

rBST in the US dairy industry

Keeping food
affordable &
abundant
through animal
productivity

[Learn more ▶](#)



UNIVERSITY OF COPENHAGEN



Animal Biotechnology applied to Agriculture



Strategies for increasing milk yield

- ❖ Genetic improvement
- ❖ Better nutrition
- ❖ More frequent milking (Robotics)

- ❖ BST
 - first animal production biotechnology

BST: Background and History

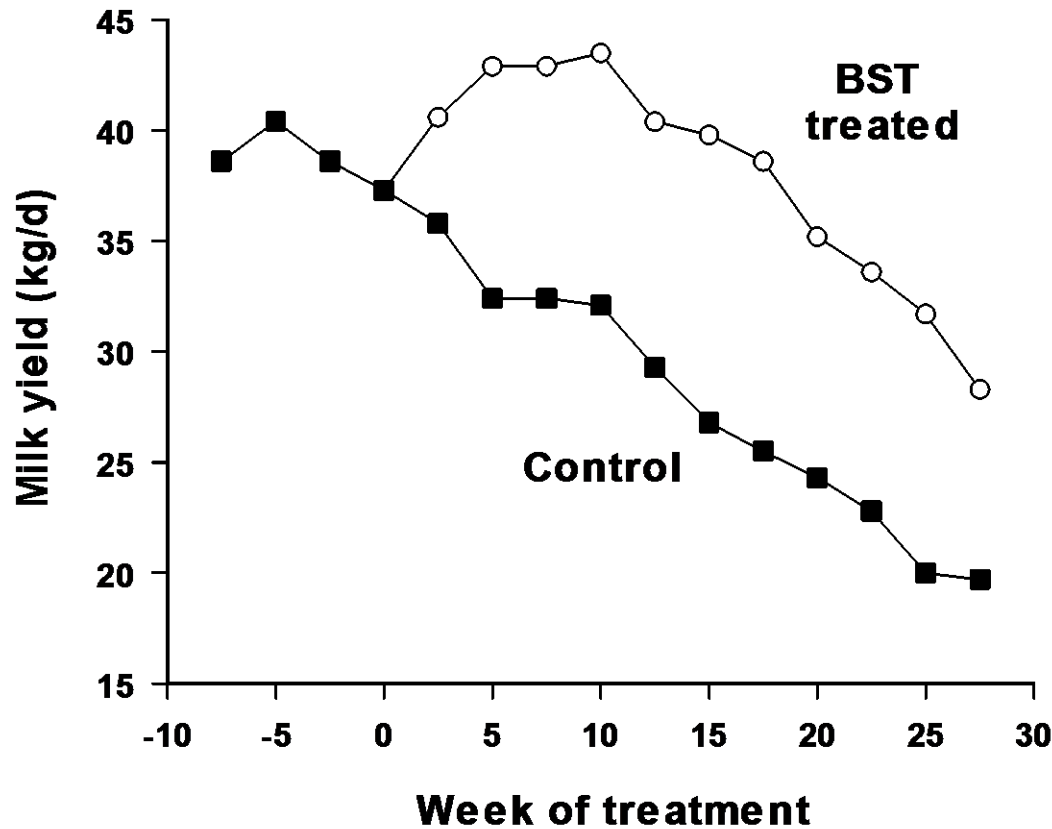
- ❖ BST stands for bovine somatotrophin
- ❖ Somatotrophin is US for growth hormone (GH)
- ❖ GH was first described more than 70 years ago
- ❖ Effects on lactation were noted in rats, then in cows as long ago as 1937
- ❖ Pituitary extracts containing GH were extensively researched as lactation enhancers in 1940s

rBST

- ❖ BST was produced using recombinant DNA technology in the early 1980s
- ❖ Several companies competed to produce the first viable product
- ❖ First rBST study in dairy cows in 1982
- ❖ By 1992 there were >1000 studies in >40,000 cows
- ❖ >1,500 publications since 1993

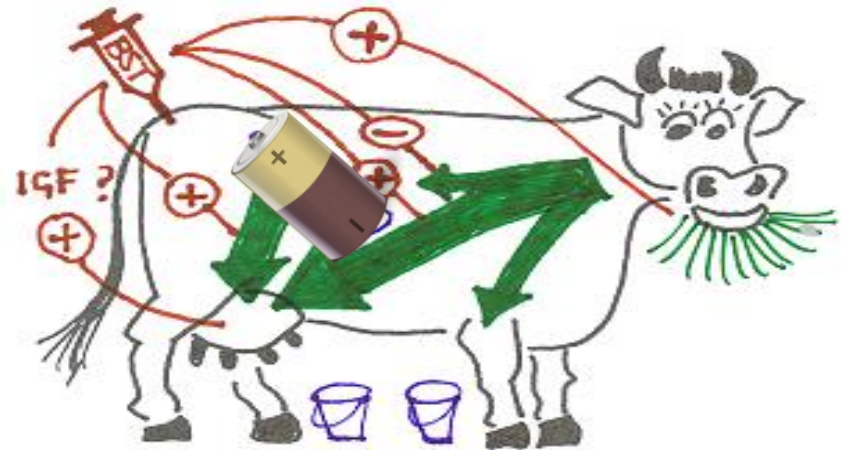
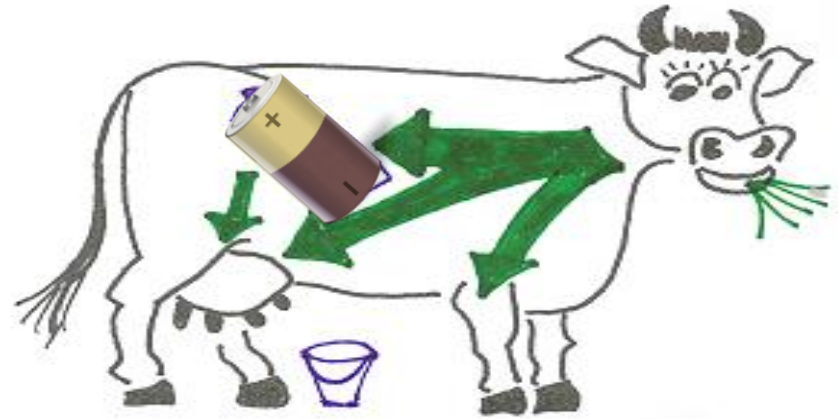
What it does

Bauman *et al*, 1985
J Dairy Sci. 68,
1352-1362

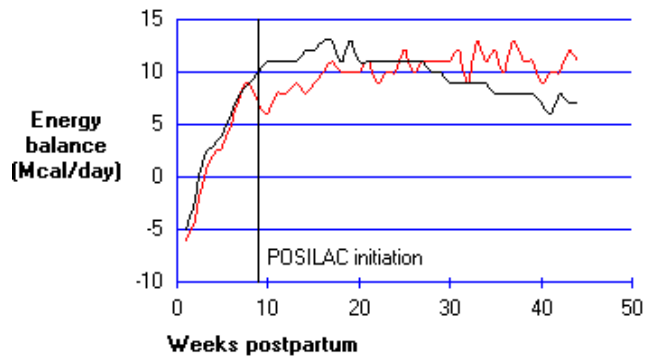
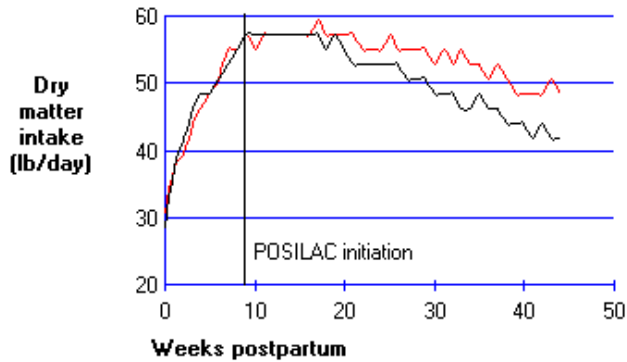
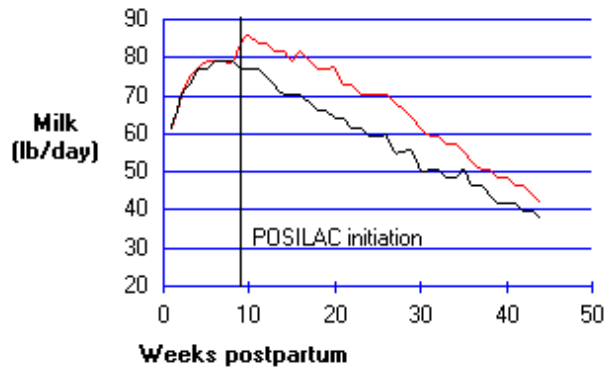


How it does it

- ∞ Repartitions nutrients towards udder
- ∞ Causes mobilisation initially...
- ∞ ...then increased intake
- ∞ Homeorhetic



Energy Balance



Cardiovascular effects of rBST

- ❖ Increased cardiac output
- ❖ Increased proportion of c.o. to udder
- ❖ Large increase in mammary blood flow

- ❖ Increased mammary glucose uptake
- ❖ Increased mammary oxygen consumption

Effects of BST on the udder

- ❖ Little evidence of direct action:
 - mammary tissue has BST receptor but binding cannot be demonstrated
 - BST does not affect growth or function of mammary cells *in vitro*
 - local administration has no effect in lactating goats
 - (although it does in GH-depleted rats)

Indirect Action through IGF1?

- ❖ IGF1 mediates many effects of BST
- ❖ IGF1 is produced by mammary tissue
- ❖ But intramammary infusion of IGF1 does not increase milk yield
- ❖ Higher yielding cows have elevated BST but often have depressed IGF1

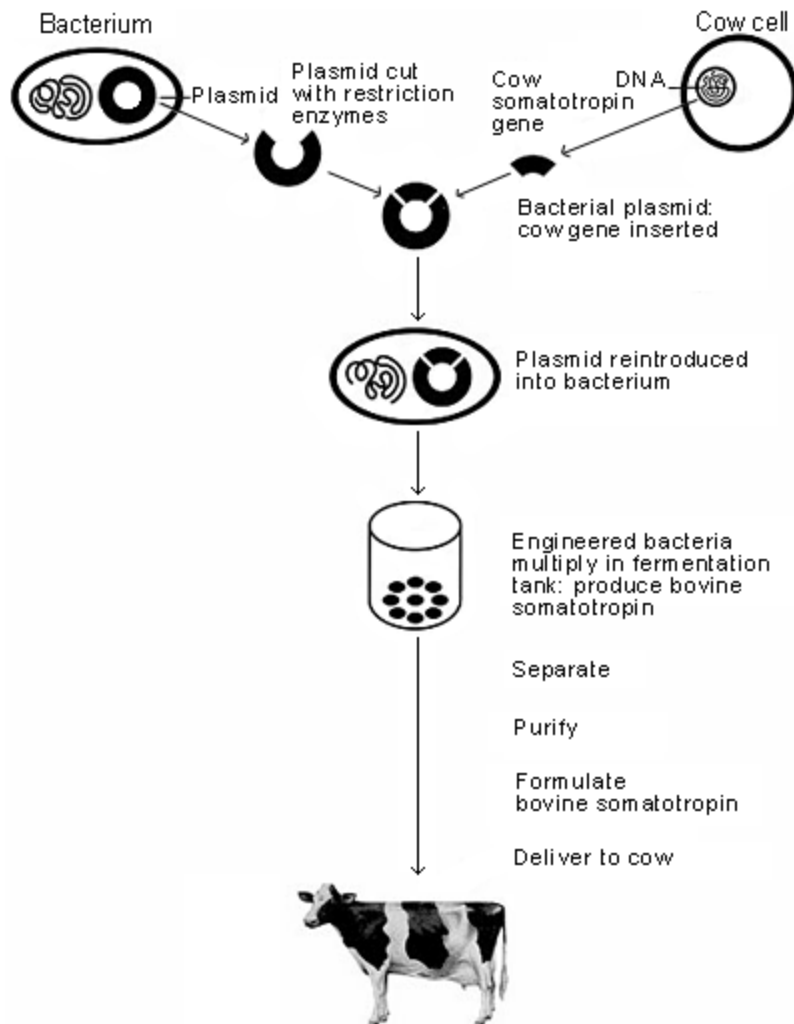
Conundrums

- ❖ Homeorhetic repartitioning explains how increased yield is supported, but not why it happens
- ❖ Exogenous BST increases yield, but depression of endogenous BST does not decrease it

Commercial Product

- ❖ BST approved for use in >25 countries
- ❖ Posilac (Monsanto) gained US approval in Nov 1993
- ❖ Was sold in US by Protiva starting Feb 1994
- ❖ Initially made in Austria
- ❖ Since march 2006 produced in Georgia, USA
- ❖ Was licensed to Elanco outwith US
- ❖ Freely available to US farmers without prescription
- ❖ 2008: Posilac product sold to Elanco

Production Method



- Using standard recombinant technology in *E coli*
- Genentech process
- Also used for insulin, hGH etc

The Product

- ❖ 500mg zinc methionyl BST
- ❖ Pre-packed syringe
- ❖ Administered by i.m. injection
- ❖ Given once every two weeks
- ❖ Starting after 60d *postpartum*
- ❖ Standard management for high-yield cow
- ❖ Do not use within 2wk of slaughter

Response to Posilac

- ❖ Cyclical BST release, highest approx. 1wk after injection
- ❖ Cyclical milk yield response
- ❖ Better response to second and subsequent injection
- ❖ 10-15% yield increase
- ❖ No effect on gross composition

Uptake in US

- ❖ >100M doses sold between 1994 and 1998, sufficient for approx. 1.4M cows
- ❖ Monsanto claimed:
 - sold to 8000 producers
 - 33% of US cows treated (3M)
 - Used more by large farms than small
 - Used more on West coast USA than East
 - 'Largest selling dairy animal health product'
- ❖ 2000 study used data from 124 herds where >50% of cows were treated throughout 1994-1998

Commercial Responses

	Pre-C	Post-C	Pre-BST	Post-BST
Milk kg/d	27.2	28.8	28.7	33.0
Fat %	3.67	3.64	3.63	3.57
Prot %	3.21	3.15	3.19	3.17
SCC	3.22	3.08	3.10	3.17

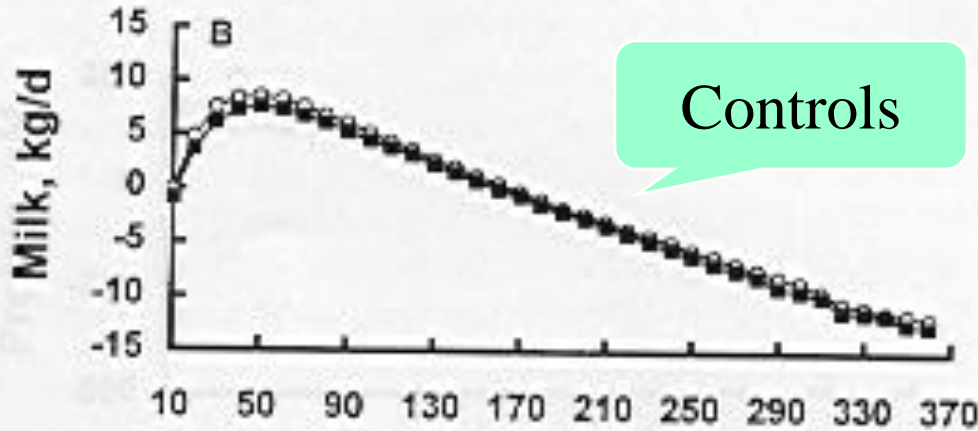
Herd Structure

	Pre-C	Post-C	Pre-	Post-
			BST	BST
Cows	74.9	75.7	84.9	90.5
n				
Age	1663	1580	1585	1510
d				
DIM	166	151	169	150

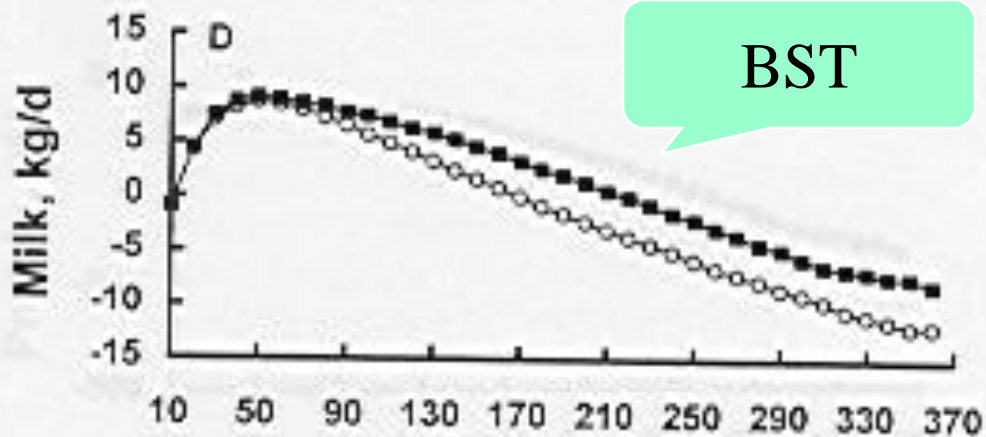
Significance of Effects

	Difference	Significance
Milk, kg/d	2.93	**
Fat, g/d	88	**
Protein, g/d	100	**
SCC, score	0.20	**
Age, d	2.7	n.s.
DIM, d	0.2	n.s.

Response by Stage of Lactation



- ∞ No response in first 60d because not treated then
- ∞ Greatest response in late lactation
- ∞ Increased persistency



Public Perception

- ❖ 1990: media antagonism in US and EU
- ❖ Monsanto established production in EU
- ❖ 1994: licensed in US
- ❖ Political antagonism in EU
- ❖ Public disinterest throughout?
- ❖ US milk was not labelled 'contains BST'
- ❖ Nor could it be labelled 'BST free'

2009!

JUST ROASTED COFFEE etc.

Organic, Fair Trade and Rainforest Alliance beans.
Organic Valley milk.

	REGULAR	LARGE
'JUST ROASTED' CAPPUCCINO (with chocolate sprinkles or naked)	\$2.79 60cal	\$3.09 79cal
'JUST ROASTED' LATTE (with steamed organic milk)	\$2.79 99cal	\$3.09 153cal
'JUST ROASTED' ESPRESSO (big flavor, small cup)	\$1.69 5cal	\$1.89 10cal
'JUST ROASTED' MOCHA (organic coffee, chocolate)	\$2.79 169cal	\$3.09 293cal
ORGANIC HOT CHOCOLATE (chocolate, steamed organic milk)	\$2.79 263cal	\$3.09 379cal
ORGANIC MASALA CHAI (with steamed organic milk)	\$2.79 62cal	\$3.09 84cal
ORGANIC WHOLE LEAF TEA (English Breakfast, Earl Grey, Green or Herbal)	\$1.59 0cal	\$1.79 0cal

Calories listed reflect beverages made with skimmed milk.
For a richer option ask for whole milk. Soy milk available at no extra charge.

Our coffee beans are ground and brewed within 21 days of roasting (nobody else does this).
TODAY'S BEANS WERE 'JUST ROASTED' ON 04/07/09

The milk Pret uses is
"Just Organic"
No Growth Hormones. No Antibiotics.

Monsanto sold Posilac to Elanco



Milk Labeling – Is Monsanto Opposed to Truth in Labeling?

Monsanto's Posilac brand dairy product was acquired by Eli Lilly in 2008. Given the long association of Monsanto with this product – its development, approval and commercialization – relevant articles will continue to be posted on our Web Page. Information on the acquisition by Eli Lilly can be found

Unfortunately in an effort to profit from unfounded fears, many milk processors have labeled their milk to suggest that milk from cows treated with rBST is harmful, or somehow different from milk from untreated cows. We stand by the safety of our products. Therefore we do support legislation requiring that milk labeling be COMPLETE and ACCURATE. We are not alone in this goal. Labeling guidelines published by the U.S. Food and Drug Administration state that labels claiming the milk is "not from cows treated with RBST" should also contain the statement that "No significant difference has been shown between milk derived from rbST-treated and non-rbST-treated cows". It is a simple

Back to 1999

11 SEP 1999

BST next on problem list

ALREADY struggling with the thorny problem of genetically modified crops, the Government and European authorities will also shortly have to deal with the equally emotive issue of milk produced with the aid of the synthetic hormone, bovine somatotropin (BST).

While the Americans are heating up their trade war with Europe, in the face of opposition to beef from hormone-treated

301
has been subject to good veterinary practice," he said.

A further argument in favour of BST introduction in Britain is likely to emerge from a three-year Ministry of Agriculture study at the Hannah Research Institute in Ayrshire, due to end soon.

This is expected to show that

By VIC ROBERTSON

Scheme has resulted in prices falling below £1 per head as up to 600,000 unwanted calves a year fail to find homes.

One alternative is sexed semen with farmers able to select for replacement heifers but Genus, one of the market leaders in this area, reckons this could be up

her doubts. "The dairy sector is already in serious financial difficulties and anything which reduces public confidence could create further problems. We have already seen the public reaction to genetic modification."

She admits to the logic of extended lactation, with reduced calf numbers and attendant stress, but points out that fertility could be compromised. Cows in the ADAS Elite herd at Bridgets, in

Pressure grows for end to milk hormone ban

VIC ROBERTSON

ALREADY struggling with the thorny problem of genetically modified crops, the Government and European authorities will also shortly have to deal with the equally emotive issue of milk produced with the aid of the synthetic hormone, bovine somatotropin (BST).

on the burner", according to Steve Knight, the US agricultural spokesman in London.

There have been numerous studies on BST in the States and all the bodies concerned have found that milk and meat from dairy cattle treated with the hormone are safe for human consumption, provided the pro-

COURIER & ADVERTISER

18 August 1999, P. 15

Dairy hormone poser looms

ALREADY STRUGGLING with the thorny problem of genetically modified crops, the Government and European authorities will also shortly have to deal with the equally emotive issue of milk produced with the aid of the synthetic hormone, bovine somatotropin (BST).

While the Americans are heating up their trade war with Europe in the face of opposition to

Why the sudden concern?

- ❖ EU moratorium on BST use expired December 31st 1999
- ❖ Completion of various reports, 2 Canadian and 2 EU, each doublet focussing on human and animal health respectively.

UK Response

- ⌚ Veterinary Products Committee reported to Government on safety of BST
- ⌚ ...risk to human health...was likely to be extremely small but could not be ruled out entirely....
- ⌚ ...treatment ...is associated with welfare problems, notably decreased body condition, an increased risk of mastitis, lameness and injection site lesions



Current EU Position

- ❖ Use of BST in dairy cows is banned
- ❖ Importation of dairy products produced with BST is allowed
- ❖ Importation of BST is allowed
- ❖ Experimental use of BST is allowed under relevant control
- ❖ Home Office Licence in UK

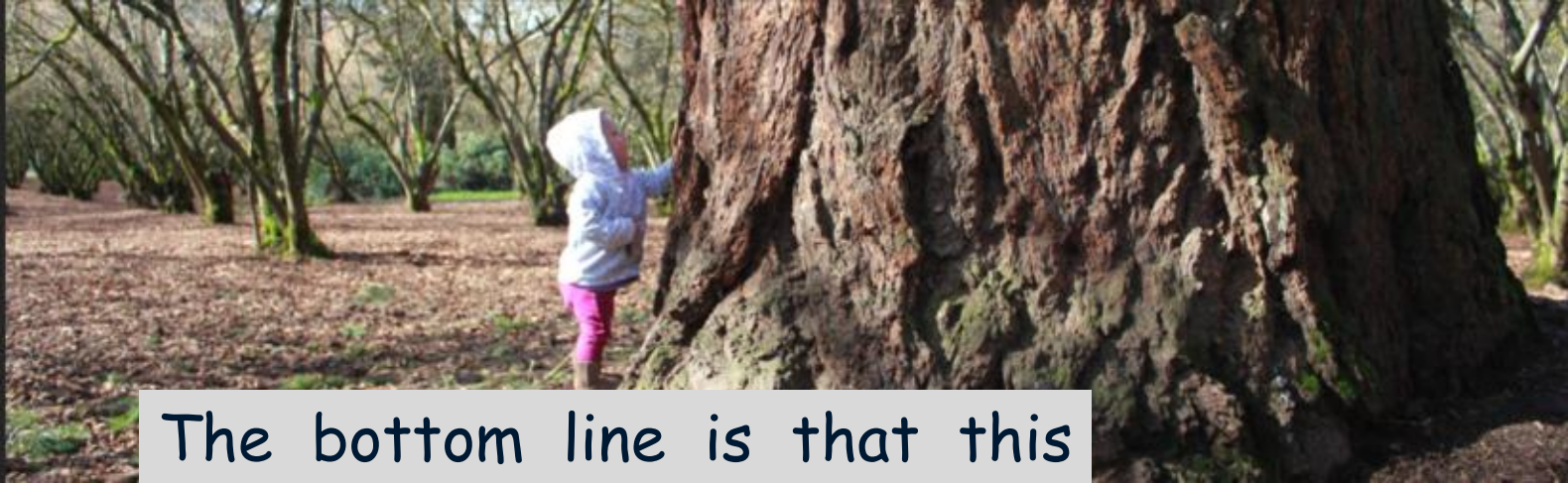
Perceived Welfare Issue

- ❖ BST: a distressing product
 - CWF analysis by Joyce D'Silva
- ❖ BST is a cynical abuse of both the dairy cow and the dairy farmer
 - Prof John Webster, Bristol Univ. Vet. School
- ❖ We will return to this in Unit 6, Animal Health

Perceived Safety Issue

Science of Mom

The Heart and
Science of Parenting



The bottom line is that this mom has come to the same conclusion as this Dr. had previously: that milk and dairy products from cows treated with rbST are safe for my children and me to consume.

We will return to this in Unit 5, Product Quality