

# ESTRADIOL STICKIES

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## Preparation *and* Usage

*JANUARY-JUNE 2021.*

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### INTRODUCTION

I spent most of 2020 converting my estradiol tablets into **a slow release formulation that I stick to my gums.** It was a weird, time-consuming project, and I was happy with the results, so I figured I should write about it and put it out into the world. Hopefully somebody finds it useful or at least interesting.

That said, **do not do any of the stuff I describe in this document!** If you, or anyone, does anything written here and something goes bad? That's not on me! Think about it! It's not reasonable to take experimental hormone formulations based on anonymous documents you find online!

### RESULTS

The project turned out **better than expected.** This is just how I take my estradiol now and I have no plan to stop. I don't get headaches like I did when I was doing injections. When I got blood work done I was taking **about 0.375mg of estradiol once per day** this way and my numbers went

<b><i>from</i></b>	
69 pmol/L ( $\approx$ 19 pg/mL) estradiol	} off HRT
35 nmol/L ( $\approx$ 1009 ng/dL) tesosterone	
<b><i>to</i></b>	
434 pmol/L ( $\approx$ 118 pg/mL) estradiol	} T + 6 hr
6.9 nmol/L ( $\approx$ 199 ng/dL) tesosterone	
272 pmol/L ( $\approx$ 74 pg/mL) estradiol	} T + 24 hr
14 nmol/L ( $\approx$ 404 ng/dL) tesosterone	

with no anti-androgens or other hormones. These numbers aren't perfect, but they do show that the stickies work, and that I can get "normal" blood estradiol levels with a **much smaller dose than I've been prescribed to take orally (4mg daily)**. Because the dose with this formula is so much smaller than the oral dose, doing the conversion can produce **10 months' worth of stickies for every month's worth of tablets** I pick up from the pharmacy. I'm now taking 0.4mg per day after tweaking the recipe a little, and I don't think there's much difference.

There haven't been any real problems with the stickies. The worst thing that has happened has just been that **sometimes they come unstuck,** but even that has only happened a handful of times—maybe 5 or 6 over the last couple months, and it's not hard to deal with.

It is a little bit of a chore to produce them, but not too bad. It takes me **about half an hour to make a batch of 20 doses,** and it doesn't require anything too expensive or unusual.

# RECIPE

MAKES 20 STICKIES

## Ingredients:

**8 mg** estradiol  
(4 · 2 mg generic estradiol tablets,  
as received from the pharmacy.)

**1.2 mL** guar gum  
(≈ 1/4 tsp)

**3.1 mL** water  
(≈ 5/8 tsp)

This is the recipe I've been using for the last while. It makes 20 doses that **each contain about 0.4 mg of estradiol,** and **take about 24 hours to dissolve** after sticking to my gums. I've included the details of how I do each step just for completeness. I'm sure there's better ways to do all these things, and I don't think the particulars of how I do this stuff are anywhere near as important as the basic ideas and outcomes. The batch size of 20 is just because I find the amounts of ingredients easy to work with.

### **Step 1: Grind!**

**Grind the tablets into a fine powder.** —I've used a (clean, ceramic) mortar and pestle for this, but I've also split the tablets into pieces with a knife or pill splitter and then crushed them against a dinner plate with my pill bottle (lid side down). **I like covering the pill chunks with a sticky note** that I stick to the plate at first to prevent little pieces from flying everywhere when doing the initial crushing, then removing the note and using the bottle to grind the crushed bits directly against the plate.

→ fine, soft, uniform, powder

### **Step 2: Mix!**

**Measure out the guar gum and mix it thoroughly with the pill powder.** —I use the same 1/8 tsp measuring spoon for measuring the guar gum in this step, and the water in the next step.

→ smooth, uniform mixture of the two powders

### Step 3: Wet!

**Mix the water into the dry ingredients very thoroughly.** —If I'm using a mortar and pestle, I just add the water in there and use the pestle to stir, smear, and grind the mixture. If I'm working on a plate I use the pill bottle much like when grinding the pills against the plate, repeatedly smearing the mixture across the plate and collecting it back together. I've also used the back of a spoon, and even my bare hands to do this. I add a little water if the dough is too dry, and just knead/work it for a while and let it dry out a bit if it's too wet.

→ bouncy dough, smooth, workable, doesn't fall apart, rolls up cleanly

### Step 4: Split!

**Divide into equal portions.** —If I'm not using a mold I usually roll it into a little snake and then divide it into however many doses I'm making. Some are usually bigger and some smaller, so I merge the biggest piece with the smallest piece and then divide them in half to even them out until there's no obviously big or small pieces.

→ small pieces of dough, all the same size, or as close as possible

### Step 5: Press!

**Form the pieces into flat circles.** —I have done this by rolling them into little balls and then squishing them down, and also by using the center of a washer as a mold. The dimensions given are for the hole in the washer I've been using recently. I also found that the hole in the washer holds exactly the right amount to allow me to just fill it up and pop the discs out without dividing up the dough first. If not using a mold, a coin or other small object with a known thickness can be used as a reference or depth stop when pressing the pieces flat. If the stickies are too thin they curl as they dry and also don't last the full 24 h. If they're too thick they are bulky and last too much longer than 24 h.

→ flat, circular pieces of dough, uniform thickness, opaque, thickness no more than 1.8 mm ( $\approx 70$  thou or just under  $5/64$  in), diameter around 9.5 mm ( $\approx 3/8$  in)

### Step 6: Dry!

**Let dry completely.** —I leave them on a plate overnight somewhere they won't be disturbed. They shrink quite a lot when they dry up. In the morning when they're dry I put them in a pill bottle.

flat, circular, hard and tough material,  
→ opaque, smaller than last step, thickness  
**around 1.1 mm** ( $\approx 3/64$  in), diameter  
**around 6.5 mm** (just over 1/4 in)

## USAGE

Using the stickies is pretty simple. After breakfast I brush my teeth and then put one of the stickies on my tongue, and push it into place on the front of my upper gums **between a canine and an incisor.** Every day I switch sides. After applying the sticky I **avoid eating or drinking for about an hour.** Over the course of the day the sticky will slowly hydrate and change from being a hard little disc into a smooth blob of gel, and eventually **completely dissolve after about 24 hours.**

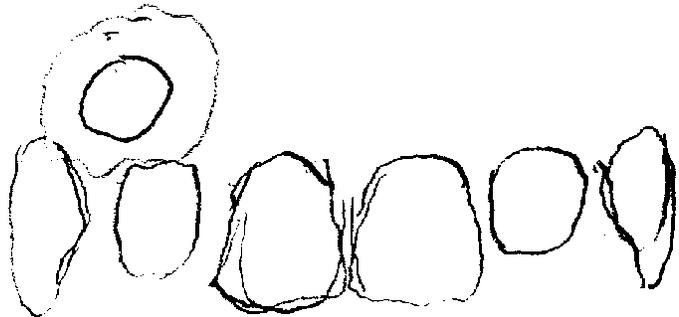


DIAGRAM: LOCATION OF STICKIES ABOVE TEETH.

In my experience, they tend to stay put pretty well up there. There have only been a couple situations that lead to them falling off more than once: **drinking within an hour of putting one on,** and **blowing my nose** (regardless of how long it's been since I put it on). However, I've found that **I can do both those things as long as I'm careful.** I've also accidentally squished them when washing my face too hard, and sneezing, maybe once each.

They **don't taste like anything.**

They can **occasionally be a little uncomfortable or slightly painful** before they get hydrated and soften up. **Those feelings go away quickly** and doesn't seem to cause any actual problems as far as I can tell.

There are a bunch of activities that I thought might be a problem but haven't turned out to be. **Eating, drinking, brushing my teeth, rinsing my mouth, kissing, oral sex, talking for extended periods of time, and drinking through a straw all**

**seem to be fine.** They don't really seem to get food stuck in them either.

If one comes unstuck before it's fully hydrated I can usually push it back into place with my tongue and **it will stick back on if left undisturbed for a little while.** After they are hydrated they're harder to put back on, though it is possible, especially if the surface is allowed to dry out a little. In those cases **I usually don't really bother with re-sticking and put on a fresh one instead.**

I did try sticking them on my lower gums, but found that they got dislodged more easily there.

I also tried sticking them on before bed rather than after breakfast, and found that they did not dissolve as nicely and felt bulkier than when applied earlier in the day. It wasn't as bad when I had split the doses into morning and night, because the 12-hour stickies are not as thick as the 24-hour ones. Though I don't like them for everyday use, **I do find the half-thickness 12-hour stickies handy for late in the day** in case I need a replacement or remember I forgot to take my morning dose.

All these quirks in how I've dealt with the stickies are, I suspect, consequences of their composition.

## DISCUSSION

**what—**

I think of the stickies as estradiol trapped in a tough, dense, disc of guar gum. There's other stuff in there, like whatever non-medical ingredients are in the tablets, but nothing that seems noteworthy. The process of estradiol leaving its sticky prison and entering the bloodstream is probably complicated and I do not have the resources to study it. If I had to make an educated guess about what happens though I would say that the estradiol is released through the erosion of the sticky as it swells with water and rubs against the lining of the mouth, before finally entering the bloodstream through that same lining.

The academic literature about this kind of thing might call it something like a **buccal mucoadhesive drug delivery system for controlled or slow release of estradiol.** That's kind of a mouthful, which is why I decided to just call them stickies instead.

**why—**

I did all this, and decided to write it up, for a bunch of reasons. Hormones are too expensive, too hard to get a hold of, and the different dosage forms all have noteworthy downsides. Those things aren't all true for every person in every place who takes hormones, but they're still real problems. I wanted to try and solve some of those problems for myself, as well as show what's possible and to take a step, however imperfect, toward a world where hormones are cheaper, easier to get, and work better.

Patches do a great job at controlled release to keep steady levels of estradiol in the blood, which allows them to be effective with small daily doses ( $\approx 0.1\text{--}3\text{ mg/day?}$ ), but they are expensive, and kind of a pain in the ass as far as I know.

Pills are cheaper and more convenient, but if swallowed the estradiol is largely metabolized by the liver before entering the bloodstream (first pass), requiring higher doses ( $\approx 4\text{--}8\text{ mg/day?}$ ), affecting the liver, and producing a different ratio of estradiol and its metabolites in the blood from what one might want to see.

Taken sublingually the same pills avoid first pass metabolism and so the usual thinking is it should be more effective than swallowing the same dose. However, blood estradiol levels increase and drop very quickly this way. That quick rise and fall means a higher dose is required than for something that releases estradiol very slowly, but how much higher? (I guess people still take about  $4\text{--}8\text{ mg/day}$  this way.) How is anyone supposed to reliably measure and make decisions about blood estradiol levels when they rise and fall so quickly?

Injections also avoid first pass metabolism by the liver, and deliver a more gradual and thus predictable and measurable rise and fall of estradiol levels, which also allows for smaller doses than swallowing tablets. I averaged about  $0.5\text{ mg}$  per day when I was doing injections. But injections are also a pain in the ass, and that's without even getting into the shortages of injectable estradiol, and doctors' (lack of) willingness to prescribe it.

Which brings me to availability. Many people have trouble getting hormones, whether because of cost, lack of local services, uncooperative or downright hostile medical professionals, and it completely sucks. People have talked about finding ways to synthesize hormones at home, and that is originally what I was planning to work on. But the more I thought about it, the more I became worried that it wasn't something just anyone was going to be able to do. Even if I could synthesize estradiol at home I would still want to purify and measure it, and all that would take a bunch of specialized equipment. Pain in the ass.

how—

At some point I had the thought that estradiol is easy and cheap to make industrially, and that there is a lot of it out in the world already as tablets, so maybe I could take advantage of that by finding a better way to use what is already there. I started thinking about making a controlled release formulation. I figured even if I didn't do as well as patches and ended up with a daily dose of 0.5 mg, it would still be only 1/8th of my prescribed daily dose of 4 mg! That would mean I would have enough estrogen in my possession for 8 times as many doses, and much more stable blood estradiol levels. It was interesting enough to be worth trying.

I decided pretty early on that I wanted whatever I came up with to be something that just about anyone could do. No weird ingredients, no special equipment, nothing expensive. That's why I ended up choosing guar gum. It's cheap, widely available, and people literally eat it all the time. It's also why I don't use a scale in the recipe. Not everyone is going to have a precise enough scale to weigh the tiny amounts of ingredients used. The result is a recipe that is no more complicated than making fresh pasta, which can be prepared using only common household objects.

After doing a bunch of research and deciding in late 2019 what I wanted to try, I spent most of 2020 figuring out this formulation and testing it on myself. I haven't taken estradiol in any other way since March 2020. I started off making only two doses at a time using split estradiol tablets, a tiny bit of guar gum that I couldn't measure at all, and maybe less than a dozen drops of water. As time passed I got a better idea of what to aim for I scaled up the recipe, both for convenience and to improve consistency by using larger amounts that were easier to measure.

I originally took about 0.25 mg per day, then tried 0.5 mg per day, which I found a bit too strong and abrupt. That scared me a little since I couldn't do any blood work at that point and I had no idea if my numbers were wildly out of range or not, so I went back to 0.25 mg until I got my first blood work results back. (Since I'm talking about dosage, it's worth noting that I'm a fairly small person.) Based on the numbers I decided to increase my dose by 50%, and after getting blood work done again, my numbers had improved by about that much. I stopped changing the dose at that point and mostly tried to fine tune the process and dimensions. I would love to have gotten more blood work done but it seemed a bit frivolous because of the COVID situation and the fact that I had already hit my blood estradiol target, so I don't have as much data as I would like. I might try 0.5 mg per day when I'm able to get blood work done again. Based on what I

know now I think it's probably a reasonable dosage.

Every time I made a change to the formula or process I generally stuck with it for about two weeks to try to understand how it affected things, and I only changed one thing at a time. I kept a log book with daily entries labelled by batch, size and shape of the sticky, the time I applied it, and the time it dissolved. This process worked well for tuning them to last 24 hours, but beyond that I didn't learn anything too exciting. For a fixed batch size and diameter, adding more estradiol makes stickies stronger, and adding more guar gum makes them thicker, which makes them last longer. When I eventually try 0.5 mg per day again I'm just going to add a 5th pill to the recipe, see if they still last 24 hours, and adjust as necessary from there.

*future/end—*

I'm going to keep improving the recipe, trying to make it faster and easier, but I feel good about how it turned out. I will also spend some time coming up with a similar recipe but using progesterone instead of estradiol. I did one quick test and was able to make something that looked promising by mixing the contents of a micronized progesterone capsule with guar gum, then adding a tiny bit of water to hydrate it and letting it dry overnight. I didn't want to delay writing this to do that work though.

That's all for now. Thanks for reading, and take care.

**THANKS** — Thanks to my friends for all the help they provided with proofreading, editing, and design. I'm not sure I would have gotten this all done without the help, and I know that if I had, it wouldn't be anywhere near as good. Thanks also to the researchers whose work on buccal mucoadhesive drug delivery systems (especially those using natural polymers) I read before beginning work on my formulation. Those papers showed me what kind of results were possible and inspired me to try finding my own way.

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