RFN Spreadsheet Formulation Guide
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Recommended pre-requisite: RFN Full Course Completion or RFN Short Guide completion with plans to take Full Course

I recommend following this guide only after you've taken the RFN Full Course, or if you are currently enrolled in the RFN Full Course and have already completed the RFN Short Guide. This guide does not cover nutrition concepts – only how to apply them within the RFN Sheet.

This guide is lays down a structured and relatively foolproof formulation method – written for beginners who need a little help getting started. It goes over how to set up your pet profile, how and which ingredients to add when, and how to balance your recipe with supplements!

STEP 1: DETERMINE ENERGY REQUIREMENT
Follow Along on the RFN Spreadsheet: Create a Pet Profile - Energy Needs

The best way to determine how many calories your dog needs is to figure out how many calories your dog is eating now. Audit your previous recipe or check the food label to figure out the kcal/day your dog has been consuming.

Is your dog doing well on that? Great. Gaining weight? Perhaps a weight-loss formulation is needed (more info on that in the links below).

Enter the ideal caloric section in the "Daily Caloric Goal *" section.

If you cannot determine how many calories your dog was eating previously, you can use the energy numbers on the Pet Profile to determine how many calories your pet should need. For dogs, the energy number ranges from 90 to 130 with 90 being a very inactive dog (senior pets, for example) and 130 being a very active, high-energy dog.

Fill in the "Energy Number" section to get an "Estimated Energy Need". If that seems right to you, enter that number in the "Daily Caloric Goal *" section (or edit as need be!)

Note that you do not need to enter an energy number in the Pet Profile. If you know your pet's ideal energy intake, you can just enter that.

Some helpful links:
- [RFN Energy Calculator](#)
- [Weight loss for Dogs](#)

STEP 2: DECIDE ON THE DISTRIBUTION OF YOUR MACRONUTRIENTS
Follow Along on the RFN Spreadsheet: Create a Pet Profile - Macronutrient Goals

The best way to see what distribution your dog would do best on, is to look at the previous food your dog was eating. From there, decide if you want to make any changes. If your dog has been doing well on the previous diet, you may want to consider keeping these ratios the same, so that it doesn't cause any issues during the transition to a homemade diet or a new recipe.

Commercial foods may not list the total carbohydrate content, but you can determine the number from looking at the provided analysis. You can use the link below from Feed Thy Dog to quickly calculate the carb content! (First, use the first, "Carbohydrates in Kibble Calculator" to determine the percentage of carbohydrates in the kibble. Then use the third, "Caloric Distribution Calculator" to determine your distribution!)

Once you know what you want the breakdown to be, enter your macronutrient goals in the Create a Pet Profile section.

Keep in mind that these percentages should reflect the caloric distribution, not dry matter basis.

Fat – Percent of Calories:

Low: less than 30%
Moderate: 30-50%
High: 50%+
Generally, dogs with high fat diets may have issues with weight gain or digestion.
Moderate fat diets are most common with homemade diets, while high fat diets are
more common with commercial raw foods.

Carbohydrates – Percent of Calories:

Very low: less than 5%
Low: 5-15%
Moderate: 15-35%
High: 35%+

Generally, dogs with very high energy needs (working or sport dogs, for example)
benefit from dietary source of carbohydrates for quick energy. Low carbohydrate diets
are most common with homemade diets.

Some helpful links:
- RFN Full Course – Unit 5
- [Commercial Carbohydrate and DMB Calculator](#)

STEP 3: CHOOSE YOUR STANDARD
Follow Along on the RFN Spreadsheet: Create a Pet Profile - Nutritional Guidelines

You have three options to chose from: NRC, AAFCO or FEDIAF.

The majority of users in the RFN group formulate using NRC standards.

Requirements and Safe Upper Limits (SULs) vary between each of the standards, so formulating can be quite different depending on the standard you are using.

The spreadsheet also uses different calculations for each of the standards:

NRC uses MW – requirements are based on the dog's weight
AAFCO and FEDIAF use DMB – requirements are based on the weight of the recipe

When formulating, be aware of these differences! The way that these requirements are calculated means that:

Dog's requirements for NRC are based on the weight in the pet profile, so you can easily edit caloric intake in the recipe without affecting the requirements. When creating weight loss diets for dogs, you should create a profile with the dog's current weight.

When using AAFCO or FEDIAF, requirements will change each and every time you change the dry matter weight of the recipe, so anytime you add or remove ingredients. When you are first starting a recipe, and you have small quantities of an ingredient in the builder, your relative requirements (the percentage bars) will be very extreme. As you build out your recipe, those will even out so you can begin to edit your recipe reasonably!

More information on how each standard works here.

Select one of the three standards in your profile.

Some helpful links:
- FEDIAF vs NRC
- RFN Group poll: What do you formulate with?

STEP 4: DETERMINE MINERAL BIOAVAILABILITY FOR PLANTS

Follow Along on the RFN Spreadsheet: Create a Pet Profile - Bioavailability of Cooked Starches and Other Plants

In the RFN Spreadsheet, there are two categories of plant matter, cooked starches and other plants.

"Cooked starches" refer to energy dense starches that are cooked before feeding, such as sweet potatoes, rice, oatmeal, and quinoa. "Other plants" would apply to all other plant matter, including leafy greens and fruits, that may be cooked or raw before feeding.

Well cooked, energy dense starchy plants tend to have higher mineral bioavailability than other plants. Iron and copper are the exception: non-heme iron and copper, found in plant matter, is much less bioavailable than heme iron and copper in animal derived products. More information can be found in the NRC book and Small Animal Clinical Nutrition for each mineral.

It's important to note that each of the standards does already account, to varying degrees, for bioavailability issues. For more information on how, and to what degree, each standard accounts for these, you will need to read the official publication for each standard.

If you are using low carbohydrates in your recipe (less than 15% of calories), I recommend the following profile:

Bio-availability of Cooked Starches			Bio-availability of Other Plants		
Calcium (mg)	100%	▾	Calcium (mg)	100%	▾
Iron (mg)	0%	▾	Iron (mg)	0%	▾
Magnesium (mg)	100%	▾	Magnesium (mg)	100%	▾
Phosphorus (mg)	100%	▾	Phosphorus (mg)	100%	▾
Potassium (mg)	100%	▾	Potassium (mg)	100%	▾
Sodium (mg)	100%	▾	Sodium (mg)	100%	▾
Zinc (mg)	100%	▾	Zinc (mg)	100%	▾
Copper (mg)	100%	▾	Copper (mg)	100%	▾
Manganese (mg)	100%	▾	Manganese (mg)	100%	▾
Selenium (mcg)	100%	▾	Selenium (mcg)	100%	▾
Chloride (mg)	100%	▾	Chloride (mg)	100%	▾
Iodine (mcg)	100%	▾	Iodine (mcg)	100%	▾

If using a very small amount of carbohydrates and following the formulation process in this guide, we don't have to account for very much bio-availability issues that are not already addressed in the standards.

If you are using moderate or high carbohydrates in your recipe, I recommend the following profile:

Bio-availability of Cooked Starches			Bio-availability of Other Plants		
Calcium (mg)	100%	▾	Calcium (mg)	75%	▾
Iron (mg)	0%	▾	Iron (mg)	0%	▾
Magnesium (mg)	100%	▾	Magnesium (mg)	75%	▾
Phosphorus (mg)	100%	▾	Phosphorus (mg)	75%	▾
Potassium (mg)	100%	▾	Potassium (mg)	75%	▾
Sodium (mg)	100%	▾	Sodium (mg)	75%	▾
Zinc (mg)	100%	▾	Zinc (mg)	75%	▾
Copper (mg)	100%	▾	Copper (mg)	75%	▾
Manganese (mg)	100%	▾	Manganese (mg)	75%	▾
Selenium (mcg)	100%	▾	Selenium (mcg)	75%	▾
Chloride (mg)	100%	▾	Chloride (mg)	75%	▾
Iodine (mcg)	100%	▾	Iodine (mcg)	75%	▾

If using a larger amount of carbohydrates, we can be a bit more conservative on relying on plant matter for minerals.

Select the level of bioavailability for each mineral for the two categories of plant matter. At this point, your pet profile (steps 1-4) should be complete!

More information on setting bio-availability settings coming soon.

STEP 5: CHOOSE YOUR MAIN INGREDIENTS
Follow Along on the RFN Spreadsheet: Recipe Builder (or Condensed Recipe Builder)

Choose a small number of ingredients to be your main ingredients. It should include 1-2 meat ingredients, which will cover your proteins and fats. If you are using carbs as a significant portion of your recipe, beyond fruit/vegetable "toppers", add 1-2 cooked starches for your carbohydrates. We will cover plant toppers later.

Add and edit quantities of your ingredients until your macronutrients and total calories are approximately (within 5-10%) correct.

Do not worry about your minerals, essential fatty acids (EFA) and vitamins yet. Just look at your macros and total calories for now.

OPTIONAL - STEP 6: ADD IN YOUR RMB
Follow Along on the RFN Spreadsheet: Recipe Builder (or Condensed Recipe Builder) - Calcium

When looking at calcium sources, you have a few options here: raw meaty bones (RMB), calcium supplements, or bone meal. Listed below are some pros and cons of each.

RMB
- Can be cost effective way to add calories
- Adds enrichment to meals
- Can be hard to balance Ca:P

- Can be a safety hazard to some animals (choking, puncture hazard)
- Most nutritional analysis is estimated and should not be used for careful formulations

Calcium Supplements
- Eggshell and human calcium carbonate supplements are popular choices
- Eggshell is easy to make at home
- There is accurate nutritional analysis available
- Does not have phosphorus, so best to use if you want to limit phosphorus in your recipes

Bone meal
- Includes both calcium and phosphorus
- There is accurate nutritional analysis available

If you want to formulate with bone, add this to your recipe until you've at least met RA (100%) for calcium. If you are going to use a supplement, skip this step.

If your dog was previously on a PMR diet, they may be used to high levels (200-300%) values of calcium and phosphorus. While some dogs do well on these levels, others do just okay, and others do poorly. Determine for your dog what is right.

TROUBLESHOOTING
- It's impossible to get Ca and P ratio correct: It's hard to balance Ca:P using just RMBs, because RMBs are a rich source of Ca AND P. It's ok to use a mix of RMBs and supplements to get the ratio right. Keep in mind different RMBs have different levels of Ca and P.
- Sodium is REALLY high: RMBs can drive sodium really high. This isn't a concern for healthy dogs (per RFN Full Course).

If you've added a RMB, adjust! You will likely need to lower the amount of the base meat ingredients to match your macros and total caloric goals (5-10% window).

STEP 7: ADD IN YOUR LIVER

Follow Along on the RFN Spreadsheet: Recipe Builder (or Condensed Recipe Builder) - Retinol (Vitamin A)

The easiest way to meet your retinol (Vitamin A) requirements is to add liver. Keep in mind that though the SUL is quite high and hard to exceed, you should keep the overall balance of your minerals and vitamins in mind.

Liver from different sources:
- Chicken liver is higher in folate (may be helpful if not using any plant matter)
- Beef and lamb liver are high in copper
- Copper in pork liver may not be bioavailable (per NRC book)

Add in your liver ingredient. If you cannot add liver (for various reasons), skip this step. You'll notice that a little liver goes a long way!

STEP 8: ESSENTIAL FATTY ACIDS

Follow Along on the RFN Spreadsheet: Recipe Builder (or Condensed Recipe Builder) - Fats

Depending on your base meat ingredients, it can be hard to meet some of your fatty acid requirements. If you are low on these fatty acids, try adding:

- **LA**: chicken or turkey skin, or safflower oil
- **EPA and DHA** – an oily fish (sardines, mackerel, trout and salmon-raw, canned or cooked-are popular options) or a fish oil supplement. If you use a supplement rather than fish, you may need to supplement Vitamin D.
- **ALA**: if you are supplying ample EPA/DHA for dogs, you do not need to meet ALA requirements

Add in your ingredients and adjust! Fats can calorie dense, so you may need to re-adjust your base meat ingredients to match your macros and total caloric goals (5-10% window).

Some helpful links:
- [Thiaminase in Raw Fish](#)
- [Ultimate Guide to Fat](#)

STEP 9: ADDRESS DEFICIENCIES IN MINERALS
Follow Along on the RFN Spreadsheet: Recipe Builder (or Condensed Recipe Builder) - Minerals

Most homemade diets, whether raw or cooked, usually have a few imbalances or deficiencies in minerals. Try these ingredient additions or swaps to meet those deficiencies. If any of these suggestions are not viable for you, you can add supplements later.

- Ca:P - if your Ca:P ratio is low, try adding a calcium only supplement, or switching your RMB to one with a higher Ca:P ratio.
- Iron – add spleen or heart, or switch base ingredients to game meat (beaver, venison, etc.)
- Magnesium – add Mg rich cooked starches like quinoa, buckwheat, oatmeal or sweet potato
- Potassium – add sweet potato or even bananas
- Zinc – add oysters or switch base ingredients to lean beef or goat
- Copper – switch to beef or lamb liver or add oysters
- Manganese – add green tripe or add mussels
- Selenium – add kidney

Note on Iodine – Iodine is generally not listed in food databases, so most recipe formulators will show that your recipe has zero iodine. While there are varying levels of iodine in the food, it is generally recommended to supplement iodine.

Make your ingredient changes then adjust! Re-adjust your base meat ingredients to match your macros and total caloric goals (5-10% window).

Some helpful links:
- RFN Full Course – Unit 6
- RFN Minerals Flashcards

STEP 10: ADDRESS DEFICIENCIES IN VITAMINS
Follow Along on the RFN Spreadsheet: Recipe Builder (or Condensed Recipe Builder) - Vitamins

Now it's time to look at your vitamins. Try these ingredient additions or swaps to meet those deficiencies. If any of these suggestions are not viable for you, you can add supplements later.

- Thiamine – add some lean pork
- Pantothenic Acid – add more organ meats. Also, check your ingredients to see if B5 data is missing. If so, you can cross check another database to see if that data exists (see link below for a helpful post)
- Folate – add in some plant matter (see "toppers" section below) or swap to chicken liver
- Choline – If you are low on choline, try adding eggs. Keep in mind that choline can be partially synthesized in dogs and cats, but you'll need to take extra care here if you are formulating a high fat diet. Generally, you should aim to meet at least 50% of the RA (RFN Full Course, Unit 9).
- Vitamin A – add cod liver oil
- Vitamin E – Unfortunately, there are not great bioavailable natural sources of Vitamin E. You will need to supplement.
- Vitamin D – add a Vitamin D rich fish like salmon or mackerel
- Vitamin K – Healthy dogs and cats can synthesize their own Vitamin K and so you do not generally need to meet RA.

Make your ingredient changes then adjust! Re-adjust your base meat ingredients to match your macros and total caloric goals (5-10% window).

Some helpful links:
RFN Full Course – Unit 6 and Unit 9
RFN Vitamins Flashcards
Food Databases

STEP 11: ADD IN YOUR FIBER AND PHYTONUTRIENTS
Follow Along on the RFN Spreadsheet: Recipe Builder (or Condensed Recipe Builder) - Fiber and Vitamins

Generally, a 1.5% fiber on dry matter basis is a good starting point, and 5%+ is considered a high fiber diet. (RFN Full Course) As with calories and macronutrient breakdown, the best place to start would be to look at your dog's previous diet. If you are already using cooked starches in your formulation, you may already have enough fiber in the recipe.

When adding in plant matter, you should consider the role of phytonutrients, which are the unique chemicals found in plant matter. Some are harmful, others beneficial. Some should be avoided for certain conditions, while others have anti-inflammatory or anti-cancer properties. When selecting plants for your recipe, you should always consider the properties of that specific plant to see if it's the right one for your individual pet.

Plant toppers are popular in RFN, with many striving feed a variety of colors for the various phytonutrients, and they can provide a nice boost in fiber.

Make your ingredient changes then adjust! Re-adjust your base meat ingredients to match your macros and total caloric goals (5-10% window).

STEP 12: FINALIZE YOUR RECIPE AND ADD IN YOUR SUPPLEMENTS

Follow Along on the RFN Spreadsheet: Recipe Builder (or Condensed Recipe Builder)

Now it's time to tweak your main ingredients to get everything *just right*. You've got your base ingredients, ingredients to meet deficiencies, and your toppers. It's time to edit quantities of all those ingredients to get your final energy and macronutrient breakdown right where you want it. Once that's done, you add in all your mineral and vitamin supplements.

Tweak your base ingredients to match your macronutrient and caloric goals. Add your mineral and vitamin supplements.

A couple tips:
- Mg supplements, more than others, can cause negative side effects. Test supplements in small doses before adding them to a bulk recipe, especially if you have a pet sensitive to GI upset.
- B Vitamins: If you are low on multiple B vitamins, you may want to use a B complex. But if you are low on just one B vitamin, it may be better to supplement just that one instead of driving other B vitamins higher than necessary

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OPTIONAL STEP 13: POST IN RFN!

If you've completed your recipe, post it on RFN for a group effort audit! Even if you are not done editing it or haven't gotten it quite right, members can often help guide you in a good direction. Looking forward to seeing your recipe!