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## Fat-fighting potential of speckled alder and balsam poplar\*

### Purpose

Being overweight helps cause Type 2 diabetes and other problems. This study looks at whether speckled (gray) alder and balsam poplar could help people keep their weight down by changing the way that fat cells form and the way they store fat. It looks at:

- How the plants affect the process that builds fat cells
- Which ingredients in the plants have these effects
- What this tells us and other scientists about how our bodies form fat cells.

### About how fat cells are made

We use the sugar in our blood for energy. When we have more sugar than we need at the moment, our bodies store it as fat. We can picture a fat cell as an empty container that can store fat. Later, if we need energy, the cell will empty the fat out so it can be turned back into a form our muscles can use.

Fat cells form through a complex process. For now, we can picture the process as having several steps:

#### **Preparatory step:**

Pre-fat cells multiply until they run out of space. Then they sit and wait until they are needed. Once you add insulin and some other hormones, these pre-fat cells start turning into full-fledged fat cells.

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\* This is a plain-language version of an article by Louis Martineau, Asim Muhammad, Ammar Saleem, Jessica Hervé, Cory Harris, John Arnason, and Pierre Haddad, called “Anti-adipogenic activities of *Alnus incana* and *Populus balsamifera* bark extract and their respective active principle, oregonin and salicortin” (version of August 13, 2008). The authors plan to submit the article to the *International Journal of Obesity* in Fall of 2008.

**Step 1:**

The cells copy themselves once or twice, increasing their number.

**Step 2:**

The cells start to change shape and turn into mature fat cells.

**Step 3:**

The cells begin to store fat. With a microscope, you can actually see the fat inside the cells.

From step one to step three, this cycle takes about four days.

We know that some plants used by other cultures disrupt this cycle. That is, they interfere with one or more of the steps. The plants may

- keep fat cells from multiplying
- keep the cells from changing shape and growing to mature size
- keep the cells from storing fat.

This could be a useful way to help people stay slim. So far, few scientists have looked at this as a way of helping control weight. Perhaps this is because there are risks. If fat doesn't get stored in fat cells, it may get stored in the liver instead.

This is even worse for health. Also, fat cells do other useful things besides store fat. If you reduce the number of fat cells, you could produce bad effects that you didn't intend.

Still, a plant that affects fat cells could be helpful in some cases. Some people think that the number of fat cells in our bodies is set during childhood. They think that if we are overweight as children, we are likely to be overweight as adults because our bodies already have lots of fat cells made and just waiting to be filled up. So a plant that helps keep fat cells from being created in the first place could be useful.

## The healing plants and fat cells

So far, the scientists have looked at 17 of the Iiyiyiu healing plants. The inner bark of four of these plants (balsam poplar, speckled alder, white spruce, and common juniper) seems to have an effect on how fat cells are formed. This is new information to western scientists—no one has written about it before. In this study, the team members looked at the two plants that seemed to have the most effect on fat cells: balsam poplar and speckled alder. They ran many different tests to try to find out how the plants produce their effects. They also identified which ingredients in the plants were having these effects.

## How do the plants affect the different steps that produce a fat cell?

Both balsam poplar and speckled alder affect fat cells, but they seem to do it in different ways. The scientists took pre-fat cells, and added the hormones that would usually make them turn into mature fat cells. They also added plant extract (tea).

- When they added alder, fewer cells than before made it to the mature stage.
- When they added balsam poplar, *none* of the cells made it to the mature stage.

This led them to conclude that balsam poplar acts very early in the process, and keeps the cells from multiplying or changing shape. Alder seems to act a bit later, and block one of the steps needed for the fat cells to be fully mature.

Once they knew that the plants act mostly at the early stages of the cycle, the scientists tried to narrow it down further. They asked: do the plants affect the very first step, in which the cells copy themselves after you add the hormones? They found that balsam poplar stopped this step almost completely. Alder, on the other hand, did not affect this first step.

### **Do the fat cells start growing again when you remove the plants?**

What happens when you remove the plant extract from the mixture? Do the cells start growing again where they left off? The scientists found that cells treated with alder will usually recover once you remove the alder. Cells treated with balsam poplar only recover if you remove the poplar in the first two days of the process. This supports the view that poplar blocks the early stage where the cells multiply.

### **Can the plants also keep pre-fat cells from multiplying?**

Recall that our bodies have pre-fat cells that turn into mature fat cells under the right conditions. If you limit the number of pre-fat cells, you will get fewer mature fat cells. Can the plants keep the pre-fat cells from multiplying? It seems that both balsam poplar and alder do this. This may be another way the plants keep fat cells from forming.

### **Do the plants also have effects at later stages of the cycle?**

Some diabetes drugs—like Rosiglitazone—seem to work by making fat cells store *more* fat rather than less. They do this at later stages of the cycle, by acting on a particular part of the cell called a “nuclear receptor.” Since balsam poplar and alder seem to make cells store *less* fat, the scientists wanted to know if they blocked this receptor.

Both plants seemed to affect this receptor. This tells us something about how these receptors work. It shows that it takes only a tiny amount of an ingredient to affect these receptor sites and affect the whole process that creates fat cells. Other scientists will be interested to know this.

### **Could the plants make fat cells “empty out” their fat?**

Our fat cells store fat until we need energy—such as if we are exercising or haven’t had enough food. Then they empty out the fat so we can turn it into energy. So the next question the scientists asked was: do the plants make fat cells “empty out” their fat? They found that alder did not do this, but poplar had some effect. However, we need to be careful because emptying fat cells has to be timed with increased burning of fat by muscles.

### **Identifying the ingredients that produce these effects**

Which ingredients in the plants affect fat cells in these ways? The scientists separated out some of the main ingredients, and repeated the same tests as before with each one of them. They were surprised to find that, in each plant, just one ingredient is responsible for most of the effects on fat cells. In alder, this one ingredient is called “oregonin.” In poplar, the ingredient is “salicortin.” They think these are ingredients that the plant uses to protect itself from animals, insects, and microbes. But because people are bigger, these ingredients can have beneficial effects for us.

### **Summary of how the plants affect fat cells**

The results show that both balsam poplar and speckled alder block one or more of the steps in how fat cells are formed. But the two plants affect the process at different stages. Balsam poplar seems to affect more than one stage. Its main effect is at the early stages, when it keeps the cells from multiplying.

In contrast, alder has no effect at the early stages. It does not keep the cells from multiplying, and it does not affect how they change shape. But it does affect *something* that happens between the first and third days of the cycle.

## **What this tells us about using the plants to control weight**

Could we use these two plants to keep people from gaining weight? There are a few things we would need to consider.

First, to work in real life, the active ingredients in the two plants have to survive digestion unchanged. This might be true for salicortin (the ingredient in balsam poplar). We know that a chemical in the same family has effects in live animals. For oregonin (the ingredient in alder) we are not so sure. Another ingredient in the same family does not survive digestion well.

Also, the ideal drug is one that acts on the kind of cell we want to affect, and on nothing else. Otherwise, we get side effects. But this study found that balsam poplar affected both the pre-fat cells and mature fat cells. Before using it, we would need to make sure it doesn't affect other kinds of cells too. However, we know that many Aboriginal groups in North America use balsam poplar as a medicine. This suggests that it is safe to take. The scientists are planning to test these plants in animals that are fed very fatty food to see whether weight gain can be reduced.

Poplar seemed to block the first step in which fat cells multiply. This might be a useful effect, but it would mostly be useful in children. It could keep the children from developing a lot of fat cells. If it is true that we don't build new fat cells after childhood, limiting the number of fat cells in childhood would make it easier for people to stay thin as adults.