

Quick Guide To Beginners' DIY

Part 2

There was such a great response to our first [Beginners DIY](#) blog that we thought we would do a part 2 with even more information for newbies, so you can really be set up for success! In this second installment we'll cover some commonly asked questions on techniques and formulating, and share tips that will help you.

Formulation Techniques

Water Baths

Something you will come across sooner or later in your DIY formulating journey are water baths otherwise known as a bain marie. Many ingredients need to be melted or heated in order to work with them, and at other times you may want to quickly cool down your formulation. Water baths are useful ways to gently bring the temperature of ingredients up or down without scorching or burning them. Here is how you do it:

You can make a hot water bath by setting a glass bowl in a pot of water on the stove and gently heating the water. You can then melt your ingredients in the bowl.

You can make an ice bath by filling a bigger bowl with ice and water and then setting a smaller bowl (a glass or metal bowl is best so the cold can quickly penetrate through; plastic is more insulating) in that. You can quickly cool down ingredients in the smaller bowl.

Insider tip: I will confess and say that when I am formulating at home for myself I cheat and use a microwave to melt my ingredients. I don't think any formulator will tell you to do this and I'm not either. Microwaves heat up very quickly so you need to keep a beady eye on things; and stuff gets really hot so you need to be aware of the safety aspects. I'm not recommending this method, but thought I'd put it out there if anyone was wondering whether microwaving was a thing.

Temperature

When you need to heat phases in order to combine them, such as your oil and water phase in an emulsion formula, it is always best to have these phases within a similar

temperature range of one another. This way the two phases can combine without any lumps forming as they cool.

Make sure you have an accurate thermometer for testing temperatures of different phases. Most emulsifiers melt at around 70 degrees C (some more, some less), so check the temperature at which your phase is at and then bring the other phase to that temperature as well so that when you combine the two they won't clash.

Heating and holding

Heating and holding was an old way of formulating and has been debunked now. You don't need to heat and hold your ingredients; only heat them until they are fully melted. Heating and holding does not impart any benefit to your formula and in fact may even destroy valuable properties of your natural ingredients.

Usage Rates Of Ingredients

We are often asked about the usage rates of various ingredients. Many ingredients such as emulsifiers, surfactants, etc will have a recommended usage range, eg. from 2-5%. This means the product can be used within that range. The exact best amount to use is formula specific and would be determined by factors such as other ingredient properties, how you want the product to look/feel, what other ingredients are in the formula, etc. Always stick within the recommended usage rates (feel free to experiment outside of those rates but they're usually recommended for a reason).

Some ingredients like carrier oils and butters don't have a recommended usage range. There's nothing stopping you from using them at 100%; their best usage rate would depend on the formula.

Don't Look For A single Answer When 'it depends'

One of the most common types of questions we get are people looking for an exact answer. Like how much emulsifier to use, or what is the ratio of oil to water to emulsifier in an emulsion, how much essential oils to use, how long will my product last, etc. These are difficult for us to answer because the answer to all of these questions is 'it depends'.

How much emulsifier to use will of course depend on the emulsifier itself (it will come with a recommended usage range), but then it will also depend on your other ingredients: what kinds and how much oil are you using? What texture, skin feel and consistency are you looking for? Are you using butters, other thickeners, stabilisers, etc? How much water phase do you want? There's a lot more to it than just how much emulsifier to use. There is a generalization that emulsifiers can be 20-25% of the oil phase which you can take as a

good starting point. However there really isn't a single answer to this so you will need to experiment to find out.

Similarly there isn't a single answer to the best oil to water to emulsifier ratio. As you can imagine there are quite a few variations to be made from this three part system, and each will yield a slightly different result. There isn't necessarily a best ratio; it will depend on what you want from your emulsion and what other ingredients you are using.

How much essential oils to use is a little more scientific but it will also depend. It will depend on the type of product: is it for the face, body, wash off, leave-on, for use in the bath, etc. And then of course it will depend on the essential oil itself as each one is different.

When it comes to essential oils safety and usage, you are looking for known sensitiser components in the essential oil. Look in the MSDS or COA for the components section as sensitisers are usually mentioned there. They will look like chemical names and will come in percentages. This is the amount of the component found in the oil. You can then look up dermal limits for fragrances or essential oils, which will tell you what the limit is. You will then need to calculate the amount of the sensitiser you used in your formulation, and compare it to the dermal limits. It will need to of course be below the dermal limit.

Dermal limits will be different for different products. Consider whether your product is a leave on or rinse off product, and whether the product is for the face, body or lips.

We will cover more on essential oils safety in a separate blog post as this is really a whole topic on its own.

Understanding When A Preservative Is Needed

Now that we've gotten through some ambiguity with other ingredients, let's get into preservatives which are much simpler to use.

The number one rule for understanding whether a preservative is required in your formulation is to ask yourself two questions: is there water in your formulation? and are you using the product up now or does it require a shelf life?

If the answer is yes there is water and it will be sitting on the shelf, then yes, you will need a preservative. If there is water in it but you're using it up straight away, then no you don't need a preservative.

If the answer is no there's no water, then go to rule two.

The second rule is to consider the environment your product will be in. If it is an anhydrous scrub stored in the shower or bathroom (a moist environment) and the user is going to be

sticking fingers in the jar (whether wet or dry, fingers always carry the possibility of contamination), then it will probably be a good idea to add a preservative, even though there is no water in the formulation itself.

If it's an oil serum stored in a sealed bottle with a pipette cap then chances are you won't need to add a preservative because the environment is not conducive to contamination.

Another rule that can be used refers to combining ingredients that all contain preservatives already, or are self-preserving. Sometimes you may have a bunch of water-based ingredients like marine collagen, hydrosols, aloe vera liquid gel, hyaluronic acid, lactic acid etc, and you want to combine them together, but since they are all self preserving or contain a preservative, you're wondering if you need to add in additional preservative. The rule is: you will need to assess on a case-by-case basis.

Water-based serums that I have made with no need for a preservative:

Hydrosol + hyaluronic acid: both ingredients are self preserving and the end product is sealed in a spritzer bottle that ensures the inside doesn't come into contact with an adverse environment.

Hydrosol + lactic acid: both ingredients are self preserving. Lactic acid is also extremely acidic and is not conducive for bacteria growth.

In general when I start combining more than two ingredients together I always add a preservative to be on the safe side. You will also need to make sure you are sterilizing your utensils and containers to minimize bacterial contamination.

Substituting Ingredients

Another common question we receive is with regards to substituting ingredients. Can I use X instead of Y, or add it in? Let's find out.

Does it do the same thing?

If you're going to substitute an ingredient, it will need to fulfill the job the same way the old ingredient did. Think about everything the ingredient does in the formula. If something else can do all those functions then it may be an OK substitute. Go to the next question.

Do they have the same solubility and state (liquid, solid, powder etc)?

You can't substitute something that has a different solubility and/or state. You need to substitute like with like. Make sure whatever you're substituting will go into the same phase of your formulation.

Remember the pH

It's important that the new ingredient has the same pH as the old one, or doesn't affect the final pH of the formula because pH can affect stability.

Other things to consider: absorbency rates, texture, colour, etc.

You'll want to keep these things the same or very similar otherwise you risk changing your final product.

If you've gone through this list and everything checks out, then your X can probably replace your Y.

Ingredients that can generally be substituted for one another:

Carrier oils - of course every plant oil is different and will have slightly different properties but they are all liquid, are all oils, generally perform a similar function in the formula and won't affect the pH. So in most cases you can safely substitute oils for one another.

Butters - butters such as mango, avocado and refined shea butter have similar consistencies and scents (neutral) so can generally be substituted. Cocoa butter is a bit of an exception as it is much harder and more brittle than the other butters and if you're using the raw version, it has that amazing chocolate scent. It's not ideal in every formula so be careful with it. Likewise, raw unrefined shea butter has quite a strong scent which even essential oils can struggle to cover up, so take care when you use it in formulations that have other delicate scents.

Hydrosols - apart from their different scents and therapeutic properties, hydrosols can be substituted for one another.

Humectants such as vegetable glycerine and propanediol can be substituted for one another.

KISS Formulas

Keep It Super Simple or KISS formulas are our best friends in the DIY world. They'll teach you the best ratios of ingredients to use, they'll save you from wasting ingredients, you'll learn all sorts of interesting things - they're just the best!

Here's an example of an advanced emulsion and then a KISS emulsion.

In an advanced emulsion (lotion/cream) you would usually have a water phase consisting of your water, hydrosol, aloe or other water base, a stabiliser such as xanthan gum, a humectant for moisture and sometimes a water-soluble, non-heat-sensitive active. In the

oil phase you might have a couple of oils, a butter, a thickener like cetyl alcohol, the emulsifier, an antioxidant like Vitamin E and perhaps an oil soluble active or two. Then in the cool down phase you would have all your heat sensitive actives and ingredients, the preservative and things like pH adjusters.

A KISS formula uses only the bare basic building blocks to make the formula. So cut down your formula to only the ingredients that are needed to make it that. You'll use only plain water instead of any other water bases, a simple oil such as almond oil, a thickener or stabiliser if that is absolutely required, and the emulsifier. Because three ingredients is all you need to make an emulsion: water, oil, emulsifier. You don't even need to add a preservative to a KISS formula because you're probably not going to want to keep it. And you certainly don't want to waste actives. Make a small batch of 50-100g so you don't waste ingredients in this experimental phase.

After researching the usage rates of your simple ingredients, decide on what amounts to use them at; just make an educated guess. The purpose of the KISS formula is to experiment with the usage rates to find out what will work best.

Make up your formula and then observe it. Is it stable? How does it feel on the skin? Is it doing the job you want it to do? You can even leave it for a day or two and observe it over this time.

If it's not stable you will need to perhaps adjust the emulsifier to oil ratio. If it feels greasy perhaps lower your oils amount or increase your water. If it isn't spreading nicely consider that adding in xanthan gum and/or cetyl alcohol can also contribute to a nice skin feel and will help with spread. If it feels waxy/no slip on the skin you may have used too much emulsifier. Take a pH reading. Write down all your observations and then think about ways to mitigate the issues and improve weak areas.

Something I quite like to do at this stage is to add in the preservative and observe. Preservatives can have quite low pHs and pH is an important factor in formulations. It can even make or break a formulation.

Read more on pH here: [The Importance Of pH In Formulation](#)

Once the preservative has been added, take another pH reading and note any changes. Does your formula stay stable or does it split? If it splits, separate half of the mixture into another beaker and adjust the pH back to around 5-5.5 and see what happens. Does your formula stabilize? If yes then great, if no you may need to include a stabilizer such as xanthan gum in your next round of tests.

Carry on making KISS formulas until you are completely happy with the result, then move on to including other ingredients in the formula. Keep in mind that any ingredients or

actives that have hectic pH or organoleptic property differences may rock the boat a bit and you'll need to make further adjustments.

KISS formulating is where a lot of learning can happen and I highly recommend it!

Final Note One of the things I often pick up from newbie DIY-ers is the fear of messing up. I understand the feeling, but it's probably the biggest thing holding you back from making your own amazing products.

Please don't be afraid to play around, test and experiment! This is where your learning will come from. Chances are you might not get the perfect emulsion on your first try (I certainly didn't), but the more you play and experiment the easier you will find it.

Juliette's top tip for beginners

I thought I'd end this blog off by sharing a tip that I've found has helped me really figure out ingredients and how they play together.

When you get your hands on a new ingredient, be that an oil, butter, active emulsifier, whatever, observe it with all your senses (ok you won't be able to hear it, and tasting cosmetics ingredients isn't always the best idea but you get where I'm going!).

Put some on your skin and note how it feels (oily, watery, powdery, drying, etc). Does it absorb quickly or slowly into the skin? How easily does it rinse off?

How does it smell?

Next, mix it with other ingredients. Does it mix with oils, or water? If its a powder does it stay blended in with the liquid or does it sink to the bottom?

Make up a KISS formula with the new ingredient and some other basics to see how it behaves in formulation. If the KISS formula didn't work first time, don't worry, tweak your percentages and make another one. Note down all your observations.

Now go forth and have fun!