毎日食べる“お肉”の安全性

The Safety of the Meat We Eat Everyday

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Hello everybody. I am Yukio Morita of Tokyo Kasei University. Today, I would like to talk about the safety of the meat we eat everyday.

I used to be a local government official, working as a food hygienist in Gunma Prefecture for 19 years. During that period, I also worked as a veterinary meat inspector and, as Gunma was exporting meat to the United States, I served as a veterinary meat inspector in-charge of meat exported to the US.

Meat exports from Gunma to the US began in 1991. Before the exports started, a delegation from the US Department of Agriculture (USDA) visited slaughterhouses in Japan. One of the comments they made at the time was, “Slaughterhouses in Japan are worse than those in Africa.” Fortunately, Japan afterwards became truly diligent about its hygiene measures and was able to clear US standards and eligible to export meat to the US.

In 1999, while I was working as a veterinary meat inspector, the US authorities decided to introduce a system known as HACCP (Hazard Analysis and Critical Control Point) to slaughterhouses. This was a countermeasure against food poisoning caused by Escherichia coli (E. coli) O157 and Salmonella bacteria contamination. The system also became a requirement for Japanese slaughterhouses exporting meat to the US, so I visited the USDA’s Food Safety and Inspection Service (FSIS) for training. Back then, the term HAACP was not very well known in Japan. In 2000 (the year after I received my training), the slaughterhouse in Gunma Prefecture introduced HACCP and became eligible to export meat to the US. At the time, we copied and implemented the hygiene control system from the US slaughterhouse where I had trained. As the previous speaker, Mr. Sakai, also mentioned, HACCP is an internationally recognized hygiene system. So when Japan produces any meat for export overseas, it is the system that should be employed as a matter of course. Historically, Japan has not been a meat exporting country. The type of HACCP introduced into Japanese slaughterhouses was a revised version of the standard HACCP used in the US. At the time, I could see that this system led to a considerable improvement in conditions both hygienically and microbiologically. Also, meat that has been more hygienically produced fetches a higher price, although that is another matter. In those days, however, there was little difference in meat pricing regardless of whether or not it had been produced hygienically or was contaminated by pathogenic bacteria. But I would like to emphasize that hygienically produced meat should naturally fetch a higher price because producers have to take greater care and incur considerable expense in the production process.

I also obtained a Health and Labour Sciences Research Grant which I used to conduct research into the hygiene situations of several Asian countries. The slide you can see here is from Vietnam. The meat is dog meat. Indeed, people in different countries eat a lot of different things.

This is a slaughterhouse in China. And this is a scene from a butchers shop in the morning.

This photo is from Thailand. It shows broiled rat being sold in the suburbs of Bangkok. People eat all kinds of things.

This is a picture postcard from Vietnam. It shows a water buffalo being transported on a motorbike. And this one shows the carcass of a pig being carried on a

motorbike. When you look closely at the carcass, you can see the mark on the neck where the blood has been drained. So we know the animal is dead. If it was alive and moving, it would obviously be impossible to transport by motorbike.

This photograph is from the Philippines. After all, many places are still unhygienic compared with Japan. This is a morning market where the price of meat is low. Of course, there are also more hygienic butcher shops and supermarkets that keep their meat refrigerated. People in various Asian countries are conscious that unhygienic meat is cheap and hygienic meat is expensive. But in Japan, many people are unaware that there are differences in the level of bacterial contamination in the meat on sale at different shops.

This is a photograph of a butchers shop in Laos. And this similar image is from Nepal.

In 2011, I visited Uganda as a short-term JICA specialist to teach about Japanese meat inspection methods. In many developing countries, the elimination of livestock diseases remains a priority task. In Japan, the elimination of such diseases has been accomplished to a large extent. We have now reached the stage of microorganism control, meaning the stage when hygienic meat can be produced. I consider this to be a very happy situation for Japan.

This is my favorite poster. It says, "Food safety began when people started using fire and stopped eating raw meat." Nowadays, more people are eating raw meat and consequently a great many food poisoning incidents are occurring.

There is also an important principle, namely that we should only eat meat from healthy animals. When foot and mouth disease became an epidemic, we heard comments along the lines of, "since it doesn't spread to humans, it is OK to eat meat from infected animals." But this is an issue that goes beyond food hygiene itself. There is not only a risk that people eating meat from sick animals will become sick as a result but a risk that another new pathogen infecting humans will appear. So remember the important principle: "Only eat meat from healthy animals."

"Safety" and "reassurance" are obviously two different things. We can guarantee "safety" based on scientific data. At present, the tentative standard for the safe level of radioactive cesium in meat is 500 becquerels. I myself believe that meat with a level of 490 becquerels is safe. We can say that meat exhibiting a higher level of radioactivity than the standard limit is not safe. Reassurance, on the other hand, is quite another matter. The sense of reassurance differs from one individual to another. I think the Japanese have a tendency to go more for reassurance than for scientific safety. We can say that "such and such a thing is safe" because we have scientific data to back up the claim. The word "safety" even appears in the name of the Food Safety Commission of Japan. But for people to really have a sense of reassurance about meat, its safety must be guaranteed. Consumers can then obtain reassurance through the exchange of information on hygiene.

Nowadays, risk control is the responsibility of the Ministry of Health, Labour and Welfare (MHLW) and the Ministry of Agriculture, Fisheries and Forestry (MAFF). Risk evaluation is conducted by the Food Safety Commission of Japan, an organization under the Cabinet Office charged with evaluating food safety based on scientific principles from a fair and neutral position. I believe Japan to be a country where risk control evaluation is carried out securely.

With regard to meat-related food-poisoning incidents such as those involving 'yukhoe' (a Korean-style raw beef dish) that occurred last year, let me give you my personal opinion. The basic HACCP concept is to ensure hygiene from the farm to the dining table. Today, before meat reaches the table, it goes through a number of processing stages including production, processing, preparation, etc. Usually, each of these stages is carried out hygienically and with a sense of professionalism. In the case of last year's incident involving E. coli O111, a lack of professionalism was evident in several places. I wish that consumers had questioned the safety of the meat given the unusual situation that diners were

able to eat raw yukhoe in a beef barbeque restaurant for such a low price. Food passes through a long list of processing stages before it reaches the table, and the baton of good hygiene must be passed on from each stage to the next. All those involved in processing must purchase hygienic meat, process it in a hygienic fashion on their own premises to make it even more hygienic, and then pass it on to the next stage. This is basic. In the yukhoe incident, some of those on the meat provision side put their priority on profit-making. Their meat was passed on to the next process without the contaminated parts being trimmed. This was unprofessional.

Japanese people have a particularly characteristic dietary habit. They are very fond of raw meat and fish dishes such as sashimi, horsemeat sashimi, yukhoe, liver sashimi, etc. I have heard that in some places people eat raw wild boar meat including the internal organs. Eating raw meat of this kind entails several risks. Some people have an image that wild means natural, but wild and natural are quite different things. The health condition of a wild animal at the time it is hunted is unknown. Indeed, it is a fact that wild animals are more easily captured if they are unhealthy. I wish that when people eat the meat of wild animals, they would recognize that "this meat is not natural, but wild."

Next, I am going to talk about the present situation surrounding meat inspection and distribution. Currently, official inspections are carried out on goats, sheep, pigs and horses in accordance with the Slaughterhouse Act, and the Poultry Slaughtering Business Control and Poultry Meat Inspection Act. This slide shows the meat Hygiene Inspection Laboratory in Gunma Prefecture. We wear clothes like these when we carry out our inspections.

This is a biological test. As a basis for eliminating diseases, it is important to look at the conditions under which the animals used for food were living. In the case of BSE (Bovine Spongiform Encephalopathy; also known colloquially as "mad cow disease"), whether cattle can walk straight or not is one of the USDA's standards of diagnosis.

This is a slide made over ten years ago. In those days, even animals with feces attached to the outside surface of their bodies were brought into the slaughterhouse. This would result in fecal matter coming into contact with the meat during the processing operation. By contrast, today, animals are cleaned before being brought to the slaughterhouse.

In Japan, as livestock hygiene has progressed, there has been a remarkable decrease in the incidence of livestock diseases. Meat these days is processed in such a way to ensure that it is not contaminated by pathogenic bacteria such as E. coli, Salmonella, Campylobacter, or Clostridium perfringens (C. perfringens). This is called microorganism control. Today, in addition to disease elimination, microorganism control has become extremely important. In order to realize microorganism control it is vital to raise clean livestock.

After biological testing, we perform tests on internal organs to determine whether or not disease is present. The present Slaughterhouse Act stipulates that each individual animal, as well as the knives and hooks being used, must be sterilized in a sterilization tank at a temperature of at least 83 C. In reality, there are some slaughterhouses where this sterilization is carried out correctly and others where it isn't. In many cases, the meat processing work is performed, not by machines but manually. Results may therefore differ depending on the individuals who handle the processing.

This slide shows the inspection of a beef carcass. At the end, an examination will be conducted to check whether there is any visible disease or external contamination. If contamination is present, it is not washed away using water. Instead, the contaminated part is trimmed away. This operation is performed manually, and there are some slaughterhouses that do it properly and others that don't.

The next slide shows the inspection of a pork carcass. As in the case of beef, an inspector will examine the carcass for contamination. If it passes, the carcass receives a "pass" stamp and is sent for distribution. When a questionable case arises in a slaughterhouse

- such as an animal that might be diseased - we bring back a sample of the material to the meat inspection center and carry out a thorough examination. In Gunma Prefecture, hygiene inspections are not only conducted in the slaughterhouses themselves but also in animal transport vehicles.

This slide shows a beef carcass swipe inspection. These inspections are carried out on predetermined individual carcasses as a means of checking whether or not clean carcasses are produced after screening and salmonella detection.

This figure is intended to explain the HACCP system employed at Japanese slaughterhouses for meat exported to the US. In order to verify whether the HACCP system has been properly established and that clean carcasses are being produced, the slaughterhouse conducts E. coli testing on carcasses as a means of outside verification. As a result, the hygiene standards of meat for export is actually higher than that of meat for domestic consumption. Also, in order to export meat these days, the introduction of HACCP is indispensible.

This slide shows personnel carrying out Salmonella swipe testing in accordance with the SOP (Standard Operating Procedures) of the USDA regulations.

In many foreign countries, a single large slaughterhouse may often carry out everything from production to processing. But in Japan there are not many slaughterhouses where this occurs. Many slaughterhouses have auction sites where their carcasses are sold to the highest bidders. When people enter the auction site, they wash their hands, sterilize their boots, and wear clean white gowns and caps.

In 1996, a slew of food poisoning incidents involving E. coli O157 occurred, which created a social problem. In response, livestock farmers were requested to ensure that cattle brought to slaughterhouses were cleaned of external feces. This is a signboard giving notice about that request.
If an animal with hardened feces attached to its body surface is slaughtered and processed, feces contamination can infect the meat. About 10% of fattening cattle carry E. coli O157 in their feces and this can contaminate their carcasses after slaughter.

A high ratio of chicken meat is infected with Campylobacter or Salmonella. While, in Japan today, beef and pork are much more hygienic than before, contamination of chicken meat remains widespread. The processing methods for chicken differ significantly from those for beef or pork. Cattle and pigs are processed manually, one animal at a time, but chickens are processed more mechanically at a rate of one carcass per second, as shown in this slide.

In this picture, you can see the machine for removing the internal organs. The intestinal tract often breaks open when the organs are removed which can sometimes result in the contents of intestines leaking out and contaminating the meat.

Chicken meat inspections are performed by a certified poultry slaughtering health supervisor and a poultry inspector who is a veterinarian. The chicken meat is washed with water and then cooled by being placed in a pool. The pool water contains chlorine, acting as a disinfectant. But this solution is not strong enough to completely sterilize any meat contaminated by intestinal contents.

In 1996, there was a nationwide epidemic of E. coli O157 in Japan. When we compare the Salmonella situation before and afterwards we see that, after 1996, both pork and beef became cleaner. Before 1996, during beef-carcass swipe inspections, Salmonella was detected in approximately 7% of samples. Nowadays it is hardly ever detected at all. Also, before 1996, when beef swipe inspections were taken in the marketplace, approximately 13% of samples tested positive for Salmonella. Nowadays, it is seldom detected at all. The situation is similar for pork as well. For both beef and pork, following the 1996 E. coli O157 epidemic, a strict hygiene control system corresponding to HACCP was introduced into slaughterhouses, with the result that the meat emerging from these facilities is now very clean. On the other hand, you should assume

that chicken remains just as contaminated as it was before. However, even if you purchase chicken and eat it, that doesn't mean you will inevitably contract food poisoning. The bacteria in question will die if the meat is sufficiently heated. When you cook chicken or chicken mince, be sure to heat it properly, then you won't have to worry about food poisoning.

This slide shows the ratios of Salmonella and Campylobacter contamination in minced beef, minced pork and minced chicken on sale in the marketplace, based on inspection results. Currently in these inspections, Salmonella and Campylobacter are not isolated from minced beef or minced pork, but in the case of minced chicken, Campylobacter is isolated from 20% and Salmonella isolated from 10% of samples examined.

Campylobacter is also isolated from bile. It is isolated from about 60% of cattle bile samples and from about 10% of chicken bile samples. When I received my AACCP training in 1999 I was told specifically that, "Bile is a contaminated substance, so if it is found on a carcass, trim off that section." I was taught to always check whether bile was present on a carcass.

With the cooperation of eight slaughterhouses nationwide we carried out swipe tests on the perianal, abdomen and chest regions of cattle carcasses and on the perianal, chest and neck regions of pig carcasses. For both the cattle and pigs processed in ISO 22000 certified slaughterhouses adhering to HACCP procedures we were unable to detect even E. coli on the surface of the carcasses. Of course, even among slaughterhouses that have not obtained ISO 22000 there are facilities that do pay attention to hygiene and where we do not detect E. coli results. However, there was one where we did detect E. coli in 13 of 60 samples. In general, I believe that the slaughterhouses cooperating with us do have good hygiene conditions. But, for those that did not give us their cooperation I believe E. coli will be detected in a higher ratio of samples from carcasses they process.
These are the results of a similar test on pork. Among slaughterhouses that deal with pigs, so far only a relative few have obtained ISO 22000 certification. We were only able to obtain the cooperation of one slaughterhouse. As might be expected, the ISO 22000-certified slaughterhouse produced hygienic carcasses in which E. coli was not detected. There are other slaughterhouses that diligently carry out hygiene measures even though they are not ISO 22000 certified. But in general, those that do have ISO 22000 certification are consistently producing clean carcasses. These results were introduced in a food bacteriology magazine.

Since the time of the 1996 E. coli O157 epidemic, a variety of measures have been taken with the result that Japanese beef and pork are now dramatically cleaner. So let's take a look at the differences in bacteriological contamination on carcasses between those slaughterhouses working hard to be as hygienic as possible (by obtaining ISO certification) and those that aren't.

This chart shows the numbers of food poisoning outbreak cases. The causative agents in the largest number of cases are noroviruses, followed by Campylobacter and Salmonella in that order.

This is the number of food poisoning patients. In terms of patient numbers too, noroviruses are the biggest causative agent, followed this time by Salmonella, Campylobacter and then C. perfringens. Although noroviruses affect the largest number of patients, the pathogens most commonly derived from meat are Salmonella, Campylobacter and C. perfringens, all of which are present in the digestive tract of livestock.

Firstly, let me explain about Salmonella food poisoning, or salmonellosis. Since Salmonella bacteria live in the digestive tract of livestock, they can become attached to the meat surface depending on the way in which the carcasses are processed. Salmonellosis in humans occurs when live Salmonella attached to meat is orally ingested in some way. The symptoms of salmonellosis may include intense diarrhea, stomachache and fever. At present, food-based Salmonella infections are more likely to derive from eggs than meat. Among the food

products made using eggs, salmonellosis occurs most commonly when people eat the dessert 'tiramisu'. Because tiramisu is made with raw egg and not heated it can often lead to food poisoning. Among meat dishes, 'toriwasa' and 'torisashi' (chicken sashimi) - both of which use raw chicken meat - are major causes of food poisoning. Salmonella bacteria are often present on this meat. Also, because reptiles host Salmonella, people sometimes get salmonellosis from eating 'suppon' (soft-shelled turtle) dishes. Salmonella bacteria are present in the intestines of these turtles. During the cooking process, live Salmonella from the meat sometimes contaminate ingredients or utensils, and once the bacteria enter the mouth, symptoms begin.

Minced beef and minced pork sold in the marketplace are very clean these days. However, approximately 10% of mixed chicken is contaminated with Salmonella. Armed with this knowledge, be sure to heat chicken meat sufficiently when cooking.

Secondly, I would like to talk about Campylobacter. These bacteria also live in the digestive tract of livestock. The incubation period for campylobacteriosis is longer than that for salmonellosis. But, as with salmonellosis, the symptoms of the infection include diarrhea, stomachache and fever. In a small percentage of cases, after these symptoms abate, the infected person may develop Guillain-Barré syndrome (GBS), a serious disorder in which the limbs become numb. Food items that are the main causes of campylobacteriosis are, as with salmonellosis, raw chicken dishes such as toriwasa and torisashi. Campylobacter also live in the liver of cattle.

As with Salmonella, Campylobacter is seldom found in minced beef or minced pork, but it is detected in about 20% of minced chicken samples. Also, Campylobacter can be isolated from about 60% of bile samples from fattening cattle and from approximately 10% of samples of beef liver sold in the marketplace. The wisdom of eating raw beef liver has become a subject of discussion recently. If you want to eat this dish, please do so in the knowledge that the risk of it being contaminated by Campylobacter bacteria is significant.

Thirdly, I would like to talk about food poisoning caused by C. perfringens. These bacteria are spore forming which means they can survive for a long time in our normal environment. C. perfringens lives in the digestive tract of livestock and reaches the outside environment when animals excrete feces. In the environment, it mainly exists in spore form. The incidences of C. perfringens food poisoning have been increasing in recent years. The main food sources of C. perfringens food poisoning are meals prepared in large pots that are not eaten on the day they are cooked and not re-heated before consumption. Since the pots are usually large, many people may eat from the same pot. So this can lead to large-scale food poisoning outbreaks.

Let me explain in more detail about the causes of C. perfringens food poisoning. When people cook using large pots, ordinary bacteria die when the pots heat up. However C. perfringens can survive in spore form because the spores are remarkably resistant to the effects of heat. When the food in large pots is boiled gently, the oxygen content of the food reduces. This creates conditions favorable for the growth of C. perfringens. This is particularly prevalent in the summertime when food cooked in a large pot is left at room temperature, perhaps because it is too large to be placed in a refrigerator. As the temperature falls to between 43 and 49 C any C. perfringens bacteria present in the food revert from their spore form to their normal vegetative form and begin propagating. By the following morning, the propagation process for large numbers of ordinary C. perfringens bacteria will have been completed. If at this point the pot is properly re-heated, the bacteria will be destroyed. But in the summertime, people often eat food prepared the day before without reheating. It is when many people eat from a large pot left in this way that large-scale food poisoning incidents can occur.

This slide shows the results of some tests for C. perfringens in minced chicken. In this next photo, the black areas are colonies of C. perfringens. Last year, there was an outbreak of C. perfringens food poisoning from Egyptian-style food that was distributed at an

evacuation center in Fukushima after the Great East Japan Earthquake.

This is a newspaper article about a C. perfringens food poisoning outbreak that took place at a special nursing home for the elderly. The food source behind the infection was pumpkin boiled in soy sauce. It had been cooked in a large pot and then served the following day without reheating. Particularly in summer, if cooked food is left in a pot at room temperature overnight, it should always be properly reheated to kill any bacteria present before serving. If people forget just one key point about food poisoning prevention, food poisoning incidents can occur. I urge everybody to remember the keypoints to prevent food poisoning.

Next, I will talk about a type of pathogenic E. coli known as enterohemorrhagic Escherichia coli or EHEC, which lives in the intestinal tract of ruminant animals in the same way as Salmonella, Campylobacter and C. perfringens. When meat is processed in a slaughterhouse utilizing the HACCP system, EHEC almost never becomes attached to the surface of carcasses. Ruminants do not exhibit symptoms even if they host EHEC strains such as E. coli O157 in their intestines. But if these bacteria infect humans, they become sick. Infection with about a hundred of these bacteria will make people ill, and according to the Food Safety Commission, the minimum number sufficient to cause infection in susceptible individuals is just two. Moreover, the incubation period for EHEC is quite long. The first symptom is a watery stool, followed by blood in the stool. In approximately 5% of cases, the infected person develops hemolytic-uremic syndrome or encephalopathy which can be fatal in some cases.

This is a case list of EHEC incidents. In 2011, there were outbreaks of E. coli O157 food poisoning in Japan caused by eating yukhoe, while in Europe there were cases of E. coli O104 food poisoning. And in 2009, diners at a major restaurant chain contracted EHEC infections.

This chart details the numbers of E. coli O157 patients. The above figure shows how the numbers of patients have varied over the past ten years. In May 2011, food poisoning incidents involving yukhoe occurred. Since then, despite the fact that people are no longer eating yukhoe, almost the same numbers of people are still being infected with E. coli O157. So presumably, there are some other foods contaminated by these bacteria in our diet even though yukhoe was certainly one of the causes of E. coli O157. In the case of EHEC, the infection routes are not limited to the 'food to people' route. Infections also run from people to people.

In the case of beef, the contamination is only on the surface of the meat. With beefsteak, Kobe beef, etc., even if the meat is contaminated and even if the meat is cooked rare, as long as the surface is sufficiently heated, there is no risk of infection. These days, however, 'portion cuts' – that is, portions of meat designed to be cut into individual serving sizes - are often produced by compacting pieces of meat together with mincemeat in a metal container, then freeze forming them for later cutting. Relatively inexpensive portion cuts may look like a single lump of meat, but in reality they are not. Meat formed in this way has living bacteria present inside it. When people eat such meat cuts served rare they can sometimes develop food poisoning.

EHEC bacteria are resistant to acidity. Wagyu (Japanese cattle) and hybrid cattle are fed on grain when being raised and fattened for meat. On this diet, their stomach becomes more acidic. Because E. coli O157 is relatively resistant to acidity, this strain undergoes selective propagation and more easily survives in the stomach and the intestines. For these reasons, I consider that Japanese fattening cattle have the world's highest E. coli O157 carriage rate.

Ensuring the safety of food means maintaining hygienic conditions at all stages from the farm to the dining table. I think the best way to do this is to introduce the HACCP concept into the home too. When meat is delivered or brought home, people need to place it in a refrigerator immediately and store it there. When cooking meat, they need to heat it sufficiently. Also, I advise to clean cooking facilities and utensils thoroughly and ensure they are sterilized. The basic

principles of food poisoning prevention are; "shut out bacteria," "don't allow bacteria to proliferate," and "heat."

As I touched on earlier, I ask that the people working on any food product distribution process to pass on their products hygienically to the next process in a professional manner. I ask them to purchase good quality food product, make them better, and then send them on to the next process. They need to maintain consumer safety by cooperating with others over the course of the various processes. And at the same time, I am asking consumers to be clever consumers. Food does have risks, so I want consumers to think for themselves about these risks when deciding what to eat and how to prepare it.

This slide concerns a case of Salmonella food poisoning that happened in Hokkaido in February 2010 as the result of school meals being contaminated. It was a very rare event in that it was a food poisoning incident (due to Salmonella) on a large scale and in the depths of winter in Hokkaido. In all, 1,300 elementary school pupils and 140 junior high school pupils were affected. The school meal cooking facility was a warm environment, and this had allowed Salmonella bacteria in the food to remain active and propagate before the food left the facility.

This is an experiment conducted on Salmonella. Five microliters (5μl) of liquid egg yolk containing Salmonella bacteria, which have been allowed to propagate, is placed on the screw thread of a bolt. The bolt is then tightened with a nut. When the Salmonella is sealed up in this way, although the number of live bacteria declines, some do survive even for a year. Salmonella can survive for a long time even under dry conditions. In food production facilities, there are machines made with such screws that come into contact with food. I would like to ask facility operators to frequently dismantle such equipment and then clean and sterilize each part.

This is my final slide today. I ask people to live life on a more scientific basis. It has been scientifically proved that eating raw meat and especially raw liver carries a risk of disease. If you harm your health by eating raw meat or raw liver, that is your own responsibility. I would like people to judge for themselves about what kinds of risks are inherent in eating different foods. To repeat, food poisoning will occur if hygienic practices are not followed at each processing stage. So the essential principles in order to prevent food poisoning are: "shut out bacteria," "don't allow bacteria to proliferate," and "heat." Some people follow a raw food diet. If so, you can't heat your food, which is one of the three principles for preventing food poisoning. In this case, it becomes even more important to realize the other two principles, namely, "shut out bacteria," and don't allow bacteria to proliferate." Also, keep facilities and utensils clean.

The number of food production facilities that have introduced ISO 22000 and HACCP is increasing. These facilities are guaranteed to have very good hygienic conditions compared to those facilities that have not done so. I would like our society to become one in which its consumers are free to choose the products of facilities that have introduced HACCP. Consumers should support these facilities.

That completes my talk.

「毎日食べる”お肉”の安全性」

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【Slide 1】

これからお話すること

自己紹介
1.食肉の基本と我が国の食習慣
2.日本の食肉検査と流通食肉の現状
3.食中毒の現状
4.食中毒の防止

【Slide 2】

これからお話すること

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【Slide 3】

自己紹介

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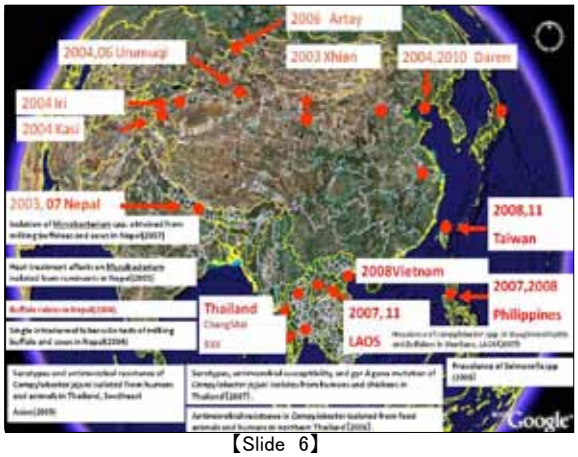
2009- 東京家政大学

外部競争研究資金にて研究を継続中・・・

【Slide 4】

USDA FSIS
Meat and Poultry Inspection Program Foreign Government Officials/Class 200
Jan. 25-Feb. 13, 1998

【Slide 5】



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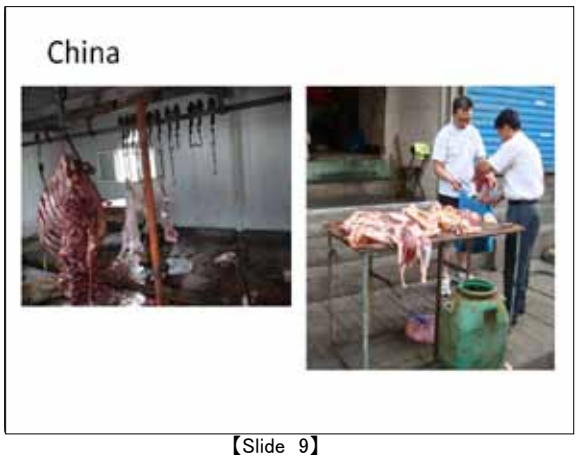
【Slide 7】

【Slide 8】



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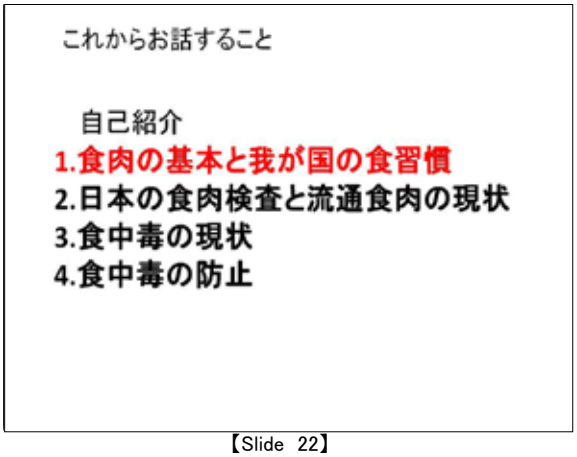
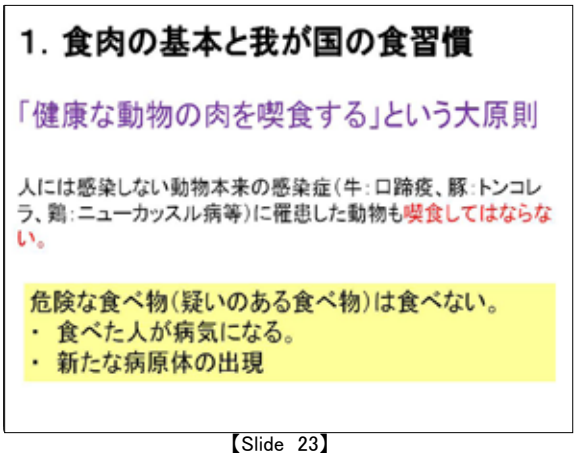
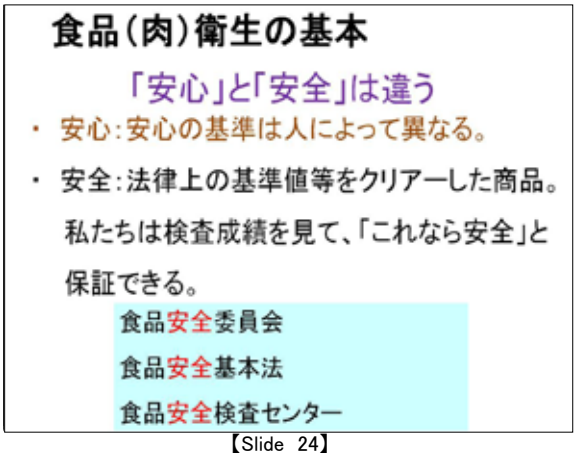


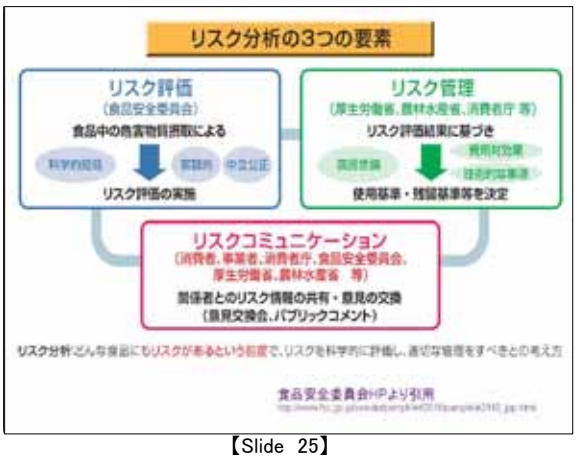
【Slide 22】



【Slide 23】



【Slide 24】



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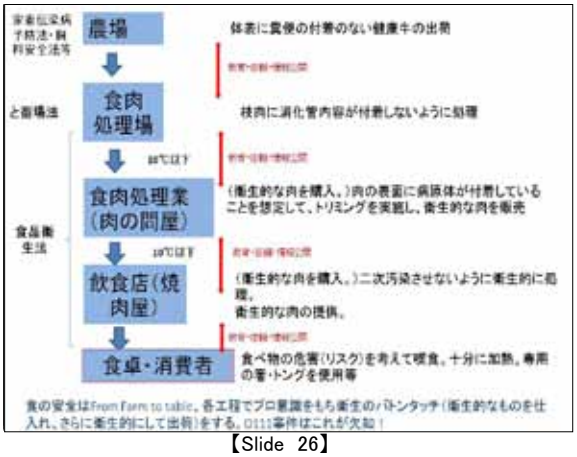
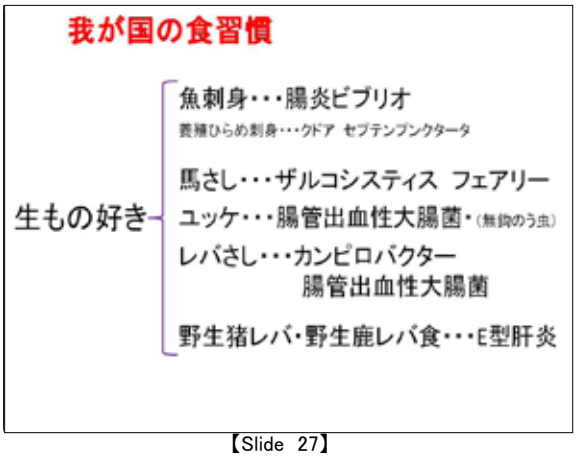
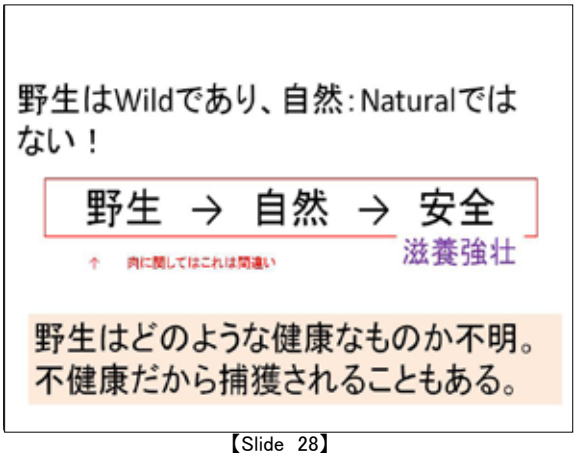


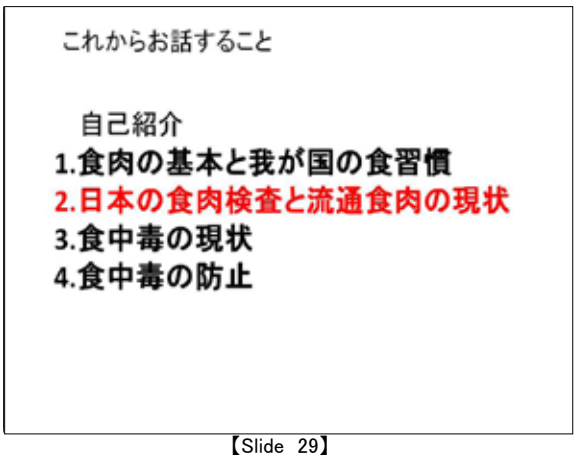
【Slide 26】



【Slide 27】



【Slide 28】

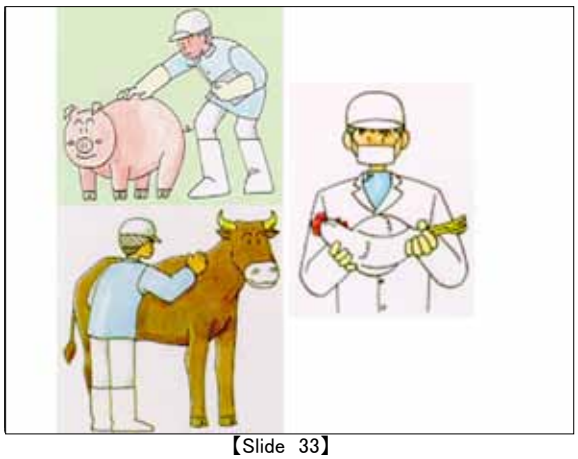


【Slide 29】

【Slide 30】

【Slide 31】

【Slide 32】



【Slide 33】

【Slide 36】

【Slide 34】

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【Slide 38】

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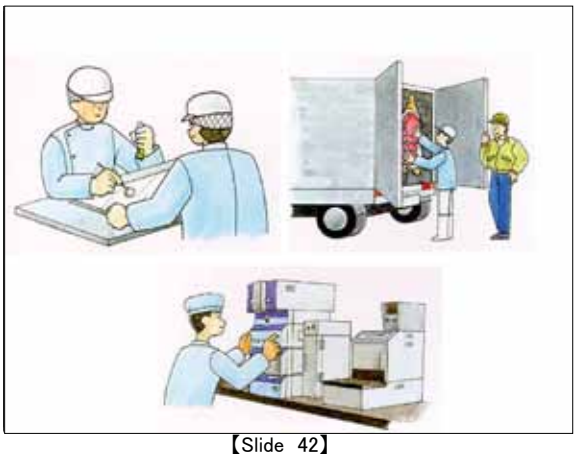
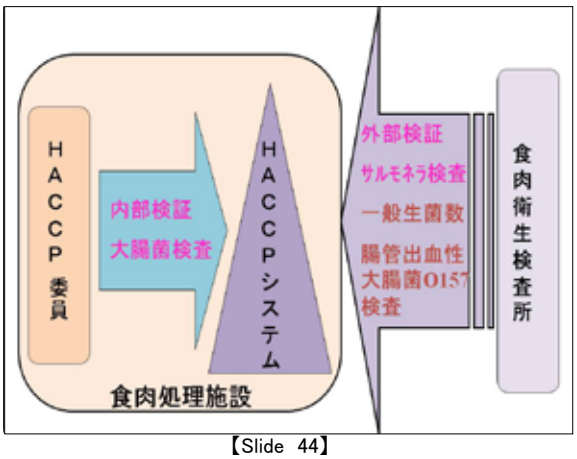
【Slide 40】


【Slide 41】


【Slide 42】

【Slide 43】



【Slide 44】

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【Slide 46】

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【Slide 50】

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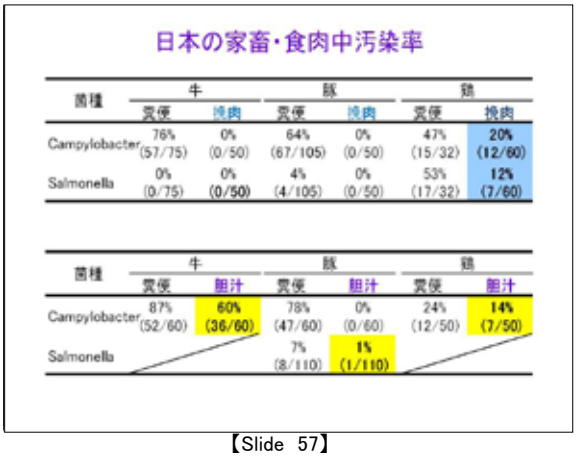
【Slide 55】

【Slide 56】

【Slide 60】



【Slide 57】

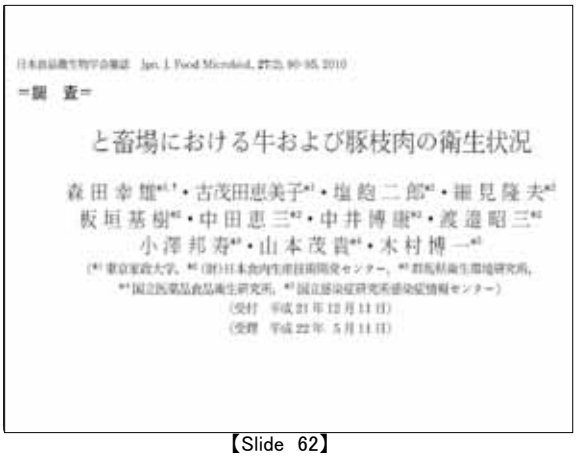
【Slide 61】

表1．市販鶏ひき肉からの*Arcobacter*, *Campylobacter*, *Salmonella*分離状況

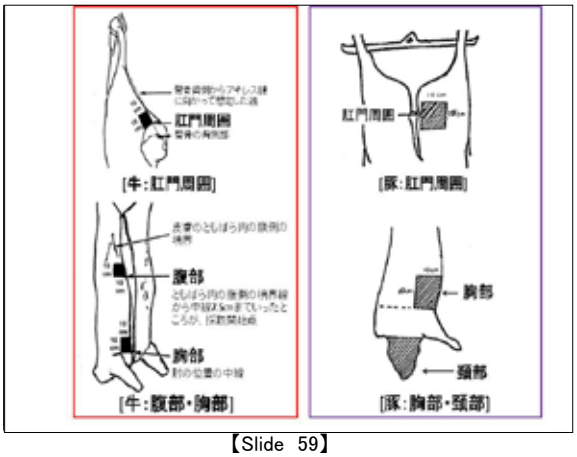
属名	陽性検体数（%）	内訳 菌種・血清型等	計
Arcobacter	26 (52)	*A. butzleri* のみ	21
		A. creaerophilus *1 のみ	3
		A. skirrowii のみ	1
		A. butzleri と *A. creaerophilus* *1	1
Campylobacter	11 (22)	*C. jejuni* のみ	11
Salmonella	6 (12)	*S.* Infantis のみ	5
		S. Yovokome のみ	1

*1 遺伝子型1B

【Slide 58】



【Slide 62】



【Slide 59】

【Slide 63】

【Slide 64】

これからお話すること

自己紹介

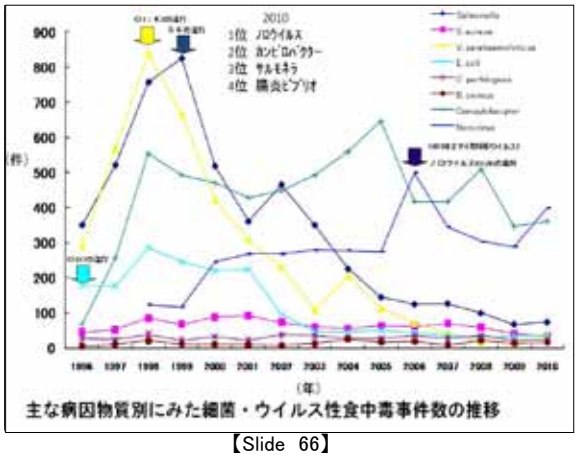
1.食肉の基本と我が国の食習慣

2.日本の食肉検査と流通食肉の現状

3.食中毒の現状

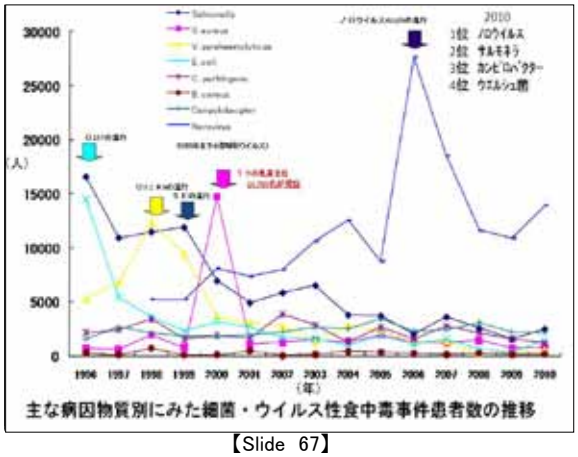
4.食中毒の防止

【Slide 65】



主な病因物質別にみた細菌・ウイルス性食中毒事件数の推移

【Slide 66】



主な病因物質別にみた細菌・ウイルス性食中毒事件患者数の推移

【Slide 67】

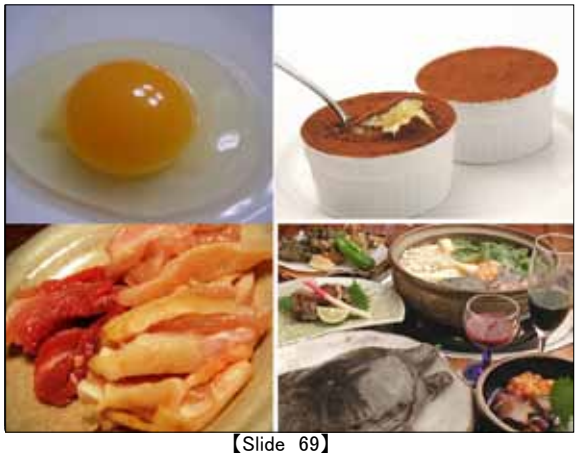
サルモネラ

菌の特長：通性嫌気性桿菌（発育：酸素が有＞酸素が無）
37℃で培養。
→ 食品中で本菌は増殖する。
血清型が約2500あり。動物（鶏・豚）の腸管内を本来のすみかとしている
近年、抗生物質が効かない耐性菌が出現

潜伏期・症状：8－48（平均12）時間
下痢・腹痛・発熱・時におう吐

原因食品：卵と卵の加工品（S Enteritidisの出現）
サルモネラに汚染された肉（特に鶏肉が多い）
原因不明も多い。微量の菌で発症。
ﾊﾞｰﾍﾞｷｭｰで起こることがある。
S. Enteritidisは卵、その他は鶏・豚由来が多い

【Slide 68】



【Slide 69】

サルモネラの検出割合

検　体	調査検体数	陽性数（%）
牛盲腸内容	75	0
豚盲腸内容	105	4（3.8）
鶏盲腸内容	32	17（53.1）
牛ひき肉	50	0
豚ひき肉	50	0
鶏ひき肉	60	7（11.7）
犬ふん便	90	13（14.4）
イグアナふん便	98	17（17.4）

【Slide 70】

カンピロバクター ジェジェニー/コリー

菌の特長：微好気性菌（酸素が3～15%の環境で生育する菌）
42℃で培養。→ 食品中では本菌の増殖はしない。
＜人は百個程度で感染することがある＞

潜伏期・症状：潜伏期が長い2－7日（2週間の場合もあり）
下痢・腹痛・発熱
（下痢・腹痛・発熱が終わったのち1－3週間後にｷﾞﾗﾝﾊﾞﾚｰ症候群：GBSを発症する場合がある）
GBSとは・・・手足、全身のしびれ、麻痺

原因食品：鶏肉（鳥さし）。牛レバー。（外国では生水の飲用）
原因不明も多い。微量の菌で発症。
ﾊﾞｰﾍﾞｷｭｰで起こることがある。
ｶﾝﾋﾟﾛﾊﾞｸﾀｰ ｼﾞｪｼﾞｭﾆｰは鶏・牛。 C コリーは豚

【Slide 71】

生肉からのCampylobacter sppの検出率

検　体	鶏	豚	肥育牛
ひき肉	20.0%	0.0%	0.0%
糞便	50.0%	63.8%	76.0%

森田ら(2003,2004)

【Slide 72】

肥育牛のCampylobacter保菌状況

菌 種	検出検体数(%)
	胆汁
C. jejuni	20(42.6)
C. coli	1(2.1)
C. lari	1(2.1)
C. coli + *C. lari*	1(2.1)
C. fetus	1(2.1)
Total	24(51.0)

N=48

庄司ら(2002)

【Slide 73】

ウエルシュ菌　生体内毒素型

特徴：
偏性嫌気性 桿菌（環境中に芽胞として存在、土壌、水、糞便）
増殖至適温度は43－46℃、分裂速度は速い
毒素産生（A型、B型、C型、D型、E型の5つの毒素：人の腸内で産生）
（生体内毒素型）
食中毒のほとんどはA型毒素産生ウエルシュ菌による：芽胞は耐熱性、毒素は易熱性

症状：
8－20時間（平均12時間）、軽い下痢と腹痛

なりやすい原因食品：
カレー、シチュー、肉じゃが等のなべものを翌日再加熱しなかった場合に発生
（再加熱不足）

【Slide 74】

大鍋で調理したカレー、シチュー、肉じゃが等を翌日に再加熱しないで提供した給食施設で発生（H22年では1,151患者、24施設：平均48名/事例）。

大鍋で加熱調理すると栄養型細菌は死滅し、芽胞のみ生存
食品中の溶存酸素が減少する

予防策

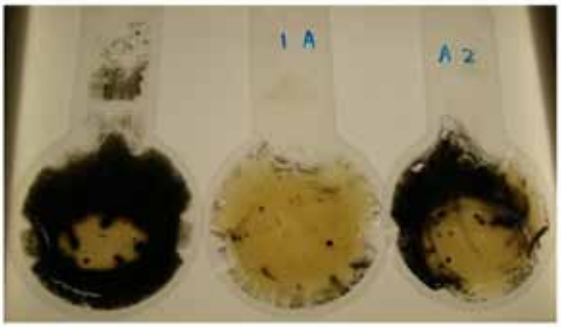
大鍋を室温で放置する
緩慢に冷却される間（至適増殖温度：43-45℃）に増殖の好条件が成立　・・・早く冷蔵

調理翌日にはウエルシュ菌（栄養型）のみ存在する食品が完成！　・・・・・・・・しっかり再加熱

食品を経口的に摂取→人の腸管内で菌が増殖するとともに芽胞が形成
芽胞形成時に毒素が産生し発症
（生体内毒素型食中毒）
潜伏期間は8-20時間、水溶性の下痢、腹痛症状を主症状
症状は比較的軽症で約2日間で治癒し、予後は良好

でも・・・大鍋で調理したものを沢山の人が食べるので多くの患者数となる！

【Slide 75】



【Slide 76】

福島の避難所で初の集団食中毒…エジプト料理の炊き出しで

福島県田村市の避難所で今月4日、エジプト大使らが訪問した際に振る舞われたエジプト料理の炊き出しを食べた69人が食中毒症状を訴え、うち9人の便と料理からウェルシュ菌が検出されたことが15日、県関係者などへの取材で分かった。県によると、同日に全員が回復した。厚労省によると、東日本大震災の避難所で食中毒が発生したのは初めてとみられる。

食中毒が発生したのは避難所になっている田村市の廃校。4日の夕食でエジプト料理の鶏肉の煮込みを食べた118人のうち、19～90歳の男女69人が翌5日夕までに下痢や腹痛を訴えた。

料理は別の場所で作った後、持ち込まれたとみられる。原材料に対し大使館は「担当者に確認中」としている。福島県は「ウェルシュ菌による食中毒は加熱調理した料理を常温で放置した後、再加熱して食べた場合によく発症する。食べ残した物は冷蔵庫で冷やすなどの対策を取ってほしい」と呼び掛けている。

（2011年6月16日 06:00）

【Slide 77】

産経ニュース

伊勢崎の老人施設で集団食中毒、60人発症／ウエルシュ菌、カボチャの煮付けが原因か

群馬県は13日、同県伊勢崎市長沼町の介護老人保健施設「まゆ玉」（岩波宏明施設長）で給食を食べた60～90歳の入所者60人が下痢や腹痛などの症状を訴え、ウエルシュ菌による食中毒と断定したと発表した。3人が点滴や投薬などの治療を受けたが、全員が快方に向かっているという。

県衛生食品課によると、60人は8日朝に食事をとり、同日夜に降に症状を訴えた。潜伏の発症者の多から、下痢などを引き起こすウエルシュ菌が検出されたことから食中毒と断定。前日夜に調理され給食で提供された「カボチャの煮付け」が原因の可能性が高いという。

県は同施設を13日から3日間の調理業務停止処分とした。同施設では8日夕食から調理を自粛している。

同施設では「今後二度とこのような問題が生じないよう、安全・安心の施設運営を心がけていきたい」と話している。

【Slide 78】

大腸菌

多くの大腸菌は動物の腸管内に生息して病原性を示すことはない。しかし、いくつかの大腸菌は悪いことをする。
それは・・・・

腸管病原性大腸菌 ・・・・・・ 発展途上国：乳幼児に下痢症
腸管毒素原性大腸菌 ・・・・ 旅行者下痢症の原因菌
腸管侵入性大腸菌
腸管出血性大腸菌 ・・・・・・ 腸管出血性大腸菌
分散接着性大腸菌　Enterohemorrhagic E.coli(EHEC)
腸管凝集性大腸菌　Shigella-Toxin-producing E. coli(STEC)
Vero-Toxin-producing E.coli(VTEC)

EUのO104は腸管出血性大腸菌と腸管凝集接着性大腸菌の両方の性質をもった新種

代表的な血清型
O157、O111、O26等

【Slide 79】

腸管出血性大腸菌

どこにいるのか？　反芻動物の腸管内
動物の病原性は？　反芻動物は菌をもっていても病気にはならない。

ヒトが感染すると…

百個程度の少量の菌で感染が成立

3-5 日の潜伏期の後に激しい腹痛をともなう頻回の水様便となる。多くは発症の翌日ぐらいには血便（出血性大腸炎）。 血便になった当初には血液の混入は少量であるが次第に増加。

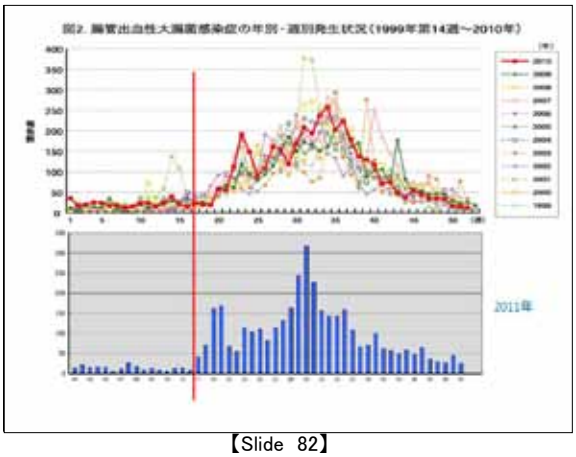
有症者の6-7%は下痢などの初発症状発現の数日-2週間（多くは5-7日後）以内に、溶血性尿毒症症候群（Hemolytic Uremic Syndrome, HUS）や脳症などを発症。

【Slide 80】

腸管出血性大腸菌に関する話題・食中毒・感染症

1977年：ベロ毒素産生大腸菌はカナダのKonowalchukらによって発見
1982年：米国 ハンバーガー
1990年：埼玉県幼稚園（井戸水）患者数319人、死者2人
1996年5月：岡山県邑久町
1996年7月：大阪府堺市
1998年：O157に汚染されたイクラの醤油漬け
2000年：同一ロットの凍結輸入牛肉
2001年3月～4月：牛肉たたき・ローストビーフ・サイコロステーキ
2001年：和風キムチ（関東）
2006年：ほうれんそう（米国）
2009年：大手レストランチェーン店
2011年：ユッケ：O111 ・ 欧州：O104

【Slide 81】



【Slide 82】

どのような処理をされた食肉に注意表示が必要ですか？

次のような処理をした食肉は、外見上処理をしていない食肉と区別が困難であるため、表示が必要となります。

●テンダライズ処理　金属の刃を用いて、肉の原型を保ったまま、筋及び繊維を短く切断する処理。
●タンブリング処理　調味液を機械的に注入する処理。
●ポーションカット　牛肉やひき肉を、金属容器にきつく詰め、凍結型した後、一定の厚みに切ること。（延長肉）
●タレかけ　肉を容器包装に入れた後、調味液を加えること。
●漬け込み　肉に調味液を加え、漬け込むこと。
●ミキシング　肉に調味料を加え、ミキサーでもみほぐすこと。

次のように、「処理を行った」こと及び「食べる際に中心部まで十分に加熱する」ことを表示します。

●筋切り処理をしていますので、中心部まで十分に加熱してお召し上がりください。
●味付け処理をしていますので、中心部まで十分に加熱してください。

「くらしに役立つ食品表示ハンドブック（全国食品安全自治ネットワーク版）」より引用

【Slide 83】

腸管出血性大腸菌（EHEC）の検出状況

動物・品種等	調査頭数	陽性頭数（%）a	血清型	検出頭数（%）	内訳 第一胃内容	内訳 盲腸内容	内訳 直腸便	調査年等
牛・黒毛和種	120	3 (2.5)	O157	3 (2.5)	-	-	3	2003
牛・黒毛和種	46	4 (8.7)	O157	3 (6.5)	1	2	-	
			O111	1 (2.2)	0	1	-	
牛・交雑種	217	12 (5.5)	O157	6 (2.8)	1	5	-	2004
			O26	5 (2.3)	1	4	-	
			O111	1 (0.5)	0	1	-	
繁殖牛・黒毛和種	14	0 (0)	O157	0 (0)	-	0	-	
搾乳牛・ホルスタイン種	82	0 (0)	O157	0 (0)	-	0	-	
肥育牛・黒毛和種	166	12 (8.5)	O157	12 (8.5)	-	12	-	1998-2001
肥育牛・交雑種	257	14 (5.8)	O157	14 (5.8)	-	14	-	
肥育牛・ホルスタイン	156	9 (5.8)	O157	9 (5.8)	-	9	-	

a）EHECが検出された頭数（%）　b）実施せず

【Slide 84】

食品の安全性確保：HACCPの考え方

From Farm to Table(Fork)
農場から食卓（箸）まで

●安全な（清潔な）食肉を納入させてください。
[段ボール箱は汚染したもの、調理場には段ボール箱は持ち込まない]
●納入した肉は冷蔵庫へ（10℃以下）すぐ保存
●十分に加熱してください。
●施設はよく清掃・器具は消毒

食中予防三原則：つけない・ふやさない・加熱する

【Slide 85】

これからお話すること

自己紹介
1.食肉の基本と我が国の食習慣
2.日本の食肉検査と流通食肉の現状
3.食中毒の現状
4.食中毒の防止

【Slide 86】

【Slide 87】

【北海道】岩見沢の小中学生食中毒　給食のサラダが原因

■釜の洗浄に問題指摘

岩見沢市内の小中学生らが食中毒症状を訴えた一斉調査で、岩見沢保健所は3日、給食に出された「ブロッコリーサラダ」などからサルモネラ菌が検出され、これが食中毒の原因だと断定したと発表した。調査の結果、調理器具の洗浄方法が悪く、ウに問題があると指摘した。同市教育委員会は今後、対応を協議するとともに、給食の再開は2月上旬になる見込みという。

■保健所、使用を停止

同保健所によると、9校の給食が作られた市立学校給食岩見沢調理場の昼食に、3日の給食メニューだった「ブロッコリーサラダ」、このサラダを食べた発症者の便などから同じ遺伝子型のサルモネラ菌が検出されたという。

同調理所ではサラダを作る際、ブロッコリー、ニンジンを別々の大釜でゆで上げてから、調理釜の中央にシャフトアームで回転する、攪拌する作業を行った。シャフトから釜が外されたのに対し、同保健所からは検出されず、保健所では何らかの理由でシャフトに菌が付着したとみて、も。

【Slide　88】

学校給食の食中毒、児童の兄弟が二次感染か

北海道●●●市の学校給食による食中毒で、食中毒症状を訴えた児童らのきょうだいが二次感染した疑いのあることが2日、同市立総合病院の調査でわかった。

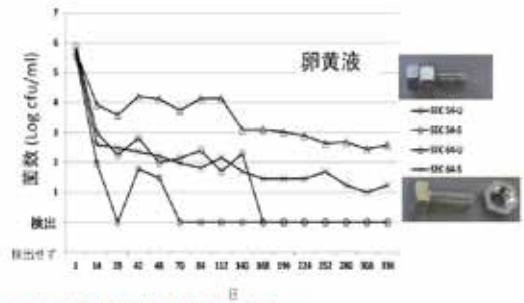
同病院には、食中毒症状がほぼ収まった先月25日以降、発症した小中学生の兄弟の乳幼児3人が発熱や下痢など同じ症状を訴え、1人が入院した。同病院小児科の医師によると、同じトイレや風呂を使う家庭では二次感染が起こりうるという。

市教委によると、これまでの発症者は小学生1334人、中学生140人、教職員71人。●●●保健所は学校給食が原因と断定している。

（2011年3月2日10時52分 読売新聞）

【Slide　89】

ネジに塗布したサルモネラの生存性



サルモネラは長期間、乾燥状態でも生存！
だから、きちんと施設の清掃・器具の消毒が必要となる。

【Slide　90】

食中毒の防止

- 科学的な根拠を背景とした生活をしてください。
- きれいな（衛生的な）食材を仕入れ、さらに、「安全」と「おいしさ」と「安心」を加えて、消費者にバトンタッチしてください。
  （原材料は衛生的なものを・・・、衛生のバトンタッチ）
- 食中毒予防三原則の「つけない」、「増やさない」、「やっつける（加熱する）」をきちんと行ってください。
- 調理施設は清潔にしてください。
- HACCPを取得している施設を応援しましょう。

【Slide　91】