN ALDA What's in that pie?

WOMEN Minced Pie. It hath turkey and dried fruit and spices. Good and sweet and we did not spare no spice. We have Dutch visitors amongst us.

ALAN ALDA I'm going to stay in this century for a while.

WOMAN Then you must be willing to eat your share of cabbage pottage.

ALAN ALDA Cabbage pottage. Well maybe I'll just come back on certain days. Could I have some of that, that's venison, right? That looks interesting. You know, I don't eat this way all the time. In fact, not so long ago it was only kings and lords who could expect to eat their fill of rich food more often than once or twice a year.

ALAN ALDA (NARRATION) Even for these settlers, who marveled at the abundance of the New World, this meal is a rare treat -- that is, according to my neighbor at the table, Mistress Priscilla Alden.

ALAN ALDA When is the last time you had a meal like this? I mean, this elaborate, this many courses?

WOMAN I would say Master Bradford's wedding. There was a feast as great as this but not quite so fine.

ALAN ALDA So when was the Bradford wedding?

WOMAN About three years ago.

ALAN ALDA So three years ago you ate a feast like this.

ALAN ALDA (NARRATION) In the days leading up to the feast, everyone in the tiny colony took time out to hunt in the forests, to fish on the bay, to prepare the best of everything. The communal oven was fired, to bake pies and the finest of white bread. Ducks and geese roasted over open cooking fires in the cottages. But this tremendous community effort was special. Cabbage soup, or pottage, with coarse bread was a typical everyday meal -- the kind of plain food that had been normal for most people for thousands of years. But nowadays, cabbage pottage is far from normal -- things have gotten turned around.

ALAN ALDA The truth is that today, most people in America -- and throughout the industrial world -- actually do eat like this most of the time. Maybe not such a variety of dishes, but the quantity and richness of our food is really like a historic feast. That may sound like a good thing, but take a look at our first story.

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FEAST OR FAMINE

ALAN ALDA (NARRATION) The rugged Sierra Madre mountains of northern Mexico. A caravan of researchers is on the road, hoping to solve a great mystery of medical science -- the case of the Pima Indians. The destination is the village of Maycoba, home to a tribe of Pimas. Dr. Eric Ravussin of the National Institutes of Health has worked with Pima Indians in Arizona for many years. Today he is extending the work to include this village. It's part of the world's longest-running study of obesity, begun by the NIH 30 years ago to investigate a tragic epidemic that struck 350 miles to the north.

ERIC RAVUSSIN 4.6.

ALAN ALDA (NARRATION) These are the Arizona Pima, close cousins to the Mexican tribe. This community suffers from the world's highest rate of obesity and its common complication, diabetes. Half the adults here develop it. The puzzle is that, as the NIH study has shown, the Arizona Pima eat no more, and no differently, than most Americans. Yet their obesity rate is much higher -- 80 percent versus 30 percent nationally. The challenge now is to find out why these people gain so much weight. Until early in the century, these people were farmers. They call themselves Akimel O'Odham -- the River People -- after the Gila River, which sustained their crops. But that way of life, along with the river, dried up when the waters were dammed and diverted.

ERIC RAVUSSIN This was the start of the change in life style. They had to curtail and finally abandon totally their farming. And they were supplied with food from the U.S. government and also on a cash basis. And the change was tremendous, and very rapid, over maybe two or three decades.

ALAN ALDA (NARRATION) We first visited Eric Ravussin eight years ago at his Phoenix lab, where he was doing groundbreaking work on energy and weight. To begin sorting out the different factors, he used this respiratory chamber. It's an artificial environment inside a box, the ultimate in controlled lab conditions. Volunteers from the Akimel O'Odham community-- like Peter Jackson here -- would spend 24 hours at a stretch sealed in the chamber.

ERIC RAVUSSIN Hello Peter, how are you doing? PETER All right.

ERIC RAVUSSIN Everything is fine?

ALAN ALDA (NARRATION) Like any engine, Peter's body absorbs oxygen to burn fuel, and breathes out carbon dioxide. Monitoring these gases in the chamber allowed Eric to compute the fuel that Peter burned, and the number of calories he used. Physical activity was also monitored, and it turned out to be critical. Even the most trivial fidgeting is important, adding up to significant energy use. Eric also found there were significant differences between individuals in levels of fidgeting. Jennifer Thomas was another volunteer.

ERIC RAVUSSIN Hello Jennifer, how are you doing?

JENNIFER THOMAS Fine.

ERIC RAVUSSIN O.K. Everything is all right? Do you need anything?

ALAN ALDA (NARRATION) Most of Jennifer's time was spent passively watching television. A motion sensor on her wrist, along with the radar, recorded little movement. But Peter's fidgeting used 600 calories a day-- like jogging four miles.

ERIC RAVUSSIN Now the problem is that it is very difficult to choose to be, you know, to have a high spontaneous physical activity. You are either born being a kind of fidgeter or born having a very low level of fidgeting.

ALAN ALDA (NARRATION) So today Eric's latest study aims to measure activity levels in children, and then see if low activity could be a predictor for later obesity.

WOMAN Molly, I'm going to do the bio-impedance on you today you today.

ALAN ALDA (NARRATION) Five-year-old Molly Howard is starting a new experiment, one that will last for the next 20 years.

WOMAN ...as still as possible, O.K.?

ALAN ALDA (NARRATION) First they measure how much fat she has now. From this electrical impedance test, the amount of fat and lean tissue in the body can be calculated. Right now Molly is not overweight, and her fat is normal. But the chances are greater than 50/50 that in 20 years she will be overweight like her mother, Elaine. To measure Molly's activity, Eric uses a new method called doubly-labeled water. It allows his subjects to get out of the artificial chamber and into the real world.

ERIC RAVUSSIN Is that good? Yeah.

ALAN ALDA (NARRATION) The water contains tracers that will track how much energy Molly expends over the next week. Her instructions -- go home and be yourself.

ERIC RAVUSSIN Good girl.

ALAN ALDA (NARRATION) Like most kids, she does a variety of things -- from fairly quiet... to very active. After a week she returns to the lab to be tested.

WOMAN All right.

ALAN ALDA (NARRATION) When the sample is analyzed for the remaining tracers, it will turn out that Molly's activity level is the same as most American kids, although in general Akimel O'Odhamkids are a bit less active than average. It will be years before it is clear whether Molly is developing obesity, but statistically it is likely. Meanwhile Eric is exploring other factors that might contribute to obesity. It's a confusing picture because Molly and the rest of the tribe have a lifestyle just like millions of other Americans. They eat the same foods, even watch the same amount of television. There is, however, one theory that has its roots in history.

ERIC RAVUSSIN There was an interesting idea suggesting that obesity is the expression of a gene called "the thrifty gene." And it's possible that people being good at storing fat -- it's a very important survival value for these people during periods of famine. And Pima Indians went through periods of famine and possibly maybe people, their being very efficient in storing fat, survived these periods of famine. And now with the availability of food and less work in the field, you know, just this, this gene is expressing itself as obesity.

ALAN ALDA (NARRATION) This theory can now be tested in the mountains of northern Mexico. The Mexican Pima have a lifestyle that must be close to that of the Arizona tribe 100 years ago. For Eric it's a golden opportunity.

ERIC RAVUSSIN It was like arriving in a naturally designed experiment. We were facing two populations with a very likely similar genetic background but living in totally different environments.

ALAN ALDA (NARRATION) What the researchers found was a stark difference. Compared to the Arizona tribe, the Mexicans have lower blood pressure and lower cholesterol levels...

ERIC RAVUSSIN 100/60, O.K.?

ALAN ALDA (NARRATION) This skin fold test shows that Mexican Pimas are leaner... The major difference is body weight. Women on average are 45 pounds lighter than in Arizona. WOMAN (Spanish)

ALAN ALDA (NARRATION) The men are 65 pounds lighter. It's a dramatic contrast, but so is the difference in life style. WOMAN (Spanish)

ALAN ALDA (NARRATION) The Mexican Pima are much more active -- because they have to be. Manual labor of all kinds is the rule. When Peter goes to work in Arizona, he hops in the car and drives. It's just one of the conveniences of modern American life. In Maycoba it's more common to walk, or ride if you are lucky. As in most American homes, in Arizona the TV occupies lots of the family's spare time. But in Maycoba there are many chores. There's no running water, no electricity, no machines. If you want food, you must grow it yourself. In Arizona, food comes from the supermarket shelf. In Mexico, diet consists of just three staples -- potatoes... Corn made into tortillas and cooked without fat... And beans. It's a very low-fat, high-carbohydrate diet. In Arizona they eat typical American meals, that are high in fat -- 40 percent overall, compared to 20 percent in Mexico. So there's a lesson in this for us all -- life style matters. For the Mexican Pimas -- in spite of their genetic predisposition, diet and exercise are good preventive medicine. Even people susceptible to obesity aren't condemned to that outcome. It's an optimistic note for people like Elaine Howard, who hopes to prevent the onset of obesity in her daughter.

ELAINE She's a pretty active person right now. She is not overweight or anything. I would like for her to learn right now that being, to stay active and, you know, to eat the right foods because I have seen how my parents have come along and they have diabetes right now. It's because our, most of our people have strayed away from the main diets that they grew up with.

ALAN ALDA (NARRATION) The Arizona tribe is now trying to renew its ancient farming tradition. It offers not only a better diet and more physical activity, but also the hope that things can turn around for the next generation. But just as the Arizona people are starting to relearn these secrets, their cousins in Mexico are starting to lose them. The new road that brought the scientists in is also bringing in the modern world. A new water supply is on its way. There's store-bought lard in the kitchen. But the tragic lesson of the Arizona tribe could be of some help.

ERIC RAVUSSIN I think that the message is really let's try to get this transition as smooth as possible, and let's try to retain some of the good things in the traditional life style. And maybe the best thing we can retain, at least it's a healthier diet with less fat, less saturated fat that is animal fat, and more fibers in the diet, and more carbohydrate.

ALAN ALDA (NARRATION) So perhaps the future of the tribes in Arizona and Mexico is one of hope, with each poised to learn from the other.

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SUPER FOODS

ALAN ALDA (NARRATION) This is farm country, in the American Midwest. Year in and year out, there's a harvest of millions of tons of wheat, soybeans and corn. The three crops are a critical part of our food, either to eat directly or to feed to animals. Yet at one time these plants were of even more fundamental importance. In three different parts of the world, they became the very foundations of civilizations. Exactly how it happened is lost in time. But in the Middle East, several thousand years ago, people learned how to cultivate wheat. The Chinese raised soybeans. And in Central America the Maya, or maybe their predecessors, grew corn. Yet the true genius of all these people is not just that they domesticated crops, but they figured out recipes that turned them into high quality food. We're in New Mexico to track down the first of these ancient recipes. The recipe transforms corn into a superior food. Josephine Nahohai is working with blue corn that was grown right here on the Zuni reservation. The color is more than decorative. Later it's going to guide Josephine through a critical stage in the recipe, after roasting and grinding are finished.

SOL KATZ So would you be kind enough to do the honors on this?

ALAN ALDA (NARRATION) My guide through the intricacies of the ancient kitchen is anthropologist, Sol Katz.

SOL KATZ Put a little bit more in here... and you can see....

ALAN ALDA How would they have ground this thousands of years ago?

SOL KATZ Yeah, well they use a mano and matate actually.

ALAN ALDA(NARRATION) The grinding method has changed little over the centuries. But corn flour has a fatal flaw -- the B-vitamin in it, niacin, is indigestible.

SOL KATZ If we were to eat this or make it into a food and eat that food, none of that niacin would be available to us.

ALAN ALDA So if we only ate this we could survive, but what would happen to us?

SOL KATZ We wouldn't survive for long, because we would develop pellagra.

ALAN ALDA (NARRATION) Probably the people of Central America first discovered how to unlock the niacin in corn, and the secret quickly spread. The essential ingredient is lime, made with roasted limestone and water. The lime water that Josephine makes is highly alkaline. Different traditions have developed to arrive at the same result.

ALAN ALDA Is the process of burning this creating alkali?

SOL KATZ It isn't creating the alkali yet. When we put that salt that this ashes leaves, back in water, then it's going to be an alkali.

ALAN ALDA (NARRATION) We're using the method of the Hopi who make ashes from one particular desert bush. But we're also going to check the recipe using a thoroughly non-traditional pH meter.

SOL KATZ This is the real strong alkali that we just made. As you can see, it's jumping, look it. It's going right off the map.

ALAN ALDA Wow. Right up to 10.

ALAN ALDA(NARRATION) Any pH above 7 is alkali. So now we're adding our ash water to a batter made with blue corn flour, which is naturally a little acid. We're aiming for a pH of 8.

SOL KATZ We're still in the acid range. So we need, it means we need to add some more of our ash. And this is... this is the difference between me now, and one of these women who really know exactly...

ALAN ALDA How would... how would she go, would she go by the color?

SOL KATZ Because she's going to go by the color.

ALAN ALDA(NARRATION) As lime water is added, natural dyes in the corn turn deep blue, just as the pH reaches 8. And that's the right alkalinity to break down the compounds which trap the niacin. Suddenly the corn is transformed into a superfood. And it tastes good, too. JOSEPHINE NAHOHAI When I make the dough, when I put the lime water in to make it blue, I guess it's for the taste, that's why we put the lime water in there.

ALAN ALDA (NARRATION) Learning to make piki bread, as it's called, is part of becoming a Zuni or a Hopi woman. The recipe is passed down from mother to

daughter. The superior nutrition it offers was vital for survival, for not only the Zuni and the Hope, but throughout Mexico and Central America.

ALAN ALDA I cannot believe I'm doing this. Well look, I got a real thin layer right there.

SOL KATZ Yes, that's perfect, that's perfect. And you still have your fingers, I think.

ALAN ALDA I've got four of them...

SOL KATZ There, perfect. Good.

ALAN ALDA See that? It's kind of small.

SOL KATZ That's all right. That's all right. It's better than I was doing.

ALAN ALDA (NARRATION) Some time between one and two thousand years ago, the Chinese developed a recipe for soybeans. The recipe is as miraculous as the alkali treatment of corn. Raw soybeans are effectively toxic because they contain anti-trypsin factor, a chemical which shuts off the way we digest protein. The recipe starts by soaking the beans.

SOL KATZ You feel the seed.

ALAN ALDA This seed?

SOL KATZ Yeah. Feel how hard that is.

ALAN ALDA Yeah, very hard.

SOL KATZ Now look how soft, how much softer this is already.

ALAN ALDA Yeah, well that's easier to eat.

SOL KATZ It's easier to start to work with. So that's one reason that... Oh don't eat it. Don't eat it.

ALAN ALDA No? What will it do to me?

SOL KATZ Ah, that's a good question.

ALAN ALDA Well, you better talk fast. Oh my... now you tell me.

SOL KATZ This is loaded with an anti-trypsin factor.

ALAN ALDA No, I'm going to have a lot of trypsin in here?

SOL KATZ No, it's going to be the opposite. Your pancreas won't be able to --

ALAN ALDA My pancreas?

SOL KATZ Right.

ALAN ALDA Why didn't you mention that! Why isn't there a warning on the pot? People go around the kitchen and say test what's in the pot all the time.

SOL KATZ Right. Right. Right. Yes, yes, yes, well, in this case... in this case what has happened is that...

ALAN ALDA Pfft...

SOL KATZ Yes, yes, exactly.

ALAN ALDA Now what?

SOL KATZ What we need to do is we need to deactivate that anti-trypsin factor.

ALAN ALDA How do we do that?

SOL KATZ Ah, what I could do is I could boil this up for about the next four hours. And that's what it would take to deactivate the anti-trypsin factor. Fortunately, one seed isn't going to poison you.

ALAN ALDA(NARRATION) We ground up the softened beans, then brought them to the boil.

ALAN ALDA Here it goes. Here it goes.

ALAN ALDA (NARRATION) Next we strained out the bean residue.

SOL KATZ What we're going to do is separate the... the beans from the milk.

ALAN ALDA Is this milk we've just made still kind of poisonous for humans?

SOL KATZ Yeah, that's right. It still has the anti-trypsin factor. Now if we went through a lot of extra technology we could deactivate the anti-trypsin factor in this by pressure cooking, modern technology, etc. But traditionally you could either

boil this for much longer, but you can see how difficult it would be to boil this. It would just boil over on us all the time.

ALAN ALDA So what do we do with this to make it trypsin friendly?

SOL KATZ So what we're going to do now is precipitate the protein.

ALAN ALDA (NARRATION) The magic ingredient is magnesium chloride, a component of seawater. It makes the soy protein coagulate into a curd.

SOL KATZ And in that process we've now basically deactivated the whole anti-trypsin. We're separating the anti-trypsin that's going to be left in the whey, and we're separating -- and the protein that's going to be precipitated is going to be free of that.

ALAN ALDA (NARRATION) What we're making, of course, is bean curd or tofu.

SOL KATZ Now that's the curd, and the bottom is the whey. We don't want it to... that's right, just go ahead and put it right in here. And what you want to do is to layer it in there really carefully. Reach in and try not to fish it around a lot. You know what I mean, just let it go in there and then slowly pull it out.

ALAN ALDA When you say layers, I'm getting different kinds of curds here as I go down...

SOL KATZ No, actually you're not. No, it's all the same curd. But the whole idea is to keep those pieces very large. And they stay that way.

ALAN ALDA Oh, so that's what you mean by layers.

SOL KATZ Right. Right. Right, exactly.

ALAN ALDA (NARRATION) Finally, we'll squeeze out the last few drops of anti-trypsin factor, leaving behind high-quality, easily digestible protein.

SOL KATZ Now I'm going to press this, OK. And if I press this, can you see the liquid running out the sides?

ALAN ALDA Yeah, yes.

SOL KATZ Watch this.

ALAN ALDA (NARRATION) What remains was a mainstay in China, more than a thousand years ago. Starting in the Middle East, wheat provided one of the most

important foods of all, thanks to a simple recipe. And thanks to yeast, a marvelous ingredient that transforms the wheat. Nowadays we add pure baker's yeast, a descendent of one of the wild yeasts that would have been used originally. As the yeast ferments the flour, a whole range of transformations take place. Protein quality improves, B vitamins increase, and chemicals which lock up calcium are broken down.

SOL KATZ So the yeast has some beneficial qualities in getting rid of some of the anti-nutrients. And as well, it also improves the actual quality. So it's taken a good source of food and made it into a superfood. So bread becomes like a superfood for us.

ALAN ALDA So you could exist, you could exist on bread?

SOL KATZ Almost you can do... almost...

ALAN ALDA Not quite on bread alone, but close.

SOL KATZ Right. Almost on bread alone. And you want to treat it a little bit more gently than that.

ALAN ALDA What do you call it punching for?

SOL KATZ Well, that's true. They punch it down, but yeast is still...

ALAN ALDA Punch the bag like that. You know, I mean you've got to give it a shot.

SOL KATZ Well, it looks like you won.

ALAN ALDA This was mine?

SOL KATZ Yeah, you definitely, you punched yours down harder than mine. And there's no doubt about who the winner is. However we'll have to... I guess the final thing will be in the tasting.

ALAN ALDA The taste, I think you're right.

ALAN ALDA (NARRATION) As a bonus, there's the wonderful puffy texture of bread caused by carbon dioxide gas, a lucky side effect of yeast fermentation. And it doesn't hurt the taste either.

ALAN ALDA Yours is very good.

SOL KATZ Mmmm... the taste of that.

ALAN ALDA (NARRATION) Our day in the kitchen was about much more than making food. Actually we were making history. Sol Katz believes that without these recipes, societies could not have developed.

SOL KATZ This is now a superfood in a sense. And... and it's delicious.

ALAN ALDA (NARRATION) What the superfoods achieve is to take nature's most productive plants and tailor them to match what our stomachs need.

SOL KATZ We've optimized the entire nutritional value of this. And now in a sense you can build a civilization off of this food.

ALAN ALDA How long do you suppose it took us to evolve culturally these ways of processing these foods so that we could get such an advantage out of it?

SOL KATZ I think that they have to co-occur, basically co-occurring at the same time. You could say you could make these domesticated, but in fact you wouldn't really be able to depend upon them very much until you step through that window of the appropriate cuisine and made a whole new thing out of it.

ALAN ALDA (NARRATION) So next time you take a mouthful of bread, remember -- that's history you're chewing on.

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COUNTING CALORIES

BARRY LEE I've tried SlimFast.

CHANTAL LA FORTUNE I've tried drinking a lot of water.

BARRY LEE Weight Watchers.

CHANTAL LA FORTUNE Rigorous exercise.

BARRY LEE Overeaters Anonymous.

CHANTAL LA FORTUNE And going down to eating like ah, rabbit food.

BARRY LEE I don't tend to look in full length mirrors if I can avoid it.

CHANTAL LA FORTUNE And I'm just miserable.

ALAN ALDA (NARRATION) The fashionable and healthy thing to be is slim. Yet more and more people are finding it too hard to keep up with this ideal. Today, 30% of Americans are clinically obese, up from a 25% ten years ago. Chantal La Fortune is in a program for the obese, defined as at least 20 percent heavier than normal.

TECHNICIAN You're going to hold on to the sides and you're going to bend down, knees onto the platform.

ALAN ALDA (NARRATION) Here at St. Luke's-Roosevelt Hospital in New York, she's being weighed underwater. It shows her body is 43 percent fat, while 25 percent is normal. Another standard test is of metabolism. That's what's going on here with Barry Lee. Many obese complain of slow metabolism, but this test shows that both Barry and Chantal burn normal amounts of calories, at rest and while exercising. So maybe they just eat too much. To investigate that, the patients are asked to keep a meticulous food diary. It's been a traditional part of obesity research for nearly a century. Here's how Barry records this meal.

BARRY LEE One portion of spinach pasta with mixed vegetables and I include what vegetables I used. In this case, squash and green and red peppers and mushrooms. I filled out the forms as best as I could recollect. And you know, if something was in ounces that I knew like a can of juice or a container of milk, I put down the exact amount. If it was a fruit, I'd say, small, medium or large. The only times it would be difficult is when you went to a restaurant.

ALAN ALDA(NARRATION) Lauren Muhlheim, a researcher at St. Luke's, converts the food diaries into calories using a comprehensive nutritional database. There are 23 varieties listed just for an English muffin. By Barry's careful records, he's eating only 800 calories a day. Many similar results have led to the conclusion that the obese don't eat any more than others. So why is he overweight? Doubly labeled water may help solve the mystery. The same as is used in the Pima Indian studies, the technique accurately measures the body's energy consumption. After two weeks, Barry is confronted by study leader, Dr. Stephen Heymsfield.

DR. STEPHEN HEYMSFIELD This water allows us to measure how many calories you burn over 14 days. And when we did that test on you we got a value of about 3100 calories a day. Now on the other hand, we had you reporting approximately 800 calories a day on your food records. So there's a big gap, 2000 or more calories a day.

ALAN ALDA (NARRATION) With doubly labeled water, Barry is brought face to face with reality. He's not losing weight because he's not really dieting.

DR. STEPHEN HEYMSFIELD For many years it was thought that the obese don't overeat compared to people who are normal body weight. And that was based on these food records and self-report to a very large extent. And now that we have objective measures of measuring how many calories people eat we're discovering that there was this, what we would call, a bias in food intake reporting. The tendency was for people who are heavier and heavier to be reporting less and less of the actual amount they ate.

LAUREN MUHLHEIM Now the question is, why are they misreporting? It did not seem to be conscious lying. These people had gone through many, many tests, and really seemed to be curious to know why they were having so much trouble losing weight.

ALAN ALDA (NARRATION) Chantal is part of an ingenious new experiment designed to find out how aware the subjects are of their own eating behavior.

WAITER Are you ready to order?

CHANTAL Ah, yes, I am. I'll have an order of the vegetable dumplings.

ALAN ALDA (NARRATION) Once again, a detailed food diary will be required.

CHANTAL I've ordered shrimp fried rice and steamed vegetables. And how I would write this down is I'm not going to eat all of this. I'll probably eat half of it, which means it will probably be about a cup of rice. And I'll probably have three of the dumplings.

ALAN ALDA (NARRATION) In this first phase of the study, Chantal's carefully prepared records acknowledge her eating 1700 calories a day. Then she's given doubly labeled water. But unlike Barry, who was kept in the dark, Chantal will be told exactly what the water is for -- that it will be used to double check her food records.

LAUREN MUHLHEIM In this experiment it's not so important that patients actually receive doubly labeled water, it's more important that they believe that they're getting doubly labeled water. And that they believe that we're going to be able to double check the number of calories that they're reporting on their food records.

DR. STEPHEN HEYMSFIELD We had a reported intake of 1700 calories a day during the screening period that we studied you and we kept records, and then the second time your intake went up to 2200 calories, that's almost a 500 calorie increase. Yet your weight stayed exactly the same.

ALAN ALDA (NARRATION) Chantal knew she was being checked, and her self-reports shot up 500 calories.

DR. STEPHEN HEYMSFIELD We were wondering, did you keep better food records the second time, or did you eat more as far as you know, or what happened?

CHANTAL Well, I was diligent both times, but I ate more on the second...

DR. STEPHEN HEYMSFIELD If you ate more, you would have gained more weight, but you didn't. Your weight stayed exactly the same.

ALAN ALDA (NARRATION) The strange thing is, Chantal has no awareness that the water made her more truthful.

DR. STEPHEN HEYMSFIELD Do you think that had an influence on you, knowing that we really knew how many calories you were eating? Do you think that made you keep slightly better records, perhaps?

CHANTAL No. I decided that if I'm going to get the true result I just have to be the same way.

DR. STEPHEN HEYMSFIELD The same way.

CHANTAL Yeah, no, it didn't affect me.

ALAN ALDA (NARRATION) But her improved accuracy shows that, deep down she must know how much she's really eating. The only person she's fooling is herself.

LAUREN MUHLHEIM The important thing about getting people to be more accurate in their self-reporting is that it would show that the information that they're eating more was available to them on some level. Now if they can be made aware that they're actually eating more then they can be made to modify their eating, and actually lose weight.

ALAN ALDA (NARRATION) So the greatest hurdle for the obese may be a psychological one. They have to first learn to be honest with themselves about how much they're eating. And then they have to use that knowledge to eat less.

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MUSHROOM MANIA

ALAN ALDA (NARRATION) Springtime in Northern Michigan. Time to get outdoors -- and time to eat morels. You may not have heard of them, but mushroom connoisseurs certainly have. There's fierce competition hunting down this elusive delicacy.

WOMAN They're delicious. I'm a mushroom maniac. Once you have one, you're like hooked, you know.

JACK CZARNECKI This is melted butter. I use just about --

ALAN ALDA (NARRATION) Chef

JACK CZARNECKI, who specializes in mushrooms, is preparing to cook the rarest morels of all -- ones that have never been near a forest, the first ever cultivated morels. In a blind test, I'm going to see if they can capture the magic of wild ones. So here are morels, type A. And here are morels, type B.

ALAN ALDA If you found a mushroom that was cultivated and tasted to you exactly like the wild mushroom, would that make a big difference to you?

JACK CZARNECKI Well, this is an extraordinarily exciting development to be able to do this. It's been tried for at least 100 years to cultivate the morel. These are picked and eaten in India and Pakistan, in Mexico, in South America, they're eaten everywhere. It's probably the most universally loved of all the wild mushrooms. And there's been a great chase, a great hunt, if you will, over this 100 year period, to cultivate these mushrooms. And it's been done now here in this country for the first time.

ALAN ALDA (NARRATION)

GARY MILLS heads the team from Michigan State University that broke the morel barrier. The key to their success has been getting to know exactly what makes a morel happy.

GARY MILLS In the case of Michigan, they like conditions which are associated with springtime. Initially it starts off as being cool weather, and also damp weather. What you need to grow any type of mushroom, morels particularly, is quite a bit of moisture. The more moisture you have the better off it will be. And the temperatures are also critical. Sometimes morels can be a little elusive. Here's one growing underneath a tree limb.

ALAN ALDA (NARRATION) It's taken Gary's team ten years of work in the lab to learn how to grow morels. Like all mushrooms, morels have a life cycle that

begins when microscopic spores drop from the mature fungus. Normally the spores would fall onto the forest floor. But here they're collected on a dish containing a nutrient jelly. After a few days, the spores germinate, sprouting tiny threads called mycelia. They're about one tenth the thickness of a human hair. In the wild, summer conditions promote rapid growth, so when fall comes around the mycelia have formed underground clumps, called sclerotia. The team raises sclerotia by taking mycelia they've grown from morel spores, and seeding it into jars of soil. After a month of simulated summer the sclerotia are dug out. Now here's the key discovery. It was always thought sclerotia were a response to some kind of abnormal stress. But in fact, they're the morel's normal wintering stage -- something previous researchers had missed.

GARY MILLS They knew the importance that the sclerotia were there, but they thought that they were just to allow the fungus to survive, to survive adverse conditions. But in reality they also store nutrients, which can then be used quickly to come out when favorable conditions start again.

ALAN ALDA (NARRATION) So the next step is to wake the sclerotia up in the spring.

GARY MILLS This is basically what's happening outside in nature during the springtime. We get the spring rains, the ground's totally saturated, the sclerotia are picking up the moisture, and from this then the morel will grow.

ALAN ALDA (NARRATION) They had to figure out a wealth of other details like temperature, light and humidity. With that though, they've tamed the wild morel. So now it's clear that mass production of sclerotia is the key to cultivating morels. They're using jars dosed with cooked wheat, to simulate ideal nutrient conditions on the forest floor. But let's not miss the forest for the trees. After all, what this is for is making it easier to eat morels.

ALAN ALDA Can you tell by the sight of them which is which? Or do you just remember what you put in what dish?

JACK CZARNECKI Let me put it to you this way, if I didn't know which was which and these were put in front of me, I couldn't tell the difference. Not from looking at them. Not from looking at them. From smelling them, I could.

ALAN ALDA Oh, from smelling them. Right now could I smell the difference? Well, I do smell the difference.

ALAN ALDA (NARRATION) Morels Rosenthal, on a bed of crisp phyllo pastry. Although they were prepared the same way, the two dishes had smelled

markedly different to me. And they looked different too. But wild morels vary a lot, and I've never smelled one before anyway, so this was a tough challenge.

ALAN ALDA OK. OK. I have a very strong preference for this one, because from my taste, it's... to me, this is like Mozart, and this is like rock and roll. This has got a lot of stuff going on, a lot of ba boom, baboom, baboom, you know. This is very light, it's nice, it tender. But I think, I think that that's cultivated, and I think that this is... is... is wild but, but I don't know. What do you... tell me now.

JACK CZARNECKI You're right.

ALAN ALDA I'm right?

JACK CZARNECKI Yes.

ALAN ALDA On both counts. I'm right about what I like, or I'm right about guessing?

ALAN ALDA (NARRATION) Wild morels, like these -- rare and expensive -- are all you can get right now. But the cultivated ones won't be long in coming.

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THE BITE STUFF

ALAN ALDA (NARRATION) America's pets eat 9 billion dollar's worth of commercial pet food a year. These dogs are members of a canine elite that decides what the rest of the nation's dogs -- or at least their owners -- will be buying next. They are taste testers at the Kansas research center of a leading pet food manufacturer.

MIKE HAND Hi Alan, this is Tango

ALAN ALDA Hi Tango...

ALAN ALDA (NARRATION) As I found out, the big trend for dogs -- as in humans -- is to healthier, less-fattening foods. Even the newest treats are nutritionally balanced.

MIKE HAND You can eat these if you want, they're just not that flavorful.

ALAN ALDA You know, this doesn't taste bad.

MIKE HAND If you would use these as hors d'oeuvres at your next party, they won't break you.

ALAN ALDA You could just pass one around.

ALAN ALDA (NARRATION) There's a back-to-nature trend, too.

ALAN ALDA Before people were responsible for feeding dogs, what did dogs eat on their own?

MIKE HAND Well dogs are omnivorous naturally. They eat plants and animal tissue. So in the wild they tend to eat things like small mammals, rabbits, mice, rats.

ALAN ALDA (NARRATION) The surprise on the list was plants.

MIKE HAND Coyotes will go in and devastate melon patches and plums and cherries, that sort of thing. If you look at his teeth these in the front are his canines. These were adapted for cutting and tearing. They're actually sharp on the backside. But the back teeth are a more table-like surface for grinding.

ALAN ALDA (NARRATION) In the wild, tearing and chewing all those plants and animals keep dogs' teeth in good shape. But supermarket diets don't give the teeth that good a work-out.

DAN RICHARDSON Let's pull up the canine tooth, the stained tooth.

ALAN ALDA (NARRATION) The result has become a common sight to dog owners and veterinarians. The computer reveals that the only the tips of the teeth are clean. The plaque, stain and tartar cause gum disease. But there is a solution.

ALAN ALDA How often do you brush a dog's teeth?

DAN RICHARDSON It's highly recommended but it's not often done. Most veterinarians, if not all, will recommend that all dogs have their teeth brushed.

ALAN ALDA How often though?

DAN RICHARDSON Every day.

ALAN ALDA Every day?

DAN RICHARDSON Every day.

ALAN ALDA Because plaque builds up ...

DAN RICHARDSON Within minutes.

ALAN ALDA Within minutes?

DAN RICHARDSON Within minutes.

ALAN ALDA Now open your mouth Penny, I'm just going to brush your teeth a little bit okay? Just open, open up your mouth.

ALAN ALDA (NARRATION) It's no surprise only one in six owners brush their dog's teeth.

ALAN ALDA I think I need a little help with this. How would you do it?

HANDLER First of all you want to settle her down and make sure she's not upset.

ALAN ALDA And you do like a circular motion?

HANDLER Yes. Even with positive reinforcement she's already developing a lot of anti-brushing behaviors.

ALAN ALDA This is really tough to believe that somebody's going to do this every day.

DAN RICHARDSON Well that drove us toward the one aspect of the concept of developing a diet that would be like having an edible toothbrush.

ALAN ALDA (NARRATION) This is conventional dried dog food -- kibble. It's bite-sized -- and that's it's first problem.

LYN JENSON They're just inhaling this food, they're not even chewing it. And so to get an active effect in the mouth we're going to have to make the kibble size much larger.

ALAN ALDA (NARRATION) The research team swung into action. The first priority -- design a bigger, bolder kibble. But that was the easy part. As the first prototypes rolled off the production line, the bigger problem facing the development team was to make a kibble you can really sink you teeth into.

LARRY HAYWARD But I have the feeling from a texture standpoint the products that are out there today don't have the texture we're looking for cause if you

break this stuff it just shatters. There's nothing left for the tooth to be cleaned with, to have that tooth brushing effect.

ALAN ALDA (NARRATION) To have a tooth-brushing effect, the kibble has to hold together while the tooth sinks in. Here's the artificial tooth -- complete with artificial plaque -- they use to test their prototypes. First, an old-style kibble. Only the very tip makes contact before the kibble breaks up. But with the eventual winning design... the tooth sinks in and is wiped clean. The secret is inside, where a scanning electron microscope reveals long vegetable fibers that bind the kibble together, as the tooth slides through it. A normal kibble, with no fiber fabric, simply crumbles. So the new kibble works in the lab. But what about where it counts? Wendy is having her teeth painted with the same discoloring stain dentists use to show up plaque on human teeth. After the staining, Wendy is let loose on a bowl of the new dental kibble. Two kibbles later -- and most of the stain has gone.

DAN RICHARDSON Clean right up to the gum line.

ALAN ALDA (NARRATION) Wendy settles in for four or five more pieces

ALAN ALDA Let's take one last look at Wendy's teeth. Open up, take a look at your teeth here. Wow, look at that, it's pretty clean.

ALAN ALDA (NARRATION) The edible toothbrush had certainly done a better job on Wendy's teeth than I had.

ALAN ALDA Good job.

ALAN ALDA (NARRATION) But edible toothbrushes won't work if they're not eaten. So after a flavor-boosting spray of fat and seasoning, the kibble is ready for the all-important taste-test. Tango was first up, and like a good company dog made the right choice. After that, though, on the day we came to film, things went down hill. But of course there was an explanation. It turns out dogs don't choose by taste alone. Where the bowl is matters too.

KATHY GROSS Some dogs are either right handed or left handed just as some people might be. And in order to get around that bias we usually run a two day test. On the first day of the test pan A would be on the left side and then on the second day of the test pan A would be on the right side. So with the two days and switching the bowls from side to side on either day we avoid that "pawedness".

ALAN ALDA (NARRATION) According to the manufacturer, the verdict by the taste tasters was two to one in favor of the new kibble. And so a new contender

will soon be entering that nine billion dollar pet food market. But before I left, there was one more testing panel to visit. This time, the testers were human.

ALAN ALDA What do you do in this room?

LYN JENSEN We have developed a trained sensory panel of individuals who are able to detect odors in dogs' breath and to quantify them.

ALAN ALDA You have a trained panel of people who smell doggie breath for ... for their ... I mean that's what they do?

LYN JENSEN Absolutely. In addition to their regular jobs they volunteer for this.

ALAN ALDA Ahh, that's good. This is just a hobby.

LYN JENSEN Absolutely.

ALAN ALDA Do you grade it, like one to ten, this is really bad, or do you have names for how bad it is?

LYN JENSEN We have a scale of zero to nine. Zero is no noticeable bad breath. Nine is knock 'em dead.

ALAN ALDA (NARRATION) One of the beagles has been eating the new kibble, the other a regular diet. After the professionals make their choice...

ALAN ALDA Alright, put it right here Blackjack. Do I have to get down to the dog's level? Say ahhh. How do you get the dog to ...?

GRADER What we do, the procedure is, walk up, open up the dog's lips, get your nose right down there, and take three little bunny sniffs.

ALAN ALDA Let's see you do this.

GRADER Okay. Come here buddy. That's all there is to it. Think about it in your head, score it, rate it.

ALAN ALDA Come here. When you speak about this, and you will, be kind. I don't know what this dog has been eating but this is definitely a dog.

ALAN ALDA (NARRATION) I was hoping this one was on the new diet.

ALAN ALDA Hello. It's a better smell over here to my nose. How did you rate them?

GRADER I would've graded that dog probably a one and this dog probably a six.

ALAN ALDA Six out of nine. I never want to smell a number nine ever as long as I live.

LYN JENSEN So it sounds like you're about ready to sign up for the panel.

ALAN ALDA I think I could be a pro at this. It's been nice sniffing you. Goodbye.

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