

University of Veterinary Medicine

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**Rehoming of laboratory beagles: ethical considerations, animal welfare, and the impact on research practices**

Beagle fajtájú laboratóriumi kutyák kihelyezése: etikai megfontolások, állatjólétre és a kutatási gyakorlatra gyakorolt hatás

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## **Abstract**

Although rehoming of laboratory beagles has gained significantly in interest over the past years, studies on this practice remain scarce. Exploring a range of relevant animal welfare considerations, this thesis examines the question of whether the work of rehoming and fostering can allow laboratory animals, such as the often-used beagle, to have a chance at a better life. Building on a comprehensive literature review on the beagle as a laboratory animal, the study discusses ethical considerations concerning both the use and the rehoming of such animals. Utilizing data on laboratory animals from the United States, the United Kingdom, and the European Union, the study evaluates post-laboratory options for these animals. Despite a lack of reliable data and few studies on the topic, the study finds an overall positive view on rehoming as a viable option for laboratory animals and discusses how rehoming can encourage the adoption of more ethical research practices.

## **Hungarian Abstract**

Bár az elmúlt években jelentősen megnőtt az érdeklődés a laboratóriumi kutyák kihelyezése iránt, továbbra is kevés az ezzel a gyakorlattal kapcsolatos tanulmány. Jelen dolgozat számos releváns állatjóléti szempontot figyelembe véve azt a kérdést vizsgálja, hogy az ilyen egyedek örökbefogadása, illetve a végleges-, vagy ideiglenes befogadók munkája lehetővé teheti-e, hogy a laboratóriumi állatok, például a gyakran használt beagle fajtájú kutyák esélyt kapjanak egy jobb életre. A tanulmány a beagle fajtájú kísérleti kutyákra fókuszálva, átfogó szakirodalmi áttekintésre építve tárgyalja az ilyen állatok felhasználásával és kihelyezésével kapcsolatos etikai megfontolásokat. Az Egyesült Államokból, az Egyesült Királyságból és az Európai Unióból származó kísérleti állatokra vonatkozó adatok felhasználásával a tanulmány értékeli az ilyen állatok laboratóriumi kihelyezésének lehetőségeit. A megbízható adatok hiánya és a témával kapcsolatos kevés tanulmány ellenére a tanulmány összességében pozitívan ítéli meg a kísérleti állatok kihelyezését, mint a laboratóriumi állatok lehetséges sorsát a vizsgálatokat követően, és megvitatja, hogy a kihelyezés hogyan ösztönözheti az etikusabb kutatási gyakorlat elfogadását.

## **Abbreviations**

ACLAM: The American College of Laboratory Animal Medicine

ADP/SPF: Antibody Profile Defined/Specific Pathogen FREE

ALURES: Animal Use Reporting- EU System

APHIS: The Animal and Plant Health Inspection Service

ASPA: The Animals (Scientific Procedures) Act 1986

ASRU: The Animals in Science Regulation Unit

AWA: Animal Welfare Act

AWARs: Animal Welfare Act Regulations

EU: European Union

FCI: Fédération Cynologique Internationale

FELASA: Federation of European Laboratory Animal Science Association

IACUC: Institutional Animal Care and Use Committee

LAS: Laboratory Animal Science Association

NDR: Nord, Deutscher Rundfunk

OGTT: Oral glucose tolerance test

PETA: People for the Ethical Treatment of Animals

The3R's: Guidance for ethical use of Laboratory animals: Replacement, Reduction, Refinement

UK: United Kingdom

US: United States

USDA: The United States Department of Agriculture

WHO: World Health Organisation

ZEBET: Zentralstelle zur Erfassung und Bewertung von Ersatz- und Ergänzungsmethoden zum Tierversuch

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# 1. Introduction

Veterinary medicine is not only the job of the classic practitioner, state veterinarian, or food veterinarian. Veterinarians treat all animals, including laboratory animals if necessary, and veterinary students are often introduced to these animals early in their studies. In the case of laboratory animals, more so even than with pets or farm animals, the veterinarian must have an open eye for not only the health status of the animal but also the general well-being. However, when it comes to animal welfare, not everyone can agree on what is right or wrong, especially in the case of a species such as the dog, which is kept as a pet, as man's best friend. The dog has long been used as the subject of many animal experiments. The purpose of the study may require the animals to be sacrificed, but in many cases, this is not necessary, so the animals can be kept alive. The question may arise as to what the fate of the surviving dogs will be.

The following literature review discusses several aspects of the use and the rehoming of laboratory beagles, examining the question of whether the work of rehoming and fostering can allow laboratory animals, such as the often-used beagle, to have a chance for a better life. The inspiration for this work comes from the student having continuously worked with the laboratory beagles of the University of Veterinary Medicine of Budapest over several years, trying to find homes for them, and realizing how highly animal welfare work should be acknowledged. After a discussion of the reasons why beagles in particular are often chosen to be laboratory animals and how they are treated in research facilities, the study delves into the post-laboratory options for these animals, discussing the state of the literature on rehoming chances given post-traumatic stress in animals as well as ethical considerations for fostering and rehoming. Finally, it is also considered how rehoming can encourage the adoption of more ethical research practices.

## 2. Literature Review

### 2.1. Experimental Animals

According to Article 1 of the EU directive 2010/63, this article sums up why this directive was established, for whom and to whom it applies. The animals that this applies to are defined as any live non-human vertebrate, including independently feeding larval forms: “fetal forms of mammals as from the last third of their normal development” and live cephalopods [1]. Following this article, it mentions specifically, non-human primates, animals taken from the wild, specifically bred, for use in procedures descendant of such an animal. Also, specifically stray animals are excluded from qualifying as laboratory animals. In laboratories, you can find a variety of animals mostly rodents, but also include cows, horses, goats, reptiles, and cats and dogs. The different animals can be seen searching for statistics in the ALURES Statistical EU Database, which stands for animal use reporting system compares the use of laboratory dogs to other species [2, 3]. In the US. the institution to ensure that the Animal Welfare Act is acted upon is The United States Department of Agriculture, USDA, which has a subunit the Animal and Plant Health Inspection Service, APHIS. The APHIS collects data on the usage of animals used by facilities in the US. These reports are undertaken annually but the data obtained is rather limited and excludes for example data on rats and mice. The report of the purpose of the type of research in which dogs are involved is not required [4, 5]. The Animals (Scientific Procedures) Act 1986, ASPA, releases an annual, detailed report on statistics of scientific procedures on living animals and one on the regulatory and framework programs. This report very generally conducts information on groups of animals used in experiments [6, 7].

Experiments need to fulfill certain standards to be granted, concerning the animals when there are no different options to receive necessary results, but a living animal is allowed to use these. Furthermore, the minimum number of animals should be used to conduct the results and the animals should endure the least possible amount of pain, distress, or lasting harm. Death as a result should be at best avoided or if necessary, only as few animals as possible should be euthanized and a painless death should be assured. Caretaking and adequate housing are needed for the animals [1].

After establishing the ground rules, we can come to dog breeds used in laboratory experiments. There is a correlation between the generally popular dog breeds and the dogs used most frequently in experiments is not deniable. Evelyn Schulte (2022) composed a table in her paper and states that the publications between 2007 and 2019 show most frequently used breeds were German Shepherds with a percentage of 7.3%, Labrador Retrievers at 6.7%, and Golden

Retrievers at 4.7%. The beagle was represented by only 1.9% of the total 5.7% when breed information was given [8]. Although the beagle was not used as often as expected still, he is one with the most published experimental papers as searching for beagle dogs gave 4790 results on PubMed while using the same search platform and changing the search word for “Laboratory dog” only 1008 results were obtained in 2022 [8]. In the paper by Prescott et al (2004), it is mentioned that the beagle and crossbreeds of these were used as the main breed, but a genetic variety is necessary for certain procedures or specific breed tests [9].

## 2.2. The Beagle

The beagle breed itself is documented in the Federation Cynologique International (FCI) with the number 161 [10]. The beagle originated from Great Britain and was first used as a scent hound. Originally, as stated by the FCI, the beagle derived from a larger foxhound. As foxhounds used to hunt in packs, this trait can also be found in beagles. This makes keeping them in larger groups easier, and thus also a good candidate for living in institutions, colleges, and schools.

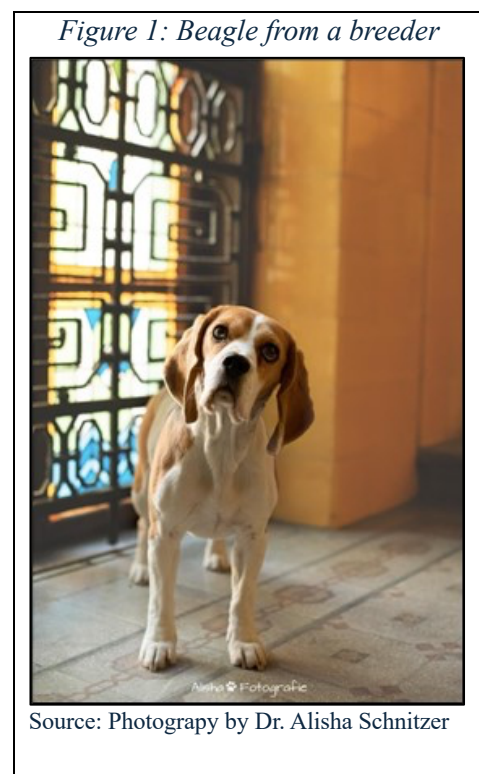
The beagles have originally been bred for hunting purposes and were kept in packs, this is very beneficial for keeping in institutions, colleges, or other schools.

The appearance of the beagle is a medium to small-sized dog; however, the larger, so-called pocket beagle also exists. Beagles are sturdy and sportive, compact dogs.

Evelyn Schulte et al. (2022) examine different breeds used for experimental research, describing the characteristics of the beagle as ideal for functioning as a laboratory dog [8].

## 2.3. The Marshall Beagle

As stated in the „*Guidelines for Breeding and Care of Laboratory Animals*”, published by the World Health Organization and International Council of Laboratory Animal Science Chapter 2 Introduction supply for dogs for such purposes can be found in dog pounds, but the dogs do not always fulfill certain standards [11]. Dogs and cats should therefore be specifically bred for experimental purposes, according to legal requirements.



Marshall beagles are a favored dog breed for laboratory work. The beagles are smaller in stature compared to the common pet beagle breed. Breeding the Marshall beagle started in the nineteenth century [12,13]. According to Allen C. Andersen et al. (1970), the need for more evolved laboratory research and for parameters that are known before and during the experiment of the dogs increased, which is the reason why the Marshall beagle was bred, so genetics, health issues, and experiences from earlier investigations would be known [13]. Breeding of the Marshall beagle was done by a firm, Marshall BioResources, and its genetical material was patented by them. The continuous evolution of the Marshall beagle led to an ADP/SPF Marshall beagle. ADF/SPF stands for Antibody Profile Defined/Specific Pathogen free, which means that it is guaranteed to be free of certain pathogens and is ideal for testing animal vaccines [14]. It was not only the new breed of Marshall beagles bred, but also known breeds were modified to try to reach uniformity.

The Voyage of the Scientific Beagle: Dogs in the Physical and Biomedical Sciences describes the history of the standardized beagle, from the beginning of the mid-nineteen-fifties [15]. One of the reasons described why the beagle was chosen, among his good nature and pack combability were also physical properties like easy-to-groom hair and small size [15, 16]. In the dissertation a comparison between beagles and humans was made and underlines how relatable experimental research is for example for cancer and Alzheimer's research. This is described in various papers, for instance in Boleman B et al. (2022) and Giaurd and Hollin (2016) [12, 16].

#### **2.4. Regulations for Keeping Laboratory Beagles**

The regulations for keeping laboratory beagles are monitored by different organizations in different countries. What they have in common is a principle that should have a high value when it comes to animal welfare in the laboratory facility. The 3 Rs principle, is used to improve the ethical use of laboratory animals, it was introduced about 50 years ago. The three Rs stand for Replacement, meaning if a method is known to experiment without using live animals this alternative should be used. Reduction, reducing the number of animals in a way that the results have a comparable significance with a higher number of animals, and Refinement, refining tests should lead to less pain and suffering for the animal [17]. Ideas evolved to add the rehoming as the 4<sup>th</sup> R into this principle, in the US mandatory adoption bills are enforced in about 10 states, and in even more states discussed [18].



In the US. Animal research is covered by the Public Health Service Policy on Human Care and Use of Laboratory Animals (PHS Policy) which need an Institutional Animal Care and Use Committee (IACUC) to ensure that the institutions function according to the Animal Welfare Act Regulations (AWARs) and follow the Guidelines for the Care and Use of Laboratory Animals. is mainly responsible for the regulations in the US. The field of tasks belongs to evaluating facilities and monitoring the animal welfare situation [19, 20]. The field of tasks belongs to evaluating facilities and monitoring the animal welfare situation. The Guidance on laboratory animals is the Animals in Science Regulation Unit (ASRU) this unit is responsible for ensuring that the Animals (Scientific Procedures) Act 1986 (ASPA) are carried out accordingly. The ASRU is the UK equivalent of the PHS Policy in the US. [21]. It holds animal welfare principles that should be followed in the UK. In the European Union (EU), regulations for animal welfare in laboratory animals also exist, and these are mostly collected in the EU directive on the protection of animals [1]. Generally, the Guide for the Care and Use of Laboratory Animals is an asset to the other regulations and gives recommendations for the keeping and caretaking of laboratory animals [22].

### **2.5. Ethical Problems with the Usage of Laboratory Beagles**

Using laboratory dogs raises multiple ethical concerns that have gained public interest over the past years, as the first thing that comes to mind for many when thinking of using beagles or other animals in the laboratory is the suffering they must endure during the experiments [23]. Ethically this is not a new problem, as stated in the paper by Carbone L (2011) this issue was addressed already in 1970 by updating the Animal Welfare Act (AWA), at least in the USA [23]. Also, Asian countries have elaborated certain guidelines, as stated by Bayne, K et al. (2013). In Singapore, for instance, one can find the Animal and Birds Act Rules 2004 which also consists of additional rules made by experts [24]. In India, the regulations are found in the Prevention of Cruelty to Animals Act 1960 in addition to rules under Acts 1998 and 2001. This was followed by the European Union which updated its 1986 Directive 86/609, which is about the protection of animals used for scientific purposes, in September 2010 [1].

Besides the pain the animals endure, the animals technically never provide any form of informed consent to their participation in the experiment. This leads to the argument that ethically it is questionable to perform experiments without an explicit agreement. This can start a conflict between the animal being seen as an object, and in most countries, the animal is indeed by law defined as an object [25]. The need for consent and the human feeling for the

pain an animal suffers and that by law it is only an object therefore leads to a paradox. Thus, as discussed, after establishing the 3Rs, further improvements in technological alternatives to animal testing have been explored. In vitro or computer simulations, for instance, could potentially reduce animal testing [26–29]. Adopting laboratory beagles can lead to a refinement of animals used for animal experiments as they are needed for a shorter period, but reducing the total amount of animals by reusing animals could also be an approach these two can contradict themselves, but largely depend on the test conducted. Reuse is regulated in Directive 2010/63/EU, in the case of the UK they adapted certain regulations from Directive 2010/63/EU and elaborated on those in the Advice Note 02/2015: Animals (Scientific Procedures) Act 1986: Use, Keeping Alive and Re-use, regulations on reuse are similar to the in the Directive 2010/63 EU (Preamble 25) [30]. This states that Member States need to ensure that an animal that has been already used in one or more experiments can only be used under certain circumstances. Those are the severity of the previous procedure was mild or moderate, the animal has fully recovered from the previous procedure, or the new procedure is classified as mild, moderate, or non-recovery. The reuse should be discussed with a veterinarian, who should take into consideration the life experience of the animal. However, there are exceptional cases of derogations from the laid-out conditions stated previously, and after a veterinarian examination, the authority may allow the reuse of an animal. In these cases, the animal has not been used more than once in a procedure enduring severe pain, stress, or suffering. In the Guide for the Care and Use of Laboratory Animals which are the main guidelines followed in the US. reuse of animals is discouraged as a strategy to aid reduction principles; it is important to have a veterinary evaluation of the animal and ensure that the animal will not suffer or endure pain [22]. Literature explicitly on the reuse of laboratory dogs gave no results. Nevertheless, literature on the reuse of animals in general exists. Rose Kovalcsik et al. (2006) conducted an online survey to obtain information on whether the reduction of animals by reusing them is utilized in laboratory facilities [31]. Approximately 150 facilities were asked to participate and 37% of them answered. Based on the answers received it could be seen that approximately 73% of the institutes reuse laboratory animals. The study revealed that 40 facilities said to reuse animals and that the most reused animals are dogs and primates. Before starting to reuse animals again, because an animal that has been already used can compromise the validity of the new experiment, a “wash-out” phase of 2-4 weeks is practiced. Dogs are reused in 22 out of the 40 facilities. Also frequently reused are primates which were mentioned 18 out of 40 times. Exclusion from reuse could have been, age, health problems due to earlier research, or behavioral well-being. Rose Kovalcsik et al. (2006) state that no clear regulations are made by

various institutions that deal with animal welfare, regarding the reuse of laboratory animals, as this study is older than the change of the Directive 2010/63/EU this does not apply nowadays as this directive regulates reuse of laboratory animals [31]. Another study that deals with a reuse issue was written by J. Silverman et al. (2008). It describes the discussion between T. Pfeiffer who wanted to reuse squirrel monkeys after her experiment and the IACUC on whether this should be accepted. In the Protocol review on the paper of Toby Pfeiffer who wanted to evaluate the learned helplessness in animals using squirrel monkeys and inflicting them with mild electrical shock, to induce the induced helplessness. The IACUC received justification from her saying that she injected herself with the shock and felt moderate pain. Also, the cortisol levels of the monkeys who received shocks were only slightly elevated compared to those of monkeys who were not shocked. Instead of euthanizing the monkey, she suggested sending the monkeys to a colleague after her research was completed so he could reuse the animals. He would retrieve physiological samples from the animals. This was considered reasonable by the IACUC and first led to favoring the idea of reusing the animals, but with further discussion, they concluded that the issue was more financially beneficial and convenient than it was an extension of the research conducted. T. Pfeiffer argued against this by stating that this would mean using twice the number of animals. The animals would not be in distress due to the induced helplessness, not the shock [32]. Mild or moderate painful and distress-causing experiments can be followed by another mild or moderate research, this is set by Directive 2010/63/EU [1]. In the second part of the paper by J. Silverman et al. (2008) this case of reuse possibility was discussed. Betsy L et al (2008) define here helplessness as the equivalent of human depression. Here the obligation of the IACUC, to keep the amount of animals low is also mentioned. But in the end, not all coherent information necessary is provided to reach a decision [32].

Another paper by Akansha Mishra et al (2014) dealt very specifically with the question of reduction in diabetic screening by reusing the animals. In her conclusion, she states that a reuse of animals in the same experiment, in this case, OGTT studies, cannot be used for a similar study, although a different study would be possible [33]. Of course, reuse must follow the regulations laid out by Directive 2010/63/EU (Preamble 25) [1].

Nevertheless, beagles are often euthanized after the end of research tests; however, it is considered unacceptable to euthanize healthy dogs. Generally, this is not a matter of morals or ethics, however, but ultimately of law as in the EU Directive 2010/63EU (Preamble 26) [1]. So-called rehoming organizations gained more popularity and necessity [34] (see Chapter 5.2.). However, this raises new long-term welfare issues concerning the laboratory beagles and their

behavior after rehoming if not responsibly rehomed. Research institutions have an ethical responsibility to the animals also after the experiments have ended to ensure an adequate retirement or compassionate rehoming, by for example handling the dogs in a way to prepare them for a possible future [35]. This new-found awareness led to a need for responsibly practicing animal welfare organizations, with a well-developed rehoming practice.

## **2.6. Increasing Interest in Rehoming Laboratory Dogs**

The growing awareness of the ethical conflicts concerning animal research has been concomitant with a rise in the interest in rehoming laboratory beagles, or “man’s best friend”. Certain factors have contributed to this trend for example a change of attitude towards animal welfare. The overall trend regarding attitudes to animal welfare has been to more awareness for the animal [36]. More and more people tend to change their diet to vegetarianism or veganism, for instance [37]. This derives not only from health aspects such as intolerances or allergies but also from a non-negligible part of humans becoming more aware of conditions in which farm animals are kept and the resulting want to reduce the consumption of meat and other animal products. Simultaneously, there is a trend to increase animal welfare in meat-producing animals even for those who choose to consume meat [38]. It would seem only natural that the welfare of not even a cow or a pig but indeed a typical companion animal would be of high and rising importance to humans [39]. Companion animal welfare and possible implications on the human-pet relationship show the increase in the status of the companion animal in our lives but also highlight the downside as over-humanizing an animal can lead to stress [40]. The industry is constantly working on advancements in alternative research methods. The ZEBET 2011, which stands for: Zentralstelle zur Erfassung und Bewertung von Ersatz- und Ergänzungsmethoden zum Tierversuch collected information and updates on the newest methods and alternatives to animal tests. Also, since the establishment of the three Rs, it is in the general interest to apply these to newer research by reducing, refining, and replacing [17, 26–29, 41]. Referring to the reduction of animals’ adoption programs increased in popularity and are more common to adopt laboratory beagles. The UK has an Advice Note regarding this topic: Advice note: 03/2015 Animals (Scientific Procedures) Act 1986 Re-homing and setting free of animals, Animals in Science Regulation Unit [42]. Also, the American Veterinary Medical Association, AVMA, encourages the adoption of healthy dogs and cats [18]. Not only does the University of Veterinary Medicine Budapest have a foster and adoption program, but multiple Universities in Germany also breed and rehome the beagles. But there are also multiple

other organizations. The statistics used on how many beagles are rehomed or killed after finishing the test series are limited in papers or not fully known [43]. The adoption programs are getting better, as most animal welfare organizations building it up takes time and finding the perfect system how to handle situations. Knowledge about how to behave and what are the most important points also comes with time [44–47]. The public awareness and advocacy change contributed by the consumption of most information from the media. Due to higher media representation of animal welfare topics by Organizations such as PETA which has a very large reader group took illegal videos in laboratories and made them public, the relevancy increases [48]. Generally, the wide mass appreciates transparency and as the whole laboratory system is mysterious it gains interest in the public eye. Furthermore, there was a big beagle puppy rescue going through the media in 2022 [49]. It received an article in the New York Times which is a very large paper read all over the world. The video material was also released [49]. A rather new documentary from 20.11.2023 [50] shows the arrival of laboratory dogs and their way to the foster home and the happy ending story in the final home, it also describes problems that can occur, it is only a documentary that was streamed on TV in Germany, but yet alone that was seen by many more people and raised awareness where hardly any awareness was before. Media attention is not only created by organizations and programs, but celebrities can help to raise awareness and shine a light on a topic as well. So, for example, Lara Trump, the daughter-in-law of Donald Trump, adopted a beagle to show her animal welfare dedication [51]. More prominent beagle adopters would be, for example, Prince Harry and Megan Markle [52]. These shifts mean more awareness, initiatives, and programs have emerged in facilities with possibilities to rehome laboratory beagles.

### **3. Objectives**

Animal welfare and the laws and regulations bound to this field are very important and all have a similar aim and focus on the principle of the 3Rs, reduction, refinement, and replacement. It was clarified by the literature that not only improving the keeping conditions of the animals in the laboratory is a relevant aspect of improving the life of the animals but also rehoming. The importance of this is highlighted by the EU Directive (2010/63/EU) and derivatives thereof for example the Advice Note 3/2015 from the U, while the Guide for the Care of Laboratory Animals followed by the US. does not specifically mention any rehoming strategies and discourages reuse. Most studies aim to find a way to improve the situation for the animals and work towards a better life. A popular opinion is to simply free all animals and find them a new

home. This approach can be short-sighted as not all animals are suitable to leave the facility, due to health issues or behavioral problems. Other than that, finding suitable homes for these special needs dogs is as challenging as it is for the few dogs that leave the facilities. To rehome all the animals would lead to multiple logistical problems. Not only the rehoming in a new can be considered complicated but the rehoming process is. The literature compiled was also made to show the troubles of rehoming. As mentioned before the topic of rehoming can be controversial and gains more public interest, also among students at this university as the University beagles are part of our education it is important to raise awareness on this topic.

Aspects of this thesis examine the question of whether the work of rehoming and fostering can allow laboratory animals, such as the often-used beagle, to have a chance for a better life. To be able to better answer this question by compiling relevant literature on the subject, and gaining knowledge via relevant publications multiple subjects needed to be explored:

1. For what purposes and experiments are beagles used for scientific projects
2. Approximately how many dogs are used in experiments and how many of them could be rehomed?
3. The animal welfare aspects of laboratory animals under an ethical aspect but also how this contributes to or hinders the conduction of experiments with the animal.
4. The Pros and cons of rehoming, why it is so important for the animals, and can also help the reputation of the facility.
5. As well as the difficulties and benefits for the dogs after being rehomed.

## **4. Methodology**

Systematic research of the scientific literature was obtained by different search engines. The major source of literature was Google Scholar, followed by the National Library of Medicine (“PubMed”). The ProQuest eBook Central was used to consult as a library database for obtaining scientific books.

The initial keywords used included “laboratory beagles”, “rehoming”, “animal welfare”, “Marshall beagle”, “dog”, “alternative testing”, “care of”, and “behavior”, among others and various combinations thereof, maximize the chance of finding adequate data to address the topic at hand. Furthermore, additional related literature was found through the bibliography of the reviewed publications. The literature obtained needed to be in English or German language.

The gathered literature was then screened to find adequate data to be used to build on the aspects of the topic of this thesis and after deemed suitable by the student researcher and supervising professor, the knowledge gained was compiled into this literature review. Information was not only obtained by literature but also using the Database of the ALURES, to which it is mandatory to report the experimental animals that were used. Accessible Data are currently from 2015 to 2020 from these data compiled graphs and tables were composed, using the website's information and filter program [2].

## 5. Results

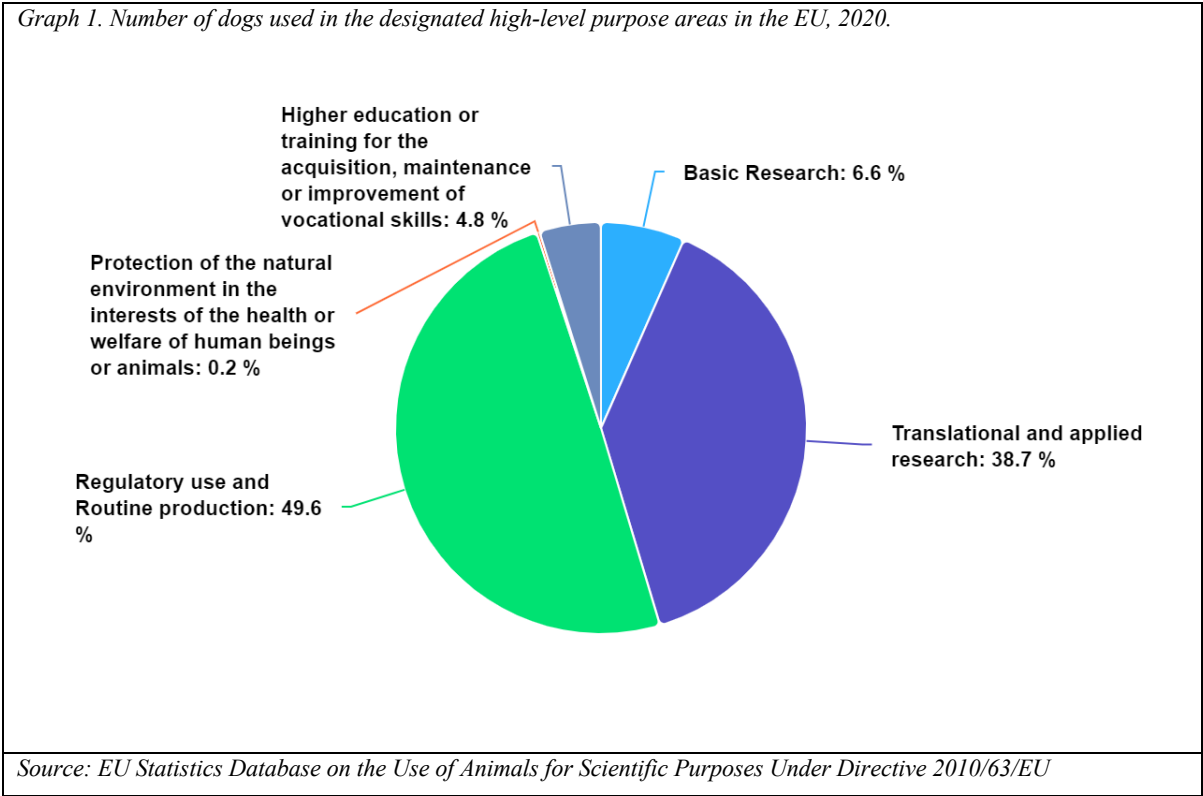
### 5.1. Use of Beagles in the Laboratory

Statistics on the use of laboratory animals are in most cases documented in an annual report, at least for the US, UK, and the EU. The most detailed data is obtained by the ALURES, for the EU, while the USDA gives the statistics for the US. While in the UK the data is released by the Home Office. Although you can find statistics in the ALURES Database, on the use of animals for scientific purposes under Directive 2010/63/EU and more specifically the reuse there is no data on rehoming. The dogs used in laboratory testing need to be reported in the ALURES the Animal Use Reporting European System. This Database conducts data not only on dogs, but all animals used for animal testing. The exact statistic in which the dog breed was used cannot be calibrated, only the species can be defined [2]. From this database the data obtained could be compiled into the following table (table 1) about the total amount of dogs used in the experiments and the dogs reused, meaning after the end of an experiment that has been mild or moderate the dogs can attend another procedure.

<b>Year</b>	<b>Total number of dogs</b>	<b>Reuse</b>
2015 (EU 28)	21739	33.3%
2016 (EU 28)	23452	33.1%
2017 (EU 28)	21359	35.9%
2018 (EU 28 + Norway)	25717	31.1%
2019 (EU 28 + Norway)	20630	36.7%
2020 (EU27 (post Brexit) + Norway)	14064	38%

Although the appearance rate of “reuse” does not show exactly how many animals survived at the end of the tests carried out, 31-38% of the animals used had already survived a previous experiment.

Evaluating the data from 2020, represented in Table 2, concerning what type of research dogs were primarily used. We can see that the majority so 49.6% are used for regulatory and routine production. The second largest use would be transitional and applied research with 38.7%. While use in higher education for example in universities the use of dogs lies only at 4.8%. The lowest percentage is made up of protection of health and animal welfare. Table 2 can be converted into a diagram to make even clearer how the purposes that dogs are used for are broad. From this it gets visually clearer how small the fraction of dogs used in animal welfare research is and how large the routine production uses animals; this is shown in Graph 1.



To explain the meaning of the titles of different fractions Basic research means experiments that help to expand our knowledge on different aspects of, in this case, living animals.

Transitional and applied research attempts to evolve treatment and prevention strategies in case of certain diseases. Regulatory tests are conducted to ensure the safety of a product mostly used in human medicine, while Routine production oversees manufacturing approval tests [6].



Table 1. Number of dogs used in the designated purpose area, 2020.

Purposes	Number of uses	Percentage
Basic Research	931	6.62%
Translational and applied research	5449	38.74%
Regulatory use and Routine production	6974	49.59%
Protection of the natural environment in the interests of the health or welfare of human beings or animals	31	0.22%
Higher education or training for the acquisition, maintenance or improvement of vocational skills	679	4.83%
<b>Total</b>	<b>14064</b>	<b>100,00%</b>

Source: EU Statistics Database on the Use of Animals for Scientific Purposes Under Directive 2010/63/EU

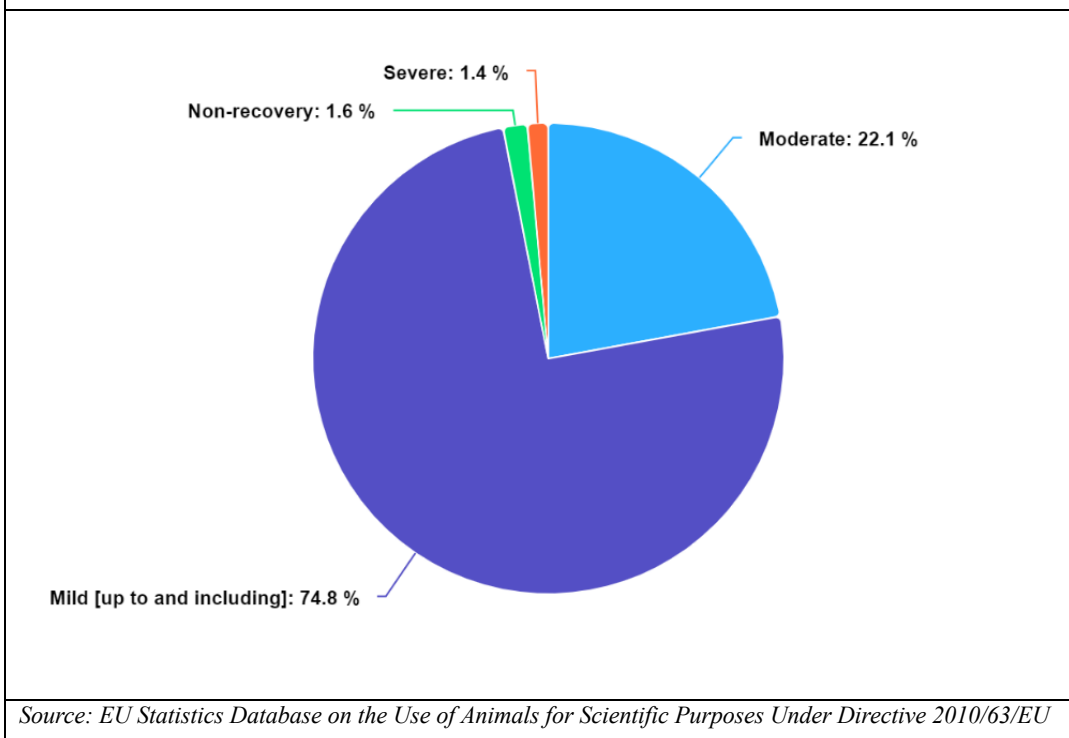
Beagles have been used in multiple studies over the years. Among those are toxicological studies and pharmaceutical testing [8]. These tests can be dated to a very early time, as the Behringwerke started to use beagles for research. The Behringwerke used to be a part of the firm Farbwerke Hoechst AG which was a chemical and pharmaceutical company [12]. Pharmacological tests and toxicity tests have been performed regularly ever since. Represented in Table 4 are the exact statistical values of 2020 of the different fields of Regulatory uses represented in Table 2 and Graph 1 and reflected as 49.6%. These 49.6% are made up of Toxicity and other safety testing including pharmacology, which has as many as 4927 dogs used which would give a percentage of 79,16%. Statistically, this is the largest fraction by far of regulatory uses. It also consists of other efficacy and tolerance testing as well as quality control (including batch safety and potency testing). Other efficacy and tolerance testing is represented by 867 dogs which gives 13.93% and quality control used 430 dogs which makes 6.91%. Since Toxicity testing resembles the largest fraction the different areas of this field were also compared and gave the result that most of the dogs are used in repeated dose toxicity tests with 2392 dogs used which translates into a percentage of 48.55%.

<i>Table 2. Number of dogs used in different fields of toxicity testing, 2020.</i>			<i>Table 3. Number of dogs used in regulatory use and its fields, 2020.</i>		
<b>Regulatory uses: Toxicity</b>	<b>Number of uses</b>	<b>Percentage</b>	<b>Regulatory uses</b>	<b>Number of uses</b>	<b>Percentage</b>
Kinetics	1321	26.81%	Toxicity and other safety testing including pharmacology	4927	79.16%
Repeated dose toxicity	2392	48.55%	Other efficacy and tolerance testing	867	13.93%
Pharmaco-dynamics (incl safety pharmacology)	642	13.03%	Quality control (incl batch safety and potency testing)	430	6.91%
Acute and sub-acute	331	6.72%	<b>Total</b>	<b>6224</b>	<b>100,00%</b>
Target animal safety	48	0.97%			
Other toxicity/safety testing	134	2.72%			
Reproductive toxicity	6	0.12%			
Genotoxicity	14	0.28%			
Safety testing in food and feed area	24	0.49%			
Skin sensitisation	15	0.30%			
<b>Total</b>	<b>4927</b>	<b>100,00%</b>			
<i>Source: EU Statistics Database on the Use of Animals for Scientific Purposes Under Directive 2010/63/EU</i>			<i>Source: EU Statistics Database on the Use of Animals for Scientific Purposes Under Directive 2010/63/EU</i>		

Among these tests are also reproductive toxicity uses that make up the smallest fraction. Transitional and applied research was the second largest fraction and tests that fall into this area would be the physiological aspects of the beagles contribute to experiments of human medical relevance for example Alzheimer's experiments [53]. Or as a recent study on the physiological impact of certain diseases a paper written by veterinarians of the University of Veterinary Medicine of Budapest evaluated the impact of a *Dirofilaria repens* infection on albumin and protein levels in the urine [54].

When looking at the severity classification (Graph 2) it can be said that the highest percentage 74.8% is represented by mild procedures. At the same time, severe and non-recovery are the smallest fractions with 1.4% and 1.6%. This data obtained is also from 2020. Further, the definitions of these classifications should be explained. Mild procedures mean that the pain experienced was so slight that the animal was able to return to its normal state within a short period. Moderate, are those procedures that cause a significant and detectable discomfort to an animal, but no life-threatening situation, for example, most surgical procedures. Procedures are considered severe if a significant deviation from the normal is seen, for example, long-term health problems and assistance with basic functions, this can include death [6].

Graph 2. Uses of laboratory dogs classified by severity in 2020.



Although the annual report from the UK gives a good definition and categorizes the data obtained similarly as can be seen above, sadly most of the data is combined and applies to all animals, regardless of the species, used in animal research. To this point, the most recent annual report is from 2022 [6]. The data on dogs are summarized under the category of specially protected species together with cats, horses, and non-human primates. These were used in 0.97%, in numbers 15000, of experimental procedures in 2022. In the case of the UK, about 53% of experimental procedures were classified as basic research, which is a way larger fraction compared to the EU. Of these, the most research areas were conducted regarding the nervous system, the immune system, and oncology. From the numbers of 2022, dogs used decreased by 2%. 4,122 procedures used dogs, mainly for regulatory procedures (86% and 70% respectively) [6]. The data from the US conducted by the AHPIS, and published by the USDA is less detailed than the ALURES, the overall number of dogs used in the US is constant and is around 60.000 dogs per year [5]. It is difficult to compare the total number of dogs used as the size and the population in the country differ [4,5]. In the publication by Ward et al (2022) literature was reviewed and conducted information on dogs used in the US for laboratory procedures, from this, it could be seen that the beagle was used in 24 publications, as was therefore represented the most. Out of the studies represented in the Ward et al (2022) publication out of the 97 represented studies, most of them regarded transitional and applied studies, which is different

from the statistics from the UK and Europe. Interesting in this publication and relevant for this literature review would be the section about the fate of the dog where it is reflected that the majority of dogs are euthanized in 53% of the cases of publications and 53% of the grants used. Reuse was only reported in 3 cases of publications and 1 grant. The rehoming section in this case was not on the fate of pure laboratory dogs but rather on pet dogs that were part of a study carried out in their home or were returned after the end of the study. Also, this publication gives no information on the statistics of rehomed laboratory beagles [4].

After reviewing the statistics from the EU and the UK, one can observe a trend towards a decreasing number of dogs being used overall, while in the US the number is rather constant, with minor fluctuations. When looking at the numbers worldwide, approximately 115.3 million animals were used in experiments in 2005 [55]. In 2015, 192.1 million were used, which leaves the conclusion that there is an overall increase in animals in experiments [56]. This number has been increasing even though the awareness of the conditions and life lived by laboratory animals is more and more represented in the media. Although laboratory animal depiction in the media is not new, the tenor of it is more and more critical [57].

It should be noted that, although it is a minor purpose area at 6.6% (Graph 1), the field of basic research in which knowledge of animal behavior is further investigated is in fact crucial for animal welfare [58]. The behavior tests for breeding purposes and behavioral issues, for example, aggression and reaction to stress experiments, were performed on groups of beagles [59–61]. These tests could help to evaluate dogs before using them in experiments and can aid animal welfare and rehoming strategies.

## **5.2. Rehoming Practices**

Rehoming was already a topic in the paper by Prescott et al. (2004) promoting it as an alternative to euthanasia, again it is stressed, that the well-being of the animal needs to be examined before leaving the institution and which is also addressed by Dr. Lara Helwig (2019), by stating that earliest adoption was mentioned in 1983 and further references can be found in literature from 1996 [9, 19]. Although the process is not a new idea viewing rehoming as a new addition to the 3R principle, adding it as the 4<sup>th</sup> R is a view in the matter, an idea by Dr. Lara Helwig, which she presented in a webinar on 13.6.2019 [19]. She also explains some ground rules for adoption which Prescott et al. (2004), Dorothea Döring et al. (2016), and Laura Haenninen et al (2020) recommend. For example, the laws must be obeyed, the veterinarian consulted, and he must permit the rehoming process, and the health status of the animal should be considered. As well as educating the new owners about financial and health responsibilities

concerning the new animal [9, 34, 43]. Adoption programs should collaborate with third parties for example shelters or rehoming programs. This is also done in the studies of Dorothea Döring et al. (2016) and Laura Haenninen et al (2020) [34, 43].

The process of rehoming is defined as the change of ownership of an animal and for that also a change of location, rehoming is used in the case of companion animals. For wild animals the word release, and in the case of non-human primates retirement, is more accurate [19]. In the particular case of laboratory beagles, this location should be structured in a way that the animal can spend the rest of its life according to its needs without having to undergo further scientific procedures [62, 63]. The rehoming options are indirect and direct [64]. However, the indirect option cannot be applied, as the animal is only removed from the scientific protocol but stays within the institution. An animal that is indirectly rehomed is still under Directive 2010/63/EU but if the animal is directly rehomed Directive 2010/63/EU does not apply to the animal anymore [62]. Directive is a legal act that is enforced by the European Union and is said to be met by member states.

Historically, the genesis of the laboratory beagles reflects a time in which animal welfare was not as present in people's minds, and ethical consideration for most animals was not as prevalent as it is nowadays [12]. However, the change of mind in recent years has led to a need for rehoming practices [23]. It is important to acknowledge the contribution the animals that have first been involved in such efforts have made in helping us with researching this topic. Ethically, the animals should receive a good retirement after their contribution to improving our lives. Most of the animals suffered from stress during the experiments, and having the opportunity to be rehomed may mitigate the anxiety and negative effects on the dog to live a more relaxed and fulfilled life post-research [23]. The animal needs to have a good health status and as stated by Dr Lara Helwig (2019), concerning the US, can only be rehomed if the dogs were administered human or veterinary pharmacological substances food supplements, or compounds of human or veterinary drugs. If the animal was exposed to infectious diseases the dogs are not suitable for adoption. Also, in case of any health hazards such as being immune-compromised, the animal cannot be adopted [18]. It is crucial to ensure a smooth and as stress-free as possible transition to a companion animal-friendly environment, and that this process is monitored and controlled by experienced experts, as the beagles have lived all their lives in a closed and very controlled environment with very few stimuli [23]. Moving a dog like this can be very overwhelming, as they have had hardly access to the outdoors, contact with non-beagle dogs, human contact, or contact with children [9,23]. An overwhelmed dog can have unpredictable reactions that he has never shown in his previous environment.



Figure 1: Beagle in Kennel (Guba)

Source: Photography by Dr. Alisha Schnitzer

If possible, the dogs should have been evaluated to a certain degree to assess their personality and behavioral tendencies to find a suitable home for them dogs. For example, in the rehoming program in Finland, the dogs received socialization training for several months before leaving the facility to be adopted [43]. Furthermore, Dr Lara Helwig (2019), defines that an animal needs to be adopted into a family as a part or companion animal and cannot be sold or used for food [18].

Dorothea Döring et al. (2017) describe the case of the German animal welfare organization *Laborbeaglehilfe*, which received 72 dogs for the study, which could be rehomed directly upon arrival [34,46]. For some of the dogs, no foster home or permanent home was found in time, which is the reason they needed to stay in a shelter until a

potential adopter was found. The time spent in the shelter was fluctuating differently, depending on the dog [34].

To ensure the well-being of the dog post-adoption support is crucial in these cases. People with no experience with laboratory dogs must have a partner they can turn to with questions. Some people may not know what it means to adopt a laboratory beagle, and these problems can also occur post-adoption. That is why the support after the adoption is a security issue for the new owner and the animal. Both need guidance and assistance to adapt to a new life [34]. The screening process to find the correct adopters can be complicated and some factors should be considered, living circumstances, experience with the species, type of residence, other companion animals, and a good, structured plan, even a training plan, for those days where the dog cannot be guided the whole day [19]. Screening methods can be interviews, phone calls, or personal meetings. Interviews took place with the owners, in the study by Döring et al (2017), to evaluate how the dogs behaved and what the new owners experienced [34]. In the paper by Laura Haenninen et al (2020), the potential owners received a questionnaire after gaining knowledge about the project via press releases and advertisements on the Internet [43]. The Finnish Federation for Animal Welfare Associations and its regional associates worked together with the University of Helsinki to find new homes. Also, in this case, the progress was

monitored inform of questionnaires [43]. In both methods and studies, the dogs found a home and have been successfully rehomed. In the US the responsible AVMA claims to support the adoption of laboratory dogs, the concept of rehoming is also positively viewed and acknowledged by The American College of Laboratory Animal Medicine (ACLAM) and the Office of Laboratory Animal Welfare but also reminds that the concept of rehoming is not regulated by the PHS Policy and funds may not be used or legal responsibilities taken, this can be conducted from the quotes made by, Dr. Lara Helwig (2019) in her webinar in 2019 [18]. What can be said is that public perception and transparency of the rehoming organization are crucial to building a community. If laboratories and rehoming organizations work closely together this could enhance the trust in scientific research and change the public perception of animal research trials.

### **5.3. Rehoming Programs**

Adoption programs are not for every institution, but they should be more of an institutional effort instead of depending on committed individuals [64]. Generally larger Laboratory Beagle organizations are for example The Beagle Freedom Project, the organization from which Megan Markle and Prince Harry have adopted their beagle [45]. More organizations that have been mentioned earlier are the Befreagle Foundation, Laborbeaglehilfe e.V., and LaborbeagleVerein [45–47]. Effective rehoming programs often involve collaboration between research institutions, pharmaceutical companies, and animal rescue organizations. That this cooperation is a beneficial one can also be read in the Guidance of Rehoming of Laboratory Animals guide. The *Laborbeaglehilfe* received the dogs from different commercial breeders in Italy, Germany, and the US, but also from a pharmaceutical company in Germany. They received 145 laboratory beagles [34]. In the NDR documentary series, the same organization is shown and tells the camera team that the facilities and the organizations have an agreement to never speak about the exact facility the dogs come from, also they receive very little information on what happens to the dogs and how they are treated [50]. They all have internet platforms such as websites, Facebook, and Instagram. On these platforms, they introduce the specific organization, and aims, and present the dogs that can be adopted. Pictures and short descriptions of the dogs help choose the perfect fit. The websites of each of the organizations give an overview of their work and inform about the topic of beagle rehoming. Explaining it can come with difficulties and already inform about rules in case you would want to foster a dog and advise for example usage of a double safety harness for new owners [50].

## 5.4. Rehoming Process

Transparency is a very important criterion for the public and it helps to have easy and quick access to information about these projects. As also described in the paper about the behavior of laboratory dogs before and after rehoming in private homes the organization *Laborbeaglehilfe* used their build community to find either permanent or foster homes for the dogs, only a few had to go to a shelter [34]. In Finland, the dogs were advertised and then given directly to new owners [43]. Before starting the rehoming process in the study from Dorothea Döring et al (2016) the dogs received regular health checks and basic grooming, this is also performed before leaving the facility [34]. Also, the dogs we received at the university had undergone regular deworming, anti-ectoparasitic treatment, and vaccination. Beagles in the research article by Laura Haenninen et al (2020) the dogs received socialization training before being rehomed. Socialization programs that take place already in the facility can help to prepare the dog for the new environment. The dogs were confronted with stimulating events and started to learn how to walk on the lead [43]. Socialization and other pre-adoption work are also recommended by Prescott et al (2004) and are part of the rehoming process [9].

Adoption criteria and screening process for potential adopters are very crucial as many people don't know what to expect when wanting to foster or adopt a beagle [18]. Clear communication is crucial to ensure that new owners get an idea of what it means to adopt a laboratory dog [9]. In the case of the paper by Dorothea Döring et al (2016), several meetings with the new potential owners were held, whilst for the research of Laura Haenninen et al (2020) Interviews were held as well as questionnaires given to the potential new owners [34, 43].

Post-adoption support and follow-up help were offered for the dogs. Even a questionnaire four years after the adoption was conducted for the study [43]. Follow-up communication between the new owner and the organization is also depicted in the documentary [50]. Now from a legal aspect, there is a Guide the LASA Guidance on Rehoming Laboratory Dogs. It gives guidance for who is authorized to agree to the release of an animal. In addition to this, the FELASA exists which also states that the best and appropriate decision should be made on behalf of the animal that will need to survive in a completely new environment [62]. How the animals should be selected and how they are prepared for their new lives (e.g. socialization programs, veterinary care. It also gives guidance for assessing the suitability of a new home and the owners [18]. Not only that but it also mentions that it can be problematic to impose too many expectations on new owners and finding new owners can be limiting. The guidance on the rehoming of laboratory dogs also gives some advice to prospective new owners. Some guidance on the



transport of laboratory animals is given in a separate guide, as this process can be very stressful for the animals. The organizations should be organized in a way that constant improvement and learning should be welcomed and strived for. When it comes to the health aspect the dogs should have been vaccinated ideally in the facility of origin, dewormed, and treated with anti-ectoparasitic medication. Blood check-ups and a general health examination should be done before releasing the animal from the facility. Animals that leave the facility also reflect on how the research laboratory is operating so not only for the sake of the animals but also for the reputation of the facility it is advised to keep the animals in good health condition and receive regular health checks [18, 64]. As in case most welfare situations spaying/neutering is advised [18]. The population of unwanted animals is already large enough and it is hard enough to find owners who are willing and capable to take care of the dogs that we already have. Also in the study, some dogs were returned for multiple reasons but in the end, rehomed successfully [34]. Owners should receive help and support for the transition period from the dog leaving the facility to living in a home with a family. Most of the organizations give also additional information about feeding regimes, grooming, and behavior management. Some can also recommend, due to a large community, dog trainers or behaviorists. Although it shows in the studies that the people rather taught the dogs themselves allowing them to ask for help is important [34, 43].

Regular veterinary checks should be recommended and, in some cases, also some basic information about vaccination given. For most of the participants, the beagle was either not the first dog they ever had or was added to an already existing dog in the household or even two beagles were adopted [34, 43]. Some dogs don't get to live directly in a forever home but need a small stop in a foster home. It is very important to have volunteers as in every welfare organization, to support, help, and foster the animals in need. To build this community it is quite an effort that needs to be done by the organization. Helping each other is also a very important part of building a community. For example, while looking for a new home for one of our university beagles, *Laborbeaglehilfe* reached out to the university via the Instagram page for the university beagles, as they had seen the post about the beagle and offered to take him into their care. The offer itself was very nice, but in the end, another solution was found. Still receiving help from larger organizations and communities can be very beneficial for smaller ones. Try to keep track of how the dogs are doing. This helps keep the community interested and updated. As in the paper by Laura Haenninen et al (2020), the experience of the owners has been written down as part of the questionnaire, one month and six months up to one year after rehoming. All of them were very satisfied with the new family member [43].

#### 5.4.1. Difficulties with Rehomed Beagles

From an animal welfare point of view, it is beneficial that the beagles get rehomed or fostered, but the person who takes over the beagle will see him- or herself confronted with challenges either not foreseen or not wanting to be seen. Most institutions support the ideas of rehoming, but the Office of Laboratory Animal Welfare also reminds us that the legal issues of rehoming are not regulated and addressed by the PHS Policy, and funds may not be used for rehoming purposes. As well legal responsibilities cannot be taken by them, this is represented as a quote in the webinar by Dr Lara Helwig (2019) [18]. After a life in a kennel with hardly any human contact, the dogs can have behavioral issues. Among those can be minor miss behaving's like jumping or in most cases not being house-trained at all. That is what is for the average dog owner basic training has not been trained with these dogs for example leash training, sit, lay down, or other commands. Most often the dogs also suffer from anxieties, mainly separation anxiety. Depending on the character of the dog this can be improved territorial issues when the dog feels safe in his surroundings. Also, family internal problems can occur, beagles tend to have more problems with males than female humans. The dogs have no experience with children and so might react scared or defensively towards the children in the family. With fellow dogs, they are mostly friendly, as the beagle is a very social breed, but miscommunication can occur as the dogs have not had a normal socialization period with dogs [34, 43]. Pre-adoption training to ease the dog into the new situation can be very helpful to overcome some of these behavioral issues and give adequate guidance to the new owners [9, 34, 43, 65]. Health issues are also common in laboratory dogs. For example, some of the female contestants in the beagle research group are not spayed which leads to an increase in the likelihood of mammary gland tumors [66]. In the study about rehoming in Finland, the dogs were divided into two groups dogs above the age of eight or younger dogs around the age of two years. In the study about the behavior before and after rehoming the average age was  $2.2 \pm 1.5$ , but it also included dogs of the age of 7 to 8. It could be seen that the younger dogs were easier to rehome and could faster adapt to the situation, besides the age adoption and adaption process influenced by the character of the dog [34, 43]. The dogs can have preexisting health issues that can occur due to a lack of preventive care. For example, infections with endoparasites (*Dirofilaria immitis* or *D. repens*) can occur if the prevention management is poor. Before the dogs leave the facility, a general examination should be done, and the new owner should be informed about regular visits to the veterinarian. Also, if possible, the medical records should be shared. If not done after leaving the facility the owner should be informed about the spaying and neutering procedure. Not only

the dog can cause problems in the rehoming process but also problems with the owner can occur. This can be due to bad screening and matching of dog and owner, but sometimes the best screening processes and longest interviews are no guarantee for a successful adoption story. Unforeseen circumstances can arise for example the owner can develop an allergy to the dog [34]. The transition can be difficult for the dog as well that why it would be recommended to prepare some pre-adoption counseling for the owner and socialization programs for the dogs [43, 64]. Generally, as in most fields communications and education is very important. It helps the owner to navigate the new situation and handle it accordingly and appropriately. To give a good history about the dogs and their potential needs can be very helpful for the owner to be able to adjust and coordinate the issues. Expectations should be discussed and if necessary, the owner needs to be enlightened. Also, adoption stigmas can be successfully demolished by clear communication. For this purpose, most animal welfare organizations keep track of former laboratory beagles and inform on the diverse internet portals about the well-being and success of the former laboratory beagle. Most often the dogs have never been in a car before and this can be challenging when it comes to the transport of the dog, either from the facility to the organization property or from the organization to the owner or foster. There is an official guidance journal for the transportation of laboratory animals [67]. As established before dogs can react to stress in new situations including transportation. The stress level can be assessed by the cortisol level and salivation, whilst the last can be common when transporting a dog in the car for the first time [68]. It is beneficial to train the animal before transportation and prepare it for what is to come [62]. Post-adoption support can help when it comes to newly developed issues, as some behaviors can only develop over time. Inadequate post-adoption support can influence the long-term well-being of the animal. It helps to build a community with a good support system, dog trainers, behaviorists, veterinarians, and other volunteers. In this way, support can be offered if needed.

Also, all this should happen according to official laws for example following the guidelines of how to rehome the laboratory dogs, or how to transport them, or other regulations according to the country, here as an example the EU [67, 69, 70].

Challenges should be addressed openly so strategies can be implemented to mitigate the stress and enhance the success and ethical integrity of promoting the well-being of the laboratory beagle in their post-research lives.

#### 5.4.2. How Rehoming May Encourage the Adoption of More Ethical Research Practices

The literature on rehoming of laboratory beagles is as mentioned before rather scarce. And this although the EU Directive was changed in 2010 to allow research facilities to rehome laboratory animals after the study was concluded [1]. Rehoming is also encouraged by the LASA guidance on rehoming laboratory beagles [70]. At this point, it is not clear how many facilities use this opportunity to rehome dogs, and how many continue the euthanasia of most laboratory animals, but it is known that about 2322 animals have been rehomed in 2015 and 2017 [3]. Of course, if the animals are in a bad health condition and don't meet the requirements to be rehomed and it is not beneficial for them then euthanasia is the method of choice, but a healthy animal should be attempted to be rehomed [43]. For now, companion animals are used in laboratories, so dogs and cats are more in the center of attention, as these species tend to live more closely with humans. Another hypothesis could be whether rehoming should be focused on only laboratory dogs. It is said that rodents have the highest participation in laboratory studies but the lowest rehoming rate. Dogs, cats, birds, amphibians, horses, and farm animals are rehomed mostly although they are the minority species used in laboratory research [3]. The socialization is supposed to ease the dog into unknown situations and make the transfer into a new home easier [43, 64].

Rehoming can reflect a good light on the laboratory facility, as there are only a few who participate in rehoming [63, 64]. It helps when the animals released from the facility are in good overall condition to persuade the public that the animals are well taken care of in the facility. Mostly the bad reputation of research laboratories using animals is what comes to the minds of people, and this can poorly reflect on the facility, which might lead to fewer rehomed dogs. However, a good adopter should be neutral on this topic and reflect ethically positively on the facility that participated in rehoming [64]. Hence rehoming programs can reflect positively on the reputation of a facility and therefore give laboratory tests a better image and can lead to more acceptance in the public eye.

### **5.5. Discussion**

The results varied as the topics researched were different. Research areas were, rehoming, literature on laboratory dogs and the history of laboratory dogs, animal welfare, experimental research groups of beagles, and various other papers. Test groups with animals were conducted and different tests for example standardized behavioral tests executed. These standardized tests gave a good view of the reactions of the laboratory dogs in specific stations. In other cases, the

study was performed in a retrospective design. Generally, the literature conducted some references reoccurred for example the paper by Carbone L et al. (2003) was referred to in multiple of the collected literature [64]. It could be found that the literature results on rehoming were few. In PubMed when entering the keyword “rehoming beagles” you receive 3 results. Entering the same keyword in Google Scholar yielded 442 results. Two papers one by Dorothea Döring et al (2016) and Haenninen L. et al (2020), focused on the entire rehoming process, starting with the selection of dogs until the follow-up rehoming [34, 43]. In the group of Hänninen L. et al (2020), 16 beagles were used, while Dorothea Döring et al (2016) used a larger group of dogs 145 from a German pharmaceutical company, 36 from a breeder from the US, 9 dogs from a breeder in Italy and 70 dogs from a breeder in Germany. As it can be seen the size of the test subjects differed significantly. Both studies show that the selection of the new owners was made by the animal welfare organization. Information about the possibility of adopting the beagles was mostly made via the internet. The methods used to determine adequate owners mostly consisted of interviews, telephone calls, and questionnaires. A guarantee for a successful adoption can never be given even if the selection work was flawless, as unforeseen circumstances can arise, for example, the development of allergies and or change in family circumstances. To figure out how the dogs managed in the home questionnaires were given to the owners and then evaluated. Commonly, the dogs show fear towards new people, separation anxiety, or traveling by car [34, 43, 65, 71]. A dog trainer or behaviorist was consulted in hardly any cases. A standardized behavioral test was conducted before and during the rehoming process. These show mostly positive behavior and adaption to the new environment by the tested dogs but also reflect the positivity of the owners towards the experience made with a rehomed laboratory beagle [34, 43, 64].

Results of some studies few important figures could be collected concerning the topic of rehoming laboratory beagles. About 2322 animals have been rehomed in 2015 and 2017 but there are no definite figures to this point in time [3]. General figures for the UK, US, and EU could be derived from the institution in charge of overseeing the use of laboratory animals [2, 4, 7]. From the individual annual reports released by each country, the EU data is the most specific and easiest filtered, whilst data represented by USDA from the individual states offers fewer filter options. So, in 2019, which is the most recent annual report around 60.000 dogs were used in the US, while in the EU 14064 dogs were used. In the UK the figure includes cats, horses, and non-human primates, hence gives no filtered number for only the dogs used. The number of so-called specially protected animals, all those mentioned previously fall into this

category is around 15.000. Hence the figures of the individual countries are hard to compare, as for their different statistical nature. The ALURS gives the most detailed data on the exact use of animals for example used in regulatory research which has no statistics documented by the US but by the UK. Regulatory use is the largest fraction in the EU with 49.6%, the UK in comparison conducts even more research in this field with 86%, while in the US the largest fraction is the transitional and applied research category [4]. The trend in all cases is decreasing as the number of dogs used in scientific research. Just as figures for compression of some data about rodents, rodents make up 94.15% of all laboratory animals of these rodents 19.14% are only rehomed. While birds, cats, dogs, horses, amphibians, and agricultural animals were rehomed by 80.86% and only makeup 5.85% of laboratory animals [3]. Rehoming was only done in under 50% of laboratories in the UK this figure was conducted by Skidmore T. et al (2020) [63].

Literature on laboratory dogs in general gave results on what types of dogs are used more often. In one of the papers, Evelyn Schulte et al (2022) explores what type of breeds are used for laboratory experiments and it shows that most of the papers found on PubMed were done with a trial group of beagles. For comparison the process was repeated with the same search criteria on 28.2.2024 and received 6330 results for “Beagle dog” and “Labrador dog” and 1366 hits on PubMed, showing that most published research is done in laboratory beagle. Most research materials found on laboratory dogs elaborated on the topic of refining the animal welfare situation of the beagles in the laboratory [35, 59, 68, 69].

Keeping of beagle in a laboratory facility has multiple advantages and disadvantages, one disadvantage concerns the ethical perspective on this subject. The literature presented shows a trend that the demand for the rehoming of laboratory beagles is growing [43, 64].

Also shown in the literature that the process itself does not only consist of the step to remove the dogs from the facility but includes work done by the staff in the laboratories. These preparations can be time-consuming, and execution can be problematic due to a lack of staff and growing compassion from the caretakers with the animals that can hinder them from executing the necessary steps needed to experiment [72]. Also, the general view on laboratories that use dogs in experiments is rather poor. So rehoming programs are not necessarily good for the reputation of the facility [64].

Nevertheless, in the end, most of the research stresses that the well-being of the dog gained importance, and as socialization programs provide easier rehabilitation pursuing this way is recommended. Increasing the well-being of the animals can be conducted by enriching the kennels and providing mental exercise for the dogs through either walks or games [43, 72].

To this point, there is not a lot of literature and figures focusing in general on the rehoming process and successes [34, 43, 63].

Overall, the papers that dealt with the topic of rehoming stated the conclusion that rehoming programs should exist and be executed more often by the laboratories. Not only that but also how important it is that the institutes work closely with animal welfare organizations, as no example could be found in the literature on rehoming done by the institute, which can lead to the conclusion that if rehoming should take place this needs to be collaboration work [34, 43, 63, 64]. Furthermore, the question arose during researching this paper how reuse of animals and rehoming of animals aid the concept of the 3Rs in different ways and if one could be favored, and maybe even expanded by the 4<sup>th</sup> R, rehoming. For the general use of animals in laboratory facilities data is collected by the IACUC and is made accessible to the public, on the website. The data only focuses on the species of dog, cat, and horse but not on the breed. For which the data is not specific on laboratory beagles. It gives information about the use and reuse of animals in the past years, but no data about rehoming or how many dogs have died after an experiment. Rehoming fulfills the aspect of refining experiments and reducing the number of animals used, while the reuse of animals reduces the overall number of animals used in experimental procedures. It can be concluded that both have certain issues that need to be addressed, for example, not all animals can be reused for experiments but also not all beagles can be rehomed [1, 31–33].

## **6. Conclusion**

Speaking about keeping a beagle in a laboratory facility comes with advantages and disadvantages, one disadvantage concerns the ethical perspective on this subject.

It is discussable what approach satisfies better the 3R principle of reduction, refinement, and replacement, either reusing dogs or rehoming them. In this literature review an overview was given of some aspects of reusing an animal for laboratory processes, which could lead to a reduction in total animals used for experiments. Not enough literature exists specifically on the reuse of dogs, although the dog is one of the more often reused species [31]. The reuse of animals can aid the 3R principle but there are conditions tied to reusing animals all set by the Directive 2010/63/EU [1]. Animals that are reused need to be in good health condition and preferably should not take part in similar trials [33]. Reducing the total amount of animals is beneficial, but also it is important to refine the procedures to be able to use the dogs for a shorter amount of time to give them a chance to be rehomed. These two approaches can contradict

themselves at least concerning animal welfare. Not all animals are suitable for reuse or rehoming, so there cannot be a clear statement on which procedure should be favored [1, 31–33]. But as an additional idea, the rehoming could be added as the 4<sup>th</sup> R into the 3R principle and would give the possibility for a more organized and overlooked rehoming process [18].

Naturally, the first logical conclusion would be to say that all animals should be “rescued” and leave the laboratory to be rehomed, this opinion is rather short-sighted and in no way doable. The dog is for most people a loyal companion and a dog in pain, or an unhappy situation triggers strong feelings. Thus, keeping dogs in kennels is not very popular anymore. Beagles kept for laboratory experiments most often endure life in closed rooms, kennels, or with a minimum time in an outside area [43, 72, 73]. The interaction with humans is mostly kept to a minimum amount. Firstly, the caretakers don’t have the time to play with the dogs or build bonds, which is ethically positive. When evaluating the situation from the research point of view we can see that some problems might occur. Problems arising could be for example the caretakers could have difficulties handling and manipulating the test subjects in a way necessary for the conducted research which can hinder the research itself [72]. In the end, most of the researchers stressed that the well-being of the dog gained importance. Also, in the long run, it provides easier rehabilitation if the dogs receive a socialization program in the facility. These can be conducted by enriching the kennels and increasing human contact (playtime, fence walks) [43, 72]. The dog is the focus now for rehoming purposes but also the other animals in the laboratory should be rehomed as well statistically the largest fraction of laboratory animals is the rodent although this species is the least rehomed one [3].

Also, these species should receive more attention when it comes to rehoming processes, as all life is valuable. When it comes to rehoming trials there is not a lot of research data present, and it is still unclear how often rehoming is practiced by the laboratories [43]. Although the EU Directive was changed in 2010 to allow research facilities to rehome the beagles that have finished their studies [1]. This trend to add the possibilities of rehoming is also encouraged by the LASA guidance on rehoming laboratory beagles [70].

However, rehoming is not good for all institutions as the condition of the dogs or anything else related to the dogs could reflect poorly on the institution’s rehoming, as it is monitored very critically by the public. Most people tend to focus on the bad reputation research laboratories that use animals have which can lead to poor reflection on the facility. However, a good adopter should be very positive about the facility that made adoption possible, as stated before not all facilities make use of the rehoming possibility [64].



While researching this topic it became clear that not only the aspects of the rehoming ideas are important, but also research materials found on laboratory dogs welfare aspects should be considered when it comes to this topic [3, 43, 63, 64, 71, 73].

Returning to the focus of literature review studies following the entire rehoming process from selecting the dogs, preparation in the facility, and the rehoming process as well as follow-up guidance are few. One study took place in Germany and the other one was the first rehoming in Finland [34, 43]. From these only one conducted or documented the socialization phase in the facility [43]. The socialization is a step to make entering the new home easier for the dogs. Teaching them how to accept a collar and a leash and how to react to novel situations, but any preparation phase provided by the institution is beneficial [43, 64]. It can be said that in the research conducted by Skidmore T et al (2024), the rehoming process is complicated and labor-intensive for the staff of the laboratory [3].

When it comes to the process of rehoming the beagles in the two studies similarities could be seen. Firstly, both worked together with local animal welfare organizations. One study from Germany worked with a welfare organization stationed in Germany, while the other study was in Finland and therefore joined a Finnish welfare organization [34, 43]. In the study from Germany, the dogs were obtained from Germany, Italy, and the US and consisted of a larger number of dogs compared to the 16 dogs that were released from the University of Helsinki evaluated in the other paper [34, 43]. In both studies, the selection process of the new owners was handled by the animal welfare organization. For advertising the dogs and the possibility for the public to gain information on the adoption project the beagles were mostly made via the internet. The interviews, telephone calls, and questionnaires were used to determine the adequacy of the new owners. A guarantee for a successful adoption can never be given even if the selection work was flawless, as unforeseen circumstances can arise, for example, the development of allergies and or change in family circumstances. Still, it is important not to have too high demands on the new owners as the process is already very hard and can be even hardened with utopia-like expectations towards the new owners.

After the relocation of the animal to its new home the animal welfare organization must continue to give further assistance to the owners. Laboratory animals can come with behavioral challenges and overwhelmed owners and dogs can run into multiple problems when not guided correctly. Commonly problematic behaviors of dogs are fear of new people, separation anxiety, or traveling by car [34, 43, 71]. Not only the behavior of the animal can lead to problems but also uneducated decisions. For example, using the wrong harness or collar in an unexpected moment can result in a dog running away, and depending on the social status of the dog with

humans it can be hard to retrieve this dog. Normal dogs don't have these issues and when adequately socialized and trained by a breeder or shelter staff the dogs tend to not show these tendencies of running away. The owners should be informed about behavioral and medical problems they might encounter when adopting and consider the workload it can take to train the dog. It is also advised that among the community of the animal welfare organization or if the institution decides to take care of the rehoming process itself be able to offer a dog trainer or behaviorist. In the studies, most of the owners trained the dogs themselves and did not consult a dog trainer. Mostly the adopters already owned a dog at a certain point in time or a dog was already existing in the family. The new dog benefited from owners with experiences which is advised when it comes to selecting potential adopters. Furthermore, an already existing dog in the family can give guidance to the dog and help to deal with unfamiliar situations. Even if no problems occur in the beginning issues can develop over time and behavioral issues tend to present themselves even after time has passed as the dog gains more confidence and trust.

It is also good for the animal welfare organization to stay in touch with adopters this gives them a source for success stories that they can share with newly interested potential adopters. Transparency is very important for the people and helps to build trust in the organization and the facility and aids the reputation if rehoming programs are performed well.

When it comes to medical advice owners should be informed about vaccination programs, spaying, neutering, and other necessary medical care (deworming, anti-ectoparasitic treatment) [34, 43, 64]. The new owners of the animals also enjoy the company provided by the new animal and usually state in the survey how happy they are about participating in the rehoming program [34, 43, 63, 65]. As stated, multiple times in this paper research is conducted concerning the entire rehoming process, to receive better statistics more research in this field should be done. The interest in this topic is still increasing in the public eye and is worth exploring further. Furthermore, exact figures on how many dogs are rehomed should be assembled and those data could have been beneficial for this literature review.

To tie this research more to this University, it can be said the University of Veterinary Medicine of Budapest's rehoming program is an indirect rehoming program. Also, it can be said that the procedures of the rehoming program are comparable with larger-scale organizations [46, 47].

The University tries to be transparent with the students on the origin of the dogs and if they know the trials that have been conducted. Over the years a good foster program, enrichment, and socialization programs as the possibility for students to walk beagles have been established. Transparency in the form of social media presentations was improved and the students got the opportunity to follow the dogs from entering the campus until the adoption day. Not only

medical but experience guidance is given by students who have already fostered beagles and of course the veterinarians responsible for the project.

Follow-up success fosters stories that are shared among the students and increase the knowledge about the project among the students. Overall, this small-scale program offered by the university gives a good insight for students interested in the field of animal welfare and the opportunity to participate in it.

## 7. Summary

The topic of rehoming beagles can be very emotional. For humans, the dog is a companion animal and is present in a rising number of households, evolving from a pet to a family member, which can be the reason the average would jump to the conclusion that laboratory dogs should all be rehomed. Generally, rehoming aids in achieving the three Rs, specifically refinement, which means that a dog is only used for a shorter period and can be rehomed earlier. Another aspect of the three Rs is the reduction of the number of animals which can be reached by reusing animals. Reusing animals can be beneficial but also comes with problems as not every animal can be reused, so rehoming is still a valuable component of reducing animal procedures and could be added as the 4<sup>th</sup> R into this principle. Rehoming begins in the facility and requires dedicated staff members who encourage the rehoming process and find time to start socialization programs for the dogs. Evaluating the situation objectively, it can also be said that a person who needs to perform experimental handling with an animal, and has a bond with this animal can be complicating the process. The rehoming process can be beneficial for the staff's morale and ensure value for the life or time that is sacrificed by the animal. Also, in the case of the dogs, the exact numbers of rehomed dogs or euthanized dogs are unclear. This is unsettling as the EU Directive established in 2010 allows research facilities to rehome beagles after the studies; additionally, LASA issued a guide for guidance on rehoming laboratory beagles. These programs are not beneficial for all institutions as the condition of the dog is monitored very critically by the public, who tend to be biased on the topic. Following the socialization in the facility, the search for a new owner continues the rehoming process. This can be difficult for multiple reasons. Firstly, the dogs can have behavioral issues after a life with hardly any stimuli and social education, a challenge not everyone wants to take on followed by the suitability of contestants. To judge the suitability, great care should be taken but also not to apply to hard-to-reach standards as this can overcomplicate the process. If an adequate owner is found, follow-up guidance should be provided to the owner. This can be assistance with behavioral issues by behaviorists or a dog trainer or expertise on how to handle the dog, for example, the correct leash and harness. For the laboratories, it is easiest to hand the external process to animal welfare organizations that ideally specialize in laboratory beagles. The focus of this literature review was to evaluate whether rehoming can lead to a better life for the beagles, and although there are only a few studies available the consensus overall is: yes, rehoming is beneficial for the life of the dogs after the finished research.

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