A Fine-Grained Image Classification Approach for Dog Feces
Using MC-SCMNet under Complex Backgrounds

Simple Summary: Currently, more and more people keep dogs, and the gastrointestinal diseases of pet dogs have brought great losses to families. However, the condition of the dog's feces is closely related to the health of its stomach and intestines. We can know the intestinal condition of dogs in advance by scoring dog feces, and implement measures such as food adjustments. The PURINA FECAL SCORING CHART and the WALTHAM™ Faeces Scoring System are good at scoring dog feces visually, but some scoring experience is required. Therefore, this paper proposes an artificial intelligence method to automatically classify the condition of dog feces by combining their classification criteria with the assistance of animal experts. This method can achieve an accuracy of 88.27%, improving the diagnostic efficiency of veterinarians.

Abstract: In a natural environment, factors such as weathering and sun exposure will degrade the characteristics of dog feces; disturbances such as decaying wood and dirt are likely to make false detections; the recognition distinctions between different kinds of feces are slight. To address these issues, this paper proposes a fine-grained image classification approach for dog feces using MC-SCMNet under complex backgrounds. First, a multi-scale attention down-sampling module (MADM) is proposed. It carefully retrieves tiny feces feature information. Second, a coordinate location attention mechanism (CLAM) is proposed. It inhibits the entry of disturbance information into the network's feature layer. Then, an SCM-Block containing MADM and CLAM is proposed. We utilized the block to construct a new backbone network to increase the efficiency of fecal feature fusion in dogs. Throughout the network, we decrease the number of parameters using depthwise separable convolution (DSC). In conclusion, MC-SCMNet outperforms all other models in terms of accuracy. On our self-built DFML dataset, it achieves an average identification accuracy of 88.27% and an F_1 value of 88.91%. The results of the experiments demonstrate that it is more appropriate for dog fecal identification and maintains stable results even in complex backgrounds, which may be applied to dog gastrointestinal health checks.

Dogs are one of the first domesticated animals in the world and are widely bred for their docile temperament. Living with a pet dog can relieve stress [1] and even provide medical psychological support [2]. Therefore, people pay more and more attention to the health and physical condition of dogs [3,4]. In the breeding process, if the dog is sick and not treated in time, the breeder will suffer both economic and spiritual losses [5]. Therefore, it is very important to discover the dog's condition in time and take treatment measures in advance. Due to the complex and changeable breeding environment or the different physical levels of dogs, dogs are often affected by parasitic infections [6], gastrointestinal biota disorders (dysbiosis) [7], stress disorders [8], etc., often accompanied by various gastrointestinal diseases [9], such as irritable bowel syndrome [10], chronic enteropathy [11], chronic diarrhea [12], etc. Observing the shape and consistency of their feces can reveal the characteristics of gut microbes [13], which can help breeders and veterinarians judge the dog's intestinal status [14], and provide feedback on the abnormal health of the dog's gastrointestinal tract.

At present, the analysis methods of feces include: experimental analysis, manual detection, machine learning, and deep learning. Experimental analysis can comprehensively detect the microorganisms and chemical components in feces [15], but it can only rely on professional equipment and medical laboratories [16], and the detection cost is high. The vast majority of methods are manual inspection, which is usually visually judged by a veterinarian on the shape, size, quality, and color of a fecal sample [17]. Based on this information, veterinarians can give early warning of potential crises in dogs' intestinal health and provide dogs with targeted food menus [18]. The PURINA FECAL SCORING CHART [19] and the WALTHAM™ Faeces Scoring System [20] are the most common stool scoring manuals. Stool score can reflect intestinal health [21]. According to them, novices can also classify dog feces, but certain experience in judging is also required, because

the manual only provides individual pictures for reference [22]. However, manual stool analysis still requires a significant amount of time, even when scored according to the manual. Analyzing feces day in and day out is embarrassing, unsanitary, labor-intensive, and difficult for the owner to maintain [23,24]. In addition, because of the inconsistency of classification standards, human subjective judgment will also affect the accuracy of classification [22]. With the development of computer technology, many researchers have introduced machine learning methods into the field of healthcare [25]. This makes it possible to automatically classify images of dog feces. Humans automatically classify input feces images by manually designing features. This approach greatly speeds up the scoring of stools. However, handcrafted features are complex and have limited detection accuracy. The deep learning that emerged later, its end-to-end network structure simplifies manual feature design and further improves the accuracy and speed of classification. This paper will provide a reference for the automatic classification task of dog feces by image classification technology based on deep learning. The method in this paper can provide a priori screening before a comprehensive diagnosis by a veterinarian, and achieve an initial early warning of gastrointestinal diseases in dogs [26]. In the absence of a veterinarian, or for an owner without a medical background, the method in this paper can also be used to evaluate the dog's feces and make targeted food adjustments [27].

The present FGVC (Fine-Grained Visual Categorization) of dog feces (Figure 1) has three problems that need to be addressed: (1) Natural environment can cause qualitative changes in feces. Dog feces are usually seen in outdoor areas. Freshly ejected feces have distinct characteristics; however, when exposed to natural settings such as wind drying, sunshine, and rain, the available information for identification is loss. Thismakes it difficult to gather enough information for standard network down-sampling operations [28,29]. (2)Misidentification of things as dog excrement. The environment in which feces are located is complex and diverse. In terms of morphological trait (shape, color, etc.), dead leaves, dirt, and broken limbs are similar to dog excrement. These items can be particularly disruptive to the categorization process when they exist simultaneously [30]. (3) Less interclass variation in dog feces. When a dog is moderately unwell, its feces are comparable to healthy ones. Only a very experienced veterinarian can correctly anticipate a dog's illness at this time [31]. This can make checking a dog's health condition considerably more costly.

3.1. Materials Acquisition

The dataset of dog feces served as the foundation for the paper. We collected a significant number of dog feces photos to create the dog feces differentiated by moisture level (DFML) dataset. We based on the PURINA FECAL SCORING CHART [19] and the WALTHAM™ Faeces Scoring System [20]. On the advice of Zuofu Xiang [59,60], the stool images were classified into four categories based on their moisture contents: diarrhea, lack of water, normal, and soft stools. In addition, we cleaned invalid images according to the following criteria: (1) complete loss of stool characteristics; (2) images that are wobbly and blurry; (3) excessive light exposure or inadequate light. Finally, 1623 valid photos were obtained, and Table 1 shows the features and amounts of images in each category. The images in the DFML dataset consist of two parts. One part was captured by Canon EOS R6 in natural light, with 1412 images from Hunan Provincial Animal Hospital, White Sand Kennel, Changsha Small Animal Protection Association; the other part was screened on the Internet, with 211 images.

Class : Lack of water
Charcteristics :
   The texture is firm and the surface is dry.
   Part of the feces is well defined, with a virtually
   spherical form, and the other part is
   concave and long sausage shaped.
   The texture is firm and the surface is dry. Pa4r8t2o f
   the feces is well defined, with a virtually spherical
   form, and the other part is concave and long

sausage shaped.

Class : Normal
Charcteristics :
    On the surface, there are some obvious fissures
    that form a serpentine curve

Class : Soft stool
Charcteristics :
The surface is lustrous and smooth, with a soft
touch and irregular shape

Class : Diarrhea
Charcteristics :
Gooey, highly fluffy, and irregular in shape,
partly liquid

The following are detailed descriptions of the four categories of feces: (1) Lack of
water, with a dry surface and a hard texture. Sometimes the feces are roughly spherical in
form, while other times it resembles a concave-convex strip. (2) Normal dog feces have
visible gaps, commonly in the shape of a long snake. (3) Soft stools have a smooth and
soft texture, a shiny finish, and an irregular form. (4) Diarrhea is sticky, extremely soft and shapeless, and
occasionally liquid. There are also similarities in the characteristics of the
categories, such as (1) and (2) lengthy strips, (2) and (3) similar surface color, and (3) and
(4) shapelessness. These traits cause disturbances in the categorization of dog feces and
researching them has practical significance for FGVC.

Occasionally, pet owners and our customers ask us about the meaning of their dog's
poo. We all know that whatever comes out from our canine's tummy most likely is
due to what goes into it. (Note: Food usually is the reason for poop problems, but
there are other non-food related factors too). We'll look into 8 poop issues and share
what they mean below. We'll cover non-food related reasons too. 💩

Why you should learn the meanings of your dog's poop

Most pet owners will rather explore home remedies first to resolve minor problems
with their pets. Our dog's stools are one of the most significant and frequent
indicators of its health. Even our Rara also poo at least twice a day. 😁 So our dog's
stools can help to update us about the state of its health.

If anything happens to our dog's poop in the future, we are the first line of
diagnosing. If you know the stool meaning, you will be able to better manage your
dog's pooping situation! 💪

Here we go – 8 different poop or stool meanings

1. Lao sai – Watery poo (Diarrhea)

Poop Meaning – Lao Sai – By Pawmeal

Ok, let's start with lao sai. (Some of you may not feel very pleasant as you are reading this 😊). One of the more common poop problems is when your dog's poo becomes spurts of liquid. When you see that your dog lets out a puddle of poop, the potential cause can vary. Some of the more common causes can be:

- Food related – Your dog probably cannot accept or adapt to the sudden switch to the new dog food. This may not necessarily mean that the new dog food is a big NO, but it may also mean that the transition is not gradual enough. Try giving 1-2 more days, while drastically reducing the amount of new dog food (mix with original). If there is still no improvement in the poop, then stop the new dog food. If the poop improves in form and becomes more solid, then it's great news. You can then slowly increase the new portion gradually until it completely replaces the original food.
- Another example could be eating something that should not be eaten, given your dog's unique body condition. This will require some food elimination to sieve out the culprit ingredient.
- Environmental – It could be some stressful event like a new family member, change of environment or living conditions.

- Other types of consumption – It may be because of medication, or consumption of water that is not suitable for drinking.
- An early warning sign of disease or infection – A more extreme possibility is that your dog's poop may indicate something serious in the body.
  Most of us will want to adopt a "wait and see" approach, hoping that the symptoms can become better. But the symptom can be minor, or it can be the start of something serious. We cannot regret it later when it is too late. So let's try to strike a balance. Here's our (and most vets') advice: If the situation does not improve after 2-3 bowel movements, it is time to visit the vet.

2. Soft, loose stools (Loses shape when picked up)

Poop Meaning – Soft Loose Stools – By Pawmeal
If your dog suddenly has soft, loose poop, there are usually 2 questions to ask as a pet owner.

- First, have you suddenly introduced or changed a new type of food to your dog's diet? It can be due to a sudden switch from feeding kibbles to fresh food. Or brand A kibbles to brand B kibbles. If your dog develops loose stools because of this, it is usually not a bad thing. However, to be kinder to your dog's stomach, it is always advisable to introduce any type of food in a slower, gradual transition. It may be very tempting to stop the change immediately, but pets' bodies take time to adjust. Give a few days, and monitor your dog's poop. If the poop is still loose, perhaps an alteration to the diet may be required (may not be a wholesale change). Otherwise, start again by feeding just ¼ of the new food and keeping ¾ of the existing food.
- The second question to ask is whether your dog has consumed food that its body is not accustomed to. It may be a once-off treat, or something that your dog bit away when no one

was watching. This may be difficult to trace, but it is an important process to remember before considering other measures. Too many parents become easily alarmed when they notice a slight change in their dog's poop.

We also note that some pet owners are worried of soft poop and rather stick to only 1 type of food permanently. We also do not encourage that, because to have a comprehensive and balanced diet over time, dogs need to have more variety in their food intake. Eating with variety helps them develop a stronger, resilient body and reduces allergies risks. If you are worried about soft stools, start small by feeding bit by bit. See if there is any adverse reaction before gradually increasing feeding amounts.

3. Very hard, pebble-like stools (Constipation)

Poop Meaning – Hard Pebble Like Stools – By Pawmeal
Very hard stools are not a good sight and not a positive sign for your dog either. However, fret not, as it is quite common for dogs to experience constipation.

One of the most common reasons for constipation is due to a predominantly dry kibble diet. There are usually too much dietary fibre present in kibbles and they do not contain any water. Some dry food manufacturing companies even use sawdust to bind kibbles.

Here are some of the typical causes for very hard stools:

- Food related – Dry dog food diets are lacking in moisture and often too high in dietary fibre. Think of yourself eating biscuits a whole day. Your poop next day will also likely be hard.

- Not enough water – Your dog probably needs to drink more water or are feeling dehydrated. Try to get your dog to drink more water. We have some interesting ways to make Rara drink more water and we'll share more separately! It is important to make sure your dog hydrates sufficiently.
- External body condition – There may be insufficient grooming especially at the back end, which means matted hair near the back side which makes pooing difficult.
- Habitual reasons – Lazy dogs who do not exercise enough can also pass out hard stools. Same for those who have tendency to self groom excessively, and you can see if the poop contains dog hair.
- More serious issues – There may be infection in the anal glands, or some hard foreign objects which are stuck in the intestinal tract, such as bones, gravel, or plastic. This may be hard to detect, and if you have ruled out the above reasons, then it may be better to seek a doc's opinion.

4. Poops in large amounts

Poop Meaning – Large Amounts Stools – By Pawmeal
One of the main reason for large, voluminous amount of poops is due to processed kibbles. Sometimes, the amount of poop is comparable to ours'! 😊 Kibbles usually contain high amounts of carbohydrates and fibre, such as soybean, beet pulp, and rice hulls. Higher carbohydrates and fibre mean more poop. It's like us eating more rice and bread, and in the end passing more motion.

Furthermore, both our dogs' and our own bodies are unable to absorb the "not-so-useful" nutrients from the food we eat, such as carbohydrates. If the body does not absorb the food, they pass out as stool. So if your dog ejects lots of poop frequently, it may mean that it is not absorbing its food fully. In that case, you need to inspect and question the quality of the food.

5. Poop is very smelly

Poop Meaning – Smelly Poop – By Pawmeal

If you have been feeding kibbles all this while, try to switch to home cooked food for a few meals. Or you can try freeze-dried, raw or dehydrated options. And compare your dog's poop smell.

Actually, dogs eating kibbles tend to produce stinkier poop because they are not used to absorbing bigger amounts of grains, starches and "grain-free" options containing peas and potatoes. When these food are not absorbed fully, your dog's digestive system does not know what to do with the food, and they pass out eventually as poop.

6. Mucus in / around dog's stool

Poop Meaning – Mucus Around Poop – By Pawmeal

If you see your dog's stool that looks slimy with a coating of mucus-like substance around or in it – it may make you worried. Common issues may be due to an inflamed colon or mild inflammation in the gut. It may also be due to parvovirus or parasites. While it is advisable to be careful, there is usually a good chance that the mucus will clear up after a few rounds of bowel movement (a couple of days). If after a couple of days, your dog's poop still contains mucus, you can then consider next course of action, ie. visit vet.

But before that, try to give your dog a 1-2 days to restore balance in its body on its own (Remember, if you want to "wait-and-see", 2-3 bowel movements is the max!) If the poop is still the same, please visit your favourite vet.

7. Dog pooping blood
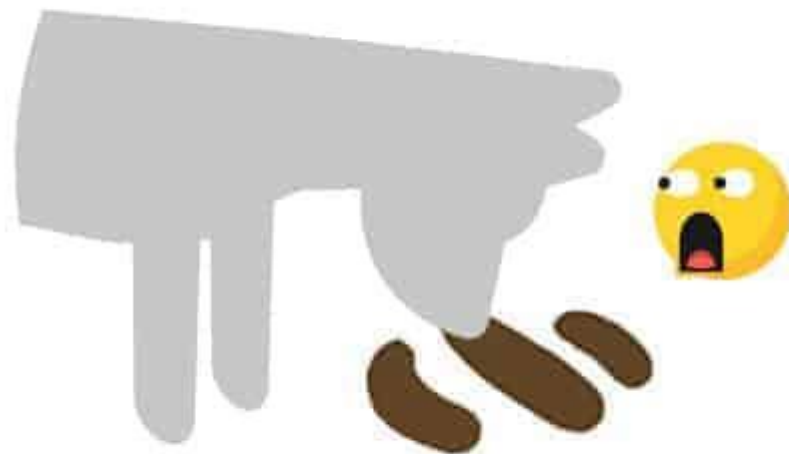
Poop Meaning – Blood In Poop – By Pawmeal

Stay calm if you see blood in your dog's poop! The colour can be fresh red or very dark red. However, the causes can range from relatively minor to very serious.

A minor issue will be because the stools are too hard which causes abrasion when it is coming out.

A more serious case will be due to parasites or worms in your dog's body which is causing wounds. Extreme issues will be due to the presence of possible ulcers or tumours.

Again, if after 2-3 bowel movements and blood still persists, it's time to bring your dog to the clinic. Don't wait any longer! Don't let any potential health problems deteriorate. Bring a sample of the blood stained poop if possible too. (This will be helpful for further diagnosing!)

Extra – 8. Coprophagia – My dog is eating its own poop!

Poop Meaning – Dog Eat Own Poop – By Pawmeal
The medical name of dog eating own poop is called coprophagia. 🔍

This is more of a behavioural issue than issues with the poop itself. But if your dog is eating its own poo, it may be due to any of the following:

- Behavioural – Your dog may be seeking attention, too bored, got inspired by other dogs or think that eating poo is a way to please you. Stressful dogs or dogs who love cleanliness may also display poop-eating actions.
- Nourishment – There may be a deficiency in certain nutrients like enzymes or trace minerals which makes a dog eat its own poop. It may be trying to replenish its nutrient needs by eating its own poop. Underfeeding may also be another reason that causes this too. Dogs are very simple, they are just trying to replenish their body's energy!
- Medical-related – It may be due to parasites in your dog's body which is absorbing the food that is inside its body. This makes your dog crave for its stool to "claim" back its nutrients. More serious diseases like diabetes, thyroid issues can also make your dog extra hungry.

ommon Remedies to Improve Your Dog's Poop (Under Normal Situations)

As Rara's pawrents, we would like to share a few friendly tips to try to improve your dog's poop. These are meant to be considered with caution, and only during the initial discovery of the poop problem. If the poop problem has persisted for more than 2 days, do consider seeking a veterinarian's advice.

If your dog's poop is lao sai (diarrhea, watery poop)

Feed some plain, steamed food that is gentle in your dog's stomach. You can consider steaming food like broccoli and pumpkin, together with your dog's preferred meat and mix together. During this period, giving slightly more vegetables or starches is alright, as the purpose is to help cleanse the body and solidify the stools.

Feeding bones is also another option. A couple of raw or dehydrated chicken or duck feet or wings (do not feed cooked – feed raw, dehydrated, or freeze-dried) may help.

You can also give some pre and probiotics to help with maldigestion, especially diarrhea issues.

If your dog's has soft or loose stools

Feed the current food (especially if it is new) less per meal. Continue for a few meals and monitor the condition of the poop for a couple of days. See if the loose stool improves.

You may want to consider adding a small quantity of mashed steam pumpkin to your dog's current (new) food.

Give plenty of clean water during this period too.

If your dog's poop is extremely hard (constipation)

Get your dog to drink more water! If your dog drinks by itself from the bowl, then it is great. If your dog refuses to drink, you can consider adding some water to his favourite food, or giving some steamed vegetable and meat broth.

Our Rara has this problem of not wanting to drink more water. As Rara is on homecooked food diet, we sometimes also add warm water to her food to make it taste like soup spoon. We also make her water bowl more 'palatable' by adding some meat-related stuff (gravy, juice, tiny meat bits) to water and she will slurp it all. ☺ These are our ways to let her drink more water. ☺

You can also add some dietary fibre like green leafy vegetables or mashed steamed pumpkin to your dog's food.

When to call the vet because of diarrhoea, loose stool or constipation?

If after more than 2 bowel movements or more than 2 days and the diarrhea or constipation still persists.

When the diarrhea or constipation occurs irregularly, especially when your dog recovers and then experiencing the same problem again (more than 2-3 times). This can potentially indicate a presence of worms.

When the diarrhea or constipation comes with blood, and lasts more than 2-3 bowel movements (or more than 2 days).

If your dog experiences vomiting, fever or behavioural change together with diarrhea or constipation – then you need to consult the vet immediately.

강아지 대변의 모양과 색깔에 따른 증상 및 원인 분석 보고서

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1. 서론

강아지의 대변은 반려동물의 건강 상태를 파악하는 중요한 지표입니다. 대변의 모양과 색깔은 강아지의 소화기 건강, 식습관, 질병 여부 등을 알려줍니다. 본 보고서에서는 강아지 대변의 모양과 색깔에 따른 증상과 그 원인을 분석하고, 사료나 간식, 건강 상태 등이 대변에 미치는 영향을 다룹니다.

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2. 대변의 모양에 따른 증상 및 원인

강아지 대변의 모양은 그들의 소화 상태와 밀접한 관련이 있습니다. 아래는 모양에 따른 주요 증상과 그 원인을 설명한 것입니다.

2.1 정상적인 모양
- **특징**: 대변이 균일하고 단단한 모양을 하고 있으며, 쉽게 집을 수 있을 정도로 견고합니다.
- **원인**: 균형 잡힌 식단과 정상적인 소화기 건강 상태를 의미합니다.

2.2 묽은 대변 (설사)
- **특징**: 대변이 물기가 많고 묽은 상태입니다.

- **원인**:
    - **급격한 식단 변화**: 새로운 사료나 간식을 갑자기 섭취했을 때 발생할 수 있습니다.
    - **소화기 질환**: 장염, 기생충 감염, 바이러스성 질병 등이 원인이 될 수 있습니다.
    - **음식 불내증**: 특정 음식에 대한 알레르기 반응이나 불내증으로 인해 발생할 수 있습니다.

2.3 덩어리진 대변
- **특징**: 덩어리로 뭉쳐 있지만, 일반적으로 정상적인 대변보다 약간 더 단단한 상태입니다.
- **원인**:
    - **섬유질 부족**: 사료에 섬유질이 부족할 경우 대변이 덩어리질 수 있습니다.
    - **탈수**: 물을 충분히 섭취하지 못했을 때 발생할 수 있습니다.

2.4 매우 단단하고 건조한 대변
- **특징**: 대변이 매우 단단하고 건조하며, 배변 시 강아지가 힘들어할 수 있습니다.
- **원인**:
    - **수분 부족**: 물 섭취가 부족할 때 나타날 수 있습니다.
    - **변비**: 섬유질이 부족하거나 운동량이 적을 때 발생할 수 있습니다.
    - **특정 사료**: 너무 고단백 사료를 먹일 경우 대변이 단단해질 수 있습니다.

2.5 점액질이 포함된 대변
- **특징**: 대변에 점액이 섞여 있습니다.
- **원인**:
    - **대장 염증**: 대장의 염증으로 인해 점액이 대변에 포함될 수 있습니다.
    - **기생충 감염**: 기생충으로 인한 장 염증이 원인일 수 있습니다.

2.6 혈변
- **특징**: 대변에 피가 섞여 있거나 붉은색을 띕니다.
- **원인**:
    - **직장 출혈**: 대장이나 직장의 출혈로 인해 발생할 수 있습니다.
    - **심각한 장염**: 중증의 장염, 기생충, 혹은 중독 등의 원인이 될 수 있습니다.

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3. 대변의 색깔에 따른 증상 및 원인

강아지 대변의 색깔은 건강 상태를 반영할 수 있습니다. 아래는 색깔에 따른 증상과 원인을 설명한 것입니다.

3.1 갈색 (정상)
- **특징**: 대변이 일반적으로 갈색을 띄며, 이는 정상적인 상태입니다.
- **원인**: 균형 잡힌 식단과 정상적인 소화 과정의 결과입니다.

3.2 빨간색
- **특징**: 대변이 빨간색을 띕니다.
- **원인**:
  - **직장 출혈**: 직장이나 하부 소화기관의 출혈이 원인일 수 있습니다.
  - **식단 영향**: 빨간색을 띄는 간식이나 음식을 섭취했을 때도 일시적으로 나타날 수 있습니다.

3.3 검은색
- **특징**: 대변이 검은색을 띕니다.
- **원인**:
  - **상부 소화기관 출혈**: 위나 소장의 출혈로 인한 혈액이 소화되어 검은색을 띌 수 있습니다.
  - **철분 보충제**: 철분이 많이 함유된 음식이나 보충제를 섭취했을 때도 검은색 대변이 나타날 수 있습니다.

3.4 흰색
- **특징**: 대변이 흰색이나 회색을 띕니다.
- **원인**:
  - **쓸개즙 부족**: 간이나 쓸개의 문제로 인해 쓸개즙이 충분히 공급되지 않을 때 발생할 수 있습니다.
  - **특정 사료**: 칼슘이 많이 함유된 특정 사료를 섭취했을 때도 흰색 대변이 나타날 수 있습니다.

3.5 녹색
- **특징**: 대변이 녹색을 띕니다.
- **원인**:
  - **식단 영향**: 녹색 채소나 특정 보충제를 섭취했을 때 나타날 수 있습니다.
  - **쓸개즙 과다**: 대변이 소화기관을 빠르게 통과하면서 쓸개즙이 충분히 분해되지 않은 경우 발생할 수 있습니다.

3.6 노란색
- **특징**: 대변이 노란색을 띕니다.
- **원인**:
  - **췌장 문제**: 췌장의 소화 효소 부족으로 인해 지방이 제대로 소화되지 않을 때 나타날 수 있습니다.
  - **특정 식단**: 노란색 색소가 들어간 음식이나 간식을 섭취했을 때도 일시적으로 나타날 수 있습니다.

3.7 회색
- **특징**: 대변이 회색을 띕니다.

- **원인**:
    - **간 문제**: 간 질환으로 인해 담즙이 제대로 생성되지 않을 때 발생할 수 있습니다.
    - **특정 약물**: 일부 약물의 부작용으로 인해 대변이 회색을 띌 수 있습니다.

3.8 보라색
- **특징**: 대변이 보라색을 띕니다.
- **원인**:
    - **식단 영향**: 보라색 과일이나 채소(예: 비트)를 섭취했을 때 나타날 수 있습니다.
    - **심각한 소화기 문제**: 이는 드문 경우지만 심각한 소화기 질환의 신호일 수 있습니다.

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4. 결론

강아지의 대변은 반려동물의 건강 상태를 즉각적으로 반영하는 중요한 지표입니다. 대변의 모양과 색깔에 따라 다양한 건강 상태를 예측할 수 있으며, 이를 통해 빠르게 적절한 조치를 취할 수 있습니다. 반려견의 건강을 유지하기 위해서는 평소 대변의 상태를 주의 깊게 관찰하고, 이상이 발생할 경우 적절한 수의학적 검사를 받는 것이 중요합니다.

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5. 참고 문헌

- [강아지 소화기 건강에 관한 최신 연구 자료]
- [반려견 대변 색깔에 따른 건강 문제 분석]
- [강아지 영양학과 사료 종류에 따른 대변 변화 연구]

위 보고서는 강아지 대변의 모양과 색깔에 따른 증상과 원인을 체계적으로 정리하였습니다. 워드 문서로 작성할 때는 이 내용을 기반으로 서식과 레이아웃을 구성하면 됩니다.