# Kumara Kisses

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## Brief

Our brief was to develop a food product or ingredient containing a major ingredient from NZ's primary industry that adds value to the 'NZ brand' in an export market.

## Research

When researching deficiencies around the world it was found that vitamin A was one of the largest around the world. The group started looking into Africa and Asia as both were subclinical. It was found that one of the highest sources of vitamin A was orange sweet potato (kumara). It was decided to use orange kumara as our NZ ingredient. The group drafted some ideas based off the deficiency map. The first was some kind of AID product for Africa and the other, a baked product product for Asia. After looking into both a decision was made to go with Asia, in particular China. This decision was made as the group felt that the opportunities in Africa would be limited to AID products. After further research into the deficiency it was found that it was most prevalent in children. So the product would be aimed at children and teenagers. To make it appealing to children and teenagers it was decided to make it a sweet biscuit.

## Vitamin A Deficiency In China

**CHINA EPIDEMIOLOGICAL DATA**

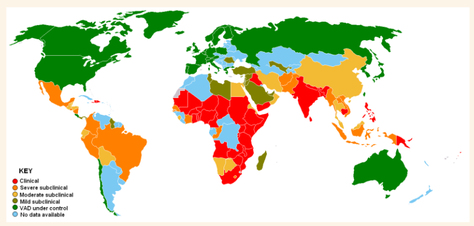
http://www.tulane.edu/~internut/Countries/China/chinavitamina.html

**Sub-clinical Vitamin A Deficiency**

*Most Recent Clinical VAD Survey*

The survey assessed clinical and sub-clinical signs of VAD.

| Group | Sample Size | Prevalence in Sample |
|---|---|---|
| > 6 months | 359 | 33.4% |
| 6-11 months | 843 | 17.9% |
| 12-23 months | 1553 | 12.7% |
| 24-47 months | 2866 | 10.6% |
| 48-59 months | 3040 | 8.0% |
| Total | 8669 | 11.7% |




## Vitamin A Focus

Vitamin A is the name of a group of fat-soluble retinoids, including retinol, retinal, and retinyl esters. They come in two forms in the human diet. The first, preformed vitamin A. Preformed vitamin A is found in foods from animal sources, including dairy products, fish and meat (especially liver).

The other form is provitamin A carotenoids. There are three types of provitamin A carotenoids, alpha-carotene, beta-carotene and beta-cryptoxanthin. All of which are plant based pigments that the body converts into vitamin A.

Both forms once in the body must be metabolised into retinol and retinoic acid to preform their biological functions.

The most important biological functions include the formation of rhodopsin, the light sensitive pigment in the photoreceptors of the eye. Also general health and growth.

The most common symptom of vitamin A deficiency (VAD) is night and other low light situations blindness.

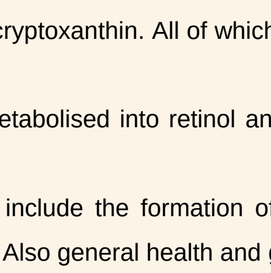
Measuring Vitamin A.

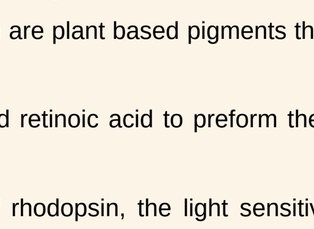
Vitamin A is normally measured in micrograms (mcg) of retinol activity equivalents (RAE). 1 mcg of retinol is equal to 12 mcg of beta-carotene, and 24 mcg of alpha-carotene or beta-cryptoxanthin. Currently vitamin A is listed on food labels in international units (IU). The conversion is as follows:

- 1 IU retinol = 0.3 mcg RAE
- 1 IU beta-carotene from food = 0.05 mcg RAE
- 1 IU alpha-carotene or beta-cryptoxanthin = 0.025 mcg RAE

The recommended daily intake (RDI) for vitamin A is as follows:

| Age Group | Recommend Dietary Allowance (RDA) |
|---|---|
| 1-3 | 1,000 IU |
| 4-8 | 1,300 IU |
| 9-13 | 2,000 IU |
| 14-18 | 1,000 IU |
| 18+ | 3,000 IU (male) 2,300 IU (female) |



100g kumara = 787 mcg RAE

## Ingredient: Kumara

Orange kumara (***Ipomoea batatas)*** is a large, starchy, sweet-tasting, root vegetable. It is commonly know as sweet potato but in New Zealand it's known as kumara.

It is very high in vitamin A.

## Revised Brief

**Hypothesis:** Based off the research our research it was found that China has subclinical levels of vitamin A amongst children especially in the rural areas. To make our product suitable for the brief it will contain kumara as our 'NZ' ingredient. To make it appealing to children it will be a sweet biscuit. So our hypothesis:

***The aim of this CREST project is to develop a kumara based biscuit to be sold on the Chinese market to help combat the vitamin A deficiency in children.***

## Optimising the formula

**Developing a basic sugar cookie using kumara as a substitute for some of the key ingredients.**

### Technique 1

***Using dehydrated kumara grounded into flour.***

The fine granules of dehydrated kumara rehydrated when mixed with the other ingredients. This made for a gritty texture and a toffee like flavour. The biscuit was quite sweet and chewy but would not be suitable for the export market. This was because it did not look appealing and the texture needed a lot of work. It was an interesting start and it was decided to not use the dehydrated kumara due to the texture.

### Technique 2

***Using kumara puree.***

This trial used steamed kumara puree. It was substituted for the flour; however the mixture was far too wet to roll so flour was added until it was suitable. The end product was still to wet and could not be picked up as it was very soft. The flavour was quite unappealing.

### Stage Gate.

At this point it was decided that research was needed to find out what characteristics of existing Chinese biscuits were popular. To do this a focus group was held with Chinese international students at Wellington High School. The students were asked to try several biscuits and say why they liked/disliked each biscuit. The most popular for both taste and texture was a 'whoopee pie' style berry biscuit. It consisted of 2 sponge layers sandwiching a berry crème mixture.

### Technique 3.

Ginger kiss style biscuit using kumara in the sandwiching biscuits. The soft sponge layers were made from kumara puree; the biscuit layers were held together by some ginger icing. The result was far better tasting as the icing brought it together. The biscuit was still very soft and did not look very appealing. This resulted in another Stage Gate decision of changing the texture of the biscuit.

### Technique 4

Sandwich cookie with harder biscuits.

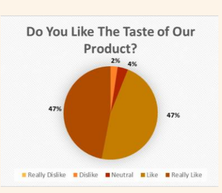
This trial used kumara puree in the biscuits. After some research it was found that a popular combination of flavours in America was 'sweet potato' and marshmallow. Based off this information the trial would have marshmallow icing. There was an opportunity to conduct sensory testing at the Wellington High open evening.

## Sensory Surveys

Wellington High School open evening was on Monday the 15th of June. This opportunity was used to gain a public opinion on the product. The product served was prototype 4. As parents moved through the classroom they were offered a biscuit and were asked to fill out a short survey. The survey consisted of 3 questions.

- Would you buy this product? Yes/No
- Do you like the texture? Really Like/Like/Neutral/Dislike/Really Dislike
- Do you like the taste? Really Like/Like/Neutral/Dislike/Really Dislike

We had 83 responses and the results were very positive as is shown in the following graphs:



## Optimal Formula

The optimal formula is the same as technique 4 except the quantity of margarine is doubled. This is because around a quarter of people surveyed did not 'like' the texture. By doubling the amount of margarine it made for a softer biscuit.

| **Nutritional Information** | | |
|---|---|---|
| **Servings per package** | **5.00** | |
| **Serving Size** | **45.00 g** | |
| | Average Quantity per Serving | Average Quantity per 100 g |
| Energy | 723 kJ | 1630 kJ |
| Protein | 1.6 g | 3.6 g |
| Fat, total | 1.2 g | 2.6 g |
| -saturated | 0.7 g | 1.6 g |
| Carbohydrate | 38.9 g | 86.4 g |
| -sugars | 30.2 g | 6 7.2 g |
| Sodium | 45 mg | 99 mg |

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