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Dear Steven Peterson, Kent Fothergill, Srijana Shrestha, Anna Senninger, and other concerned parties,

We write to you in reference to Document 87 FR 73297, Docket EPA–HQ–OPP–2017–0750; FRL–10219–01–OCSPP, pages 73297-73298, titled *Pesticide Registration Review; Proposed Interim Decisions for the Rodenticides; Notice of Availability* and published on 2022-11-29, covering Docket ID Nos. EPA-HQ-OPP-2015-0767, EPA-HQ-OPP-2015-0768, EPA-HQ-OPP-2016-0077, EPA-HQ-OPP-2015-0778, EPA-HQ-OPP-2016-0139, EPA-HQ-OPP-2015-0769, EPA-HQ-OPP-2015-0770, EPA-HQ-OPP-2015-0754, EPA-HQ-OPP-2015-0481, EPA-HQ-OPP-2015-0777, and EPA-HQ-OPP-2016-0140 (Case Nos. 2755, 2760, 2765, 2100, 7600, 7630, 7603, 3133, 0011, 2205, and 0026).

Specifically, we wish to comment in emphatic support of the following Proposed Interim Decisions[1]:

- Classifying all SGARs [Second-Generation Anticoagulant Rodenticides], strychnine and zinc phosphide products as restricted use pesticides (RUPs).
- Classifying as RUPs all FGAR [First-Generation Anticoagulant Rodenticides], bromethalin and cholecalciferol products sold in packages larger than one pound.

As well as on several related items of broad relevance to the regulatory landscape of the above rodenticides. We are two authors with extensive training in the ecological, environmental, biomedical, and veterinary sciences from several of the world's leading academics institutions. We have professional experience working with rodent models in both research and veterinary capacities, as well as personal experience interacting with wild rodents (as avid outdoor enthusiasts) and with rodent infestations at home. We have performed many rodent euthanasias.

As a concession to space and to better complement others' comments, we will focus on the effects that rodenticides considered here have on their primary targets, with brief mention of other considerations. This comment will be structured according to four general sections:

1. <u>Rodent Lives.</u> Where we briefly review recent scientific understanding of rodent cognition and emotional capabilities.
2. <u>Rodent Deaths.</u> Where we briefly review recent scientific understanding of the effects of rodenticides considered here, with comparison to perspectives in the lab animal veterinary field.
3. <u>Rodent Alternatives.</u> Where we briefly review alternative methods for rodent population

management.

4. Rodent Actions. Where we make two specific and one general suggestions in light of the above, urging further restrictions and enforcement of restrictions on the sale and use of considered rodenticides.

Thank you for providing this opportunity for us to comment on these Proposed Interim Decisions, that we may leverage our expertise to advocate on behalf of interests belonging to those unable to advocate for themselves.

1. Rodent Lives.

Rodents, especially mice and rats, number among the best studied taxa on our planet. Their use as research models, both biomedical and basic, endow us with as good an understanding of their cognition as may be currently possible for any non-human animal. It is from this extensive body of work that we know them to not only feel their own pain[2] but that of their cagemates'[3], and that this empathy can motivate them to action[4]. They feel joy anticipating play[5] or when stimulated[6], regret[7] and trauma[8] after tragedy, and a sense of body ownership[9], metacognition[10], and metamemory[11]. They share in our biases[12] but dislike unfairness[13,14] and prefer prosocial rewards[15]. They hope when they're awake[16] and dream when they're asleep[17], they outperform humans on certain cognitive tasks[18], and they are so neuroanatomically and behavioraly similar to ourselves as to serve as models for autism[19,20], ADHD[21,22], depression[23,24], anxiety[25,26], schizophrenia[27,28], and many other psychiatric phenotypes[29], though with admittedly varied portability. And while these results do not generalize across even all mice and rats, much less the >2,000 member species of Rodentia[30] (pursuant to 7 U.S.C. §136), their demonstration in so narrow a subset of the order is less likely to be a product of inability as of opportunity.

2. Rodent Deaths.

In the laboratory setting we require that rodent culling, both individually and at scale, be carried out by trained personnel to minimize not only pain, but also sources of potential distress such as the "elimination of established scent marks"[31]. Another essential consideration is speed. Even opioids, among the most powerful painkillers, are judged unacceptable because they are too slow acting[31]. And when new evidence arises, we revise recommendations according to these criteria[32] so that animals are granted the best euthanasia within our means.

Anticoagulant, neurotoxic, hypercalcemic, and other rodenticides covered under this decision do not result in a fast, painless, or *good* death. Rather, we have strong evidence they elicit tremendous amounts of suffering in both rodents and in many non-target animal species[33] through intended or unintended secondary poisoning via ingestion of either treated bait or dead and dying rodents. For anticoagulant rodenticides alone, these include but are not limited to "dogs, horses, cats... deer, polecats, owls, eagles, falcons, ducks, martens, foxes, etc... and humans"[34], and have been further detected in many additional classes and orders of animal[33]. Neither are they fast, killing over hours, days, or weeks depending on the species, animal, rodenticide, and dose (eg from 0.5-2 weeks after exposure in the case of FGARs and SGARs[35]). We know their effects in rodents and other taxa quite well, often from direct observation of animal condition and behavior upon poisoning. And while we can't directly question non-human animals' on their experiences, we can supplement this knowledge with human observation and report, following Item IV in the *U.S. Government Principles for the Utilization and Care of Vertebrate Animals Used in Testing, Research, and Training*: "IV. Proper use of animals, including the avoidance or minimization of discomfort, distress, and pain when consistent with sound scientific practices, is imperative. Unless the contrary is established, investigators should consider that procedures that cause pain or distress in human beings may cause pain or distress in other animals."[36]

In the case of anticoagulant rodenticides comprising the majority considered here, on-target death by acute coagulopathy and its sequelae is characterized by "vomiting and hematemesis (vomiting of blood), nasal bleeding, vaginal bleeding, and ear bleeding, dysuria, and hematuria"[34], and for related anticoagulant rodenticides, "paresis then full paralysis of all limbs, which continue[s] until death... conscious but unmoving during most of this period, except for some occasionally pushing or pulling themselves along the floor."[37]. Humans, meanwhile, "can experience localized muscle pain[38], joint pain[39] and potentially severe abdominal pain caused by intra-peritoneal, mesenteric or ovarian bleeding[38–43]. Haemorrhages within the lungs, kidneys, spinal cord, orbits of eyes and gonads are also painful[44]. Bleeding into lungs or airways can cause further distress by making breathing difficult[44], and poisoned humans may also experience dizziness, localized reduced motor strength, the inability to urinate, and sometimes even paraplegia[38,39]... plus gastrointestinal, orbital, intra-cranial and a variety of other haemorrhages judged 'capable of producing severe pain'[45]."[46].

Other common rodenticides are no gentler in their mechanism of action. Zinc phosphide kills by evolving phosphine gas in the stomach, which is then absorbed into the blood, ultimately causing heart and lung failure. Before their deaths, animals experience "respiratory distress[45,47–49], diarrhoea[50], excitation[48], and lassitude and depression[45,47–49]. Poisoned rodents may kick at their abdomens with their hind feet[51] and show postural changes indicative of pain[45]... convulsions and paralysis[45,52]"[46]. In humans, symptoms "include diarrhoea and vomiting[52], both often very severe, black and smelling of phosphorus[52–54]. 'Excitement'[52] and respiratory distress are also common[45,54–56]. Victims report experiencing nausea, headaches, vertigo, a feeling of coldness, chest tightness and abdominal or stomach pain[45,52,57,58]. As the poisoning develops, this abdominal or retrosternal pain tends to become burning and very severe[45,53,54,56,57]"[46].

Cholecalciferol, or vitamin D_3, kills by "hypercalcaemia, kidney failure, and/or the side-effects of soft-tissue calcification, particularly metastatic calcification of the blood vessels and nephrocalcinosis"[45,47,59]. Non-human animals experiencing the above show "lethargy and severe depression, anorexia, vomiting and polydipsia[60,61]... gastrointestinal haemorrhage, myocardial necrosis, and calcification of vascular walls[62]... [and] calcification of the kidneys and stomach[63]", and humans "typically show vomiting, anorexia, weight loss, irritability and depression[45,47], and experience severe, frequent (if transient) headaches, nausea, and pain and intense discomfort in other parts of the body[45]."[46].

Strychnine kills with paralysis, severe pain, seizure, and eventual suffocation[64,65].

These are not *good* deaths.

3. Rodent Alternatives.

Safe, effective, specific, and *overwhelmingly* less painful methods of rodent population control have become increasingly available, though many still face scientific and regulatory challenges. Most of these involve modulating the creation of new rodent lives rather than the lethal removal of existing ones. Work on rodent fertility control is actively ongoing[66], with immunocontraceptive methods[67,68] receiving particular attention in rodents over decades of research[69–72], and plausibly effective across multiple rodent generations[72]. Other rodent fertility control methods include implanted, injected, ingested agents[72]. Of these, the latter most directly substitute for poisoned bait, with ContraPest®-treated bait (EPA-approved for use on Norway and roof rats) having been found effective in both laboratory[73] and field[74] conditions, with successful deployment in Phoenix, AZ[75], New York, NY[76], Los Angeles, CA[77], Chicago, IL[78], and many other cities across the country.

Other avenues also avail us. Careful trash and other resource management[79–81] in both urban and rural areas may reduce carrying capacities and regulate rodent populations as they naturally depress their own fecundity. Physical mechanisms such as captive-bolt traps may represent a much faster and less painful alternative[82] to the above rodenticides when lethal measures are judged to be necessary, paralleling S2.2.2.3 of the 2020 AVMA Guidelines[31] describing acceptable physical methods of rodent euthanasia. Moreover, these often produce ample positive externalities: fertility control can "reduce the horizontal transmission of diseases by causing less social disruption than culling and decreasing contact rates between males and females, and also decrease vertical transmission through removing the parent-offspring infection pathway"[72], reducing risks of rat-human zoonosis, and few would oppose cleaner streets and alleyways free from decaying rodent food sources. Though these rodenticide alternatives are not without costs, including both greater expense and time-to-effectiveness, ongoing R&D in chemical synthesis and other technologies, especially incentivized by wider adoption, will eventually lower the former, and months pass quickly when contextualized within a long-term, integrative population management strategy.

4. Rodent Actions.

In certain settings, rigorous evaluation of the balance of harms may still advise the use of those rodenticides considered under these Proposed Interim Decisions. Sometimes, alternative options are simply unfeasible or unsuitable, and we do not believe total restriction to be an advisable solution at this time. Instead, we urge two specific actions:

1. reclassification of those rodenticides (Bromethalin, Chlorophacinone, and Diphacinone[83]) that are currently "unclassified" and implicitly "for general use" as "Restricted Use Pesticides", *in addition to* other rodenticides proposed for classification here[1]. Commercial availability of these products allowing for their irresponsible use by untrained purchasers likely results in tremendous, preventable harm[81], and requiring that administration be carried out by certified applicators[83,84] will extensively mitigate that harm, much like requiring training in euthanasia methods in the laboratory setting[85].
2. enforcement of the EPA's 2008 *Rodenticides Risk Mitigation Decision*[86] to include online stores as falling under "other general retailers". The 2008 decision lists out multiple examples of retailers prevented from selling Restricted Use Pesticides: "hardware and home improvement stores, grocery stores, convenience stores, drug stores, club stores, big box stores, and other general retailers". In the 15 years since the decision, e-commerce has grown from 3.3%[87] of total US sales to over 13% in 2021[88], and Restricted Use Pesticides are readily available for sale at major online stores (eg Amazon.com, the second largest retailer in the US[89]). What may have been an understandable oversight then is a massive subversion of the 2008 Decision now, as online commerce has expanded to greater and greater market shares.

Finally, we make a more general proposal: look to the only other industry that manages and culls rodent populations at comparable scale (in the billions per decade[90]) — laboratory animal research and medicine[91] — and note the stringent regulations it has adopted with respect to humane endpoints and euthanasia. Essentially all its guiding documents, both national and international, incorporate pain, stress, and time as criteria to prioritize between alternative methods of killing (eg The Animal Welfare Act[92], PHS Policy[93], The US Government Principles[36], The

Guide for the Care and Use of Laboratory Animals[85], CIOMS International Guiding Principles for Biomedical Research[94], and AAALAC International guidelines[95], among others). This *Notice of Availability* states that it “may be of interest to a wide range of stakeholders... [and that] the Agency has not attempted to describe all the specific entities that may be affected by this action”. Excluded from explicit mention are the entities most directly affected, the most relevant and primary stakeholders involved in all legislation pertaining to rodenticide regulation: the rodents themselves, whose interests and concerns lie in safeguarding their own lives and avoiding terrible pain.

Upon consumption of rodenticide-treated bait, rodents will seek familiarity, safety, and shelter. They will hide themselves away, hoping for eventual recovery. We can neither see nor hear them as they lie dying in their burrows or in our walls. That doesn’t absolve us of their suffering, not when we cause it directly and not when we enable it indirectly. **We emphatically urge you to consider effects on rodent welfare[91] when legislating acceptable use of these rodenticides, including them among the stakeholders impacted by these and future Agency decisions.**

Thank you for your time and consideration,

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