# 人の健康と動物たち

## The Effects of Animals on Human Health

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Hello everybody. I am Hidehiko Uchiyama.

I used to belong to Azabu University but I have since moved, from this year, to Tokyo University of Agriculture. While at Azabu University I studied under the guidance of Prof. Mitsuaki Ohta for over ten years. Today, I'd like to talk about what I was taught in those years, and also about the things I believe I should try to tackle from now on.

The subject of my talk today is "the effects of animals on human health". Under this theme, I intend to talk mainly about the current state of animal-assisted therapy, or AAT, in this country.

The foundation of AAT at the academic level is the subject of anthrozoology, which is the scientific study of the relationships between humans and other animals, or human-animal interaction. I would like you to understand that AAT is essentially a variant, or in other words, an application model of anthrozoology.

I would like to talk about the historical side of studying human-animal interaction. Perhaps this will basically be a brush-up story for you. It concerns an association that goes by the long name of "the International Association of Human-Animal Interaction Organizations" and is better known by the acronym IAHAIO. The President of this association is Dr. Rebecca Johnson. IAHAIO was founded in 1990 as an international organization to bring together national associations and related organizations interested in advancing the understanding and appreciation of the links between animals and humans.

Relationships between people and animals began to become a topic in the 1980s, a few years before the IAHAIO was established. The real starting point in the field was marked by the Dundee meeting held in 1979. Here, specialists in education, psychology and veterinary science gathered and discussed the idea of holding a conference for the purpose of seriously considering human-animal interaction and the effects animals have on people. This movement eventually led to the establishment of the IAHAIO in 1990.

The IAHAIO holds conferences at three-yearly intervals. These conferences have taken place in Geneva in 1995, Prague in 1998, Rio de Janeiro in 2001, Glasgow in 2004 and Tokyo in 2007. I suppose some of you may have been among the participants. I took part in the Tokyo conference and the Stockholm conference, which was held in 2010. At the Stockholm event, a wide range of research and activities related to human-animal interaction were introduced.

In addition, in 1991, an organization called the International Society for Anthrozoology, or ISAZ, was established as a support organization for the scientific and scholarly study of human-animal interactions. ISAZ has held an annual conference each year since 1992, and its 2011 conference met in Indianapolis. This organization also publishes a quarterly academic journal entitled Anthrozoös. In 2006, another organization called the International Society for Animal-Associated Therapy, or ISAAT, was formed. This organization has the mission of certifying educational institutions involved in AAT (animal-assisted therapy), AAA (animal-assisted activities), and AAE (animal-assisted education).

The attitude in the West towards proceeding with human-animal interaction and animal-assisted therapy is based on the pragmatic standpoint of making positive use of animals in human health. As was announced at the Stockholm conference, approximately 17% of hospitals in Germany now have an AAT department and 95% of medical professionals including general practitioners recognize the efficacy of AAT. I myself consider this efficacy to be a powerful fact that has not yet been realized in Japan.

So, how has the subject of human-animal interaction been developing in Japan? The Society for the Study of Human Animal Relations, or HARS, was established in 1995. Currently, HARS and the Japan Animal Hospital Association, or JAHA, are participating in the IAHAIO as representative Japanese national members. In 2008, a society called 'Nihon Dobutsu Kaizai Kyoiku Ryoho Gakkai' was established in the same field, and this year it was certified as an NPO. So the movement is gradually gaining ground. However, in the West, a movement that was considering human-animal interaction seriously had already gained momentum by the 1980s. So simply stated, regarding AAT and human-animal interaction, Japan is lagging behind the West by 15 or 20 years.

At this point, I believe I should introduce you to anthrozoology, which serves as the basis for studying human-animal interaction. Yesterday, Dr. Rebecca Johnson talked about this research field so there may be some overlap between our accounts. But I intend to go into a great deal of detail.

This slide shows the survival rates of patients with cardiac diseases following discharge from hospital. This is a famous research paper by Friedman. In the actual paper, a table of tests is shown. This shows the results made into a figure, comparing pet owners with non-pet owners. Furthermore, it compares owners who keep dogs with owners of other animals, and shows the survival rates of cardiac disease patients one year after being discharged from hospital. Cardiac disease patients tend to be physiologically weak. Even when only experiencing mild stress levels their blood pressure can rise and put a burden on the heart sufficient to kill them.

It is plainly obvious that the survival rates of cardiac disease patients differ significantly between those who have pets and those who don't. And of course, pet owners have better health results overall. In particular, since dog owners go for walks with their dogs, they benefit from the exercise effect. Friedman made a comparison between dog owners and owners of other pet animals, but even those keeping animals other than dogs showed significantly higher survival rates than non-pet owners. This research is considered to be the fundamental basis on which the study of human-animal interaction rests.

J.M. Segal studied the relationship between owning a dog and stress as measured by the average number of hospital visits people made. This research looked at elderly people. Of course, when people get old, their physical functioning tends to deteriorate. In addition, many older people become lonely after they are separated from their spouse or their friends. On this basis, elderly people can be divided into those facing many kinds of social stress and a group with low stress, comprised of elderly people in general. When these people are further classified into dog owners and non-dog owners, we find a self-explanatory result which is illustrated by the average numbers of hospital visits made by members of each group.

I have written that early prevention and health maintenance are important ways of limiting increased medical expenses that can be expected due to the aging society. Even among the elderly, in the low-stress group there is not a great difference in the hospital visit frequency between pet owners and non-pet owners, but when elderly people are under very strong social stress, the number of hospital visits made by pet owners is significantly lower than the number made by those who don't keep pets.

This next slide shows the results of a survey into the emotional states of elderly women. The subjects of this survey were classified by group into those who kept pets and those who didn't, and also into those who lived

with their families and those who lived alone. When these groups were compared, the results that emerged were very clear. The group that kept pets reported a reduced feeling of loneliness, improved control over their emotional ups and downs, a greater capacity to see things optimistically, and less susceptibility to becoming disturbed or unsettled.

This is a similar piece of research. This survey classified the subjects into those who kept pets and those who didn't, and compared their daily level of spiritual elevation, daily problems, satisfaction with life, sense of positive hope, etc. The results show that people who associated with pets on a daily basis ranked higher across the board.

This next piece of research, by James Serpell, is very interesting. It looked at the relationship between the incidence of health problems and pet dog and cat ownership. The health problems examined included minor headaches and stomachaches that happen on an everyday basis. During the first month after a group of previously non-pet owners acquired a pet, they reported a highly significant reduction in the occurrence of minor health problems. Actually, the group that acquired a cat showed a slight improvement over the first six months, but for the group that acquired a dog this improvement was maintained throughout the first ten months. This research demonstrated that daily health problems tend to decrease when people keep a cat or a dog.

All of this research says positive things about pet ownership. But is this really the case? Just the other day, I read a book entitled Some We Love, Some We Hate, Some we Eat by Harold Herzog. Maybe some of you have read it too. In that book, there are lots of reports concluding that animals have good effects on people both psychologically and physically. Also, there are a few reports stating that having pets doesn't have any effect the health at all. In the book it also states that the author asked Friedman, who I introduced earlier, "what effects do animals have on people?" Friedman answered, "animals certainly have a good effect on people, but they are not a cure-all."

Now, let's look at what kind of changes happen to pet owners' bodies as a result of keeping, or being in contact with, their animals as measured by the number of hospital visits they make or the changes in health problems they experience.

The research shown in this slide was conducted by Anderson. These readings show the maximum (systolic) and a minimum (diastolic) pressure. These are the measures figures for plasma triglycerides, which indicate the blood viscosity, and for plasma cholesterol. These are the figures for the male group. The white ones are for the group that didn't keep pets and the yellow ones are for the group that did keep pets. Among male pet owners, systolic blood pressure, plasma cholesterol and plasma triglycerides values were low. Among females up to the age of 39, there wasn't much difference between those who kept a pet and those who didn't. But for women over 40, we can see a clear difference in the values of these indicators.

At this point, stress becomes a keyword. What kinds of bodily reactions occur due to stress? When a person feels the effect a stressor, what kind of reaction does the nervous system produce? These are autonomic reactions. On the right side is the hypothalamic-pituitary-adrenal axis (HPA axis) pathway, which eventually leads to the secretion of that well-known hormone cortisol. Also involved are hormones such as corticotropin-releasing hormone (CRH) and adrenocorticotropic hormone (ACTH). The nervous system responds to stressors very quickly. The mechanism is complicated. I teach this to students, but it is difficult to get them to understand. Such a reaction occurs in response to such and such a stressor, for example, when you do some exercise, or when you apply yourself to some task that is a little hard, such as studying, or doing some chores that daily living requires. So it is better if you don't think that it is bad for these reactions to occur. Actually, it is necessary for these reactions to take place on a daily basis.

However, when this kind of thing happens continuously over a long period, cortisol tends to be secreted for a longer time in response to each new stressful incident,

and the sympathetic nervous system goes into a state of protracted strain. This is the stress state.

Motooka's research involved measuring the state of the parasympathetic nervous system by analyzing the variability of the heart rate. This is because in order to ease stress, we should pay attention to the parasympathetic nervous system, which works in parallel with the sympathetic nervous system as part of the autonomic nervous system. Heart rate variability analysis looks at the action of the autonomic nervous system in real time by analyzing the heart wave interval, which is the interval between successive R waves. [An R wave is an upward deflection displayed on an electrocardiogram (ECG).]

This is called the high frequency component, or HF. It is an indication of the work carried out by the parasympathetic nervous system. For instance, walking the dog enhances parasympathetic nervous system activity. The action of the system is much more pronounced when walking with a dog than when walking alone. When the parasympathetic nervous system is working actively it means that the sympathetic nervous system is in a relaxed state. This slide shows that the effect produced by walking the dog daily becomes successively greater on the first, second and third days, etc. This is the result of comparing the parasympathetic nervous system in those who keep, and those who don't keep, a dog at home. As you can see clearly, the action of the parasympathetic nervous system is enhanced in those who keep a dog at home.

So far, we have looked at a variety of studies. Healy created a very convenient and very clear conceptual diagram to show that dogs have a positive effect on people's health by considering the mental, physical and psychological aspects of health, and he mapped out a health chain in dogs and their owners. Dog owners increase the amount of exercise they take, of course. And when their exercise increases, people can sleep better. Their physical health improves, and this means they have a lower absentee rate from work. Moreover, one of the social effects of keeping a dog is that when people enjoys themselves with a familiar partner they do feel healthier. And when a person feels healthier, the number of hospital visits is lower as a matter of course. This figure shows a chain linking dog-ownership with owner health very clearly.

At this point, I am going to change the subject. So far, I have been talking about various research findings, but now I would like to tell you about the IAHAIO 2007 Tokyo Declaration. It begins: "Given the scientific and medical evidence proving the beneficial effects to human health and well-being that arise from interactions with companion animals, given the biological and psychological evidence for the innate affinity of humans to nature, including other living beings and natural settings,"

From this standpoint it continues: "the members of the International Association of Human-Animal Interaction Organizations unanimously approved the following resolution and guidelines for action at the IAHAIO General Assembly held on October 5, 2007 in Tokyo, Japan. It is a universal, natural and basic human right to benefit from the presence of animals. Acknowledgement of this right has consequences requiring action in various spheres of legislation and regulation. IAHAIO urges all international bodies and national and local governments..." And then it lists the following stipulations.

The first stipulation is: "To enact housing regulations which allow the keeping of companion animals if they can be housed properly and cared for adequately, while respecting the interests of people not desiring direct contact with such animals." This is followed by: "To promote access of specially selected and trained, healthy, and clean animals to medical care facilities to participate in animal-assisted therapy and/or animal-assisted activities." The third stipulation is: "To recognize persons and animals adequately trained in and prepared for, animal-assisted therapy, animal-assisted activity and animal-assisted education," and the fourth is: "To allow the presence of companion animals in care/residential centers for people of any age who would benefit from that presence. The fifth and final item on the list is: "To promote the inclusion

of companion animals in the school curricula according the 'IAHAIO Rio Declaration on Pets in Schools'." However, let's consider the actual situation at present. Let's try to visualize it. Already five years have passed since this declaration was issued but, so far, it seems that not even one of these stipulations has been realized completely. Despite such a clear and concise declaration being issued there has been little progress. Although there is no doubt that things are moving forward little by little, nothing significant has been achieved yet.

Healy, who I mentioned a little earlier, carried out a large-scale survey on pet keeping and human health in three countries simultaneously, namely Australia, China and Germany. The survey revealed that the number of annual hospital visits paid by pet owners was 15 to 20% less than the number of visits paid by people who don't keep pets. When this is converted into health care costs, pet ownership is estimated to save the equivalent of 754.7 billion yen in Germany and 308.8 billion yen in Australia. This research is comparatively recent. In Japan too, given the advance of the aging society, rising health care costs are unavoidable. In this context, the positive effect of keeping animals as pets is worth highlighting.

In Japan, research has become an important tool in the drive to expand the positive health effects of contact with animals as widely as possible and also to broaden the spread of AAT, AAE and AAA. So I would like now to consider the direction that this research is taking in Japan. It starts from the point that the health effects animals bring to people have already been demonstrated scientifically and it goes on to examine this subject in more depth so as to discover in what ways animals affect human health. I think this is a very important subject.

We need to pursue more deeply the mechanisms by which these various changes occur, and we need to further our research into the significance of better relationships between people and animals. Also it is essential to conduct this research based on a scientific approach containing both quantitative and qualitative analysis, and using methods by which reproducibility can be achieved. As I wrote in my summary, James Serpell has said that there have been relatively few scientific studies on this subject. So this is a matter of some concern in Western countries as well.

In our approach, oxytocin came up as one of the substances related to human health. Oxytocin is a hormone that, among other things, stimulates the production of breast milk, although men produce oxytocin as well as women. In mother-child relationships oxytocin concentrations are observed to rise. Beyond its role in milk production oxytocin has long been regarded as a mysterious hormone. Indeed, in recent years it has also been called the 'happy hormone'. Several researchers have been studying oxytocin with the idea that it can serve as a measure of the positive relationship between people and their dogs.

Let's look at a concrete research paper and its results. In one experiment, 55 "pairs" each consisting of a dog and its owner interacted in a room for 30 minutes. The oxytocin concentration in the owners' urine was measured both before and after the interaction period. In the case of the 13 owners who reported that their relationship with their dog was good, the oxytocin concentration rose significantly. Conversely, in the case of the 42 owners who reported their relationship with their dog was not good, the oxytocin concentration in their urine did not change. However, even among this latter group of owners, when they practiced eye-contact training (a basic form of dog training) in some cases their oxytocin concentration did increase.

Earlier, I said that we should adopt an approach to how we build good relationships between people and animals. In this experiment, among the 55 dog owners, only 13 reported having a good relationship with their dogs. That is about 23% of the total. We can't say anything for certain because the experiment was only carried out with 55 dog owners. Still, I think we should take note of what the results suggest about people who have good relationships with their dogs.

Something else to which I have been paying attention is brain activity measurement using NIRS (Near Infra-Red

Spectroscopy), a technique that Hitachi Ltd. has named 'optical topography'. Optical topography systems are groundbreaking measurement devices that have been attracting a lot of attention recently. They are capable of measuring the activity of the cerebral cortex, other parts of the brain, and changes in nerve activity.

Originally, optical topography systems were huge and expensive devices. But recently they have become quite compact and easy to use. It was difficult to employ the earlier optical topography systems for animal-related experiments. This is the screen of the measurement device. A band is first wrapped around the subject's head and then the waveforms from each brain measurement site are shown on the screen. There are 16 channels and 16 spots, in either blue or red, and these waveforms are displayed for each measurement site. Optical topography measures the changes in oxygenated and deoxygenated hemoglobin at each of these sites.

This is a video I recorded of an NHK Special documentary on the treatment of depression. The program shows this device being used. Let us look at the video for a short while. (Video projection)

As you saw, the subjects are provided with various kinds of stimulation. For example, they can be asked to think about a word. They can be given a different subject and the changes in their brain activity can be observed as they think about it. It can be used as one index in depression testing. When a mentally healthy person undergoes this test while being monitored by optical topography, the indications rise significantly when the subject is asked to think about one particular word. But in the case of a depressed person the indications do not rise very much. This is especially conspicuous in the case of the frontal lobes. I suppose that since this particular experiment was shown on television, there might have been some exaggeration, but in the most advanced research quantification of the results may have progressed.

I carried out the following experiment personally. There were five subjects, represented here as Mr. A, Mr. B, etc. I was studying the kinds of change that can be observed in brain activity when the subjects touched a dog, looked at a dog, touched a cat, or looked at a cat, respectively. At this point, a dog or a cat was brought in. When the dog or cat appeared, just by seeing the dog, this person's brain activity went up this way. Then it rose like this when they touched the dog. In the case of cats, the changes were even more significant. Someone's brain activity went up by this much when they saw the cat, and by this much when they touched the cat. This experiment was performed with only a small number of subjects, so we can't conclude anything from it unless we analyze the results in detail. However, the changes were observed for sure. But in the case of one person brain activity did actually decrease.

I have been thinking about what it is about animals that are good for human health and how, by using such monitoring devices, we can discover at what point and by what mechanism the effects of animals appear. I have personally experienced using this device, and I would like to show you what happened. Unfortunately, it is rather difficult to see. Time is shown along this axis. This is one minute. Changes in brain activity are shown here. Now, it's going up a little. I must have had a thought about something. This is such a sensitive machine, so it is rather difficult to use. At this point, a dog appeared. Let us look at a video as I issue various commands to the dog.
(Video projection)

This was a very good dog. He obeyed me well which pleased me. Look at this channel 7. You can see the indication is up. I think it suggests that when a dog obeys my commands, or when communication with the dog goes well, the indicator goes up.

My guess is that, from these experiments, we can come to an understanding of what it is about human-dog interaction that most influences human brain activity. It might be the 'contact with', 'issuing commands to', or simply 'touching the animal'. Also, regarding my background, I am not a dog trainer and I don't have much experience with dogs. When people such as dog trainers who are used to handling animals took part in

this experiment, the changes in brain activity that were observed were not very large.

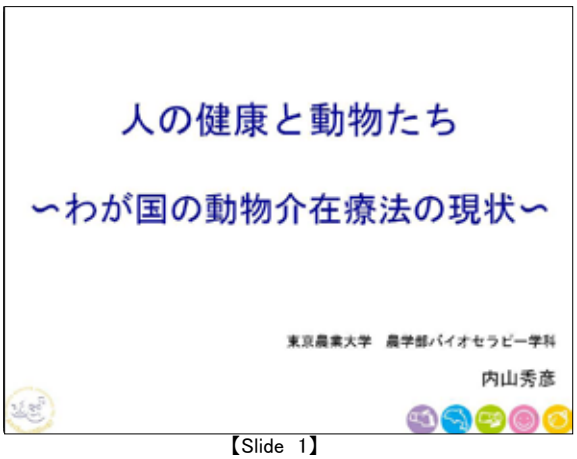
Here are the results of my experiment. You can see this part rises in a vague way. But even though I only underwent this experiment for one or two minutes, a significant change is visible.

From this point, represented by the dotted line, the dog appeared. This is the part where I am giving commands. Channel 7 is this part. Seeing this alone, I think the experiment is very interesting. I intend to continue this research.

This is an overview of animals appearing in AI (artificial intelligence) studies, based on a collection of study results published over the past ten years. The results show that, in the overwhelming majority of cases, dogs were used. AI studies commonly use pet dogs as subjects of study while ordinary dogs are used for AAT. Not many cats appeared in these studies. I have also looked at research published in Anthrozoös over the past decade. Here too, dogs made up the overwhelming majority of study subjects although there are a few studies using dolphins and horses. Cats appeared rarely. However, if we think paradoxically, we should consider experiments using horses and cats as well.

This scene shows a compact optical topography system. The device is placed on the subject's back and the band tied around the subject's head. This is the point in the middle of an experiment. The researchers are paying attention to changes occurring in brain activity when the subject gets onto a horse and how this change differs from what is observed during interaction with other animals.

When I obtain new research results I would like to report them to you. For now, that completes my presentation. Thank you very much for your attention.



【Slide 1】

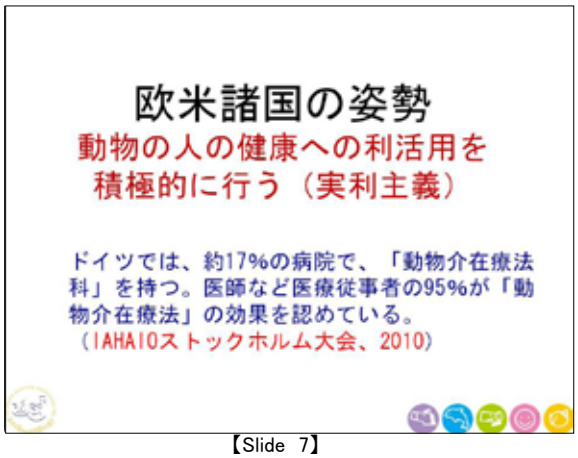
【Slide 2】

【Slide 3】

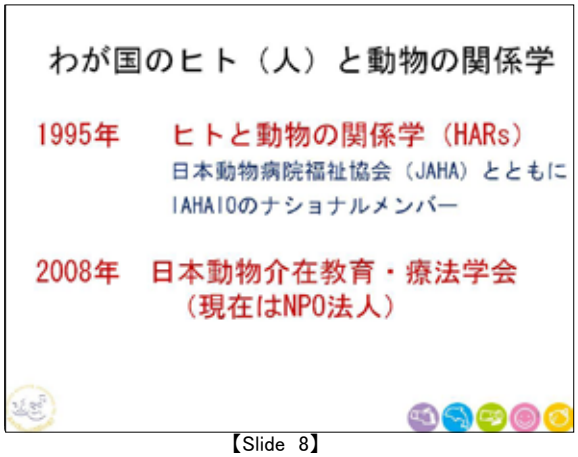
【Slide 4】

【Slide 5】

【Slide 6】



【Slide 7】



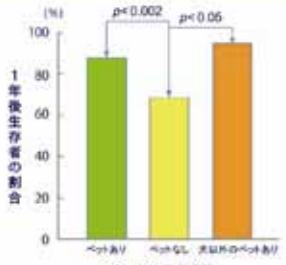
【Slide 8】

人と動物の関係学の

基盤になった研究

【Slide 9】

1．動物がもたらす人の健康への良い効果～心疾患の患者さん～

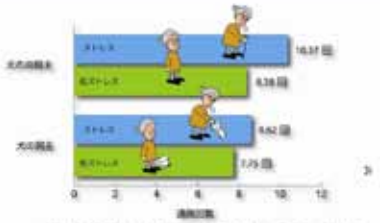



心臓疾患患者の退院後の生存率　(Friedmann et al., 1980)

ペットを飼っている人の方が飼い主でない人と比べると，１年後の生存率が高い

【Slide 10】

2．動物がもたらす人の健康への良い効果～高齢者と医療費～

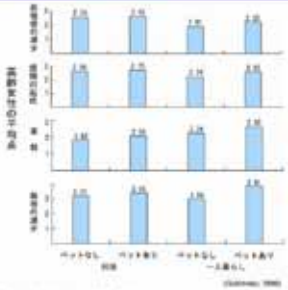



犬を飼うことをストレスの問題として表した平均頻回回数　(Siegel, 1990)

急速な高齢化による国民医療費の増大に対して，早めの予防，健康維持が重要

【Slide 11】

3．動物がもたらす人の健康への良い効果～高齢者～



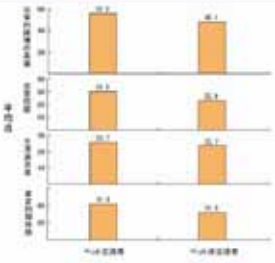

高齢女性の感情評価

一人暮らし、他の人と同居、ペットあり、なしの効果

ペットを飼っている人の方が得点が高い

【Slide 12】

5．動物がもたらす人の健康への良い効果～ペットとの交流～

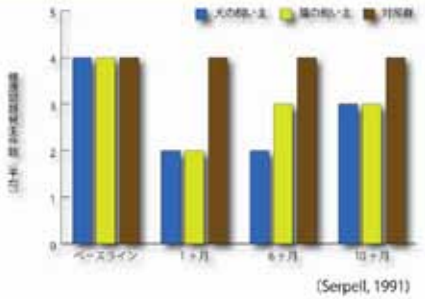


日常的精神の高揚，日常の問題，生活の満足度，肯定的期待感に関するペット交流者と非交流者の平均点　(Miller et al., 1992)

ペット交流者の方が得点が高い

【Slide 13】

4．動物がもたらす人の健康への良い効果～ペットを飼うこと～




(Serpell, 1991)

犬や猫を飼うと日常的な健康問題が減少する

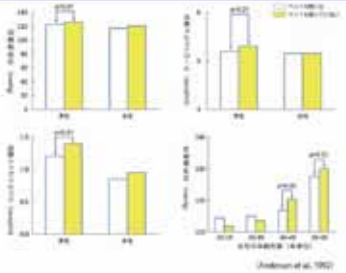
【Slide 14】

動物（ペット）の飼育、
あるいは動物とのふれあいによって

人のからだにどのような
変化が起きているのか？

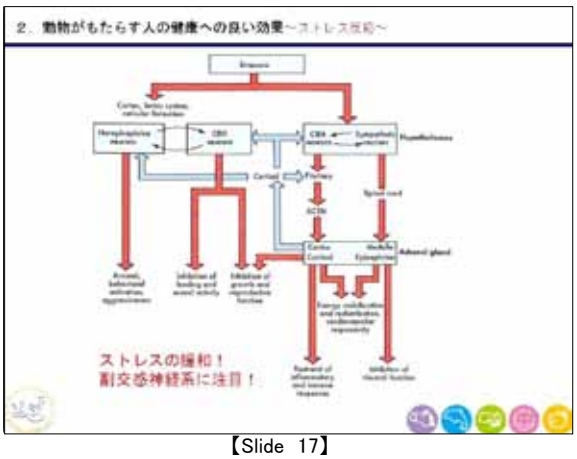
【Slide 15】

1．動物がもたらす人の健康への良い効果～生理的効果～

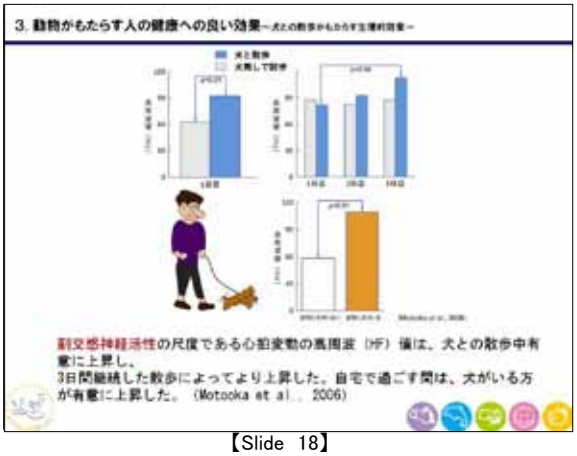


男性のペットの飼い主は、収縮期血圧と血漿コレステロール、血漿トリグリセリド値が低い。４０歳以上の女性において、ペットを飼っている人の方が収縮期血圧が低い。(Anderson et al., 1992)

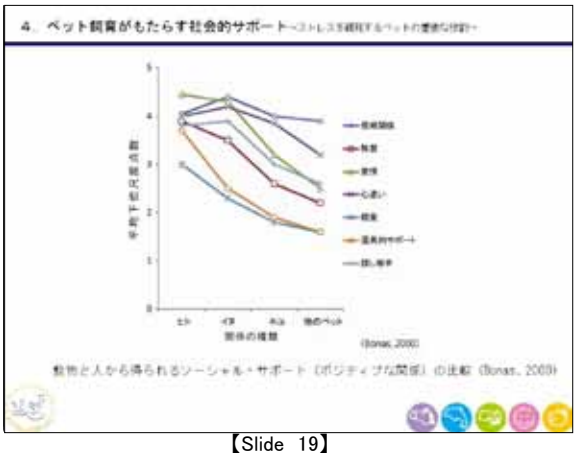
【Slide 16】



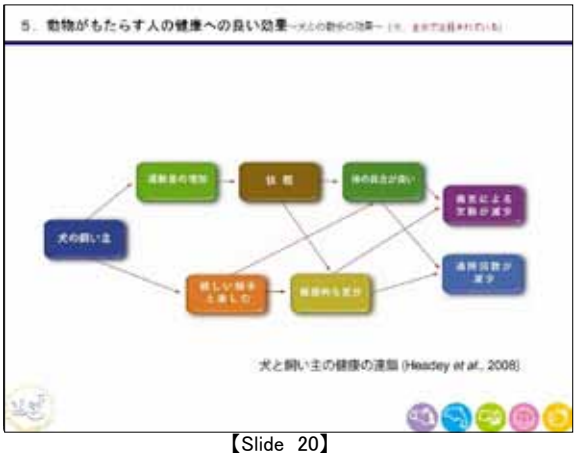

【Slide 17】



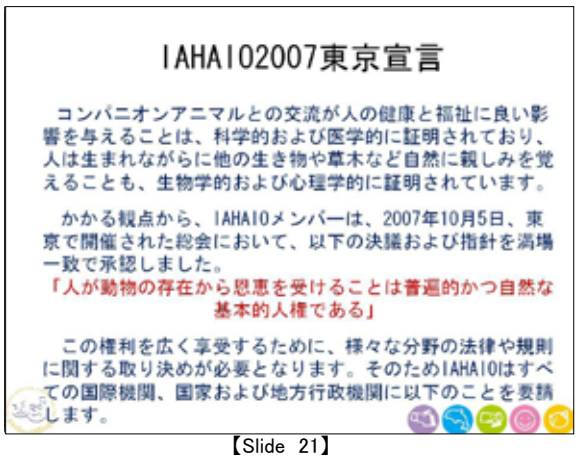

【Slide 18】




【Slide 19】




【Slide 20】

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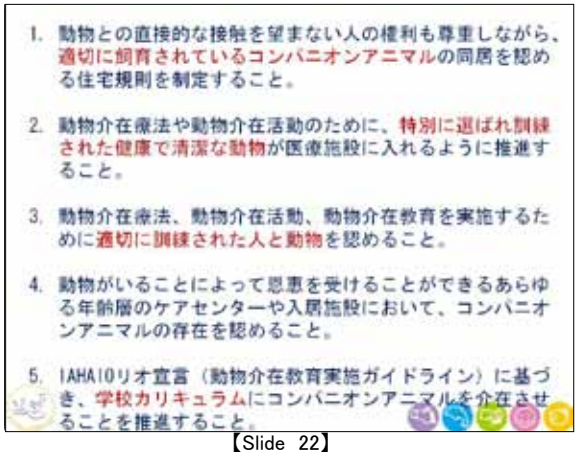


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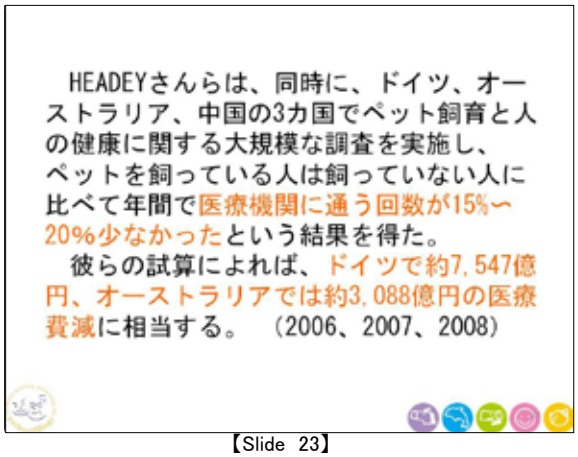


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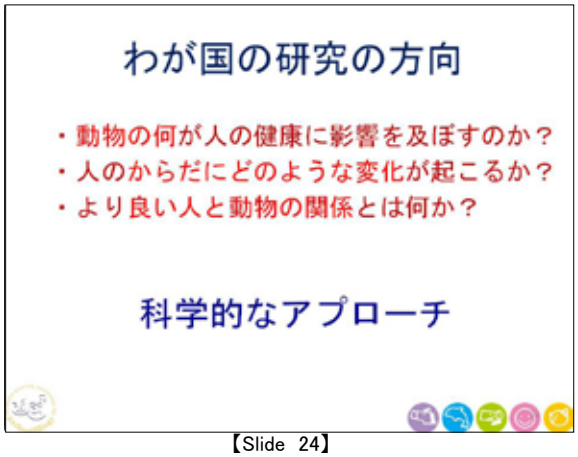


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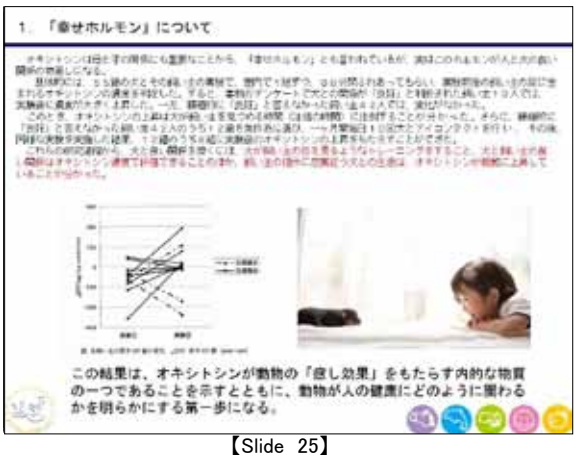


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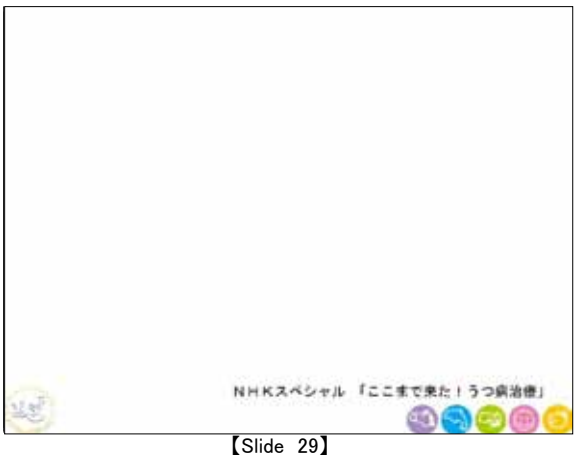
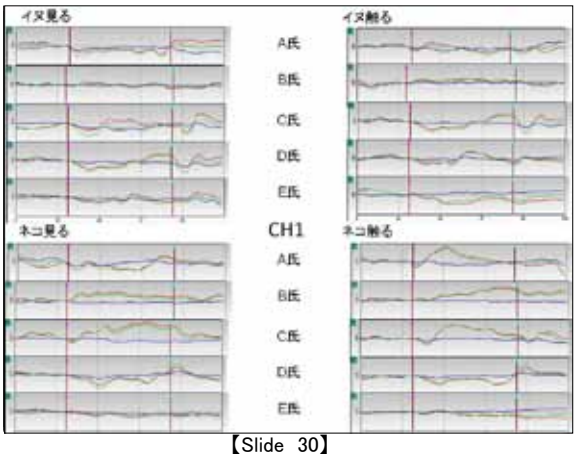


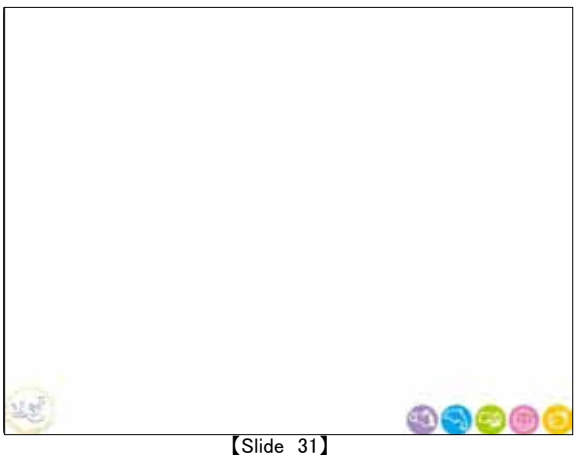

【Slide 29】


【Slide 26】




【Slide 30】


【Slide 27】



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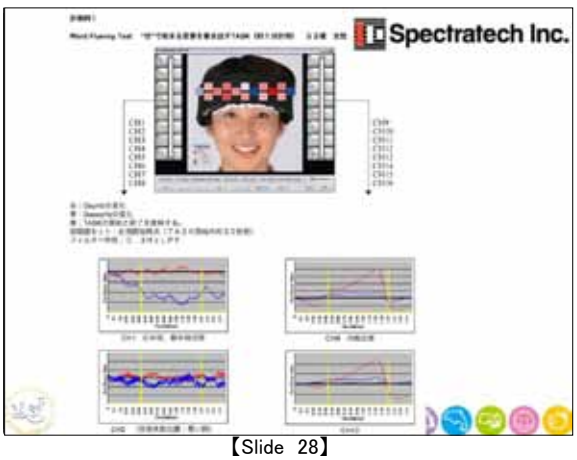
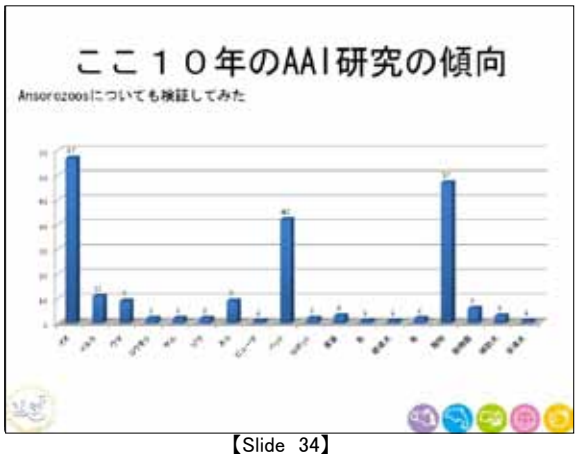



【Slide 28】

【Slide 32】


【Slide 33】

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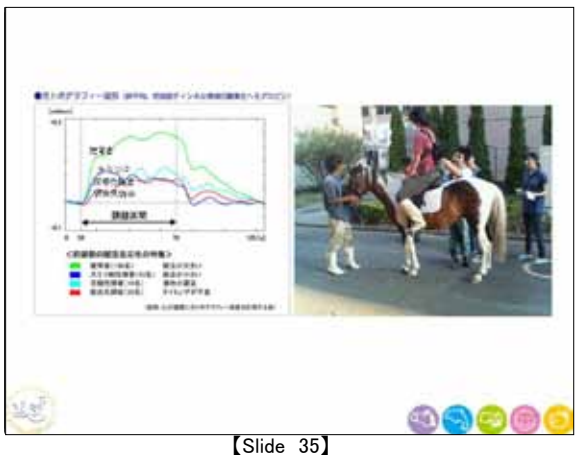

【Slide 35】