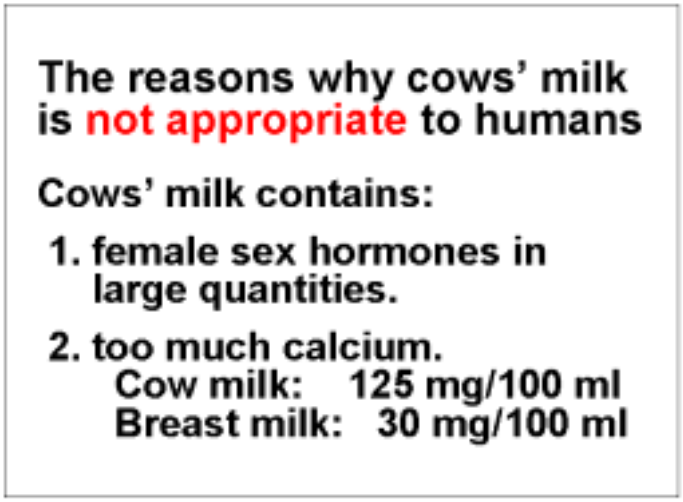
Hormonal effects of cows' milk on human health

Sato A and Ganmaa D

Slide 1

Japan had no dairy culture until the end of World War II. Japanese had essentially been vegetarians for several hundred years. Cereals, soybeans, vegetables and occasional seafood consumption met nutritional needs. Ordinary Japanese neither drank milk nor ate dairy products. In contrast to Western people who have been drinking milk for several hundred years, Asians only began drinking milk 60 years ago. Cows' milk at one time may have been beneficial for Western people, but I will show evidence for its ill effects on humans, particularly on Japanese health. Even for Westerners, today's milk may be harmful because dairy farming practices have changed significantly since the 1920s or 1930s. Beginning about 80 years ago, pregnant cows and especially those in the latter half of pregnancy have come to produce a greater proportion of the milk that is consumed. Pregnancy increases the production of female sex hormones, and these hormones are in the same or much higher range in the milk from pregnant cows than in the blood of pregnant animals. Consumption of dairy products is excessive in developed countries, a trend that probably started in the 1940s and 1950s.* Our hypothesis is that the consumption of cow milk and milk products causes various ill effects on human health. We sincerely hope that you test this hypothesis.

*Sharpe RM, Skakkebaek NE. Are oestrogens involved in falling sperm counts and disorders of the male reproductive tract? Lancet 341: 1392-95, 1993.



Slide 2

There are two main reasons why we think today's cows' milk is not appropriate for humans: First, cows' milk contains estrogens and progesterone in large quantities. Second, cows' milk contains too much calcium, amounting to 125 milligrams per 100 milliliters, which is about 4 times more than that of breast milk.

Traditional milk
&
Modern milk

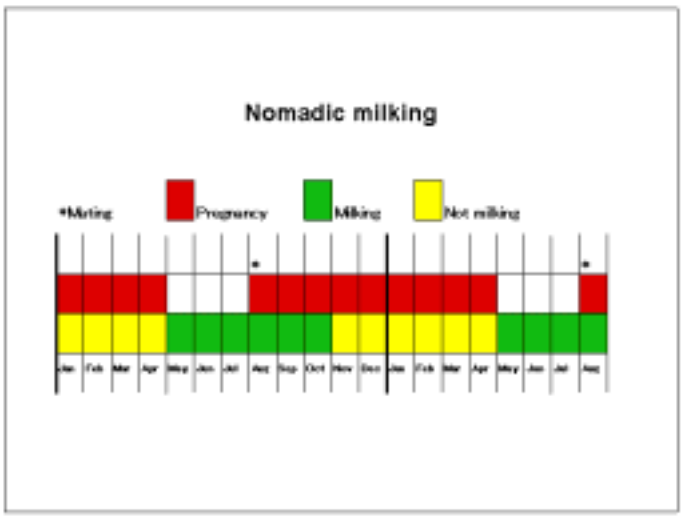
Slide 3
First, I will describe modern and traditional milk production practices, using Mongolia as a model for traditional milk. Next I will focus on the hormone concentrations in these two types of milk. Then I will trace the link between the increased hormones in modern milk and their ill effects on human health.

Slide 4
I visited Mongolian Nomads in 1999. Cattle there behave as wild animals. They move around freely, grazing at will. Nomads control their cows by keeping their calves in an enclosure. After grazing, mother cows return to the enclosure to nurse their calves. The nomad binds the mother cows to the fence of the enclosure.

Slide 5
The nomad lets a calf out to suckle its mother's milk. While the calf is nursing, the nomad binds the cow's hind legs.

Slide 6
Then, the nomad separates the calf from the mother and binds the calf to the fence and begins to milk the cow for human use. Afterward the nomad allows the calf to suckle milk again until it is satiated. I was told that the cow pictured here was 14 years old and had given birth to 10 calves.

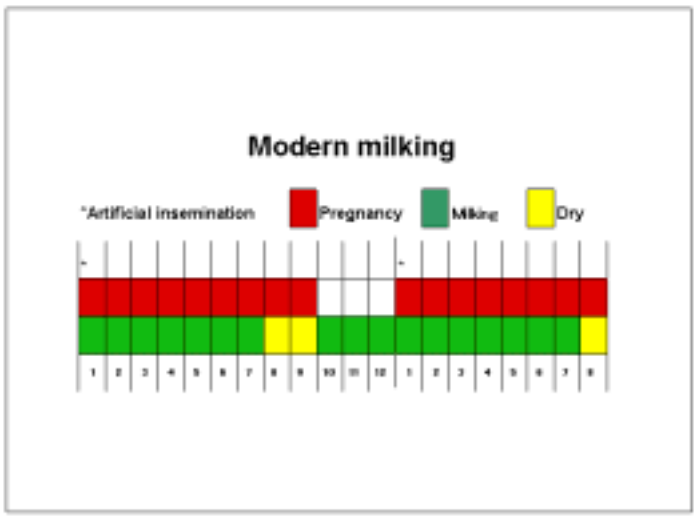
Slide 7
The volume of milk that was collected from this cow was 2 or 3 liters at most. The volume of this container is about 20 liters.



Slide 8
Mongolian cows feed only on grass and they do not secrete milk during the latter half of pregnancy. They get pregnant by natural mating in July or August, and give birth to calves in April or May. The Mongolian nomads milk their cows for only 5 or 6 months from May to October, obtaining, at best, 5 liters of milk per day per cow.

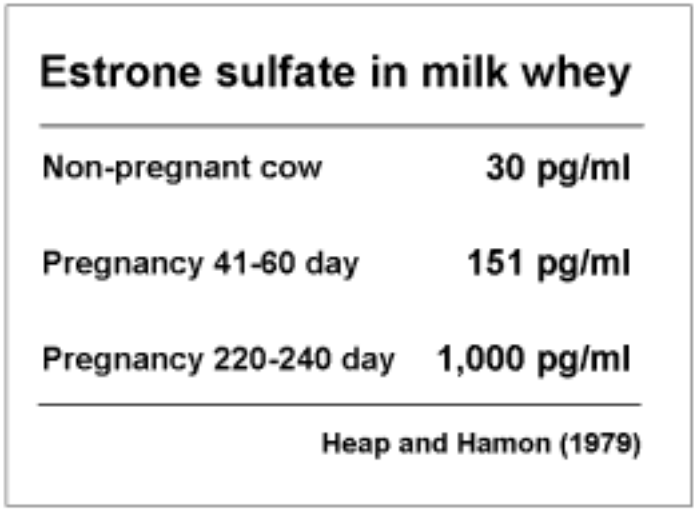
Slide 9

I do not know whether modern dairy farming practices in Japan are the same as in other developed countries. In Japan, the cow is impregnated by artificial insemination 12 to 14 months after birth. The length of pregnancy is 280 days, the same as in humans. After giving birth, the cow secrets colostrum. Soon after birth the calf is separated from its mother and the colostrum is milked by machine and given to the calf with a feeding bottle for five days. From the sixth day after delivery, the cow is milked every day for 300 days. Two or three months after delivery, the cow is inseminated artificially and gets pregnant while it is proficient in milk secretion. Milking is stopped for 60 days just before the next delivery, which is referred to as the "dry period or days dry." The cow is slaughtered after giving birth to 4 or 6 calves.

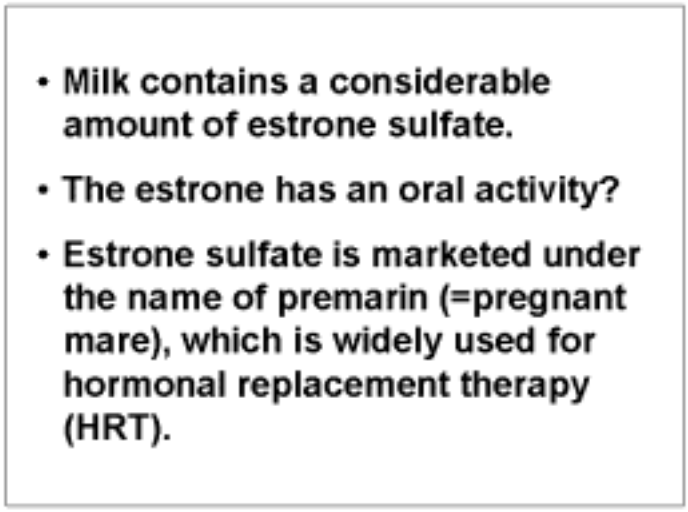


Slide 10

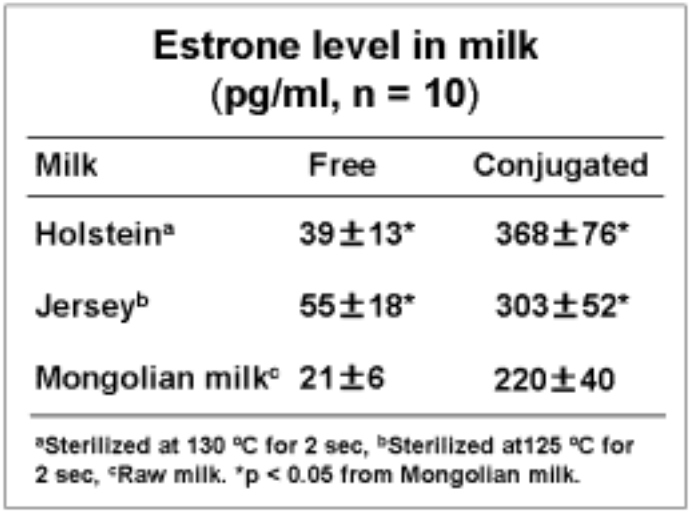
Cows are milked for 7 or 8 months while they are pregnant, including the latter half of pregnancy up to the dry period. Modern genetically-improved dairy cows are usually fed a combination of grass and concentrates (grain/protein mixes and various by-products). They are milked during the latter half of pregnancy, even at 220 days of gestation. One final comment on Japanese dairy practices, the use of recombinant bovine growth hormone is legal in Japan as it is in the US. However, it is said that dairy farmers in Japan do not use this hormone. I do not know why nor whether this is true.



Slide 11
The most abundant hormone in milk is estrone sulfate. According to a 1979 study by Heap and Hamon, milk from non-pregnant cows contains 30 picograms per milliliter estrone sulfate. The concentration rises with pregnancy progression. It is 150 picograms in the first or second month of pregnancy, and in the last stage of pregnancy it rises to as high as 1,000 picograms per milliliter.



Slide 12
Estrone sulfate has a high oral, estrogenic activity. Once in the body it is converted to estrone or estradiol. That estrone sulfate has a high oral activity can be understood by the fact that Premarin, which is marketed for hormone replacement therapy contains naturally occurring conjugated estrogens derived from pregnant mares.



Slide 13
We measured by high performance liquid chromatography the estrone levels in Japanese commercial milk and traditional Mongolian milk. Holstein milk was sterilized at 130 degrees Centigrade for 2 seconds and Jersey milk at 125 degrees Centigrade for 2 seconds. The samples brought back from Mongolia were of raw milk. Considerable amounts of estrone sulfate were found in both Holstein and Jersey milk. The concentration in the commercial milk was significantly higher than that in Mongolian raw milk. This finding clearly shows that estrone sulfate is not destroyed by sterilization at 125 or 130 degrees Centigrade.

Progesterone level in milk (ng/ml, n = 10)

Milk	Whole	Whey	Milk fat
Holstein[a]	26±3*	10±1*	281±8*
Jersey[b]	28±5*	12±2*	389±21*
Processed milk[c]	33±6*	15±1*	416±31*
Mongolian milk[d]	4±1	1±0	38±2

[a]Sterilized at 130 °C for 2 sec, [b]Sterilized at125 °C for 2 sec, [c]Water-added concentrated milk, [d]Raw milk. *p < 0.05 from Mongolian milk.

Slide 14

Milk contains another female sex hormone, progesterone. The concentration is known to range from 10,000 picograms per milliliter in whole milk to 300,000 picograms per gram in butter.* That is, the concentration of progesterone in milk is higher by a factor of 10^{-3} than that of estrone sulfate. We measured the concentration in the commercial milk in Japan and the raw Mongolian milk. The commercial whole milk had a much higher concentration of progesterone than Mongolian milk. It is said that when a dairy cow is pregnant, the progesterone concentration in whole milk exceeds 8 nanograms or 8,000 picograms per milliliter. I can therefore positively state that the commercial milk in Japan is derived predominantly from pregnant cows and that the Mongolian milk is derived predominantly from non-pregnant cows. Please note that the progesterone level in milk fat is much higher than that in whole milk. Therefore butter and cream contain abundant female sex hormones. Also, the ratio of the concentration of estrogens to progesterone in the milk from pregnant cows resembles the ratio of estrogens to progesterone in oral contraceptive pills. However, the absolute amounts of these hormones are much lower in milk.

*Hartmann S, Lacorn M, Steinhart H. Natural occurrence of steroid hormones in food. Food Chemistry 62: 7-20, 1998.

Milk has uterotrophic activity in rats.

Ganmaa D et al. Commercial cows' milk has uterotrophic activity on the uteri of young ovariectomized rats and immature rats. International Journal of Cancer 118, 2363-65, 2006.

Slide 15

The question is whether the sex hormones in milk have biological significance in humans. In answering this question, we performed two series of uterotrophic tests, one with young ovariectomized rats and the other with sexually immature rats.

Estrogen concentrations (pg/ml) in the low-fat milk used in this study[a]

	Free	Conjugated	Total
Estrone	58±23	378±151	436±151
Estradiol-17β	54±49	159±114	214±91
Estriol	-	53±35	53±35
Total	113	591	703

Values are mean±SD (n = 10).
[a]Qin LQ et al. (2004)

Slide 16
The estrogen levels in the milk used in this study are listed on this slide. The total estrogen content was 700 picograms per milliliter, of which estrone conjugates, at 380 picograms per milliliter, comprised more than half. In each experiment, 36 rats were divided equally among three groups. Each group of 12 rats was kept on powder chow for 7 days, and given one of three different liquids: commercial low-fat milk, artificial milk, or artificial milk containing estrone sulfate at 100 nanograms per milliliter. The artificial milk contained the same amount of protein, fat, and carbohydrates as the low-fat milk.

Uterine weight in ovariectomized rats

	Body weight (g, A)	Uterine weight (mg, B)	B/A
Milk	227.9±7.8	72.6±7.2*	0.32±0.03*
Artificial milk (negative control)	228.4±7.8	60.2±6.1	0.27±0.03
ES in AM (positive control)	229.6±11.6	76.0±5.0*	0.33±0.03*

Values are mean±SD (n = 12).
*Significantly different (p < 0.01) from Artificial milk (AM) .

Slide 17
At autopsy, the uterine weights were measured. This table shows the body weight, uterine weight, and the ratio of uterine weight to body weight in these ovariectomized rats. The uterine weight of rats treated with low-fat milk was significantly greater than that of rats treated with artificial milk. The ratio of the uterine weight to the body weight was also significantly higher in the commercial milk-treated rats than the artificial milk-treated rats. Both the absolute and relative values of the uterine weights were higher in the estrone sulfate group than those in the milk groups. But the difference between the two groups was not statistically significant.

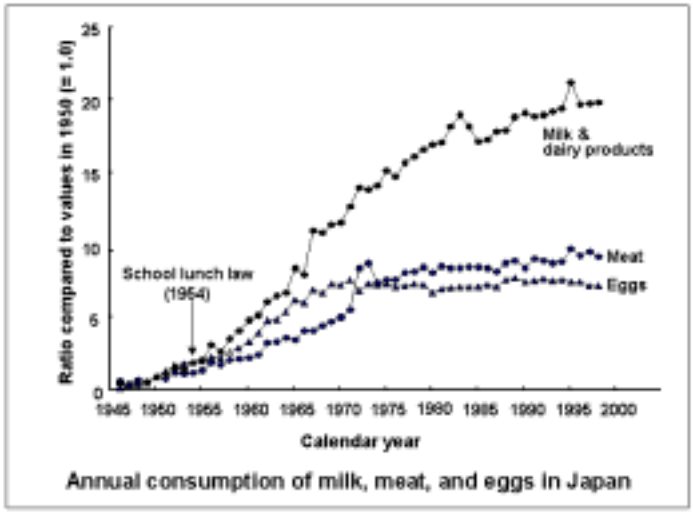
Uterine weight in sexually immature rats

	Body weight (g, A)	Uterine weight (mg, B)	B/A
Milk	38.6±3.3	36.7±3.8*	0.96±0.15*
Artificial milk	37.9±4.0	24.2±3.0	0.64±0.10
ES in AM	39.2±6.0	71.3±14.6**	1.85±0.46**

Values are mean±SD (n = 12)..
*Significantly different (p <0.01) from Artificial milk (AM; negative control). *ES (positive control) is significantly different from Milk (p <0.01) .

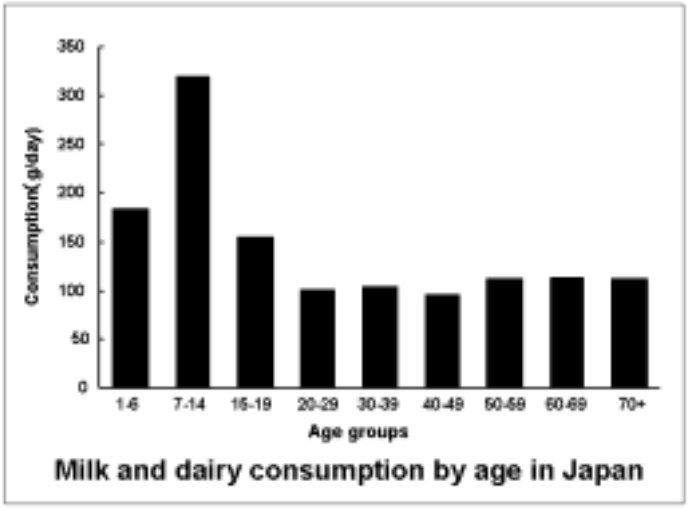
Slide 18
This table shows the results in sexually immature rats. Estrone sulfate at a concentration of 100 nanograms per milliliter had a more marked uterotrophic activity than the low-fat milk. The uterine weight in the commercial milk group was significantly higher than that of the artificial milk group. It can be said that the uteri of immature rats are much more sensitive to estrone sulfate than the uteri of sexually

mature rats. From this study, we conclude that commercially available milk in Japan has uterotrophic activity in both young ovariectomized rats and sexually immature rats.



Annual consumption of milk, meat, and eggs in Japan

Slide 19
I would like to draw your attention now to the recent decline in fertility in Japan.
Japan has experienced dramatic lifestyle changes since World War II. In 1954 a law was enacted making it compulsory for children to drink 200 milliliters of milk at every school lunch. School children are not allowed to go out until they finish their milk. Since the enactment of The School Lunch Law, consumption of milk and dairy products increased 20-fold over the past 50 years.



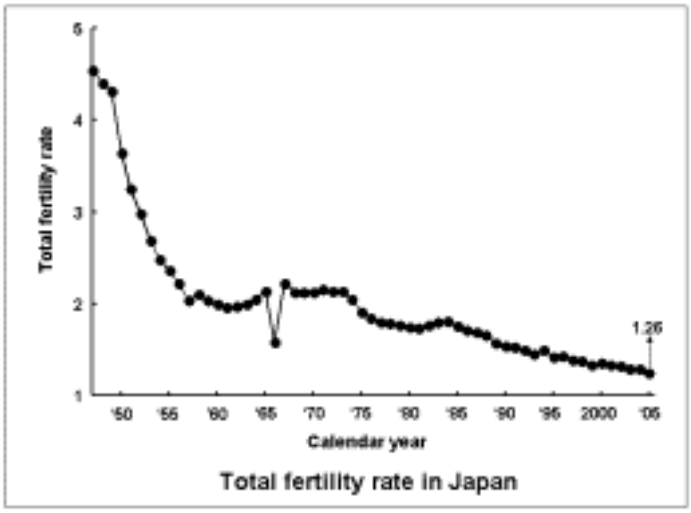
Milk and dairy consumption by age in Japan

Slide 20
As a natural consequence of the School Lunch Law, the consumption of milk and dairy products by prepubertal boys and girls is quite high in Japan. The average dairy consumption in this age group reaches 320 grams per day (approximately 11 ounces or 325 milliliters).

- Average concentration of estrone sulfate in commercial milk is 370 pg/ml.
- Prepubertal children in Japan daily consume 320 ml milk on average.
- Daily estrone sulfate intake = 100 ng.
- Milk has any adverse effects on the sexual maturity of Japanese prepubertal children?

Slide 21
A boy who drinks 300 milliliters of milk a day is calculated to take 100 nanograms estrone sulfate into his body everyday. Some children actually drink 1 liter of milk a day because their parents encourage them to quench their thirst with milk instead of water. One liter of milk contains 370 nanograms of estrone sulfate alone. According to Andersson and Skakkebaek of Denmark,* the daily production of estradiol in prepubertal boys is in

the range of 40 to 100 nanograms. The question that naturally arises is whether the several hundred nanograms of estrone sulfate in commercial milk has any adverse effects on the sexual maturity of prepubertal boys. No clear answer to this question is available at present.
*Andersson AM, Skakkebaek NE. Exposure to exogenous estrogens in food: possible impact on human development and health. European Journal of Endocrinology 140: 477-85, 1999.



Total fertility rate in Japan

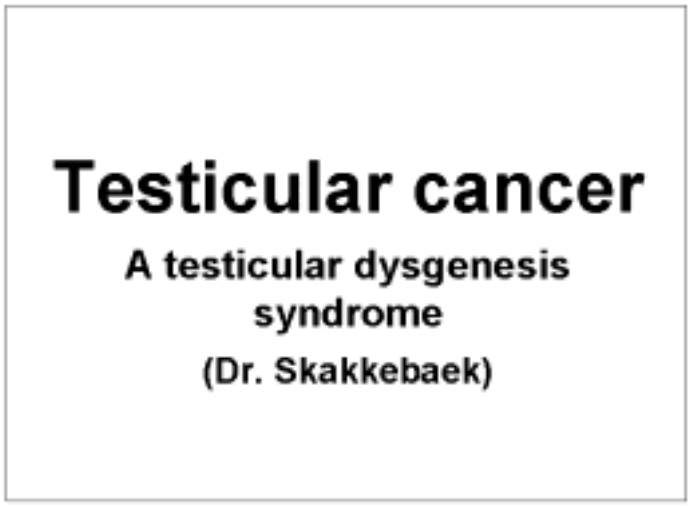
Slide 22
The population size of Japan is shrinking. The total fertility rate, that is, the average number of children born to each woman in her lifetime was 2.16 in 1970. It started declining in 1974, and has continued to decline, recording the lowest level, 1.25 in 2005. According to economists and sociologists, this decline is attributable to non-marriage and late marriage, which now prevails among the younger generation in Japan. In principle I agree with this view.

Semen qualities of residents in Kawasaki, Japan in comparison to other cities

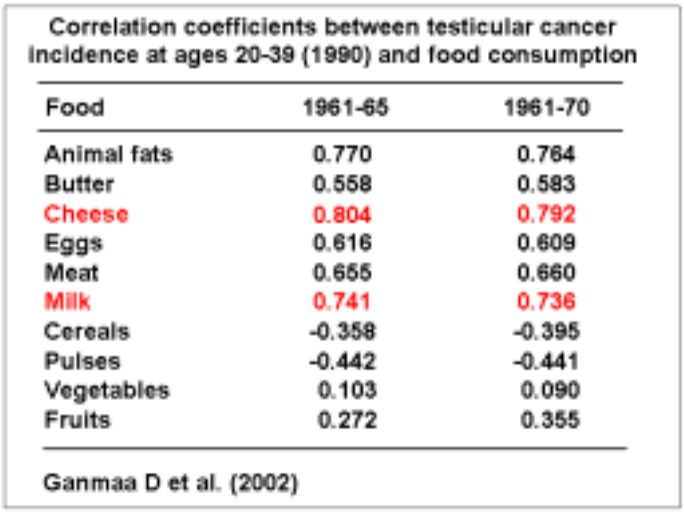
	Semen concentration	Total sperm count	Motile sperm	Normal morphology
Kawasaki /Copenhagen	96	83*	93*	85*
Kawasaki /Paris	91	82*	98	87*
Kawasaki /Edinburgh	78	70*	88*	85*
Kawasaki /Turk	68*	55*	89*	82*

Ratio of semen parameters in Kawasaki to other cities (=100).
*Significantly different ($p<0.05$).
Iwamoto T et al. Semen quality of 324 fertile Japanese men. Human Reproduction 21, 760-765, 2006 (modified).

Slide 23
However, in Japan one in seven couples are infertile and about 460,000 couples now receive infertility treatment. In 1973, 2.8 million pregnancies occurred. But 30 years later in 2004, the number of pregnancies declined by one half to 1.4 million. Use of oral contraceptives was not approved by The Japan Ministry of Health and Welfare until 1999. As in the United States, access to oral contraceptives in Japan is restricted to prescription by a gynecologist or obstetrician. I am therefore inclined to consider that the decline in fertility in Japan is partly caused by a decrease in male reproductive ability.
Semen quality has so far been said to be the lowest in Denmark. However, according to a recent study performed in Japan, semen quality of Japanese men in Kawasaki and Yokohama was worse than Danish men in Copenhagen.



Slide 24
It is of importance to note that in the past 50 years, the incidence of testis cancer has increased while semen quality has decreased worldwide. Dr. Skakkebaek of Denmark has proposed the testicular dysgenesis syndrome hypothesis that suggests that the incidences of hypospadia, cryptorchidism, impaired spermatogenesis, and testis cancer are related to perinatal exposures to environmental endocrine disruptors.



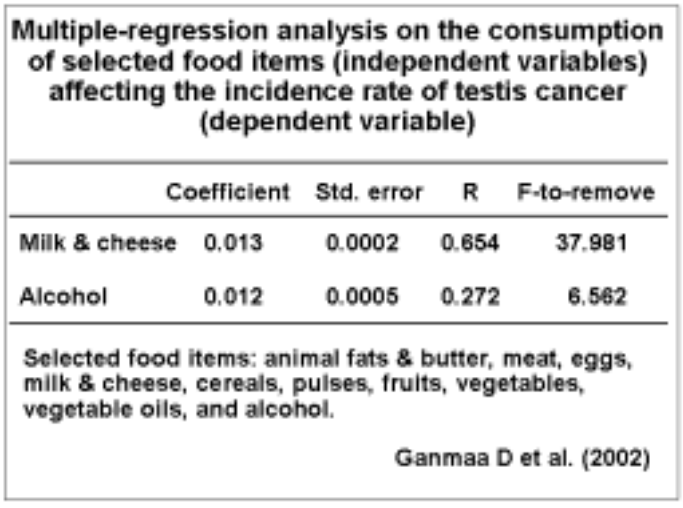
Correlation coefficients between testicular cancer incidence at ages 20-39 (1990) and food consumption

Food	1961-65	1961-70
Animal fats	0.770	0.764
Butter	0.558	0.583
Cheese	0.804	0.792
Eggs	0.616	0.609
Meat	0.655	0.660
Milk	0.741	0.736
Cereals	-0.358	-0.395
Pulses	-0.442	-0.441
Vegetables	0.103	0.090
Fruits	0.272	0.355

Ganmaa D et al. (2002)

Slide 25
To further investigate the recent increase in testicular cancer, we examined the relationship between food consumption and testis cancer incidence in 42 countries.* In almost all countries, the highest incidence of testis cancer was found between ages 20 to 39 years. Hence, the incidence in 1990 was correlated with food consumption between 1961 and 1970. Among food items, cheese was most closely correlated with testis cancer incidence, followed by milk and animal fats.

*Ganmaa D, Li XM, Wang J, Qin LQ, Wang PY, Sato A. Incidence and mortality of testicular and prostatic cancers in relation to world dietary practices. International Journal of Cancer 98: 262-267, 2002..



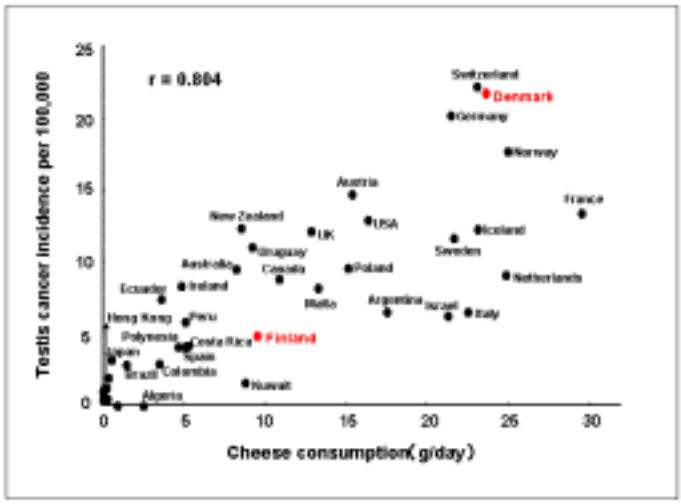
Multiple-regression analysis on the consumption of selected food items (independent variables) affecting the incidence rate of testis cancer (dependent variable)

	Coefficient	Std. error	R	F-to-remove
Milk & cheese	0.013	0.0002	0.654	37.981
Alcohol	0.012	0.0005	0.272	6.562

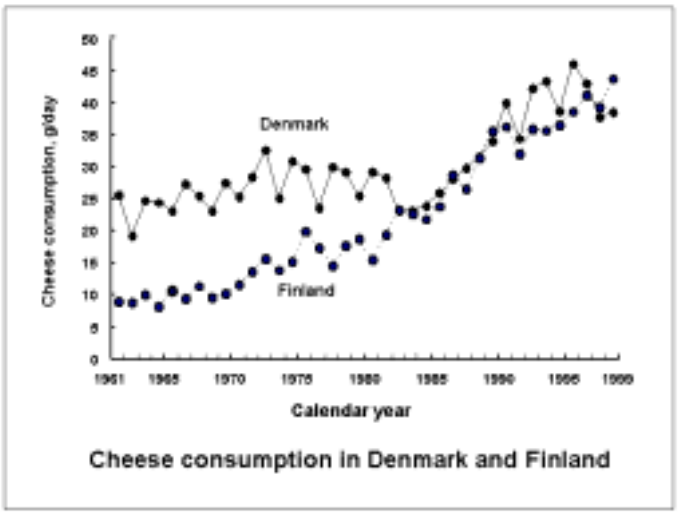
Selected food items: animal fats & butter, meat, eggs, milk & cheese, cereals, pulses, fruits, vegetables, vegetable oils, and alcohol.

Ganmaa D et al. (2002)

Slide 26
Stepwise-multiple regression analysis identified the combination of cheese and milk as the factor contributing most to the incidence of testis cancer. We hypothesize that sex hormones or some other ingredients in cheese or some particular processes in cheese production may have adverse effects on testicular development.

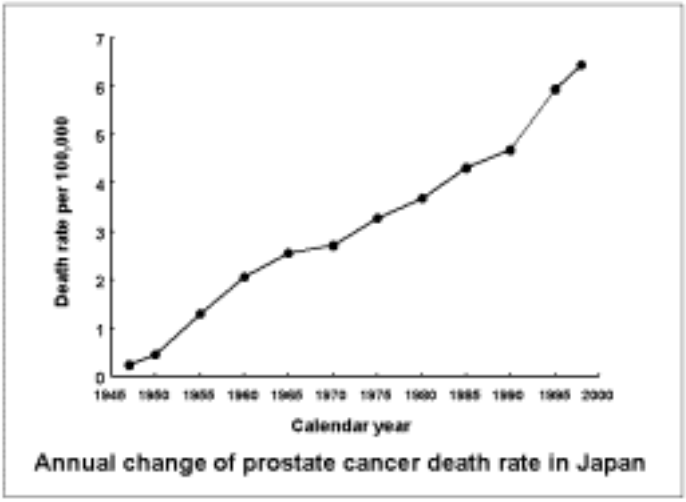


Slide 27
The association of testis cancer incidence with cheese consumption shows a distinct difference between the two Scandinavian countries, Denmark and Finland. Both testis cancer incidence and cheese consumption are high in Denmark, but both are low in Finland. We were eager to know why the opposite occurs in these two dairy consuming countries.



Slide 28
This figure shows the yearly consumption of cheese in Denmark and Finland from 1961 to 1990. In the 1960s and 1970s, the consumption of cheese was much higher in Denmark than in Finland. However, the consumption in Finland increased rapidly in the 1980s and is reaching almost the same level as that in Denmark in more recent years. We suspect that testis cancer incidence in Finland is increasing now as well, and will catch up to the incidence in Denmark in 20 or 30 years.

Slide 29
I will now address the topic of hormone-dependent cancers, prostate cancer in men and breast cancer in women.



Annual change of prostate cancer death rate in Japan

Slide 30
Prostate cancer incidence is much lower in Japan than in Western countries. Nevertheless, prostate cancer mortality increased almost linearly, about 25-fold over the last 50 years.

Correlation coefficients between prostate cancer incidence (1988-92) and mortality (2000) and food consumption (1961-97)

Food	Incidence	Mortality
Animal fats	0.480	0.606
Butter	0.450	0.576
Cheese	0.586	0.618
Eggs	0.463	0.392
Meat	0.642	0.594
Milk	0.711	0.766
Cereals	-0.648	-0.661
Pulses	-0.302	-0.283
Vegetables	-0.043	-0.162
Fruits	0.316	0.356

Ganmaa D et al. (2002)

Slide 31
Our ecological study found that both incidence and mortality of prostate cancer are most closely correlated with the consumption of milk.

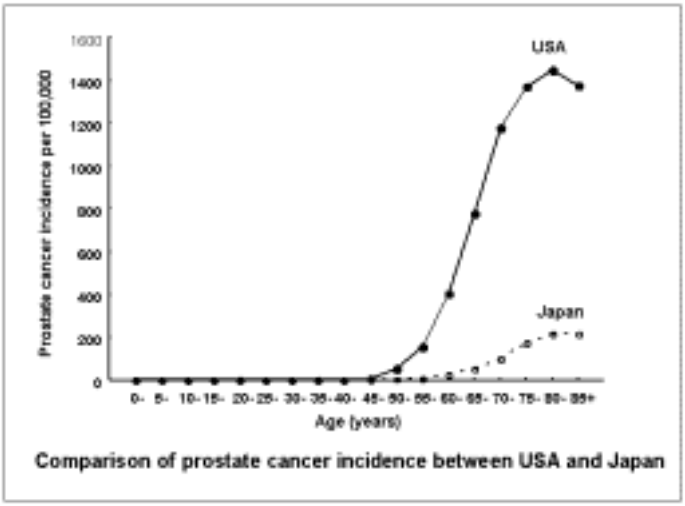
Multiple-regression analysis on the consumption of selected food items (independent variables) affecting the incidence and mortality rate of prostate cancer (dependent variable)

	Coefficient	Std. error	R	F-to-remove
Incidence vs. 11 independents				
Milk & cheese	0.036	0.007	0.525	24.180
Cereals	-0.091	0.023	-0.425	15.807
Mortality vs. 11 independents				
Milk & cheese	0.014	0.002	0.580	35.045
Cereals	-0.031	0.007	-0.418	18.644

Selected food items: animal fats & butter, meat, eggs, milk & cheese, cereals, pulses, fruits, vegetables, vegetable oils, and alcohol.

Ganmaa D and Sato A (2005)

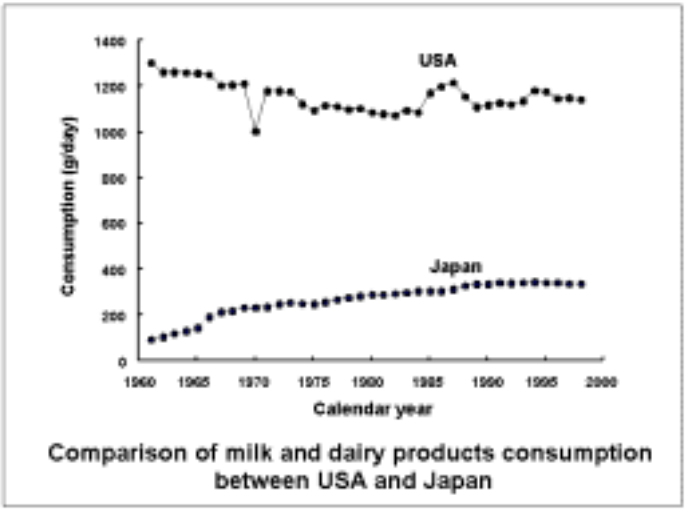
Slide 32
Multiple-regression analysis identified the consumption of milk and cheese as the factor most contributing to both the incidence and mortality of prostate cancer.



Comparison of prostate cancer incidence between USA and Japan

Slide 33

Although Japan now has the most rapidly increasing rate of prostate cancer incidence in the world, the incidence in Japan is less than one-tenth that in the United States. What causes this big difference?



Comparison of milk and dairy products consumption between USA and Japan

Slide 34

I am sure that this difference can be explained by the difference in milk consumption between the two countries. This graph compares daily milk and dairy product consumption, excluding butter. Americans consume more than 1,000 grams of milk and dairy products a day, while Japanese consume about 300 grams a day. The consumption in the United States is about 4 times higher than that in Japan.

Correlation coefficients between breast cancer incidence (1988-92) and mortality (2000) and food consumption (1961-97)

Food	Incidence	Mortality
Animal fats	0.480	0.606
Butter	0.450	0.576
Cheese	0.586	0.618
Eggs	0.463	0.392
Meat	0.642	0.594
Milk	0.711	0.766
Cereals	-0.648	-0.661
Pulses	-0.302	-0.283
Vegetables	-0.043	-0.162
Fruits	0.316	0.356

Ganmaa D and Sato A (2005)

Slide 35

With respect to breast cancer, our ecological study revealed that the food that is most highly associated with the incidence and mortality of the cancer is milk and dairy products.

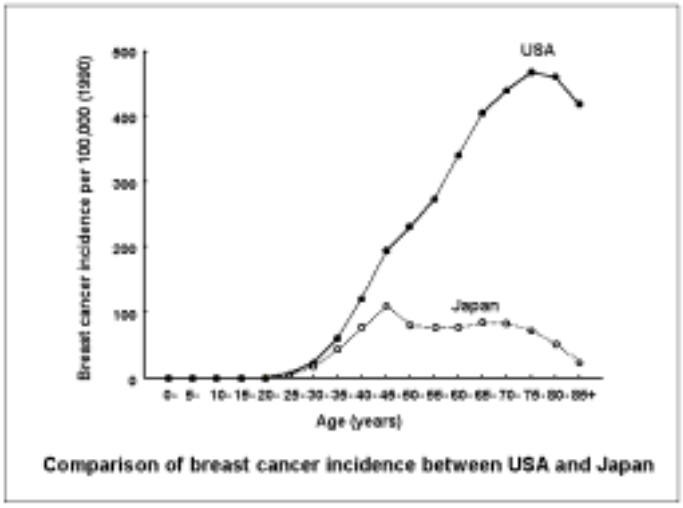
Multiple-regression analysis on the consumption of selected food items (independent variables) affecting the incidence and mortality rate of breast cancer (dependent variable)

	Coefficient	Std. error	R	F-to-remove
Incidence (1993-97) vs. 11 independents (1961-98)				
Meat	0.251	0.025	0.862	13.724
Mortality (2000) vs. 11 independents (1961-98)				
Milk & cheese	0.022	0.003	0.814	68.527

Selected food items: animal fats & butter, meat, eggs, milk & cheese, cereals, pulses, fruits, vegetables, vegetable oils, and alcohol.

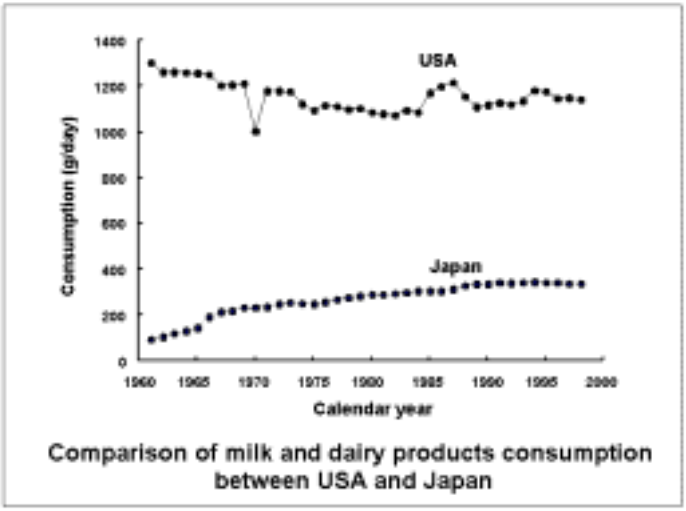
(Ganmaa D and Sato A, 2005)

Slide 36
Multiple-regression analysis revealed that the most significant contributor to breast cancer incidence is meat, while the most significant contributor to breast cancer mortality is milk and cheese consumption.



Comparison of breast cancer incidence between USA and Japan

Slide 37
Breast cancer incidence in the US is much higher than that in Japan.

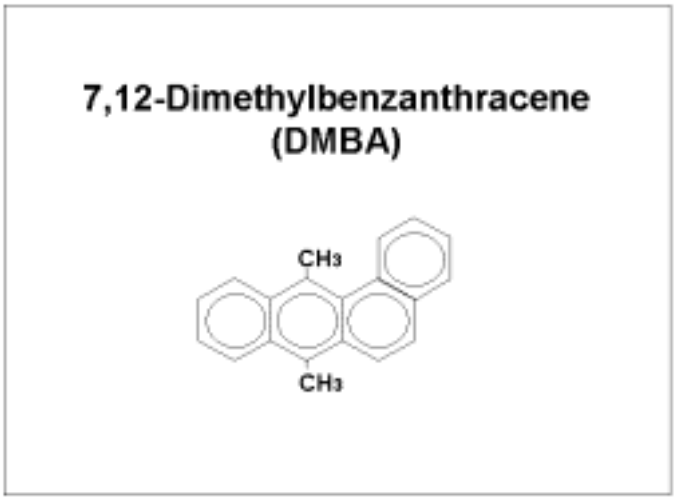


Comparison of milk and dairy products consumption between USA and Japan

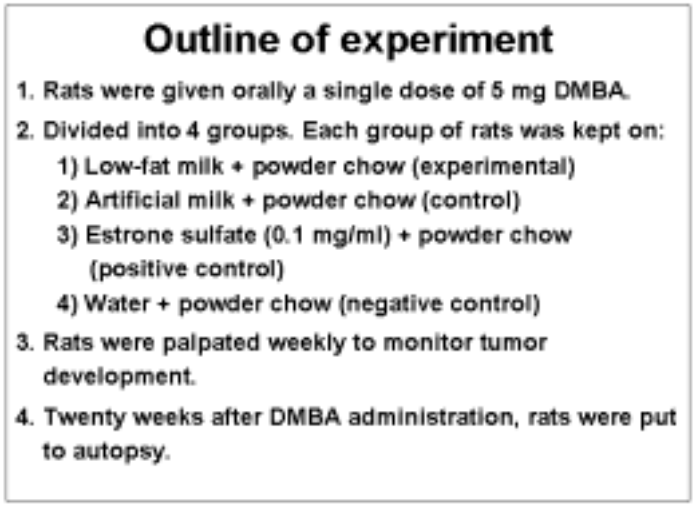
Slide 38
I am sure that, as in the case of prostate cancer, this big difference can be explained by the difference in milk consumption between Japan and the U.S. Epidemiological findings have not always evidenced this association between incidence of breast cancer and consumption of milk and dairy products. However, in nutritional epidemiology precise evaluations of individual consumption of dairy products is very difficult because dairy products are used in a variety of Western foods, including bread, ice cream, chocolate, cake, and some cookies. In Western countries dairy consumption is a life long dietary habit of most people. It may be difficult to

find a group of women who completely avoid dairy consumption, except for vegans. The problem would easily be solved if epidemiologists compare the breast cancer incidence between strict vegans and lacto-ovo vegetarians.

Slide 39
We assessed the effects of commercial low-fat milk on the development of DMBA-induced mammary tumors in rats. The details have been described in the International Journal of Cancer.

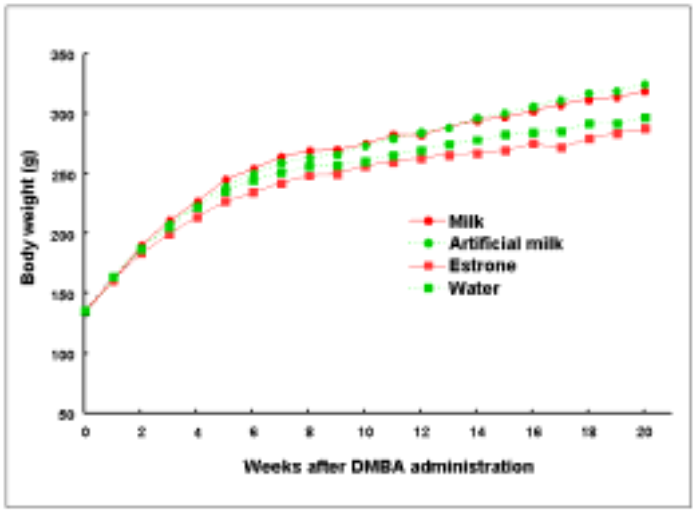


Slide 40
DMBA or 7,12-dimethylbenzanthracene is a chemical carcinogen. When given to rats, it causes mammary tumors. The development of mammary tumors is hormone-dependent and has frequently been used as a model for human breast cancer.



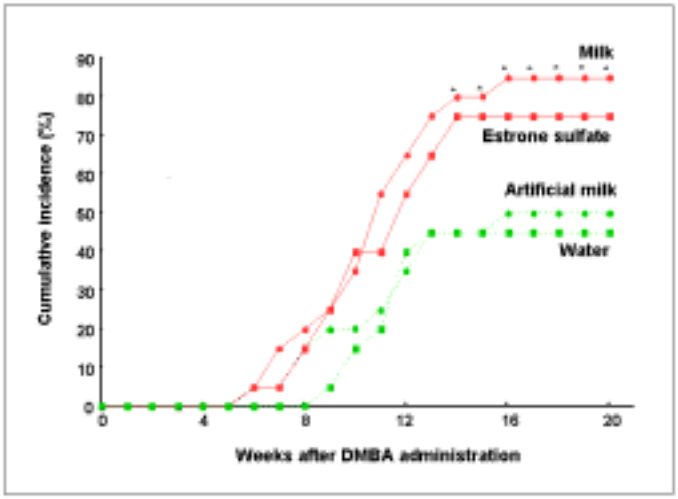
Slide 41

I will outline the experimental design. Rats of six weeks of age were given a single oral dose of DMBA. The animals were then divided into four groups and kept on different dietary regimens. Low-fat milk was the experimental group; artificial milk served as the control group; estrone sulfate as the positive control group; and water as the negative control group. Rats were palpated weekly to monitor tumor development. 20 weeks after DMBA administration, rats were autopsied.



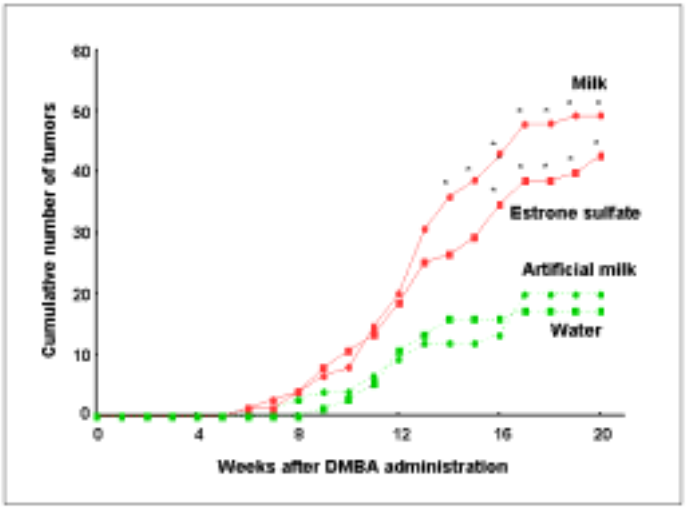
Slide 42

As you can see from this slide, there was no significant difference in body weight between the commercial milk group and the artificial milk group.

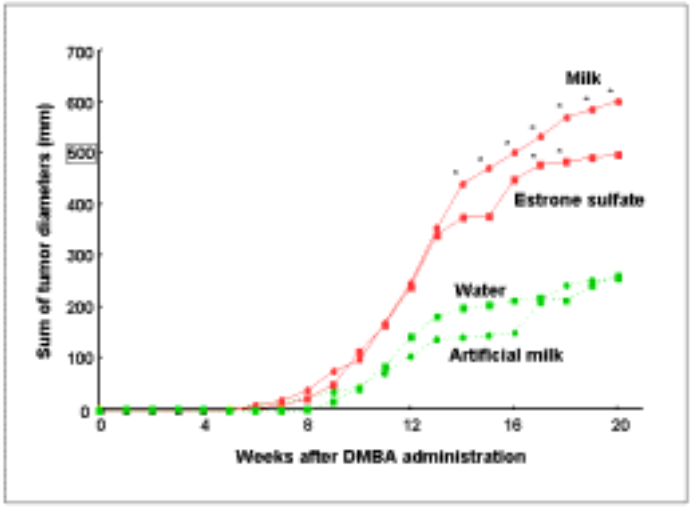


Slide 43

This slide shows the cumulative incidence of mammary tumors. Please note the difference between the commercial milk and the artificial milk groups. The incidence was significantly higher in the commercial milk group than in the artificial milk group.



Slide 44
This slide shows the cumulative number of mammary tumors. The number of tumors was also greater in the commercial milk group than in the artificial milk group. Estrone sulfate, too, significantly promoted the development of tumors.



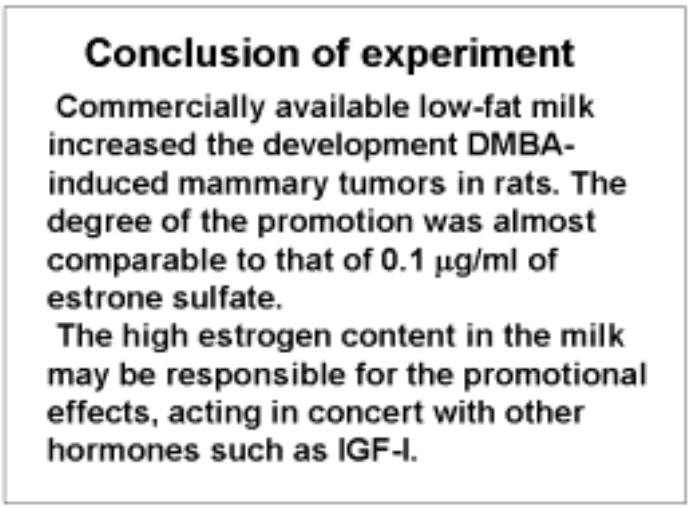
Slide 45
Finally, the size of the tumors that developed in the commercial milk group was greater than those in the artificial milk group.

Milk increases serum level of IGF-I

	Estrone (pg/ml)	IGF-I (μg/ml)
Milk	75.7±35.8[3]	0.748±0.125[1,2,3]
Artificial milk	58.7±17.4	0.629±0.109
Estrone sulfate	77.7±36.4[3]	0.648±0.152
Water	40.3±15.0	0.669±0.065

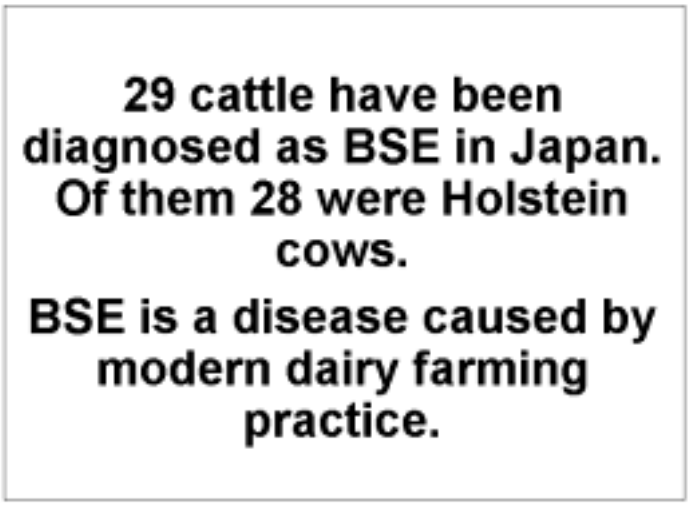
[1]Significantly different from Artificial milk; [2]different from Estrone; [3]different from Water.

Slide 46
This table shows the serum levels of estrone and IGF-1 at the end of the experiment. Commercial low-fat milk increased the level of IGF-1 in addition to the estrone level. Although estrone sulfate given orally increased the serum level of estrone, this hormone alone did not affect the level of IGF-1.



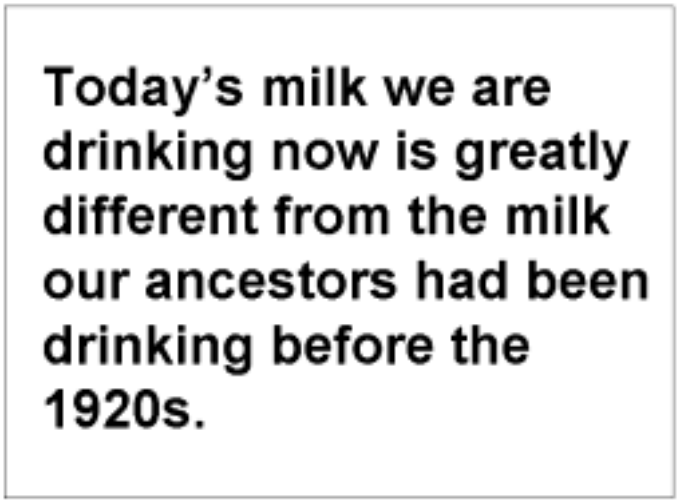
Slide 47
We conclude that commercially available low-fat milk promotes the development of DMBA-induced mammary tumors in rats. The degree of the promotion is almost comparable to that of 100 nanograms per milliliter of estrone sulfate. The high estrogen content in milk may be responsible for the promotional effects, acting in concert with other hormones such as IGF-1.

Slide 48
Before I conclude my talk, I will briefly update you on the problem of Bovine Spongiform Encephalopathy, or BSE in Japan.



Slide 49
By September 28th of this year (2006), 29 cattle had been diagnosed with BSE. Of them, 28 were Holstein dairy cows. It is certain that the BSE outbreak in Japan is related to today's dairy farming practices, but the details remain unknown.

Slide 50
We have a proposal for dairy farmers all over the world. Consumers have demonstrated their willingness to pay higher prices for organic milk. We feel that milk from non-pregnant cows would also be marketable at premium prices.



Slide 51
In conclusion, you may feel skeptical that milk is harmful to human health. You may say that you have been drinking milk and eating dairy products for several hundred years without any apparent harm. I would like you to understand that today's milk is vastly different from the milk your ancestors consumed 80 years ago.

Acknowledgement

We thank Ms. Kris Demko for revising our manuscript.