

# Reduction of Circulating Microplastic Burden in Companion Dogs Following Administration of a Food-Grade Plastic Adsorptive Compound: A Preliminary Case Series

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## ABSTRACT

Microplastics (MPs) are pervasive environmental contaminants with documented systemic distribution in mammals. Companion dogs share household MP exposure pathways with their owners and may serve as sentinel indicators of environmental burden. We report a preliminary, owner-initiated, single-arm observational case series in which five companion dogs from one household received a companion animal-specific, food-grade Plastic Adsorptive Compound (PAC) at 1 mg/kg body weight twice daily for 42 days. Blood was drawn at baseline and Day 42 and analyzed by an independent third-party laboratory using validated microscopy-based polymer identification. Cohort-level circulating particle count fell from 71 to 23 (-68%) and estimated surface-area burden fell from 554,805 to 125,978  $\mu\text{m}^2$  (-77%); four of five dogs showed count reductions and all five showed surface-area reductions. No adverse effects were observed. Because this report used no control or placebo arm, no randomization, and a single pre/post measurement in one household, these findings cannot establish efficacy and are consistent with-but do not rule out-regression to the mean or unmeasured temporal confounds. We present these results as a preliminary pilot observation, and describe in a larger, crossover, multi-timepoint trial currently underway (n=40, over 180 days) to confirm whether the pattern reported here holds under controlled conditions.

## INTRODUCTION

Microplastics (MPs; <5 mm) are ubiquitous environmental contaminants now detectable in human blood, lung tissue, placenta, breast milk, liver, and brain [1-4]. Their small size enables systemic distribution, and emerging evidence implicates them in oxidative stress, immune dysregulation, endocrine disruption, and cardiovascular injury [5-8]. A 2024 prospective cohort study reported an association between the presence of microplastics and nanoplastics within carotid atheroma plaques and increased risk of myocardial infarction, stroke, or death over 34 months of follow-up; As an observational association, this finding does not establish causation [8].

Companion dogs are exposed to MPs through multiple, overlapping household pathways. Dogs consume commercial pet foods packaged in plastic-lined bags and cans, drink from plastic water bowls, and chew on plastic and synthetic polymer toys. Their proximity to the floor is a further plausible exposure route, as floor-level dust may be enriched in microplastic fibers shed from synthetic carpets, vinyl flooring, upholstered furniture, and clothing; Whether this translates into meaningfully higher inhaled or ingested dose relative to humans in the same household has not, to our knowledge, been

directly measured, and we note it here as a plausible rather than established mechanism. Dogs cannot modify these behaviors or select alternative materials, making them a population of continuous, involuntary MP exposure within the domestic environment.

Dogs have been proposed as sentinel species for environmental health, given shared household exposures with humans and shorter lifespans that may compress the interval between exposure and detectable biological effect [9]. Published data on circulating MP burden in companion animals, and on whether that burden is modifiable, remain limited.

A food-grade PAC was previously evaluated in an open-label, proof-of-concept human study (n=7); 30 days of administration was followed by a mean 74% reduction in measured blood MP concentration, with no adverse events reported [10]. As an uncontrolled pilot study, that report is likewise unable to exclude regression to the mean or temporal confounds. The proposed mechanism is gastrointestinal adsorption of ingested plastics prior to systemic absorption, with possible secondary mobilization of tissue-bound particles; This mechanism has not been directly demonstrated and remains a working hypothesis.

The present report describes an observational, owner-initiated case

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series in which a companion animal-specific PAC was administered to five companion dogs from a single household. We describe this explicitly as a preliminary, single-arm, uncontrolled pilot observation. Its purpose is to report a pattern worth testing rigorously, and to determine whether the results would be similar to the human study.

MATERIALS AND METHODS

Study design and ethical considerations

This was a prospective, owner-initiated, single-arm observational case series of five companion dogs residing in one household. The pet owner and household have no financial, professional, or personal relationship with Pure BioHealth. The owner approached Pure BioHealth independently and elected to administer a companion animal-specific PAC based on an analogous human intervention. All blood draws and supplementation decisions were made at the owner's direction; animals were not recruited, randomized, or subjected to investigator-directed procedures, and there was no comparison or placebo group. Institutional Animal Care and Use

Committee (IACUC) approval was not required under applicable guidelines for veterinary observational case series involving client-owned animals. Written informed consent for publication was obtained from the animal owner.

Subjects

Five adult companion dogs from a single household were included, representing four breeds and both sexes: Belgian Malinois (Isabella, female; Manu, male), Shepherd Mix (Lilly, female), Cane Corso (Louie, male), and French Bulldog (Ferdinand, male). Body weights ranged from 15.8 kg (Ferdinand) to 45.5 kg (Louie); Mean 30.0 kg. Two dogs (Isabella and Manu) were street rescues from Los Angeles temporarily resident in the household; the remaining three were permanent residents. This introduces exposure heterogeneity across subjects that was not otherwise characterized or controlled for. Individual subject identifiers are pseudonyms assigned by the owner. Individual body weights and calculated doses are presented in (Table 2).

Table 1. Per-subject microplastic particle count and surface area burden, pre- and post-intervention.

| Dog       | Pre count | Post count | Δ count | Pre SA (Surface Area) (μm²) | Post SA (μm²) | Δ SA  | Note |
|-----------|-----------|------------|---------|-----------------------------|---------------|-------|------|
| Ferdinand | 29        | 4          | -86%    | 3,30,496                    | 5,969         | -98%  | -    |
| Isabella  | 11        | 0          | -100%   | 41,155                      | 0             | -100% | -    |
| Manu      | 9         | 1          | -89%    | 16,965                      | 314           | -98%  | -    |
| Lilly     | 7         | 7          | 0%      | 30,473                      | 11,624        | -62%  | -    |
| Louie     | 15        | 11         | -27%    | 1,35,717                    | 1,08,071      | -20%  | \$   |
| Total     | 71        | 23         | -68%    | 5,54,805                    | 1,25,978      | -77%  | -    |

**Note:** \$ Louie had a documented single acute ingestion event (remote control) during the study period; Net reductions in both metrics were nonetheless observed. SA=Surface Area; Calculated as  $A=4\pi r^2$  using representative bin radii of 5, 20, and 50 μm for <10 μm, 10-30 μm, and 30-70 μm bins, respectively. This is an exploratory, unvalidated metric.

Table 2. Subject characteristics and individual PAC doses.

| Subject   | Breed            | Sex    | Age/Stage | Body wt (kg) | BID dose (mg) | Total daily dose (mg) |
|-----------|------------------|--------|-----------|--------------|---------------|-----------------------|
| Ferdinand | French bulldog   | Male   | Adult     | 15.8         | 15.8          | 31.6                  |
| Isabella  | Belgian malinois | Female | Adult     | 33.4         | 33.4          | 66.8                  |
| Manu      | Belgian malinois | Male   | Adult     | 34           | 34            | 68                    |
| Lilly     | Shepherd mix     | Female | Adult     | 16.8         | 16.8          | 33.6                  |
| Louie     | Cane corso       | Male   | Adult     | 45.5         | 45.5          | 91                    |
| Mean      | -                | -      | -         | 30           | 30            | 58.2                  |

**Note:** BID=Twice daily. Individual BID dose=Body weight (kg) × 1 mg/kg. Total daily dose=BID dose × 2. Weight range: 15.8-45.5 kg.

Intervention

A companion animal-specific PAC was administered orally at 1 mg/kg body weight twice daily for 42 consecutive days. Given the weight range (15.8-45.5 kg), total daily doses ranged from 31.6 mg (Ferdinand) to 91.0 mg (Louie); Individual doses are presented in Table 2. The formulation, developed by Pure BioHealth (Arroyo Grande, CA, USA), is a species-adapted version of the human PAC product evaluated in Kimless, et al. (2025), containing exclusively FDA GRAS-designated, food-grade ingredients formulated for canine palatability and gastrointestinal transit. No pharmaceutical agents, synthetic polymers, or non-food-grade binders were included. No additional interventions were initiated where the dogs' environment, food, and toys remained the same.

Sample collection and laboratory analysis

Blood samples were collected from each dog at baseline (Day 0)

and after the 42-day intervention (Day 42) by a licensed veterinary professional and submitted to an independent third-party laboratory for MP quantification using a validated microscopy-based polymer identification assay. Particles were enumerated across three size bins (<10 μm, 10-30 μm, 30-70 μm). Baseline and post-intervention samples from a given subject were processed in batched runs to minimize inter-assay variability. There was no blinding of sample timepoint to laboratory personnel beyond standard batched processing, and no repeated baseline measurement to characterize pre-intervention biological variability.

Surface area modeling

To approximate biologically relevant exposure burden as a secondary, exploratory endpoint, particle counts per size bin were converted to estimated surface area using spherical geometry ( $A=4 \pi r^2$ ) and representative bin-midpoint radii (<10 μm →  $r=5 \mu\text{m}$ ; 10-30 μm →

$r=20\text{ }\mu\text{m}$ ;  $30\text{--}70\text{ }\mu\text{m} \rightarrow r=50\text{ }\mu\text{m}$ ), yielding per-particle surface areas of 314.2, 5,026.5, and 31,415.9  $\mu\text{m}^2$  respectively. This model is a simplifying approximation—real particles are not spherical and bin-midpoint radii introduce assumption-driven error—and has not been independently validated against direct surface-area measurement. Results based on this metric should be interpreted as exploratory.

### Statistical approach

Given the observational, single-arm, small-n design, analyses were limited to descriptive within-subject percent change and cohort-level totals and means. No inferential statistical testing was performed, and none is appropriate for this design; no claims of statistical significance are made anywhere in this report.

## RESULTS

### Particle count outcomes

Four of five dogs showed reductions in total circulating particle count following 42 days of PAC administration (Table 1). Reductions among the four ranged from 27% (Louie) to 100% (Isabella); Three dogs (Ferdinand, Isabella, Manu) exceeded 85%. Lilly showed no net change in particle count (7 pre, 7 post). At the cohort level, total particle count fell from 71 to 23 (-67.6%); Mean individual percent reduction across all five subjects was 60.4%. These are descriptive observations in five dogs with no comparison group and should not be read as an estimate of a treatment effect.

Louie experienced a documented acute ingestion event (a remote control) during the study period and nonetheless showed net reductions in both particle count ( $15 \rightarrow 11$ ; 27%) and surface-area burden ( $135,717 \rightarrow 108,071\text{ }\mu\text{m}^2$ ; -20%). We note this as an observation consistent with continued adsorptive activity during the study window; It is equally consistent with normal biological variability, and the single-arm design cannot distinguish between these explanations.

### Surface area burden outcomes (exploratory)

Using the exploratory surface-area model described in Section 2.5, total estimated burden fell from 554,805  $\mu\text{m}^2$  to 125,978  $\mu\text{m}^2$  across the cohort (-77.3%). All five dogs showed reductions on this metric, including Lilly (0% count change; -61.9% modeled surface-area reduction) and Louie (-20.4%). We flag Lilly's case specifically because it illustrates how sensitive this exploratory metric is to the bin-based radius assumptions; A shift of even one or two particles between size bins can produce a large modeled surface-area change without a large change in the underlying data. This metric warrants independent validation and should not yet be treated as a confirmed measure of biologically relevant burden.

### Particle size distribution

Weighted mean particle radius declined in four of five subjects following intervention, most notably in Ferdinand ( $27.2 \rightarrow 8.8\text{ }\mu\text{m}$ ; -68%), indicating a shift toward smaller particle bins post-intervention in this small, uncontrolled sample.

### Safety

No adverse effects were observed or reported by the owner in any subject during the 42-day period. All five dogs completed the full intervention without clinical signs of gastrointestinal intolerance, behavioral change, or other treatment-related concerns. Given  $n=5$  and the absence of a control group, this should be read as a preliminary, reassuring safety signal rather than a formal safety

evaluation.

## DISCUSSION

This preliminary, single-arm case series describes a pattern-reduced particle count and modeled surface-area burden in five companion dogs following 42 days of PAC administration, with no adverse effects observed. We report this as an observation worth testing formally, not as evidence of efficacy. The design cannot distinguish a true treatment effect from regression to the mean, unmeasured temporal or environmental confounds shared across the household, or ordinary biological variability, and we did not include a control or placebo arm, randomization, or a repeated baseline to characterize pre-intervention variability. Any resemblance between the magnitude of change observed here and that reported in the uncontrolled human pilot study [11] should be read as two single-arm observations pointing in the same direction, not as convergent confirmation of an effect; neither study's design supports a causal claim on its own.

The exploratory surface-area metric produced larger apparent effect sizes than particle count alone, and Lilly's case (0% count change, -62% modeled surface-area change) illustrates why: the metric is sensitive to which size bin a small number of particles falls into. We think this metric is worth carrying into a controlled follow-up, alongside—not instead of—raw particle counts, and worth validating independently against direct measurement.

Louie's documented acute ingestion event during the study window is presented descriptively; we did not treat it as evidence that the compound provided reserve adsorptive capacity, since a single-arm design with no control provides no basis for that inference.

Companion dogs plausibly share aspects of their MP exposure environment with their owners, and we think this supports the value of a properly controlled companion-animal study, both for animal health and as a possible sentinel signal for shared household exposure. We stop short of a one health efficacy claim on the basis of this report.

## LIMITATIONS

This report has substantial limitations that should be weighed heavily by the reader. The sample size ( $n=5$ ) is small and drawn from a single household, limiting both statistical power and generalizability. There was no control or placebo group, no randomization, and no blinding of intervention status, so the design cannot rule out regression to the mean, spontaneous temporal variation, or shared household/environmental changes over the 42-day window as alternative explanations for the observed changes. Only a single baseline measurement was obtained per subject, so pre-intervention biological variability was not characterized. Baseline diet composition, pre-existing health conditions, and breed-specific gastrointestinal characteristics were not formally recorded. The surface-area metric is an unvalidated exploratory model. Given all of the above, this report does not permit causal inference about the effect of PAC on circulating MP burden in dogs and should be interpreted as a preliminary pilot observation.

### Future directions

These preliminary observations are intended to justify, not substitute for, a properly controlled trial. A larger, randomized, controlled trial is currently underway: 40 companion dogs across multiple households, randomized to an active or untreated comparator arm with crossover at Day 90, and blood drawn at Day 0, 45, 90, 135, and 180 to test both replication of the effect in the newly treated

group and reversal in the group withdrawn from treatment, rather than relying on a single-arm pre/post estimate. Future work should also formally characterize baseline exposure contributors (pet food packaging, bowl material, toy composition, flooring type), include dose-ranging across body-weight classes and breeds, independently validate the surface-area metric, and incorporate inflammatory and metabolic biomarkers to evaluate whether any reduction in circulating MP burden is associated with measurable clinical benefit.

## CONCLUSION

This preliminary, uncontrolled case series describes a reduction in measured circulating microplastic particle count and modeled surface-area burden in four to five of five companion dogs following 42 days of a food-grade plastic adsorptive compound, with no adverse effects observed. Given the single-arm design, small single-household sample, and absence of a control group, these findings should be treated as preliminary rather than as evidence of efficacy. They are reported here to motivate, and are being followed by, a larger controlled crossover trial (n=40, over 180 days) capable of supporting a causal claim.

## AUTHOR CONTRIBUTIONS

Conceptualization, D K ; Data curation, D K and J P K; Formal analysis, J P K; Methodology, D K, J P K and J Z; Writing-original draft preparation, D K; Writing-review and editing, J P K and J Z; Supervision, D.K. All authors have read and agreed to the published version of the manuscript.

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## INSTITUTIONAL REVIEW BOARD STATEMENT

This study was conducted as an owner-initiated, client-directed observational case series involving no experimental manipulation of animals. All blood draws and supplementation decisions were made at the direction of the pet owner. IACUC approval was not required for this observational report under applicable guidelines governing veterinary case series involving client-owned animals. The study was conducted in accordance with applicable ethical standards for veterinary observational research.

## INFORMED CONSENT STATEMENT

Written informed consent for publication of the observational findings was obtained from the animal owner.

## DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article are available from the corresponding author upon reasonable request.

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## CONFLICTS OF INTERESTS

D.K, J P K, and J.Z. are affiliated with Pure BioHealth, the developer of the plastic adsorptive compound evaluated in this study. This relationship is disclosed in full transparency. The pet owner and household are entirely independent of Pure BioHealth and have no financial, professional, or personal relationship with the company. The funders had no role in the design of the study; In the collection, analyses, or interpretation of data; In the writing of the manuscript; or in the decision to publish the results.

## REFERENCES

1. Leslie HA, Van Velzen MJ, Brandsma SH, Vethaak AD, Garcia-Vallejo JJ, Lamoree MH. Discovery and quantification of plastic particle pollution in human blood. *Environ Int.* 2022;163:107199.
2. Ragusa A, Svelato A, Santacroce C, Catalano P, Notarstefano V, Carnevali O, et al. Plasticenta: First evidence of microplastics in human placenta. *Environ Int.* 2021;146:106274.
3. Jenner LC, Rotchell JM, Bennett RT, Cowen M, Tentzeris V, Sadofsky L. Detection of microplastics in human lung tissue using  $\mu$ FTIR spectroscopy. *Sci Total Environ.* 2022;831.
4. Roslan NS, Lee YY, Ibrahim YS, Anuar ST, Yusof KM, Lai LA, et al. Detection of microplastics in human tissues and organs: A scoping review. *J Glob Health.* 2024;14:04179.
5. Kadac-Czapska K, Osko J, Knez E, Grembecka MM. Oxidative Stress-Current Problems and Prospects. *AOX.* 2024;13:579.
6. Li Y, Tao L, Wang Q, Wang F, Li G, Song M. Potential health impact of microplastics: A review of environmental distribution, human exposure, and toxic effects. *EHS.* 2023;1(4):249-257.
7. Campanale C, Massarelli C, Savino I, Locaputo V, Uricchio VF. A detailed review study on potential effects of microplastics and additives of concern on human health. *Int J Environ Res Public Health.* 2020;17:1212.
8. Kalkman DN, Renkens MP, Grundeken MJ. Microplastics and nanoplastics in atheromas. *N Engl J Med.* 2024;390:1726.
9. Wright SL, Kelly FJ. Plastic and human health: A micro issue?. *Environ Sci Technol.* 2017;51(12):6634-6647.
10. Kimless D; Kennedy JP; Zand J. Reduction of systemic microplastic and nanoplastic burden using a food-grade Plastic Adsorptive Compound (PAC): A proof-of-concept human study. *Glob J Lif Sci Biol Res.* 2025;10:1000102.
11. Koelmans AA, Nor NH, Hermesen E, Kooi M, Mintenig SM, De France J. Microplastics in freshwaters and drinking water: Critical review and assessment of data quality. *Water Res.* 2019;155:410-422.