



# PROPAGATING THE RIGHT PROTEINS

## A2A2

Our industry is governed in many ways by consumers and their preferences for certain types of dairy products. In recent years, A2 milk has gained popularity in different parts of the world because of research indicating potential health benefits of this type of milk. According to a USDA report from 2018, the market share for A2 drinking milk in Australia has grown to 10% with a growing export market for A2 infant formula to China. The A2 milk market has expanded to include countries such as New Zealand, the U.S., and the UK and this product is supplied by many major food retailers. Producers desiring to transition their herd to only produce A2 milk can convert their herd through various breeding strategies.

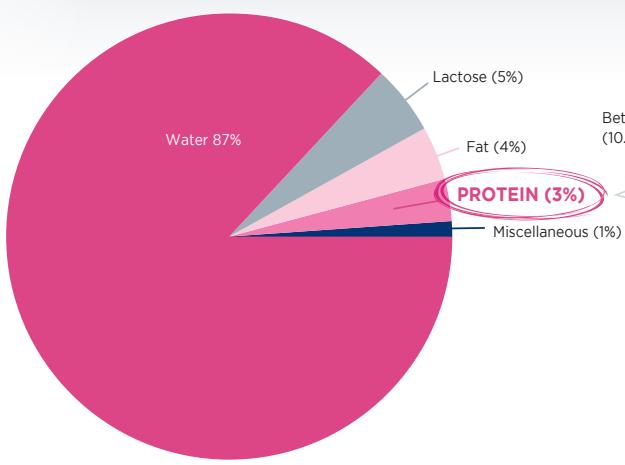
## WHAT IS THE DIFFERENCE BETWEEN A1 AND A2 BETA-CASEIN?

Milk is comprised of 87% water and 13% solids which include proteins, fats, lactose, and minerals. For a more complete breakdown on the components in milk, please see **Figure 1**. The major proteins contained in milk are called caseins and one of these caseins called Beta-casein is responsible for the A2 status of an animal. Beta-caseins have two major variants, A1 and A2, and are comprised of amino acids.

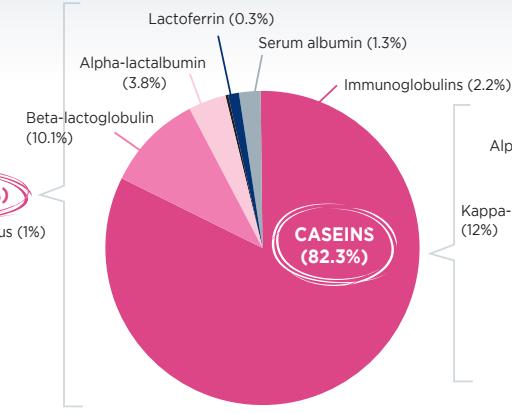
THE DIFFERENCE BETWEEN A1 BETA-CASEIN AND A2 BETA-CASEIN IS THE AMINO ACID FOUND AT POSITION 67 ON THE AMINO ACID CHAIN. THE A1 VARIANT CONTAINS HISTIDINE AND THE A2 VARIANT CONTAINS PROLINE.

The difference between A1 Beta-casein and A2 Beta-casein is the amino acid found at position 67 on the amino acid chain. The A1 variant contains Histidine and the A2 variant contains Proline. This change in amino acid composition is thought to affect the digestion of these proteins by humans, as some research points to milk containing strictly A2 Beta-casein being easier to digest especially in people identifying as milk intolerant. As promotion of this idea has gained momentum, the demand for A2 milk in the marketplace has increased and some milk markets have included premiums for farms producing A2 milk.

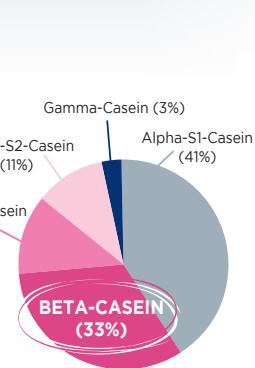
### WHOLE MILK



### PROTEIN



### CASEIN



**Figure 1**

Milk is comprised of water and various solids of which 3% are proteins. Caseins are the largest group of protein in milk encompassing 82.3% of all milk protein. There are several different types of caseins, and Beta-Caseins which account for 33% of all caseins are responsible for the A2 status of the female.

## HOW CAN YOU TRANSITION YOUR HERD TO PRODUCE ONLY A2 MILK?

If you are interested in transitioning your herd to produce only A2 milk, there are a couple strategies to consider. Every cow has two Beta-casein genes in their DNA and the combinations include A1A1, A1A2, and A2A2. In the Guernsey and Jersey breeds of dairy cows, the A2 variant is predominant while Holstein, Friesian, Ayrshire, and Shorthorn populations have roughly equal amounts of the A1 and A2 variant in their populations. Each herd will have a varying frequency of strictly A2A2 females, but if you have roughly an equal frequency of A1 and A2 genes in your herd, it could take up to 10 years to convert your herd to strictly A2 milk by using only A2A2 sires in your breeding strategy. The only way to guarantee that an A2A2 offspring is produced in a breeding strategy is to breed an A2A2 cow to an A2A2 bull. If you breed an A1A2 female with an A2A2 bull, you will have a 50% chance of getting an A1A2 offspring and a 50% chance of getting an A2A2 offspring. If you breed an A1A1 cow to an A2A2 bull, you have a 100% chance of getting an A1A2 offspring. For an illustration of these breeding strategies, please see Figure 2.

If you would like to expedite the process of transitioning your herd to only produce A2 milk, you can genomic test your females to identify the frequency of the A2 gene in your population. If you are already testing your female calves, you can use this test to identify A2A2 females to make heifer replacements by breeding them to sex-sorted A2A2 bulls. You can also identify A1 females to cull or to use as embryo recipients.

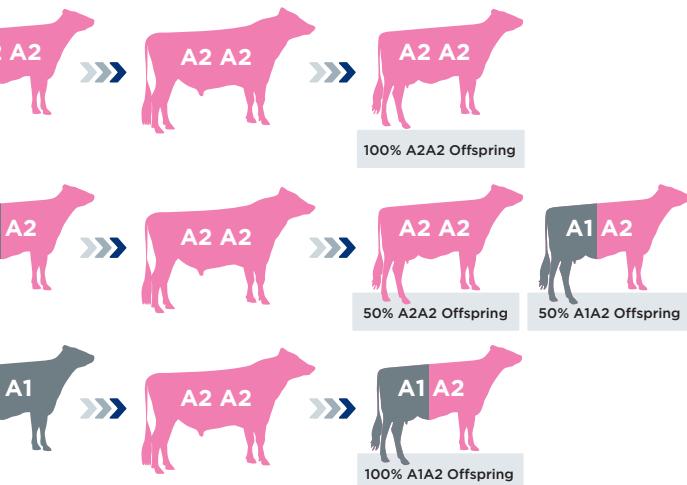
**STgenetics** is now excited to offer our genomic testing customers the ability to test for Beta-casein A2 through Genetic Visions on our new VM2 chip. In the past, additional testing for Beta-caseins could be prohibitive, but now it is more accessible than ever to test your herd, so you can make the right breeding decisions for your market. After you select the path for transitioning your herd either by a conventional breeding strategy or through a breeding strategy enhanced by genomic testing, **you can utilize Chromosomal Mating to optimize other economically important traits in your herd to maximize your profitability.**

A2 milk markets are expanding in select regions and could be an important market for you to capitalize on by transitioning your herd to only A2A2 females. The most efficient way to transition your herd is to utilize genomic testing with Genetic Vision's new VM2 chip with the capability to test for Beta-casein A2 to determine the A2 status of your females.

YOU CAN THEN MAKE CULLING AND BREEDING DECISIONS TO PROPAGATE ONLY A2 GENETICS BY BREEDING A2A2 FEMALES TO SEX-SORTED A2A2 BULLS.

**HOW TO CONVERT TO 100% A2 MILK HERD?**

- ✓ Genomic test the herd
- ✓ Prioritize A2A2 females as dams for the next generation
- ✓ Use only sexed semen from A2A2 bulls



**Figure 2**

Each herd may include A2A2, A1A2, and A1A1 females. This illustration shows the outcome of breeding each of these types of females to an A2A2 bull.

UTILIZING GENOMIC TESTING WILL GREATLY REDUCE THE TIME IT WILL TAKE TO COMPLETELY TRANSITION YOUR HERD TO PRODUCE ONLY A2 MILK BUT WILL DEPEND ON THE INTENTIONALITY OF YOUR BREEDING AND CULLING DECISIONS BASED ON A2 STATUS.

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