

# Beta-Casomorphin-7 and A1, A2 Milk



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# Beta-Casomorphin-7 and A1, A2 Milk



*“A1 Milk”*

*“The Devil’s In The Details”*



*“A2 Milk”*

*prepared by*

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&

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Diplomate, ABVP-Dairy

**Windsor Dairy, LLC**



Sponsored by  
**Windsor Dairy, LLC**

owners:  
Dr. Meg Cattell & Dr. Arden Nelson



**RAW MILK and RAW MILK CHEESE**  
Grade A, Certified Organic, Pasture Fed, No Grain

**JUN 28 2008**

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# What is Milk ?

- Milk is the highly evolved secretion of the mammary glands of mammals
- It is the *most perfect food* for each specie's infants
- Perfect nutrition, prepackaged in heated, attractive mammary glands that Mom always has with her...

# What is Milk ?

- 85% water
- 4.6 % lactose (milk sugar)
- 3.7 % triacylglycerols (milk fat)
- 2.8% **caseins** (milk protein)
- 0.54% Minerals and 3.36% miscellaneous



# Good Science versus “Guessing”

- Good Science gets our stamp of approval on the slide presenting the material

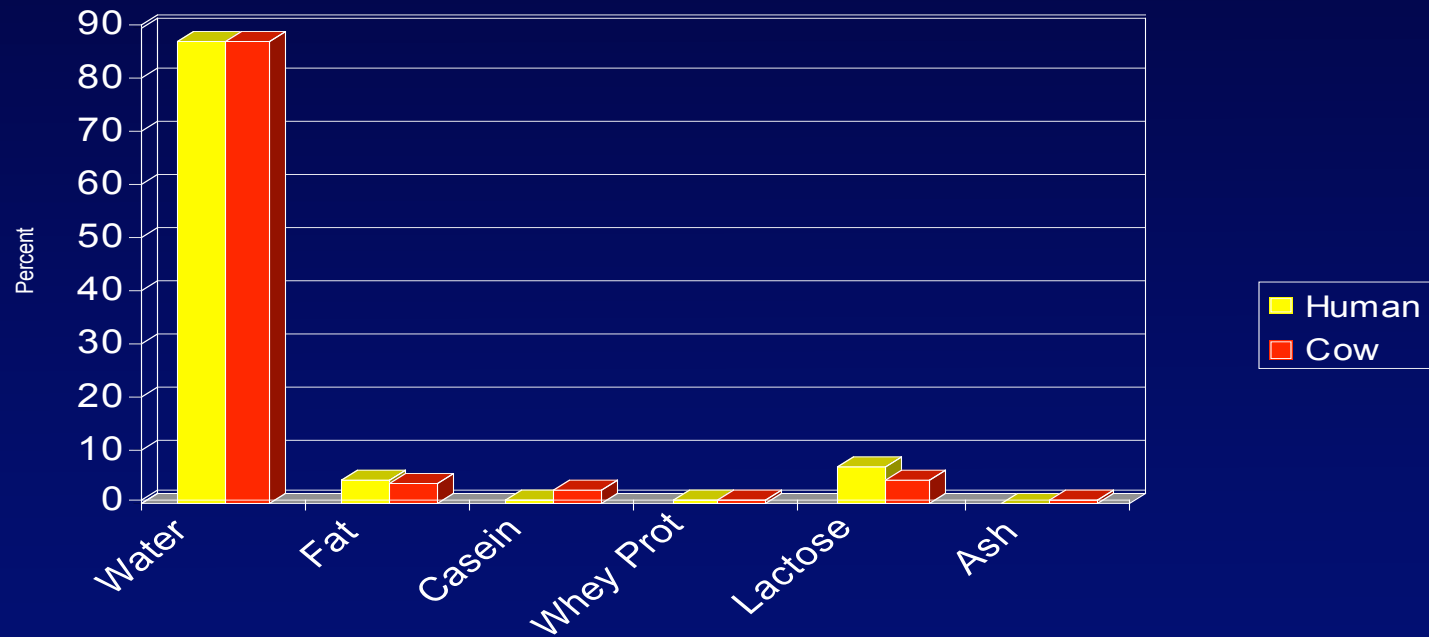


# Good Science versus “Guessing”

- Bad “Science” ~ “guessing”
- Bad science is worse than guessing and gets our stamp of disapproval on the slide



# Human Milk Compared to Cow Milk (as is basis, with water)

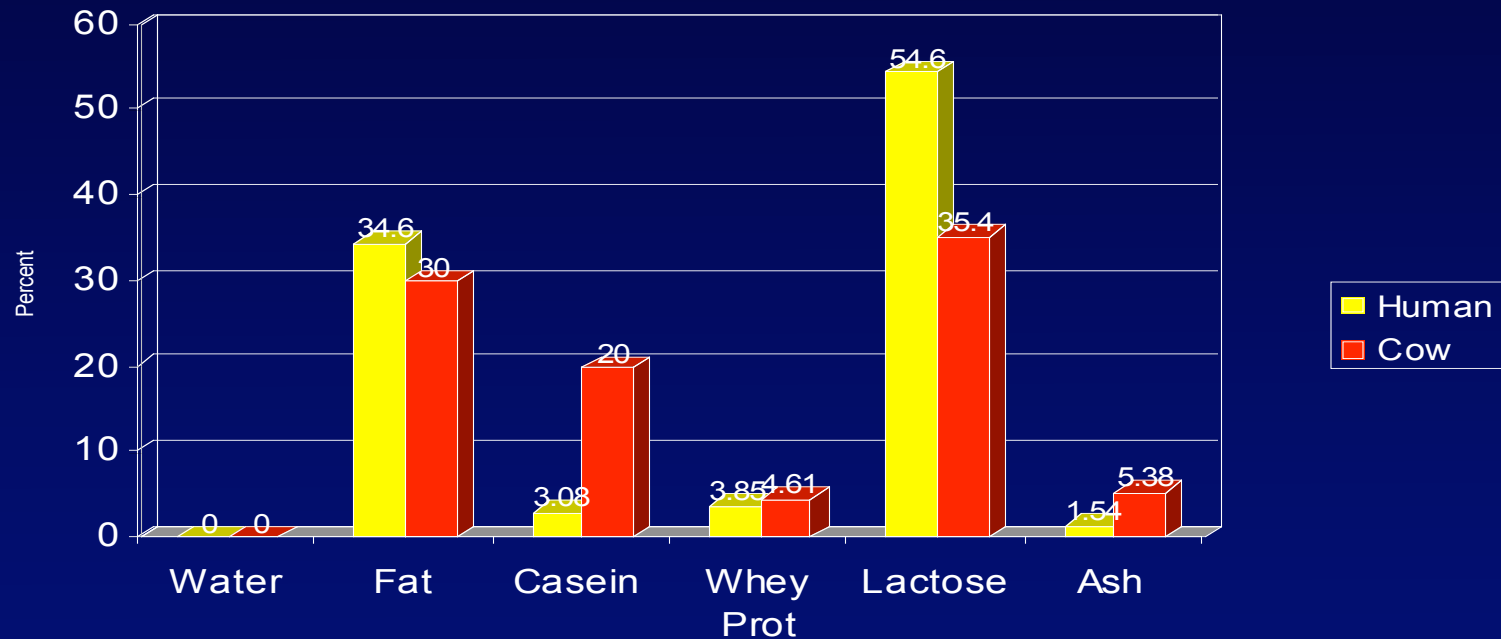


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# Human Milk Compared to Cow Milk (dry basis, without water)



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# Cow Milk Proteins

- Casein (main milk protein)
- Whey proteins
- Enzymes



# Casein = milk protein

- Alpha-casein - 36%
- Beta-casein - 27%
- Kappa-casein - 9%
- Peptides, amino acids - 27%

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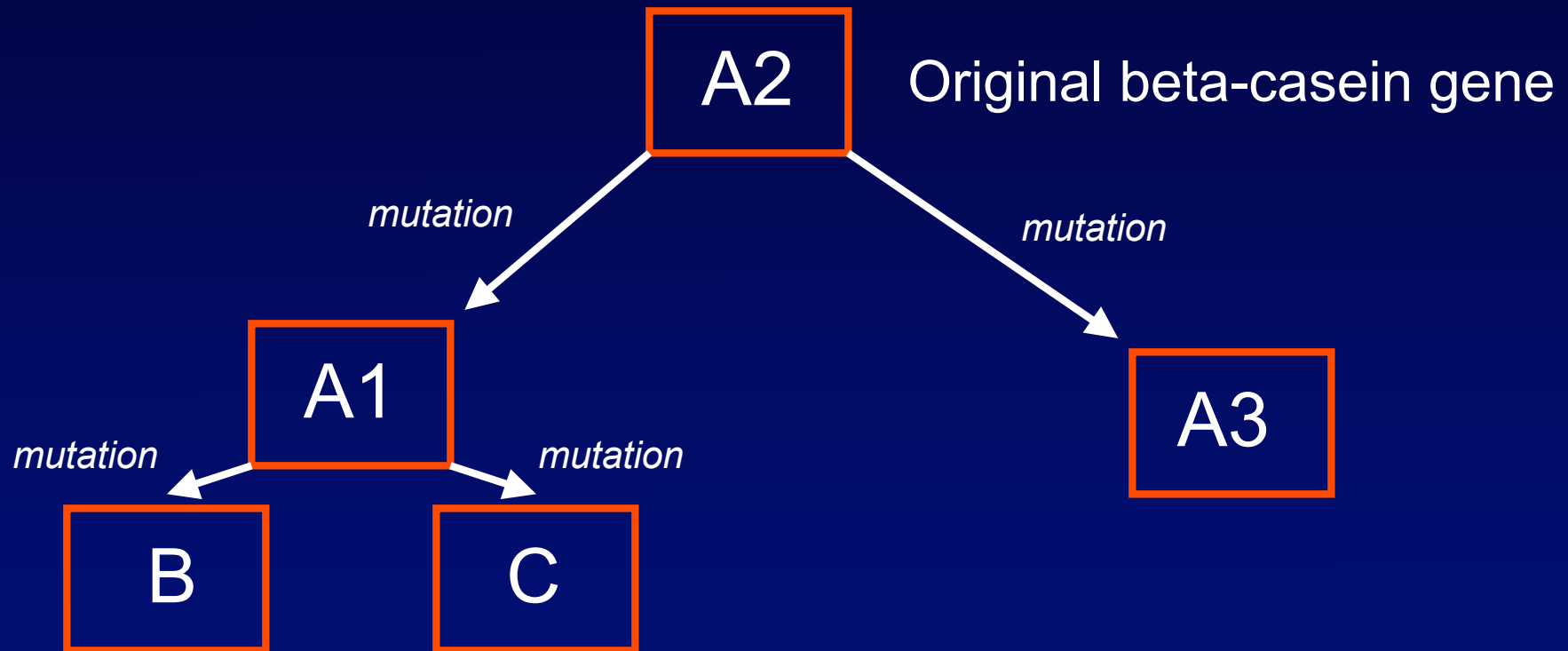
# Cow Beta-Casein Genes

- First beta-casein gene discovered = A1
- Original beta-casein gene = A2
- Subsequent variation of A1 = B, C
- Variations of A2 = A3



# Bovine Beta-casein genetics

*abbreviated*



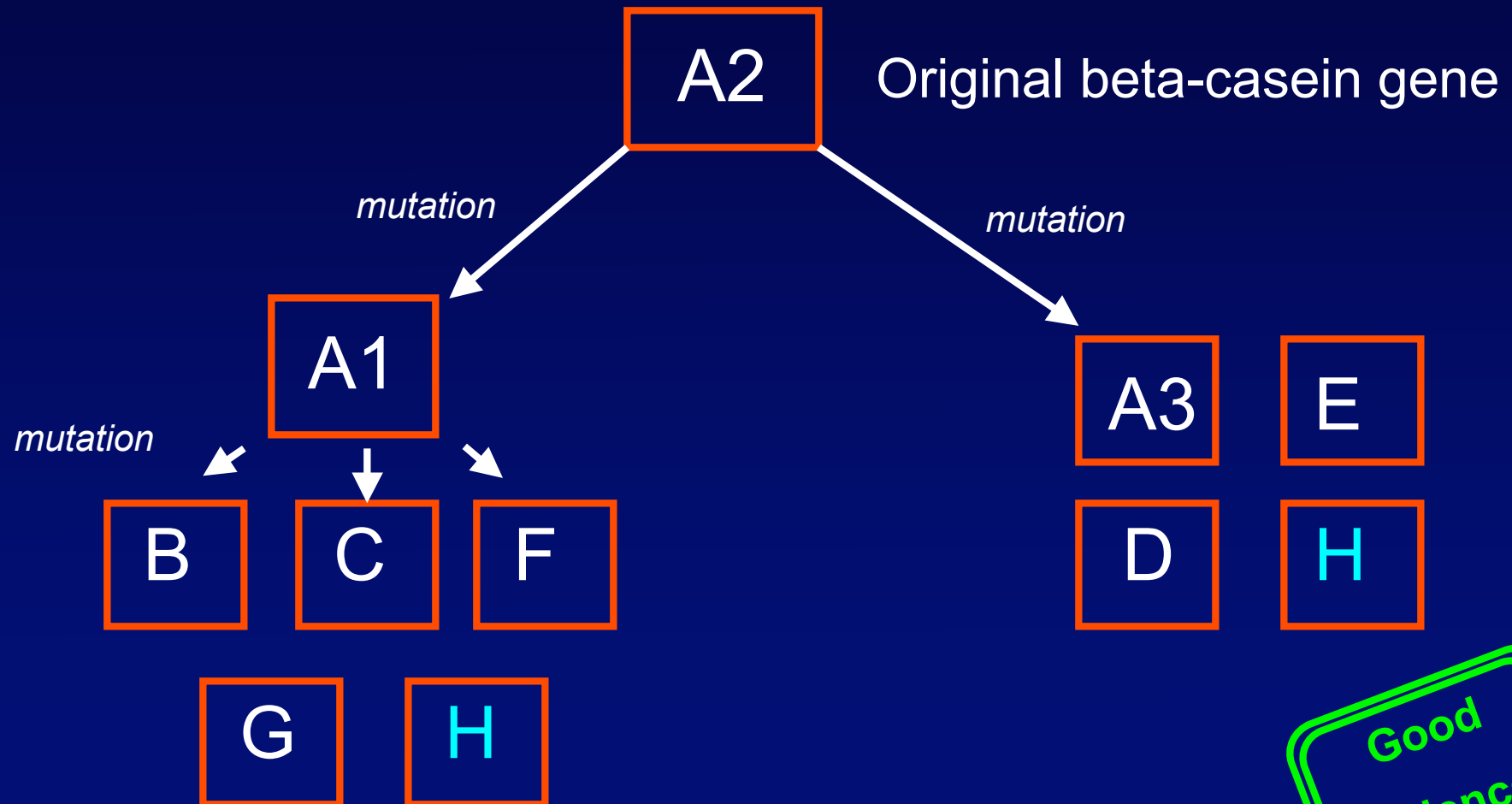
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# Bovine Beta-casein genetics

Formaggioni, et al. 1999. Italy.



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# Bovine Casein Genetic Variation

Formaggioni, et.al. 1999

- Alpha-Casein = 9 variants
- Beta-Casein = 15 variants
- Kappa-casein = 11 variants



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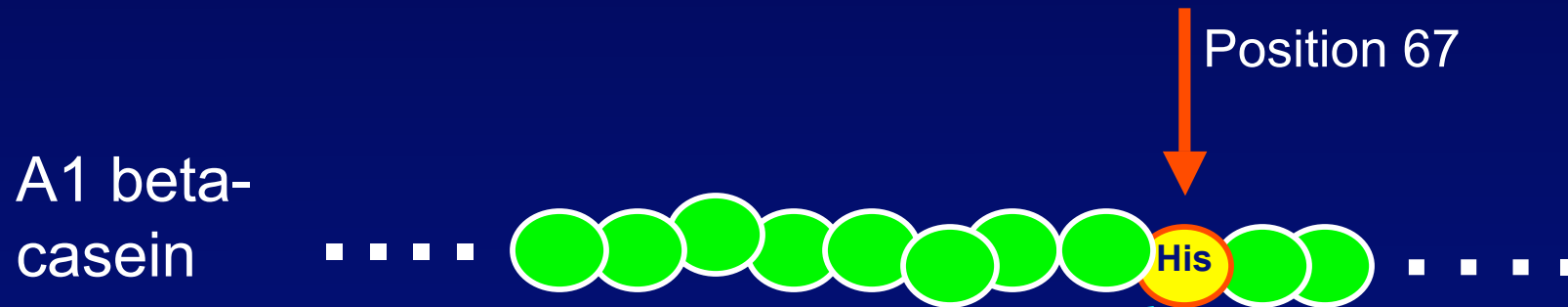
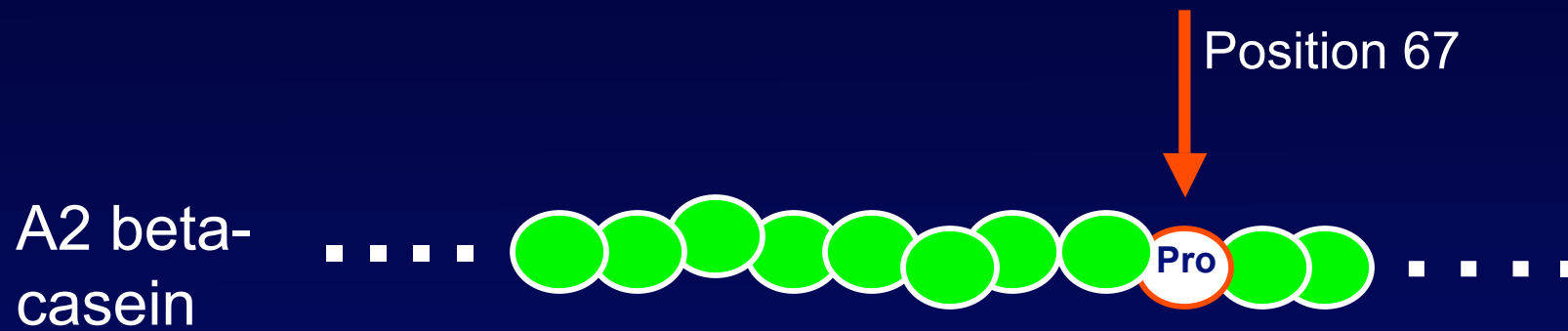


# Genetic Mutation Changed A2 into A1 beta-casein

- Beta-casein is 209 amino acids long (1972)
- Position 67 change from proline to histidine created A1 beta-casein
- One amino acid difference allows the formation of **beta-casomorphin-7 (BCM7)** via digestion



# Position 67 Change Turned A2 into A1 beta-casein

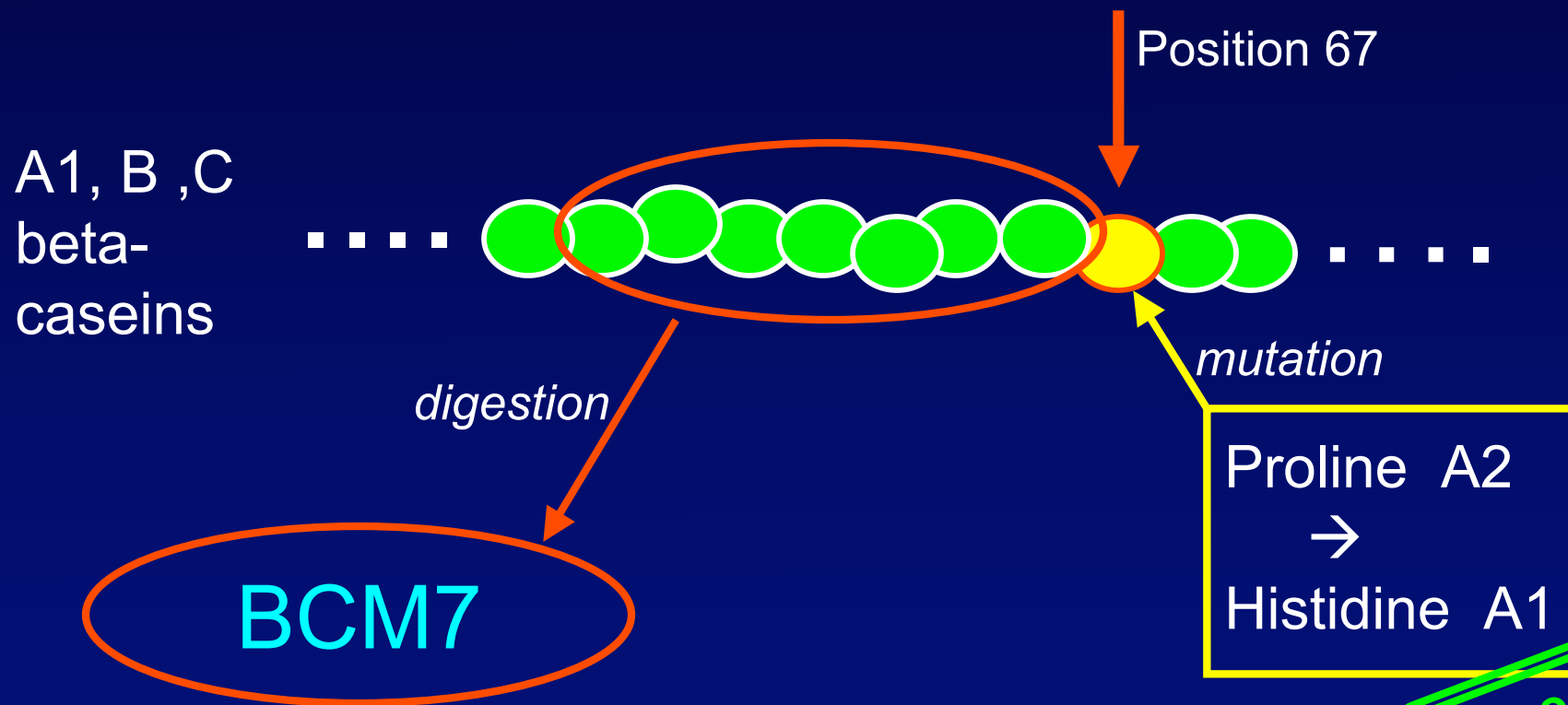


*weaker bond*

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# The changed A1 beta-casein can yield BCM7



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# “Devil in the Milk”

## Leaky gut syndrome - 1

- Book author is Keith Woodford, PhD in agricultural economics
- He suggests that **beta-casomorphin-7**, a digestion product of beta casein, can be absorbed through the gut wall in people with leaky gut syndrome, and is a possible irritant chemical to those with autism and other neurological diseases



# “Devil in the Milk”

## Leaky gut syndrome - 2

- Only A1 beta-casein, and its siblings, beta-casein B and C, can result in **beta-casomorphin-7 (BCM7)** production
- Beta-casein A2 and A3 do not produce BCM7 during digestion



# BCM7 is not the only BCM

Jinsma & Yoshikawa, Peptides, 1999.

- Other BCMs are produced from other segments of casein proteins
- BCM9, BCM13, BCM21
- Active or not? Good or bad effects?

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# Caso-morphins are bad & GOOD !

Elitsur & Luk, 1991

- BCM7 affects :
  - GI motility
  - GI absorption
  - GI secretion
  - GI immune function



- BCM7 has large positive effects on human mucosal immune system

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# Milk protein digestion products

- **527 bioactive peptides** identified (so far) - the result of protein digestion in humans (Dziuba, et al, 1999.)
- Do you suppose that some of these could be good?
- Do you suspect that some of these could be bad?





# Milk consumption history

- We have genetic evidence that adult humans have been consuming milk from other species for at least 7,500 years ...
- We have survived as a species so far...



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# “Devil in the Milk”

Heart disease, diabetes -1

- Dr. Woodford also suggests that A1 milk may be linked to the incidence of heart disease and also to the incidence of diabetes
- The original research used for this hypothesis was intended to find a link between heart disease and cholesterol

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# “Devil in the Milk”

Heart disease, diabetes - 2

- The original investigation methods used for the basis of this hypothesis are questionable
- Same methods used by Ancel Keyes in his “7 country” heart disease cholesterol study
  - » (22 countries to 7)

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# “Devil in the Milk”

Heart disease, diabetes - 3

They could NOT find a correlation between **A2** milk and heart disease,

But, they found a correlation with increased **A1** milk consumption and heart disease

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# Beta-Casein Terminology

by Devil in the Milk

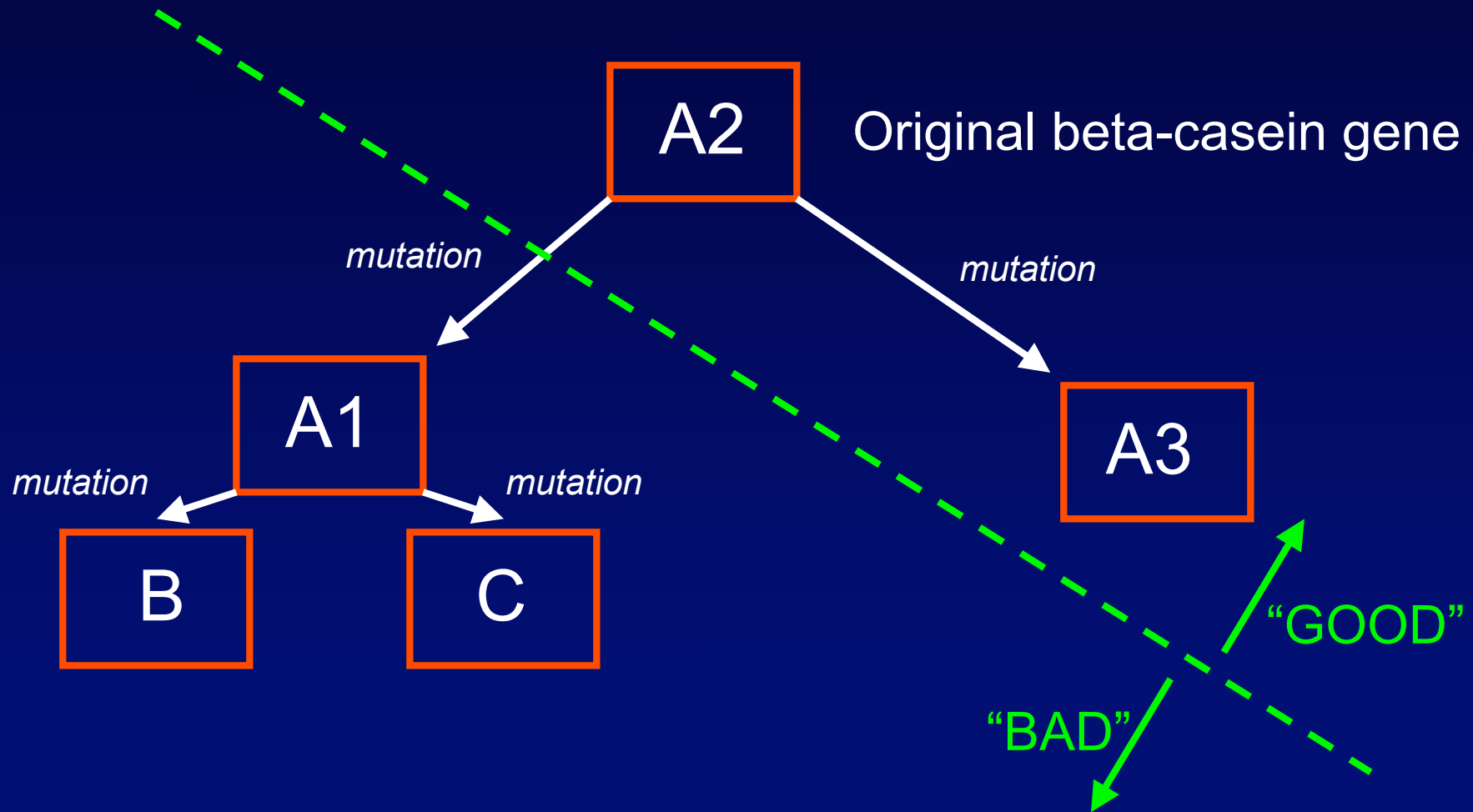
- According to the definition by Woodford, “good” casein cannot produce beta-casomorphin-7
- “Good” casein is A2 and A3
  - Collectively referred to as A2 in the book
- “Bad” casein is A1, B, C
  - Collectively referred to as A1 in the book

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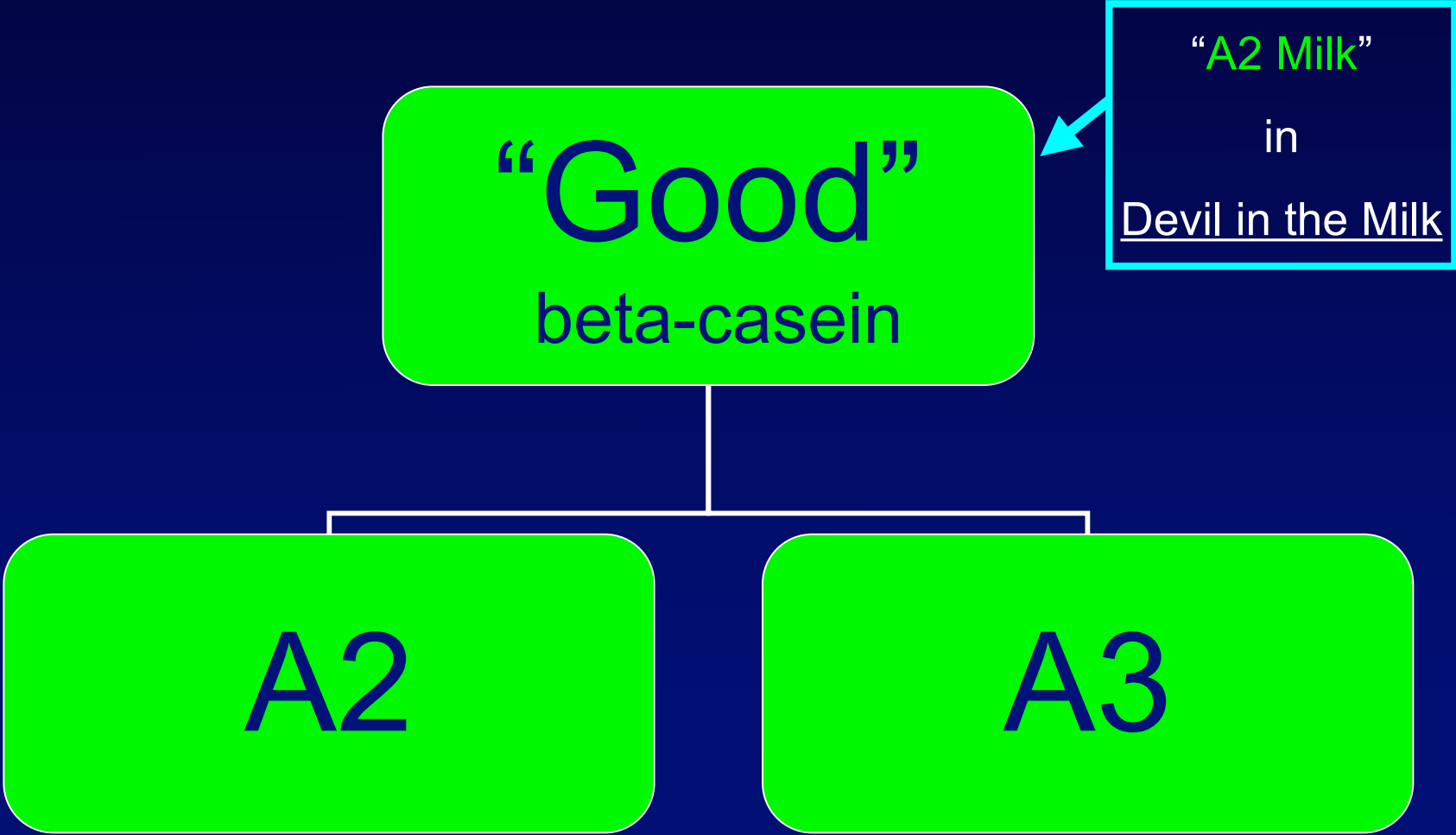




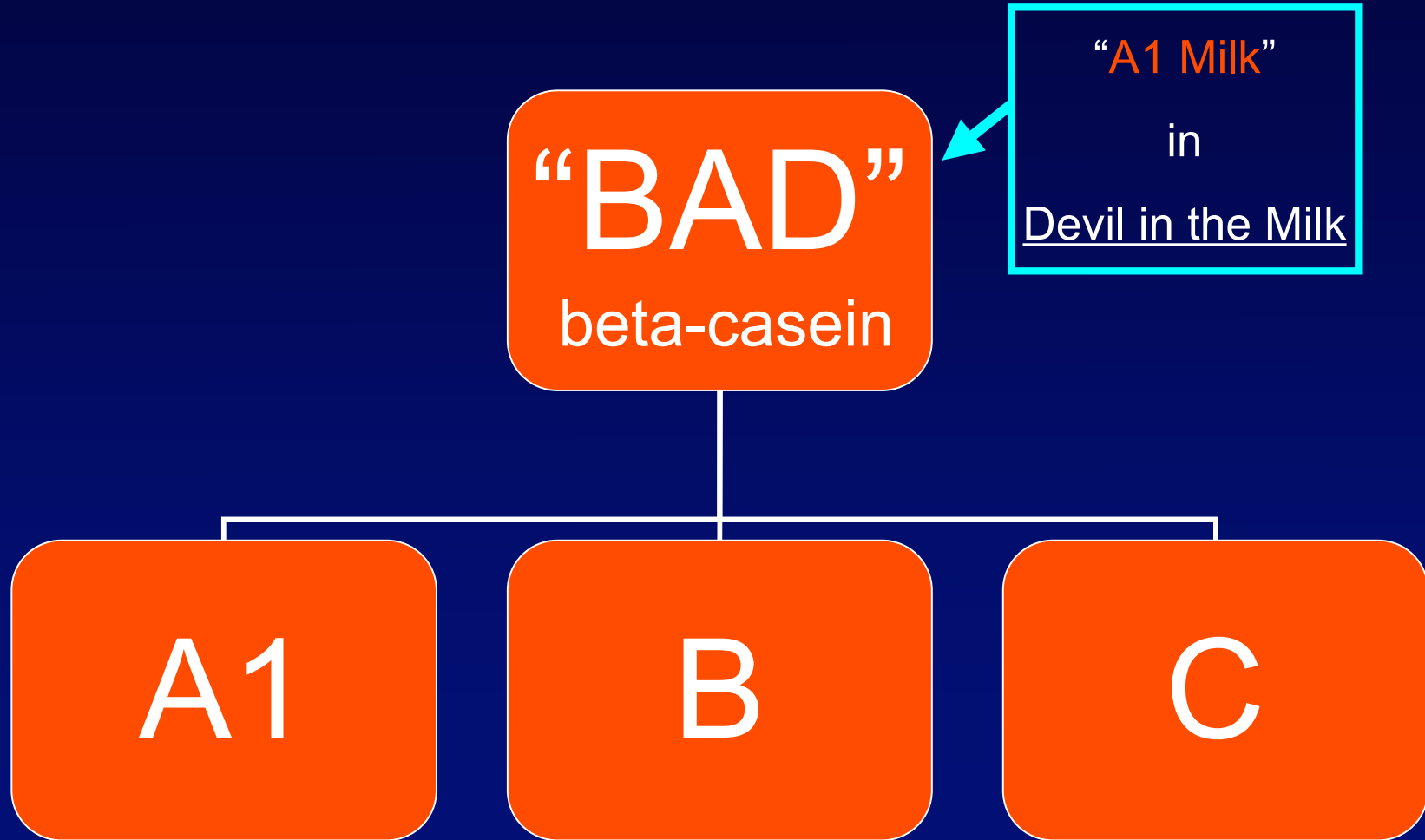
# Bovine Beta-casein genetics



# Beta-casein classification – “GOOD”



# Beta-casein classification – “BAD”



# Critique: beta-casein & heart disease - 1

in the book: Devil in the Milk

- The critical question is : Why is A1 milk defined as A1, B, and C beta-casein while the study only uses A1 milk WITHOUT including B and C milk?
- YET, the book claims that the hypothetical cause of heart disease is BCM7 created by digestion of A1, B and C milk ? ? ?

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## Critique: beta-casein & heart disease - 2 in the book: Devil in the Milk

- This is exploratory epidemiological research and it has its place for hypothesis generation
- BUT IN NO WAY proves association, nor causation...

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## Critique: beta-casein & heart disease - 3

in the book: Devil in the Milk

- This is the same methodology that was used by Ancel Keyes in the “Seven Country Study” that erroneously started the entire cholesterol theory of heart disease....
- He started out with data from 22 countries, and whittled it down to only 7....!

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# Critique: beta-casein & heart disease - 4

in the book: [Devil in the Milk](#)

- It is ironic that the only supporting animal model evidence linking BCM7 and heart disease comes from a rabbit study *(Atherosclerosis. 2003 Sep;170(1):13-9. Tailford, et al.)*
- Sound familiar?



# Beta-Casein Gene Research Review - 1

by Meg Cattell, DVM, MS

- Studies performed in 9 countries
- Studies on 6 dairy breeds
- Five total casein gene variations
- Studies published between 1982-2001

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# Beta-Casein Gene Research Review - 2

by Meg Cattell, DVM, MS

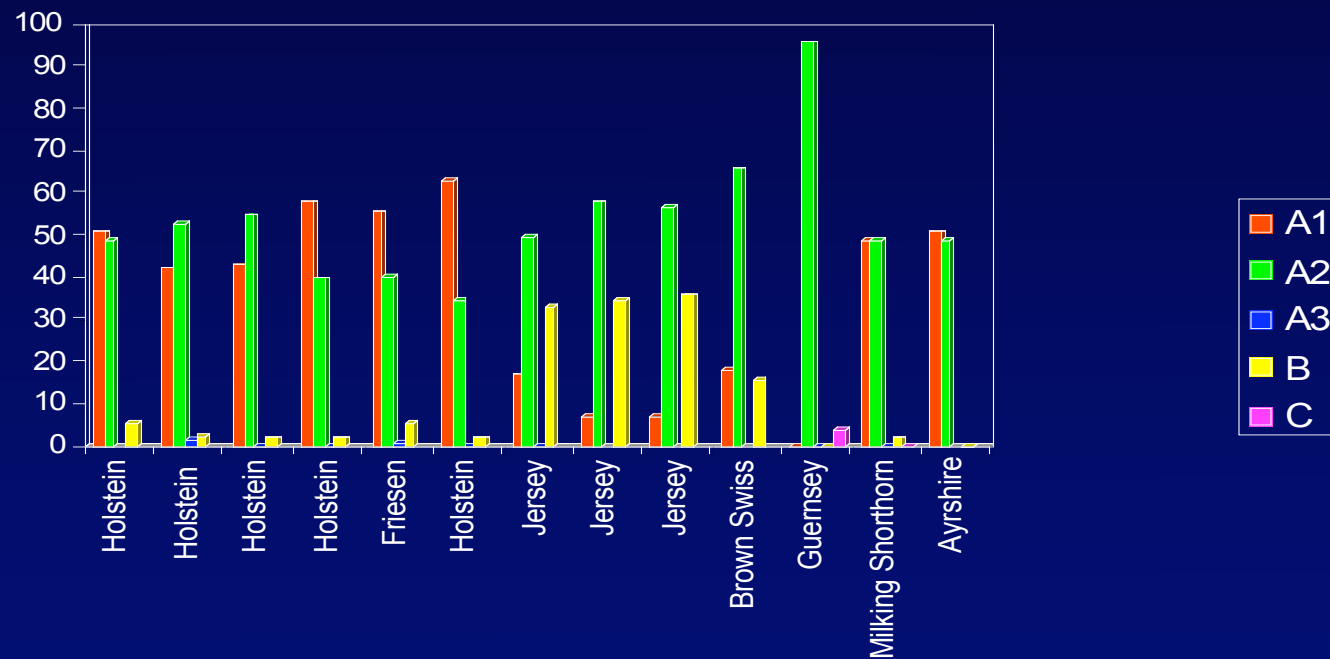
- Six studies included Holsteins
- Three studies included Jerseys
- One study each included Brown Swiss, Ayrshire, and Milking Shorthorn

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# Beta-Casein Genes by Breed

## Summary of 9 studies



# Beta-Casein Genes by Breed

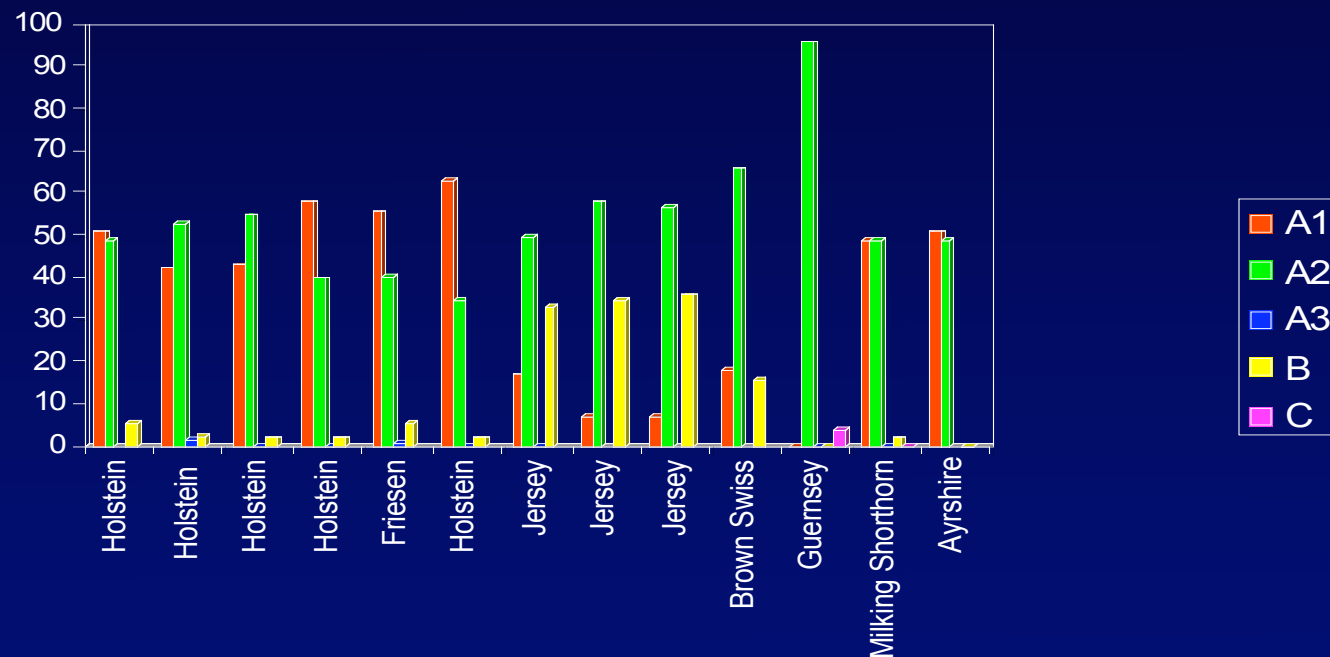
## Summary of 9 studies

- Notice the consistency within breed across studies.
- This raises confidence level about all the data.



# Beta-Casein Genes by Breed

## Summary of 9 studies

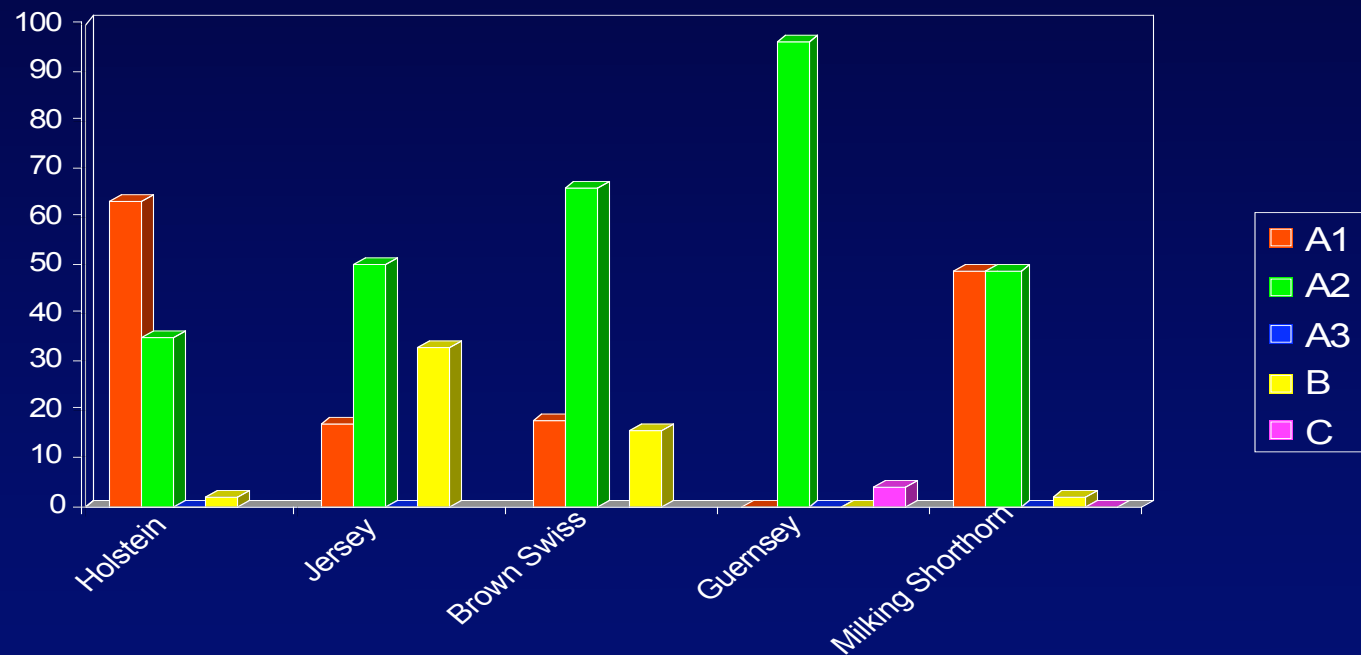


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# Beta-Casein Genes by Breed

## California Study, 1991

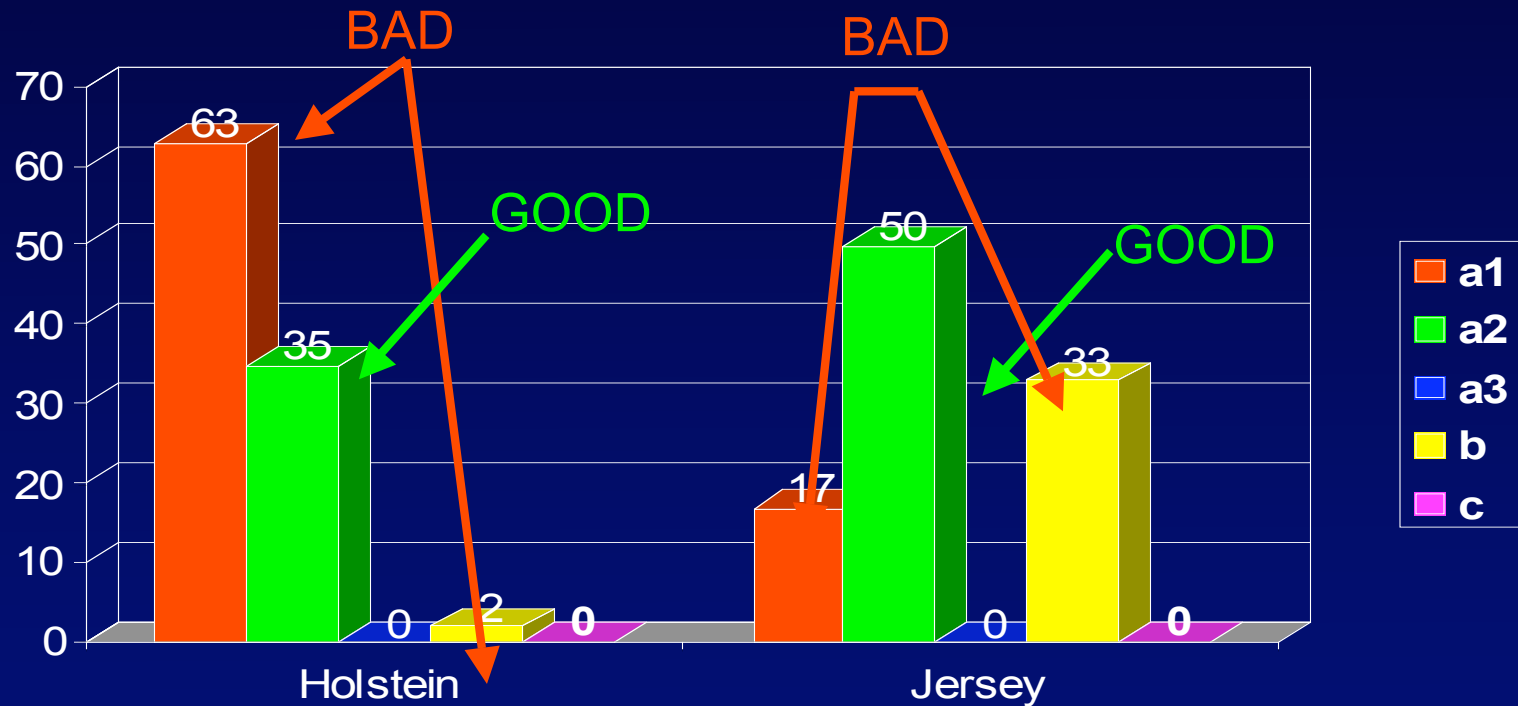


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# Beta-Casein Genes by Breed

## California Study, 1991

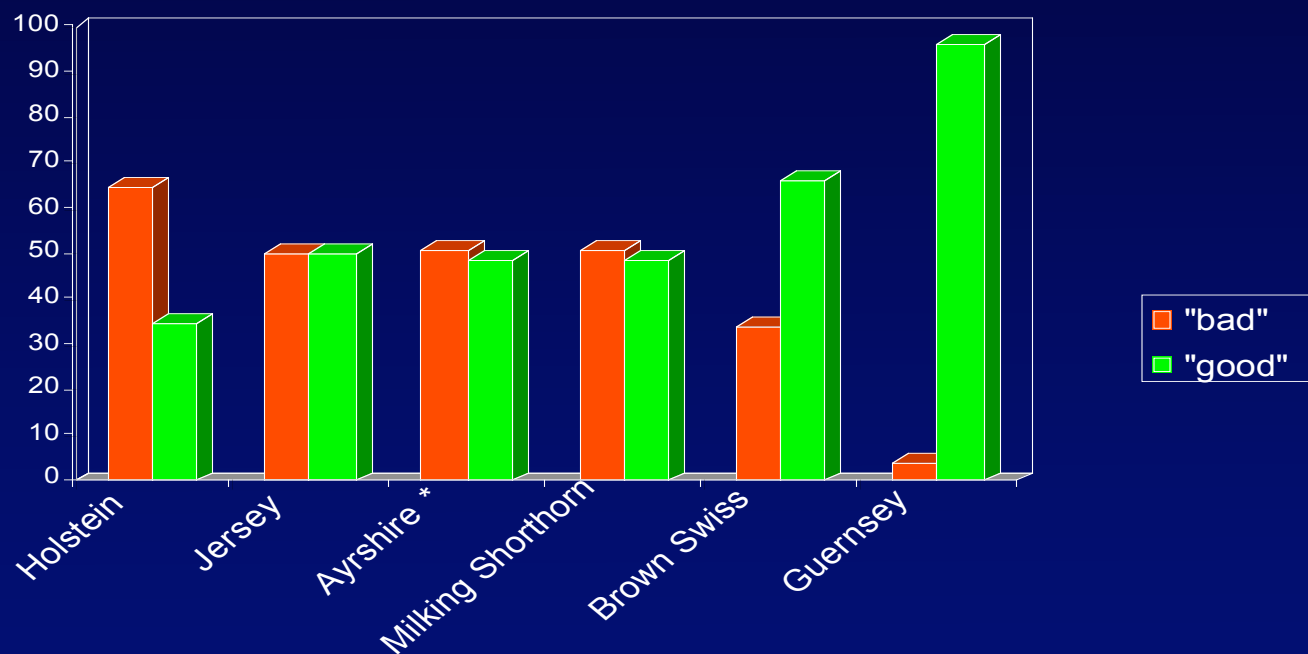


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# The "GOOD" and the "BAD"

*based on California, 1991 and Finland, 2001\**



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# Rank of Six Dairy Breeds, “Good to Bad” based on beta-casein type

- Guernsey
- Brown Swiss
- Ayrshire, Jersey, Milking Shorthorn
- Holstein

“Good”



“Bad”

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# Ayrshire

Ayrshires originated in the County of Ayr in Scotland, prior to 1800.

Henry W. Hills, Windsor, Connecticut, around 1822, imported Ayrshires to U.S.

Ayrshire Breeders' Association started 1920s.



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# Brown Swiss



One of the oldest of all dairy breeds.

Developed in the northeastern part of Switzerland .

Bones found in the ruins of Swiss lake dwellers date back to probably 4000 BC.

First cows brought to the United States in 1869 by Henry M. Clark of Belmont, Mass.

Brown Swiss Cattle Breeders' Association of the USA was formed in 1880.

# Guernsey

Origin is the Isle of Guernsey.

About 960 A.D., Robert Duke of Normandy sent a group of militant monks to the Isle. The monks brought with them the best bloodlines of French cattle -- and developed the Guernsey.

The American Guernsey Cattle Club was started in 1877.





# Holstein



Migrant European tribes settled the Netherlands close to 2,000 years ago, bringing cattle.

Breed origins were black Batavian cattle and white Friesian cows. The result is the Holstein-Friesian.

In 1852, Winthrop Chenery, bought a Holland cow from a Dutch sailing master in Boston.

U.S. Holstein Association formed in 1885.

# Jersey

Isle of Jersey, largest Island in the Channel Islands.

Known to exist in the UK mainland since 1741.

One of the oldest herds in UK is that of Her Majesty the Queen at Windsor.

U.K. Jersey Cattle Society was founded in 1878. American Jersey Cattle Association started in 1922.



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# Milking Shorthorn



One of the oldest of dairy breeds, originated in Northeastern England.

First imported to U. S., in 1783, when "Milk Breed" Shorthorns came to Virginia.

In U.S., first volume of the American Herdbook, 1846.

# Dr. Cattell's Conclusion

- “Do not judge a cow by her color “



- “Unless she is orange and white ...(like a Guernsey)”

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# Conclusion by WAPF Ad Hoc Committee - 1 November 2009

- “Precautionary Principle”
- People with presumptive leaky gut syndrome should avoid exposure to BCM7, if possible, until more is known...





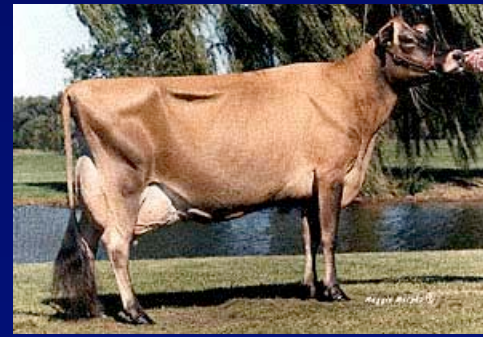
# Murray Laugesen

of Laugesen & Elliott, authors  
of  
diabetes, heart disease and A1 milk study  
(New Zealand Medical Journal, 2003)

- “The correlations we have described are far from conclusive, but cannot be ignored.”

## Conclusion by WAPF Ad Hoc Committee - 2

- Exploratory studies merit analytical follow-up research
- Good science needs to be performed prior to condemnation or glorification



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# Questions ?



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*“Pour l’amour des vaches et des hommes.”*



*We made this food for our family; we saved some for you.*

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